

Installation and Operation Guide

DMR Repeater

SBR8040/SCR8040/SER8040



sepura

Going further in critical communications



General

This guide contains the installation and basic operating instructions for the DMR Repeater models SBR8000, SCR8000 and SER8000. This guide does not contain information relating to the installation of accessories such as the antenna and duplexer. Refer to the installation instructions supplied with these accessories for further safety and installation instructions.

Disclaimer notice

Sepura's policy is to continually improve its products. The features and facilities described in this document were correct at publication, but are subject to change without notice.

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The logo for Sepura, featuring the word "sepura" in a bold, lowercase, sans-serif font. The letters are black and have a slight shadow effect, giving them a three-dimensional appearance. The logo is positioned on the left side of the page, below the contact information.

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Safety

Read these safety instructions carefully.

Attention!

This product is restricted for occupational use and is not intended or authorised for use by the general population.

It is the responsibility of the person operating the product to ensure that it is operated safely at all times, and that local laws and regulations governing the usage of Radio Frequency (RF) products are observed.

Users must be trained to operate this product safely. Their personal safety could be affected if they do not understand how to operate this product correctly.

CAUTION! Product weighs 12.5 Kg, take care when lifting.

Exposure to RF energy

Sepura designs and manufactures products to meet strict guidelines and international standards relating to Radio Frequency energy and the potential health risks associated with using such products.

This product contains radio transmitters and receivers that receive and transmit Radio Frequency (RF) signals when switched on. The antenna radiates RF energy only when transmitting and not in standby mode.

Users should be informed of the potential health risks associated with long term exposure to RF energy by their employer.

RF energy interference with electronic equipment

Some personal medical devices, such as hearing aids and pacemakers, can be affected by RF energy. Always consult your

service provider or the manufacturer of the medical device before using RF wireless devices.

Accessories

Sepura products have been tested to meet strict guidelines for personal safety and operational conditions. Only accessories approved by Sepura are recommended for use with this product.

Always read the instructions supplied with the accessory for additional safety instructions.

Unauthorised modifications to the product could cause the product to become non-operational and void any product warranty.

The use of non-approved accessories may invalidate any product warranty and may compromise the product safety ratings.

Servicing

Do not attempt to dismantle this product.

Servicing and repairs to this product must be performed by trained service technicians at Sepura approved service centres.

CAUTION! This product has double pole/neutral fusing.

FCC NOTICE

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Radiation Exposure Statement: This equipment complies with FCC radiation exposure limits set forth for a controlled

environment. The antenna should be installed and operated with minimum distance 1.0m from human body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

IC Warning

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence.

L'exploitation est autorisée aux deux conditions suivantes:

- (1) l'appareil ne doit pas produire de brouillage, et
- (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

The term "IC:" before the certification/registration number only signifies that the Industry Canada technical specifications were met. Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This radio transmitter (identify the device by certification number, or model number if

Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each

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antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (identifier le dispositif par son numéro de certification ou son numéro de modèle s'il fait partie du matériel de catégorie I) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

IC Radiation Exposure Statement: This equipment complies with IC RF radiation exposure limits set forth for an controlled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. The antenna should be installed and operated with minimum distance 1.0m from human body.

Regulatory



Sepura declares that this product is compliant with the essential requirements and other relevant provisions of the European R&TTE directive 1999/5/EC relating to radio and telecommunications terminal equipment and the mutual recognition of their conformity. This product is also compliant with directive 2011/65/EU having been designed and manufactured to the RoHS requirements.

