WTE MT-RX-4

AIS SART, DSC, 121.5MHz + 406 EPIRB ALERTING RECEIVER

User Manual

© WTE Limited, 2026 – Christchurch New Zealand

Table of Contents

Introduction....4
Key Features....5
Safety Information....7
Operation....10
Buttons....11
MENU/BACK:....11
UP:....11
DOWN:....11
RIGHT:....11
ENTER:....11
Icon Bar....12
Summary Screen....13
406 Decode Screens....14
DSC Decode Screens....15
RSS Screen....16
AIS Screens....18
GPS Screen....21
DF Screen....22
Alert Operation....23
Sequence of events when an alert is processed:....24
Spectrum Analyser....25
Beacon Monitoring....26
MT-RX-4 Configuration....27
TOOLS Menu....28
SPECTRUM Sub Menu....29
TOOLS Sub Menu....31
Alerts Sub Menu....32
406....32
AIS-SART....32
AIS PROXIMITY....33
AIS COLLISION....33
GPS ANCHOR....33
RSS....33
RELAY TIME....33
SOUNDER TIME....34
DUP REJECT TIME....34
System Sub Menu....35
LANGUAGE....35
BACKLIGHT....35
CONTRAST....35
TIME....36
SOUND....36
RS232 BAUD....36
RS422 BAUD....36
MAIN SCREEN....36
ANTENNA POS....36
FACTORY....36
SET DEFAULTS....36
TEST....37
DF Sub Menu....38
WAYPOINT TARGET....38
WAYPOINT LAT....38
WAYPOINT LONG....38
VOICE REPEAT....38
BEARING....38
DEF POSITION....39
DEF LAT....39
DEF LONG....39
DEF HEADING....39
NMEA OUT Sub Menu....40
OUTPUT....40
TYPE....40
TEST....41
TEST LAT....41
TEST LONG....41
AIS Sub Menu....42
COLLISION....42
PROX ALERT....42
PROX WARN....42
OUT PORT....42
DISPLAY....42
RSS Sub Menu....43
FREQ A....43
FREQ B....43
SQUELCH....43
SQUELCH DELAY....43
SWEEP DETECT....43
SCAN RATE....44
SERIAL OUT....44
406 Selective DB Sub Menu....45
AIS Collision Avoidance....46
AIS SART Transmission Logging....48
GPS Anchor....49
406 Beacon Transmission Logging....50

© WTE Limited, 2026 – Christchurch New Zealand

406 Serial Messages.....51
MT Serial Out Packet Format.....51
Raw Data Serial Out Packet Format.....52
Checksum Calculation.....52
AIS Serial Messages.....54
DSC Serial Messages.....55
CDDSC — DSC Information.....55
CDDSE — Expanded DSC.....57
CDDSV — DSC Summary.....58
Target Setting.....61
406 Selective Decode.....64
406 Selective Decode Applications.....64
Installation.....66
Connecting to the MT-RX-4.....66
Configuration Methods.....67
Web Browser Configuration.....68
Serial Command Configuration.....70
*USERPASS.....70
MT-RX-4 Firmware Upgrade.....71
Firmware Upgrade Utility.....71
Upgrade Process.....72
AIS OpenCPN Support.....73
406 Decoder PC Application.....74
Serial Port Configuration.....76
Integrated Mapping.....76
Live Map Updates.....76
Static Map Button.....77
Email Notification.....78
Testing Email Notification.....79
MT-RX-4 Customisation.....80
Installation.....81
Cables Supplied.....81
Connecting to the MT-RX-4.....82
Connector Pin descriptions.....83
RHS (Right Panel).....83
LHS (Left Panel).....84
Output Hardware Connection.....87
Open Collector Outputs.....87
Serial Connections.....88
RS-232.....88
RS-422/RS-485.....89
RS-485/RS-422 Point To Point.....90
RS-485/RS-422 Multi-Point.....90
RS-485 Multi-Point – 2 Wire.....91
Bus Terminating Resistor.....91
RF Connections.....93
Power Connections.....94
Ethernet Interface.....95
Omni or Directional Antenna.....96
Omni antenna.....96
Directional antenna.....96
Antenna Elevation.....97
Physical Dimensions.....99
Mounting Hardware.....100
DIN Rail.....100
Mounting Channels.....101
Top Mount.....102
Side Mount.....103
Bottom Mount.....104
Mounting Bolts Dimensions.....105
Top and Bottom Drilling Template.....106
Side Drilling Template.....107
Optional Mounting Inserts.....108
Disclaimer.....111
Manufacturing Marking and Labels.....112
Maintenance.....112
Product End of Life.....113
Product Warranty.....114
Abbreviations and Glossary.....115
Specification.....116

© WTE Limited, 2026 – Christchurch New Zealand

Introduction

Thank you for choosing the MT-RX-4.

The MT-RX-4 is an Ethernet, Serial (RS232 plus RS485/RS422) and USB capable multi-band receiver. The MT-RX-4 has been designed to decode emergency signals and then provide an alert to locate the source of the transmission for the purposes of early rescue or monitoring. The MT-RX-4 replaces the original MT-RX-3. The primary improvement is the inclusion of DSC receiver support, and much increased receiver sensitivity.

The MT-RX-4 performs equally well as a standard 2 channel AIS receiver, making AIS data available via its serial ports. The monitoring and alerting capability of the MT-RX-4 makes the receiver more feature rich and configurable than most other AIS receivers available on the market.

The MT-RX-4 operates multiple independent DSP (Digital Signal Processing) receivers concurrently allowing the simultaneous decoding and alerting of several distress signal types over many different frequencies.

The MT-RX-4 has been developed to provide an alert and simple GPS-based direction-indicating capability for:

- 406MHz EPIRBs, PLBs and ELT beacons operating across the frequencies 406.020 to 406.045 MHz.
- AIS-based SART alerting devices operating on both 161.975MHz and 162.025MHz.
- DSC Digital Selective Calling distress transmissions.
- 121.5MHz or 243MHz man-overboard devices and emergency homing transmitters with the use of directional antennas.

These receivers operate concurrently to provide excellent coverage over many emerging and existing distress devices. The receiver technologies used take advantage of DSP techniques for high sensitivity and high rejection of unwanted interfering signals.

AIS receiving and processing features include:

- Dual -123dBm receivers.
- Clear man-overboard alerts, and time-stamped logging to SD card.
- Graphical and text-based local vessel display.
- Proximity alerts and warnings.
- Configurable collision avoidance alerts.
- GPS anchor alerts.
- TCP, RS232, RS422, RS485 Serial output for connection to PC-based mapping tools.
- Compatible with OpenCPN free mapping software.