Disposing of this product



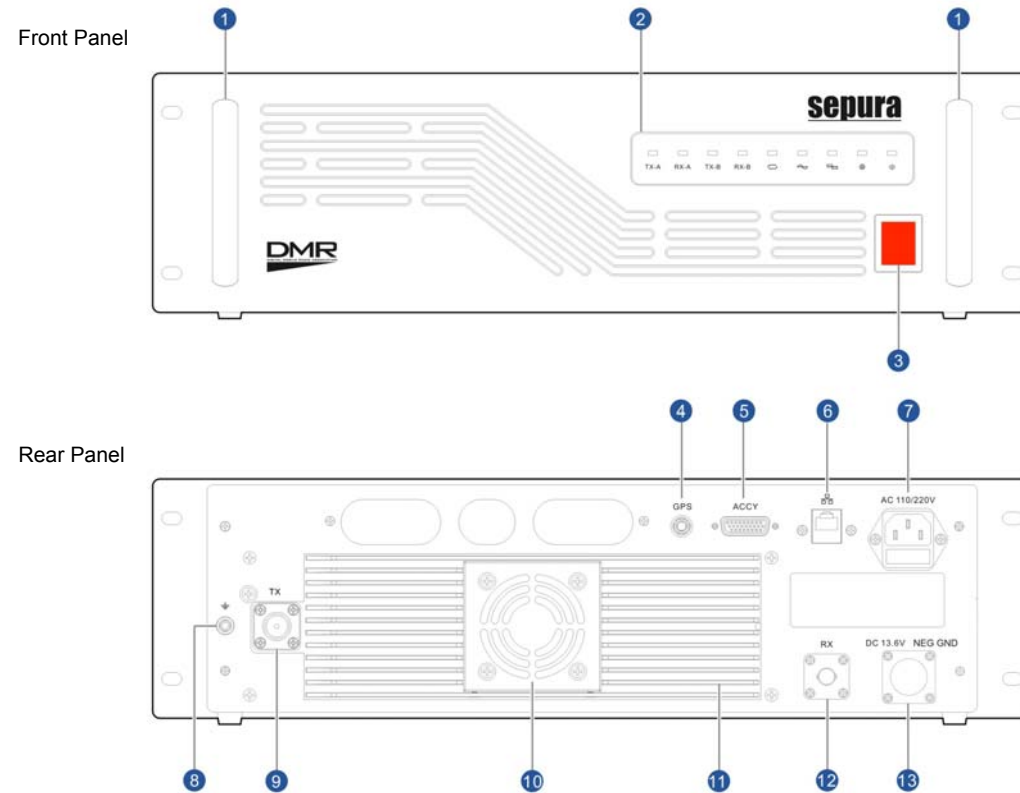
This symbol on the product or its packaging indicates that this product must not be disposed of as household or commercial waste. Some countries have set up collection and recycling systems for waste electrical and electronic products. By ensuring that this product and its packaging is disposed of correctly, you will help prevent potentially negative consequences for the environment and human health, and help conserve natural resources. Please dispose of your waste product according to your national and local regulations. Contact Sepura or your Service Provider for information about disposing of this product in your region of the world.

Technical specification

Frequency Range	400-470 MHz
Dimensions (WxDxH).....	482.5 x 338.5 x 132.5 mm (3U)
Weight.....	12.5 Kg
Power Supply AC.....	100-120V@2.5A 50/60 Hz 200-240V@1.5A 50/60 Hz
Power Supply DC.....	10.8 – 15.6V@15A
DC Fuse.....	13.6V15A
AC Fuse.....	2.5A 250V AC, 5x20mm
Fuse Type	HRC ceramic, Time lag (T)
Power Rating	240W
Transmitter Power Output.....	40W
Working temperature range	-30 to 60°C (-22 to 140°F)

For more technical information about this product, refer to the product technical datasheet available from our website.

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Controls, connectors and components






Refer to the illustration for the location of the following controls, connectors and buttons.

- (1) Handles
- (2) Status indicators
- (3) Power switch
- (4) GPS antenna connector
- (5) Accessory connector
- (6) Ethernet (RJ45) connector
- (7) AC power input connector with fuse holder
- (8) Grounding point
- (9) Transmit antenna connector (N-type)
- (10) Fan
- (11) Heat sink
- (12) Receive antenna connector (BNC)
- (13) DC connector

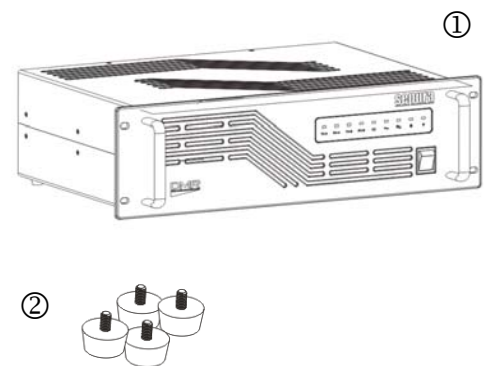
Status indicators

The Repeater has a series of LEDs on the front panel that indicate various operational states.



LED	Description
TX-A	Indicates slot 1 is transmitting
RX-A	Indicates slot 1 is receiving
TX-B	Indicates slot 2 is transmitting.
RX-B	Indicates slot 2 is receiving
	Repeater mode. When illuminated, the repeater is active. When the repeater is inactive, the LED is off.
	Analogue mode. For analogue or mixed signals the LED flashes when active. When inactive the LED is off.
	Digital mode. For digital or mixed the LED flashes when active. When non-active the LED is off.
	Alarm mode. Illuminates when there is a problem with the repeater. See Basic Operation.
	Illuminates when the repeater is switched on.

Unpacking



- (1) DMR Repeater
(2) Desk mount feet with screws (4 pieces)

Unpack the contents of the box and ensure that all items are received in good condition. If any of the goods are damaged or not supplied, notify your Service Provider within 10 days of receipt of the equipment.

Accessory information

Sepura supply a range of accessories for this product. Contact your Service Provider or visit our website for a full list of accessories.

Accessory	Part No.
Wall mount bracket	300-01071
AC Power cable (UK)	300-01139
AC Power cable (EU)	300-01141
AC Power cable (US)	300-01138
AC Power cable (AUS)	300-01140
Repeater Battery Backup cable	300-01067

Installation

Guidelines and recommendations

It is important that the repeater does not exceed the working limits detailed in the technical specification section of this guide.

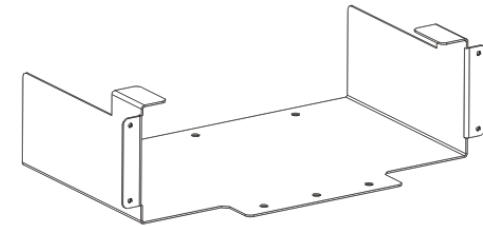
When rack mounting the repeater, ensure sufficient air flow to prevent overheating and secure the unit within the rack system. Cabling should be carefully routed and secured to prevent connections becoming loose.

When desk mounted, always attach the four desk mount feet to the repeater. The desk must have a flat level surface. The repeater creates low level background noise and it is recommended that it is not located in an office environment.

It is recommended that when wall mounted, it must be positioned so that it is clearly visible to personnel to reduce the risk of personal injury by collision. Ensure sufficient air flow to prevent overheating. Cabling should be carefully routed and secured to prevent a trip hazard and connections becoming loose.

The repeater has a battery backup facility that maintains service in the event of an AC power supply failure. It is recommended that both AC and DC power supplies are connected to the repeater to prevent loss of service. If the AC power supply fails, the repeater will shut down and reboot using the DC power supply. Time taken to reboot using the DC supply is typically 60 seconds. When the AC supply is restored, the repeater will switch to the AC supply automatically without a reboot.

Wall-mount bracket installation



The wall-mount bracket is supplied with the following items:

Item	Qty
ST6 x 35 expansion screw	6
M5 x12 screw	4
Plastic plug	6

Only attach the wall bracket to a solid wall using the fixings supplied.

Use the bracket as a template to position the holes on the wall. Ensure that the bracket is level. Use a small punch or pencil to mark the position of the holes on to the wall.

Drill 6mm diameter holes on the wall in the positions marked and drill to a depth to suit the length of the plastic plugs and screws. Insert the plastic plugs into the holes.

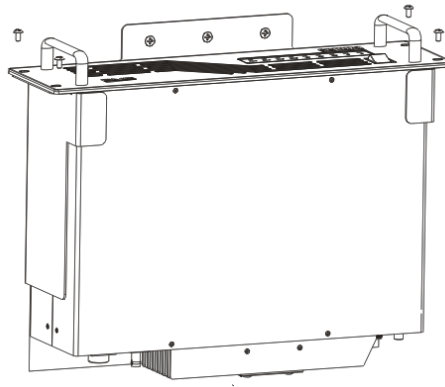
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Hold the bracket securely, keeping it level. Secure into position using the ST6 x 35 expansion screws. Ensure that the bracket is secure and level.

Remove the desk mount feet (if fitted) from the repeater.

With the top of the repeater against the wall, slide the repeater into the bracket.

Secure the repeater to the wall bracket using the four M5 x 12 screws as shown.

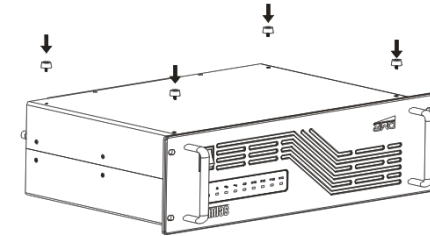


Attaching the desk mount feet

If the repeater is installed onto a desk or bench, the four screw type desk mount feet, supplied with the product, should be attached.