© WTE Limited, 2026 – Christchurch New Zealand

406 and AIS alerts can be logged to internal memory storage, and provide a time-stamped history of alert location and activity. The file history can be viewed on the MT-RX-4 and any logged transmission can be set as a target that provides a bearing and distance to the transmission source.

The outputs or on-board relay can be connected to external alerting devices, and the internal/external speaker provides alerts and voice prompts for “voice only” guidance to selected targets.

The high visibility graphic display provides clear details relating to the alert and when GPS information is available provides a clear bearing and distance to the distress transmission source.

The patented selective database allows 406 test transmissions to be used to provide a secure locally managed rescue system for 406 PLBs.

A simple top-level display provides at a glance a summary of the activity on all monitored distress channels over the previous several minutes.

Logged information can be viewed on the MT-RX-4 itself and retrieved by connecting to the USB port (of the MT-RX-4), or by removing the SD card with care and inserting into a micro SD card reader.

NMEA output can be configured to allow integration with chart plotters and PC based mapping tools.

The MT-RX-4 can be used as part of another system with minimal processing requirements through a simple serial interface.

Key Features

- Multiple receivers for simultaneous decoding of AIS, DSC, 406 (all used frequencies) and 121.5MHz (and optionally others).
- Logging of alerts.
- Multiple connection options – RS232, RS422, RS485 and USB. Ethernet supports use via web browser, TCP server or TCP client.
- Integration with PC software and NMEA devices for indication and use of GPS data.
- Configurable on the device itself, USB or via Ethernet.
- Can raise distress alerts for AIS, 406 and 121.5MHz (or optional other frequencies).
- Standard AIS features such as graphical display of ships, list of closest vessels and collision avoidance alerts.

© WTE Limited, 2026 – Christchurch New Zealand

- GPS anchor and alerts.
- Optional software-controllable antenna inputs (up to 4).
- Optional low-cost spectrum analyser providing huge visibility of transmitting signals, either to assist search and rescue or for direction finding.

© WTE Limited, 2026 – Christchurch New Zealand

Safety Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, or maintain it.

The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

This is the safety alert symbol. It is used to alert you to potential injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

!WARNING
WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.

!CAUTION
CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury

NOTICE
NOTICE is used to address practices not related to physical injury.

© WTE Limited, 2026 – Christchurch New Zealand

!WARNING

THIS EQUIPMENT IS NOT INTENDED FOR MAINS VOLTAGES

- MT-RX-4 was **NOT** designed to operate and/or be connected directly to live mains voltages. The MT-RX-4 must be connected to a certified, suitably rated low-voltage DC supply.

Failure to follow these instructions can result in death or serious injury

NOTICE

HAZARD OF EQUIPMENT DAMAGE

- This product is not chemical resistant. Detergent, alcohol, aerosol sprays, and/or petroleum products may damage the front panel. Clean using a soft cloth moistened in water.
- The radio can be damaged if there is any potential difference between the chassis-ground, Serial signal ground, power (-) input, or antenna coaxial shield. Before connecting any wiring, ensure that all components are earthed to a common ground point.
- The antenna port can be damaged if signals greater than 13 dBm are injected/received. Do not directly connect any other transmitter to the RF connector.
- Extreme heat or high temperatures can damage MT-RX-4 components. DO NOT expose or operate the unit in extreme heat (above 70 degrees Celsius) or leave in direct sunlight or any other UV source.
- Although this product is designed to be rugged, it will not survive excessive shock or vibration abuse. The MT-RX-4 is intended to be mounted permanently either in a land-based location or in a vehicle. When fitting in a vehicle, vibration damping mounts may be required.
- The MT-RX-4 IP rating is IP-51. MT-RX-4 is not waterproof or dustproof. DO NOT directly expose to rain or use in a condensation-forming environment.
- When antennas are co-located on a community (shared) site the correct site engineering must be performed to ensure that RF exposure limits are met.

© WTE Limited, 2026 – Christchurch New Zealand

FCC NOTICE

This device complies with Part 15.247 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.

This device must be operated as supplied by the equipment supplier. Any changes or modifications made to the device without the written consent of the equipment supplier may void the user's authority to operate the device.

NOTICE

This symbol on the product or its packaging indicates that this product must not be disposed of with other waste.
Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment.

The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and help ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, contact the dealer from whom you originally purchased the product.

© WTE Limited, 2026 – Christchurch New Zealand

Operation

Once a power source has been connected to the power connector the MT-RX-4 start-up status is displayed on the LCD.

When the MT-RX-4 is operating normally, the two green status LEDs flash briefly once every second.

On start-up under normal operation there is a message sent out the serial port. The message indicates the firmware revision, serial number and other software-related information.

For all electrical wiring connections, please refer to the "**Installation**" Section in this manual.

© WTE Limited, 2026 – Christchurch New Zealand

Buttons

MENU/BACK:

When on the MAIN SCREENS press this button to enter the MENU. When inside the MENU, used to return back one level from within the MENU, until returning back to the MAIN SCREENS.

UP:

When on the MAIN SCREENS press this button to cycle between sub-screens. When in the MENU used to navigate or alter selected configuration items.

DOWN:

When on file related screens of the MAIN SCREENS shifts between entries. When in the MENU press this button to navigate or alter selected configuration items.

RIGHT:

When on the MAIN SCREENS press this button to cycle between main screens. Within the MENU used to enter sub MENU items or select items for configuration.

ENTER:

Use this button to select file related items from within the MAIN SCREENS. This button is also used to accept a value on a confirmation pop-up screen.

On the RSS and Spectrum Analysers screens this button is used to clear the peak held signal values.

© WTE Limited, 2026 – Christchurch New Zealand

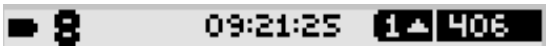
Icon Bar

The MT-RX-4 top icon bar provides information about the display screen and operating status.

On this screen the battery condition, quality of GPS signal, alert indication and system time (auto set from a GPS source) can be monitored at a glance.

The far right text indicates the selected main screen. This is either “ALL”, “406”, “RSS”, “AIS”, “GPS” or “DF”. Pressing the RIGHT button cycles through these screens.

Each screen can have sub-screens. When these are available, there is a small UP arrow next to the sub-screen number (shown as “1” on the example below). These screens can be accessed by pressing the “UP” button.