Using a soft cloth or rubber mat to protect the external surfaces, place the repeater with the underside facing upwards, onto a flat surface.

Secure the feet into position using the screws supplied.



Connections

All connectors are located on the back panel of the repeater. Ensure that the cables are routed so that they are kept well clear of the antenna cable.

Route cables carefully to eliminate the possibility of damage by sharp edges. Ensure all cabling is secured and routed to avoid the risk of a trip hazard.

AC power supply

Connect AC power supply to the 110/240V AC power input connector.

Connect the repeater grounding point to an appropriate earthing point.

DC power supply

The Repeater Battery Backup cable (optional) is required to connect the repeater to the DC power source.

Connect the repeater grounding point to an appropriate earthing point.

Connect the cable to the DC connector on the repeater.

Connect the red wire to the positive terminal on the DC power source.

Connect the black wire to the negative terminal on the DC power source.

If the power cable needs to be shortened, it must be shortened from the DC power source connection end. A fuse must be fitted to the positive line (red wire) when the cable has been shortened. A new fuse holder must be fitted (not supplied) because the existing fuse holder cannot be reused. The fuse

must be positioned close to the DC power source positive terminal.

CAUTION! Failure to connect the wires to the correct terminal of the battery or power supply may damage the product and void any warranty.

CAUTION! DO NOT extend the Repeater Battery Backup cable. This will affect the backup operation.

Antenna

In order to reduce the risk of RF burns, the antenna must always remain connected whilst the equipment is switched on. Under no circumstances should the antenna be connected or disconnected whilst the equipment is switched on. Do not touch the antenna when the repeater is switched on.

CAUTION! Do not operate the repeater without an appropriate RF load attached.

Basic operation

Power on/off

To switch the repeater **on**, operate the Power on/off switch. The Power on/off status indicator illuminates and the repeater runs a start-up test routine that takes approximately 60 seconds. The Alarm indicator illuminates for the duration of the test. On completion of the test routine, the Analogue mode or Digital mode indicator (depending on the selected active channel preference) illuminates.

To switch the repeater **off**, operate the Power on/off switch.

Voice and data transfer

The repeater uses different frequencies when receiving and transmitting. Received signals that are weak due to attenuation are amplified and transmitted at a higher strength than received.

When transmitting, the repeater mode indicator illuminates. If the repeater is transmitting an analogue signal, the Analogue mode indicator flashes when transmitting. If the transmitting signal is digital the Digital mode indicator flashes when transmitting.

The frequency and DCS/CTCSS for analogue signals, is configured using the DMR Manager software.

Alarm mode

The Alarm indicator on the front panel illuminates when certain operational states warrant. When the repeater is in start-up mode, the LED remains illuminated for the duration of the start-up routine (approx. 60 seconds).

LED state	Alarm condition
Illuminated for more than 60 seconds	The internal temperature exceeds the working limits. or Rx and Tx PLL (Phased Lock Loop) have failed. or Tx VSWR (Voltage Standing Wave Ratio) is incorrect.
Flashing once every second	Rx PLL failure.
Flashing every two seconds	Tx PLL failure.

Configuring the Repeater

The repeater is configured using the DMR Manager software run from a computer connected directly to the repeater or over a network.

Connect a standard LAN/WAN cable (RJ45 connector) to the Network connector on the repeater with the other end connected to either a computer or network connection.

The default IP address for the repeater is 192.168.1.100. This address can be changed using the programming software.

Caring for your product

The product does not require regular servicing. Caring for your product as described in this guide will help maintain the product in good operational condition.

Always wear eye protection when using brushes or other tools to clear debris from connectors or other parts of the product.

Do not use chemicals, aerosols or abrasive cleaners. Chemical coatings must not be applied to any part of the terminal or battery.

Clean the exterior surfaces using a lint free soft cloth.

Check cable connections regularly to ensure that they are secure.

Duplexer specifications

An optional duplexer can be used with the repeater. The duplexer allows the repeater's receiver and transmitter to operate on a single antenna at the same time. When operating within neighbourhoods where other RF devices are installed, including broadcast antennas and microwave link transmitters, the duplexer prevents interference with other RF devices.

The duplexer can be connected externally to the repeater.

The duplexer must comply with the recommended technical specifications below:

Frequency Range	400-470MHz
Bandwidth	± 400KHz
Insertion Loss.....	<1.0dB
Isolation.....	>80dB
Suppression	>80dB
V.S.W.R	<1.3
Nominal Impedance	50Ω

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