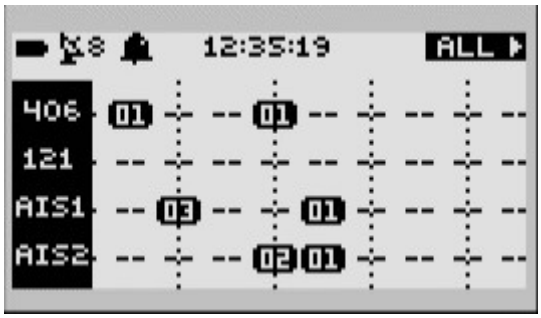
Icon	Description
	The far left battery icon indicates system voltage. When connected to an external supply, this icon displays always as a full battery.
	Indicates that there is no valid GPS signal.
	Indicates that there is a valid GPS signal. Flashes between this icon and a large BOLD number. This is the number of satellites used in the GPS fix solution.
	The alert shown on the screen is a distress message, and NOT a test.
	The alert shown is a TEST message.
	There currently is a signal present that has opened the squelch (better viewed on the RSS screen), that has been present for at least the configured TRIG period of time. This could be any signal that exceeds the configured squelch setting.
	A valid emergency homing signal has been detected for at least the configured TRIG period of time. This is the sweep signal transmitted on 121.5MHz or 243MHz by 406 beacons and used for search and rescue final location. This icon takes priority over the “S” icon. The signal strength of the homing signal must also exceed the squelch setting.
	An alert has been raised based on the current ALERT configuration within the last 60 seconds.

© WTE Limited, 2026 – Christchurch New Zealand

Summary Screen

This screen provides the best indication of recent activity on distress channels of interest. If the user has shifted from the main screen, after several minutes of inactivity the MT-RX-4 will automatically return to this screen.

The start-up and default return screen can be altered by the user to any screen (MENU->SYSTEM->MAIN SCREEN), e.g. to primarily display AIS vessel transmissions. When a DSC receiver is present and licensed, the second row will display DSC instead of 121. This will show the DSC transmission activity instead of 121.5 homing signal activity.



Activity on each distress channel is shown by the number of messages received on each channel within a 30-second time slot. On AIS channels, large numbers of transmissions can be expected when SART AIS messages have not been filtered and in proximity to shipping channels. The AIS display can be configured to display only SART AIS messages.

On the top line of the screen shown there is “406” shown with a “01” then on the same line another “01”. Each dotted vertical line is used to mark the passing of one minute, allowing the activity of the last 5 minutes to be seen. On the 406 line it can be seen that there was a 406 transmission decoded approximately 20 seconds ago, and another nearly 2 minutes ago. If the number displayed “04” - then 4 messages have been decoded in that particular 30 second time slot.

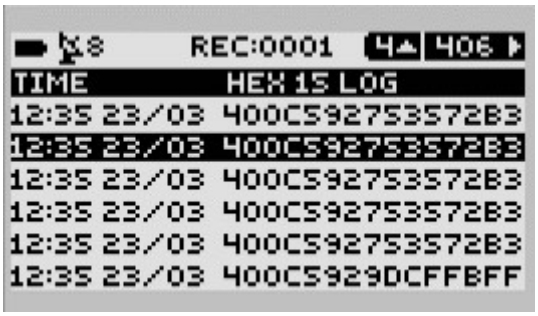
From this top-level screen, pressing the right button cycles through each technology-specific summary screen. While on each screen, pressing the up button cycles through sub-screens for each, providing access to logged results, live data as received and additional parameters.

© WTE Limited, 2026 – Christchurch New Zealand

406 Decode Screens

The 406 main screen provides several decode sub-screens that display details regarding the 406 message processed. Recent database files stored on the internal SD card provide translations from country ID to country name and also provide details of beacon model and manufacturer.

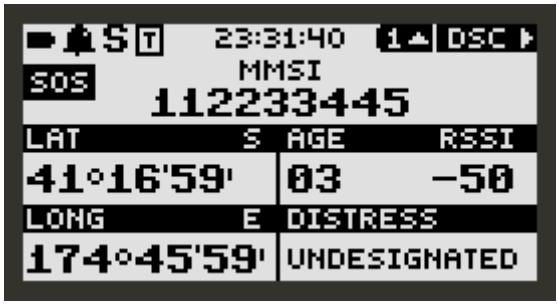
The decode history sub-screen provides a means to view time-stamped entries, and also allows the entries to be selected to be used with the direction finding screen (see Target Setting).



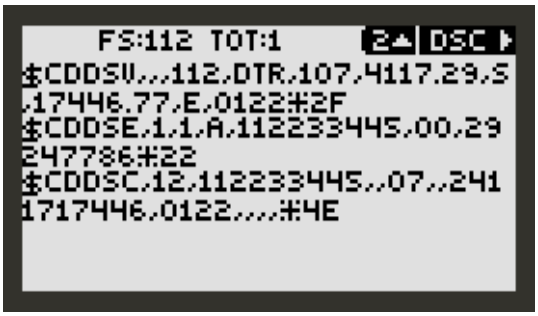
© WTE Limited, 2026 – Christchurch New Zealand

DSC Decode Screens

The DSC (Digital Selective Calling) main screen provides details of DSC type 112 distress transmissions on 156.525MHz and the nature of the distress. The DSC screen is only visible if a DSC receiver is present and the option has been licensed.



The output history screen gives an indication of decode activity and lists the last NMEA messages that have been sent out the serial port.



© WTE Limited, 2026 – Christchurch New Zealand

RSS Screen

The RSS (Received Signal Strength) screen provides continuous measurement of signal strength from up to two configured frequencies. When used in conjunction with a directional antenna, this screen can assist in close-range location of many varieties of man-overboard transmitters, 406 PLBs and voice transmitters.

The RSS screen can be configured to display and provide an alert for any frequency from 120MHz to 449MHz, but is particularly useful for the distress homing signals transmitted on 121.5MHz, 406MHz and 243MHz.

Alerts can be raised when the signal level has increased above a configured squelch level for the set trigger period. Optionally, an alert can be raised only when a valid 121.5MHz downward sweep is detected on the channel. This will greatly decrease the probability of false alerts.

As shown above, when a signal level increases above -80 dBm for 3 seconds the RSS receiver begins to look for a valid sweep signal. The 'S' icon will now be displayed indicating that the RSS squelch is open.

© WTE Limited, 2026 – Christchurch New Zealand

If the downward sweep is present for 3 seconds an alert will be raised (if RSS alerts are enabled) and the 'S' icon will change to the 'H' icon (to indicate that a homing signal has been detected). Any squelch level, squelch trigger period and sweep trigger period can be configured. Sweep detection can be disabled if required.

Peak signal values are held for the last minute. The SIGNAL bar shows first the last received signal strength measurement, followed by the peak signal measurement.

The first RSS screen switches between the two configured RSS frequencies (A+B shown top left), allowing homing sweep signals to be identified. Pressing the up button will allow a clearer non-switched view of frequency A and B in isolation.

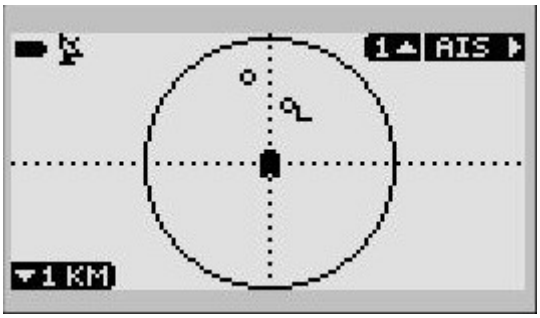
In the following screen RSS frequency B has been set to 406.028MHz, allowing 406 beacon signals to be captured and held even though they are only transmitted once every 50 seconds.

© WTE Limited, 2026 – Christchurch New Zealand

AIS Screens

The top-level AIS screen defaults to the graphical vessel summary, providing details of vessels within the area and direction of travel. AIS target and collision avoidance status can be viewed on this screen.

The vessels shown on the top level AIS screen are as follows:



Stationary vessel

Moving vessel, indicating direction.

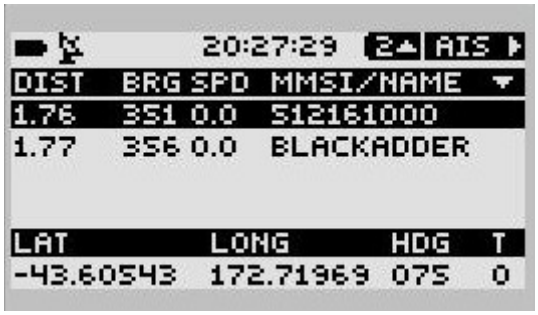
Vessel expected to collide based on collision alert configuration (flashing).

Vessel set as a target (for direction finding using the DF screen).

Vessel that has not transmitted data in the last minute.

© WTE Limited, 2026 – Christchurch New Zealand

The AIS vessel list screen provides an ordered list of the closest vessels, updated as new transmissions are decoded. The last transmission from each vessel can be selected to provide additional information such as current location. Any vessel on this screen can be selected as a target by pressing the square button, allowing the Direction Finding (DF) screen to be used.

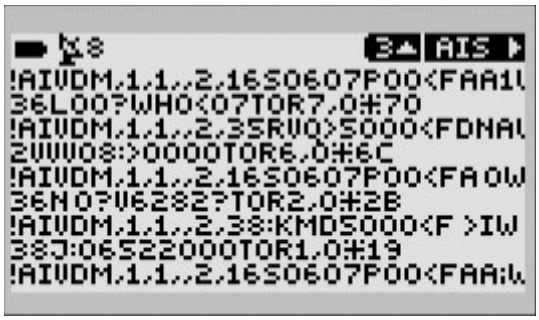


The SART (Search and Rescue Transponder) screen provides information relating to AIS distress-type transmitters operating on both 161.975MHz and 162.025MHz. These transponders are commonly used as man-overboard transmitters.

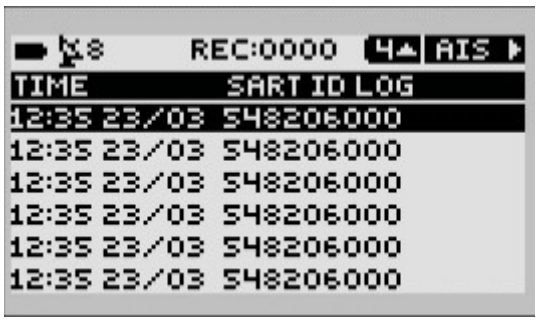
Information decoded on this screen is logged directly to SD card, and can be selected as a target for direction finding.

The AIS raw data screen displays decoded AIS packets from both channels in real time. The MT-RX-4 can be configured to output this data via the serial ports, which can then be used by PC based AIS mapping tools. All AIS single and double sentence messages are decoded. Variable length AIS messages are decoded up to a length of two sentences.

© WTE Limited, 2026 – Christchurch New Zealand



The decode history sub screen provides a means to view time-stamped entries, and also allows the entries to be selected for use with the direction finding screen (see Target Setting). Only AIS-SART messages are listed in the history.



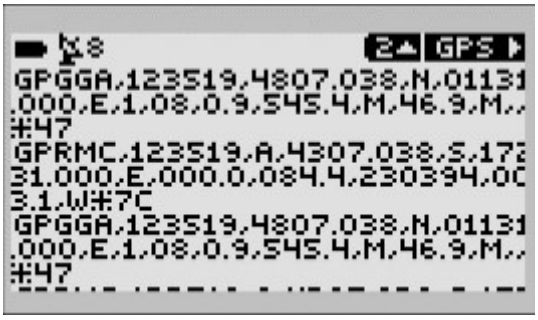
© WTE Limited, 2026 – Christchurch New Zealand

GPS Screen

The GPS screen provides details of the GPS data that is provided to the MT-RX-4 for direction finding. If the GPS anchor feature is currently in use, the distance from the anchor set location is

shown – see “GPS Anchor”.

The GPS raw data sub screen provides real time updates of provided GPGGA and GPRMC NMEA sentences that are used to determine the current location, quality of fix and time.



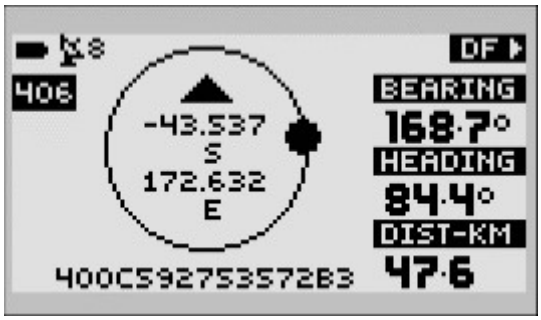
© WTE Limited, 2026 – Christchurch New Zealand

DF Screen

The GPS DF screen provides an indication of the currently selected target, including bearing and distance to that target. The operation and use of the DF screen is better described in the "Target Setting" section. While in this screen voice prompts can be enabled to allow direction finding to the target without the need to look at the screen.

The DF screen allows direction finding to 406 and AIS transmissions, and also to manually entered waypoints.

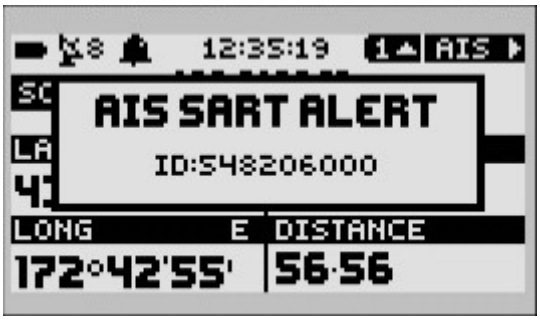
Note: This screen requires a GPS position from a connected NMEA source (or for a position to be manually entered), and for the alerting device to be transmitting its position.



© WTE Limited, 2026 – Christchurch New Zealand

Alert Operation

The MT-RX-4 can be configured to raise an alert through the on-board relay or sounder under a variety of conditions. The duration of sounder operation and relay operation can be independently configured via the alert menu system.



406 alerts can be raised for transmissions that are:

- General Distress.
- General Distress plus any test transmission.
- General Distress plus any ID matching the 406 IDs stored in the 406 Selective Database.

AIS alerts can be raised for transmissions that are:

- Type 1 messages, status 14 (SART active)
- Type 1 messages, status 14 plus status 15 (SART test).
- Within a configured distance, providing a simple proximity alert. Separate “warning” and “alert” distances can be configured.
- Determined to be on a collision course, based on direction of travel, speed and safe area distances configured – see “Collision Avoidance”.

DSC alerts can be raised for transmissions that are:

- Type 112 Distress

RSS (Received Signal Strength) alerts can be raised for transmissions that are:

- On a configured frequency between 120MHz and 470MHz.
- Above a configured signal strength threshold.

© WTE Limited, 2026 – Christchurch New Zealand

- Above a signal strength for a configured period of time or determined to contain a valid downward sweep signal for a period of time.

GPS Anchor alerts can be raised when moving outside the safe anchor radius for a set location.

Upon reception of a configured alert message type, the relay is closed for the configured period of time (set via the alert menu system) and the sounder operates independently for a configured period of time (heard through internal speaker).

Sequence of events when an alert is processed:

1. Relay operates (for configured period of time).
2. Sounder operates (for configured period of time).
3. The display shifts to either the 406, 121 or AIS decode screen as appropriate (unless already on the DF screen).
4. An alert pop-up to indicate a new alert is displayed (if this is a new alert).

If there is an ID and location available for the alert (not applicable for 121.5 alerts):

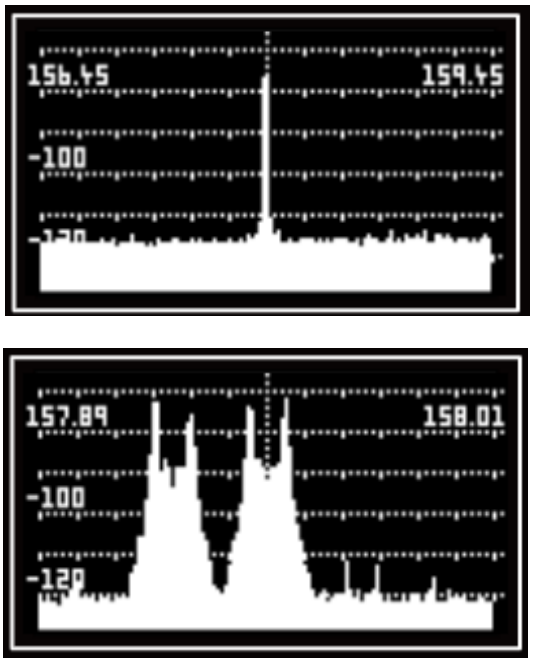
5. The decoded alert message is logged to the SD Card.
6. The ID of the alert (406 hex 15 ID or AIS MMSI) is stored.
7. The configurable duplicate reject timer is started (preventing the same ID from raising another alert until a period of inactivity has elapsed).
8. If not already on the DF screen, the ID and location of the alert ID are automatically set as the active tracking target ID (but will not automatically shift to this screen).

When any key is pressed the sounder will cease and the relay will open.

© WTE Limited, 2026 – Christchurch New Zealand

Spectrum Analyser

The optional spectrum analyser is a very simple-to-use tool that provides a span of either 120kHz or 3MHz around a configured test frequency. The receive bandwidth of 1kHz is suitable for inspection of potentially interfering adjacent channel signals. The analyser can display signals as low as -125dBm. Use for site inspection or to view a large range of frequencies, hugely simplifying search and rescue efforts looking for a channel that someone is talking on, or to assist with direction finding using a directional antenna.



© WTE Limited, 2026 – Christchurch New Zealand

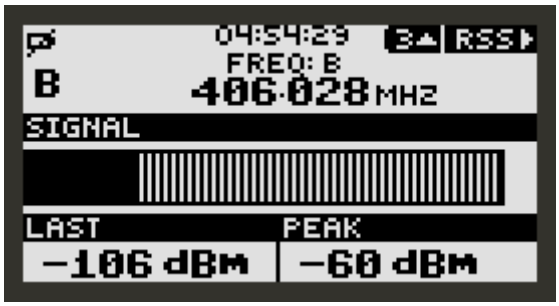
Beacon Monitoring

The WTE-MT-RX-4 is well suited as a monitoring receiver for search and rescue applications. By simply turning the unit on, beacon transmissions will be displayed as they are received. Optionally the internal sounder will operate.

406 beacons transmit at 406MHz burst with a much higher power than the 121.5MHz homing signal often transmitted by many devices. This high power burst is only transmitted once every 50 seconds, and is normally very difficult to capture to allow use for an indication of proximity to a beacon.

The WTE-MT-RX-4 includes a 1 minute peak capture and hold to allow 406 beacon transmission signal strength to be tracked, albeit only updated every 50 seconds. After 1 minute of inactivity, the peak signal is automatically cleared. Manual clearing of the peak signal is possible at any time by pressing the square ENTER button.

Setting the RSS frequency to a known 406 beacon frequency will allow signal strength measurements close to that frequency to be monitored. An exact frequency can be used, or the receiver can be set to 406.030 to allow coverage of 406 beacon frequencies from 406.025 to 406.035 MHz.



© WTE Limited, 2026 – Christchurch New Zealand

MT-RX-4 Configuration

At any time the “MENU” button can be pressed that will enter the configuration menu. The receivers continue to operate normally and can raise alerts while in the menu system.

At any time the active buttons that may be pressed are shown on the screen, such as the “MENU”, “UP”, “DOWN” and “RIGHT” buttons. Using the above screen as an example, pressing the “RIGHT” button will enter the “ALERTS” sub menu. When reaching any configuration item, pressing the “RIGHT” button again will highlight the item to change.

Once inside the menu, pressing the “MENU” button again will go back up one level until the menu mode is exited. All configuration changes are written to file only when leaving menu mode.

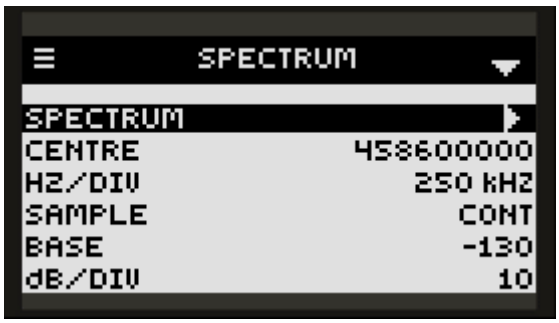
© WTE Limited, 2026 – Christchurch New Zealand

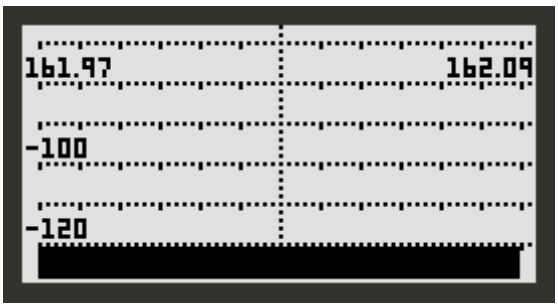
TOOLS Menu

Provides access to diagnostic tools. This includes the spectrum analyser and serial terminal.

© WTE Limited, 2026 – Christchurch New Zealand

SPECTRUM Sub Menu





SPECTRUM
Displays the radio spectrum using the settings in this menu. Signals between -128dBm and 0dBm can be displayed. **Power levels above 17dBm (50mW) will destroy the receiver input**.

CENTRE
Displays the centre frequency to be displayed on the screen.

HZ/DIV
Either 10kHz or 250kHz. The screen is 6 divisions wide in 120 steps.

When on the 10kHz setting the RBW (receiver bandwidth) is set to 1kHz. The span on this setting is 120kHz, allowing for adjacent channel power to be observed.

When on the 250kHz setting the RBW is set to 25kHz. The span on this setting is 3 MHz.

SAMPLE
When set to CONT the spectrum analyser screen will be updated with new values approximately twice a second. When set to PEAK only higher values will be written to the screen. At any time, the ENTER button can be pressed on the SCREEN to clear the screen and load new PEAK values.

© WTE Limited, 2026 – Christchurch New Zealand

BASE
Defines the base signal level on the screen. When set to -100, only signals with a strength greater than -100 dBm will be displayed. Range is -130 dBm to -60 dBm.

dB/DIV
Scales the signal level displayed. Either 10 dB/DIV or 20 dB/DIV can be set. When 20 is set a dynamic range of 120 dB is possible.

© WTE Limited, 2026 – Christchurch New Zealand

TOOLS Sub Menu

This is a very basic serial terminal that shows data that is either sent or received on the RS232, RS422 or Ethernet port. This may be useful to confirm if data is being received successfully from third-party equipment. Printable characters are displayed in bold, non-printable characters in smaller hexadecimal (OD OA is the same as \r\n).

© WTE Limited, 2026 – Christchurch New Zealand

Alerts Sub Menu

406

Items ACTIVE ONLY, ACTIVE+TEST and ACTIVE+DB can be selected.

ACTIVE ONLY:

Only distress transmissions will activate an alert and close the relay. All test transmissions are logged and displayed, but will not raise an alert.

ACTIVE+TEST:

Both distress AND test transmission will result in an alert being raised.

ACTIVE+DB:

All distress transmissions AND any test transmission that matches an ID in the 406 selective database will result in an alert being raised.

AIS-SART

Items ACTIVE ONLY and ACTIVE+TEST can be selected.

ACTIVE ONLY:

Only AIS type 1 messages status 14 transmissions will activate an alert and close the relay. All test transmissions are logged and displayed, but will not raise an alert.

ACTIVE+TEST:

Both AIS type 1 messages status 14 transmissions AND status 15 test transmissions will result in an alert being raised.

© WTE Limited, 2026 – Christchurch New Zealand

AIS PROXIMITY

Allow generation of warnings and alerts for the distances configured in the AIS menu.

Items ENABLED+WARN, WARN ONLY, DISABLED and ENABLED can be selected.

ENABLED:

When selected, any AIS transmission that is determined to be less than the configured PROX ALERT DIST will result in the relay and sounder operating.

ENABLED+WARN:

In addition to the same functionality as the ENABLED setting, this setting also provides a short-duration audible warning and screen pop-up when any AIS transmission that is less than the configured PROX WARN DIST distance.

WARN ONLY:

When selected, upon reception of any AIS transmission that is less than the configured PROX WARN DIST will result in a short duration audible warning and screen pop-up. This setting will result in the relay NOT closing.

DISABLED:

No AIS proximity alerts or warnings will be generated.

AIS COLLISION

Allows the generation of collision alerts based on the settings configured in MENU->AIS->COLLISION.

Items ENABLED and DISABLED can be selected. See “AIS Collision Avoidance”

GPS ANCHOR

Sets the allowed travel distance before raising an alert. Distances from 5 – 500 meters can be set. The GPS Anchor feature is set from the GPS main screen, not in the menu – see “GPS Anchor”

RSS

The RSS (Received Signal Strength) alert when enabled will operate the relay and sounder as configured. Disabling will result in no alert being raised.

RELAY TIME

The time in seconds that the relay will close for when an alert is raised. Pressing any button after an alert is raised will result in the relay opening again. The relay will be able to operate again after the source of the alert has been absent for the DUP REJECT TIME.

© WTE Limited, 2026 – Christchurch New Zealand

SOUNDER TIME

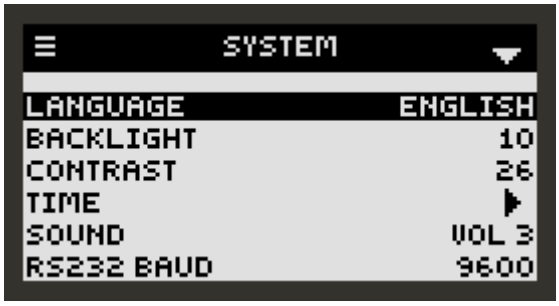
The time in seconds that the on-board sounder will operate for when an alert is raised. Pressing any button after an alert is raised will result in sounder operation ceasing.

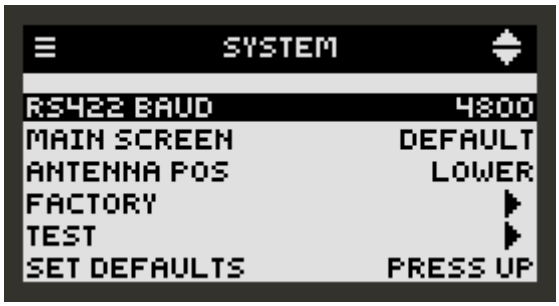
DUP REJECT TIME

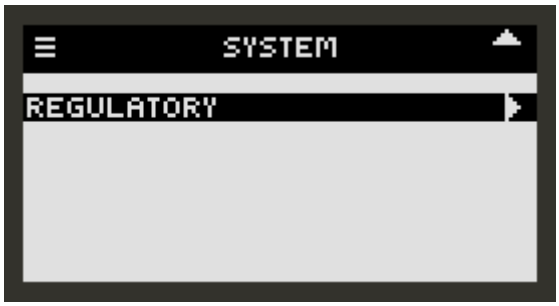
The duplicate reject feature determines the period of time that must pass before an alert of the same ID or type will raise an alert again. Typically alert transmissions are sent every minute. Raising a new alert that needs cancelling again every minute when tracking an alert is not typically desirable. When the feature is set to a non-zero value a duplicate reject timer is restarted each time the same ID is received. If the transmission source was to cease for this period of time, then restart, a new alert would be raised. When set to 0, the feature is disabled and a new alert is raised for each transmission. The duplicate reject applies to AIS, 406, RSS and PROXIMITY alerts. Once an RSS alert has been raised, the signal level must decrease below the trigger threshold for the duplicate reject time before a new RSS alert can be raised.

© WTE Limited, 2026 – Christchurch New Zealand

System Sub Menu







LANGUAGE

The currently used language. Currently only English and Spanish are included. Please advise if you require translations for another language.

BACKLIGHT

This is the time in seconds that the backlight stays on for after each key press. The backlight may be set between values of 0 and 30. A value of 0 results in the backlight being disabled, a value of 30 results in the backlight being permanently on.

CONTRAST

LCD contrast setting. Set value from 10-36.

© WTE Limited, 2026 – Christchurch New Zealand

TIME

Setting of the internal real time clock. This is automatically updated from a GPS source if present.

SOUND

Setting to OFF prevents the sounder from operating and disables all system sounds except when an alert is raised. Volume level can be set from 1-5 for internal speaker.

RS232 BAUD

Sets the baud rate of the RS232 port to either 2400, 4800, 9600 or 38400 N:8:1. Equipment can be connected to either the RS232 or RS422 ports, or to both simultaneously.

RS422 BAUD

Configuration of baud rate of the RS422/RS485 port. The port is configured to N:8:1

MAIN SCREEN

This allows any page on any main screen to be set as the default main screen. This results in this screen being the screen that is first seen when powering up the unit, or after a period of inactivity the MT-RX-4 will automatically revert to this screen.

Setting to DEFAULT will unset the last custom set screen and will return to the factory default main screen. Setting to USER SET will set the screen to be the screen that was last used before entering the menu.

ANTENNA POS

Selects the antenna to use. LOWER(0) is right hand side lower position, UPPER(1) is right hand side upper position. During normal operation the antenna can be switched using the serial command *C40=x<CR>. Defaults to right lower on factory reset.

FACTORY

Tools for factory calibration and testing purposes only.

SET DEFAULTS

Allows all configuration items to be reverted to the default factory new state. When the confirm pop-up is selected, pressing the RIGHT button will allow the tick to be selected. Pressing the square ENTER button will now allow defaults to be set. Default settings will only be applied when leaving the menu.

© WTE Limited, 2026 – Christchurch New Zealand

TEST

Allows testing of the unit by generating test messages as if they had been decoded by the unit under normal operating conditions. If a “406-TEST” test is performed, and the unit has been configured to ignore test transmissions, then there will be no change to the unit behaviour. The same applies for AIS SOS and TEST options.

Pressing the RELAY option provides a simple method to check relay operation.

Pressing WAVE allows playback testing of wave files from the SD card.

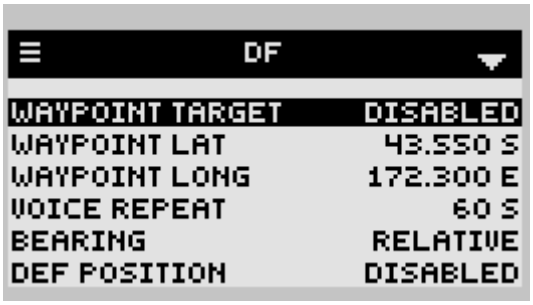
REGULATORY

Regulatory items such as FCC-ID*. The MT-RX-4 does not transmit any radio signals.

*Note: Publication number 784748-D01, FCC-Part 90 allows for devices with integrated display to not require a printed label on the device holding this information.

© WTE Limited, 2026 – Christchurch New Zealand

DF Sub Menu



WAYPOINT TARGET

When enabled the DF screen uses the WAYPOINT LAT and WAYPOINT LONG settings to navigate to. It is not possible to permanently enable this setting and is reset after being activated. Reset of this option is to ensure that normal preference on startup is to set a target to a new 406 or AIS alert, not a previously set waypoint that may no longer be current.

WAYPOINT LAT

Waypoint latitude to use when the WAYPOINT TARGET is enabled. This setting is stored with other configuration data, but not actively used unless the WAYPOINT TARGET has been enabled.

WAYPOINT LONG

Waypoint longitude to use when the WAYPOINT TARGET is enabled. This setting is stored with other configuration data, but not actively used unless the WAYPOINT TARGET has been enabled.

VOICE REPEAT

This setting controls how frequently the voice prompt operates that provides a bearing and distance to the selected target. If the system sound is disabled, then the voice prompt will not be heard.

Setting to 0 disables the voice repeat frequency.

BEARING

Items RELATIVE and TRUE can be selected. The relative setting will generate the “Relative Bearing to Target...” voice prompt. The bearing is expressed as 0-360 degrees relative to the current direction of travel.

The TRUE setting provides the “True Bearing to Target...” voice prompt. This bearing is relative to true north.

© WTE Limited, 2026 – Christchurch New Zealand

DEF POSITION

When ENABLED the MT-RX-4 will use the configured default latitude, longitude and heading until an externally provided GPS position has been provided. This means that if the MT-RX-4 is used in a fixed position, such as in a building or oil rig, the heading and distance to an alert can be determined without the need to connect an external GPS source.

DEF LAT

Default Latitude for use when the default position is enabled.

DEF LONG

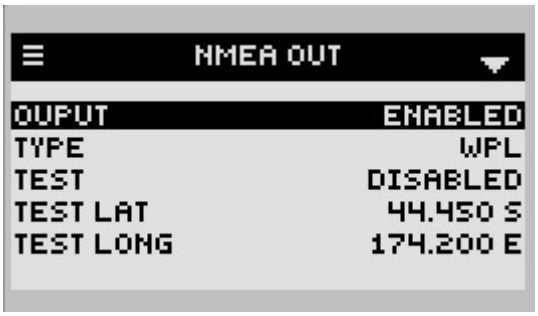
Default Longitude for use when the default position is enabled.

DEF HEADING

Default heading for use when the default position is enabled.

© WTE Limited, 2026 – Christchurch New Zealand

NMEA OUT Sub Menu



OUTPUT

When ENABLED the configured NMEA output sentence will be sent out the serial port once every second only after a 406 message with a valid position has been decoded. The NMEA output will be at the rate configured in the SYSTEM sub menu. Typically the NMEA output should be configured to be 4800 baud which is the default rate for NMEA 0183 compatible equipment.

The MT-RX-4 has both RS232 and RS422/485 serial interfaces for connection to a variety of NMEA systems.

TYPE

Items WPL, RMB, BWC and GLL can be selected. This is the NMEA sentence type that will be used when there is valid information to display. The type WPL or BWC should be used when possible, since these sentence types when used with the MT-RX-4 allow not only the position of the alert to be displayed, but also the nature of the alert in the form of a way-point, such as 406-SOS.

Activating Alert	**WPL and BWC Waypoint Tag Used**
406 Beacon Distress Transmission	406-SOS
406 Beacon Test Transmission	406-TEST
406 Beacon Transmission in Database	MOB-1, MOB-2, MOB-3... indicating entry in database.
NMEA Test Output	TEST

© WTE Limited, 2026 – Christchurch New Zealand

NMEA Sentence Type	Typical NMEA Output
WPL	$GPWPL,3751.65,S,14507.36,E,**406-SOS***77
RMB	$GPRMB,A,,,001,MOB,3751.65,S,14507.36,E,,,,V*88
BWC	$GPBWC,,3751.65,S,14507.36,E,,,,,,,**406-SOS***99
GLL	$GPGLL,3751.65,S,14507.36,E,*93

TEST

When ENABLED the NMEA output test feature is enabled, using the TEST LAT and TEST LONG settings. This allows testing of a navigation system without the need to activate an actual 406 beacon. For this feature to operate the OUTPUT must be ENABLED. The configured TYPE will be used for the duration of the NMEA output test. This setting is not persistent; cycling power to the MT-RX-4 will always result in the feature being disabled. If the feature is enabled and an actual 406 message is decoded, the test setting will be automatically disabled.

TEST LAT

Latitude for use when the NMEA output TEST is ENABLED.

TEST LONG

Longitude for use when the NMEA output TEST is ENABLED.

© WTE Limited, 2026 – Christchurch New Zealand

AIS Sub Menu

COLLISION

Allows all collision avoidance parameters to be set – see “Collision Avoidance”

PROX ALERT

Defines a vessel “safe distance” from the current position before raising an alert (note that proximity alerts must also be enabled in the ALERTS menu).

PROX WARN

Defines a vessel “safe distance” from the current position before raising a warning. A warning is a lesser audible alert and does not operate the relay. (note that proximity alerts must also be enabled in the ALERTS menu).

OUT PORT

Controls which serial interface decoded AIS messages are sent out. By default this is set to NONE. Options are RS232, RS422, NETWORK or ALL. Baud rates are configured by the SYSTEM->RS232 BAUD or SYSTEM->RS422 BAUD setting. NETWORK sends data out the Ethernet port as configured in MENU->TCP IP.

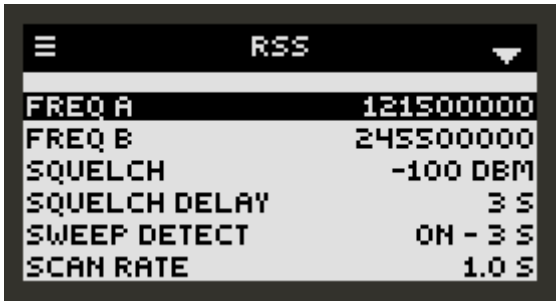
This output can be used by navigation equipment that can accept standard “!AIVDM” NMEA style messages. The system baud rate typically should be configured to be 38400 baud if this feature is used.

DISPLAY

Setting to SART ONLY will result in ONLY AIS type 1 status 14 and 15 messages being displayed on the summary screen. Setting to ALL displays all AIS messages on the summary screen. This setting does not affect the ability to raise an alert or use any AIS feature.

© WTE Limited, 2026 – Christchurch New Zealand

RSS Sub Menu



FREQ A

This is the primary frequency used by the Received Signal Strength alert and RSS screen. The FREQ A parameter can be set between 120MHz and 470MHz. By default 121.5MHz is configured.

FREQ B

This is the secondary frequency used by the Received Signal Strength alert and RSS screen. The FREQ B parameter can be set between 120MHz and 470MHz. By default 243MHz is configured. The secondary frequency can be effectively disabled by setting to the same as FREQ A.

SQUELCH

This is the signal level that the received signal must exceed (for the SQUELCH DELAY period) in order to raise an alert.

SQUELCH DELAY

This is the time in seconds that the measured signal must have exceeded the configured SQUELCH level before an alert is raised. Each time the signal drops below the SQUELCH level the SQUELCH TRIG (as shown on the RSS screen) is reset and the full delay period must elapse again before an alert can be triggered.

If under normal operation the “S” icon is seen frequently (due to interfering signals in proximity), the SQUELCH level should be increased until the “S” icon is no longer seen under normal operation.

SWEEP DETECT

This item can be set to DISABLED or a value between 1 and 20. When DISABLED, an alert can be raised without the need to detect a valid sweep. When set to between 1 and 20, the sweep signal

© WTE Limited, 2026 – Christchurch New Zealand

must be present for this period of time before an alert can be raised.

SCAN RATE

This option is used in conjunction with the SERIAL OUT option. This item can be set to DISABLED when set to 0 or to a value between 0.1 and 3.0 seconds. When setting to DISABLED there is no signal strength scanning of the set frequency. The user may wish to alter this setting in particular when sending the RSS value to the serial port in an application that requires a relatively high rate of signal strength reporting. The SCAN RATE option increases internal noise, and results in a degradation to AIS receiver sensitivity. This option would not normally be used unless the MT-RX-4 is under external software control, and used for a short duration of time. A setting of 1.0 would result in no noticeable degradation in performance.

SERIAL OUT

This item can be set to DISABLED or ENABLED. Setting to ENABLED will result in a signal strength sentence to be sent to the serial port at the SCAN RATE configured above. There will be no periodic serial output if the SCAN RATE is DISABLED. If SCAN RATE is DISABLED and SERIAL OUT is ENABLED, there will be serial output only when the signal strength is above the configured SQUELCH level.

The serial output format for the RSS frequency is:

SS,C,NNN<CR>

where NNN is the signal strength in dBm.

where C is 0 for FREQ A and 1 for FREQ B.

When an RSS is above the SQUELCH level the following serial output is generated, regardless of the alert setting.

SS,A,NNN<CR> (when FREQ A signal level high)

SS,B,NNN<CR> (when FREQ B signal level high)

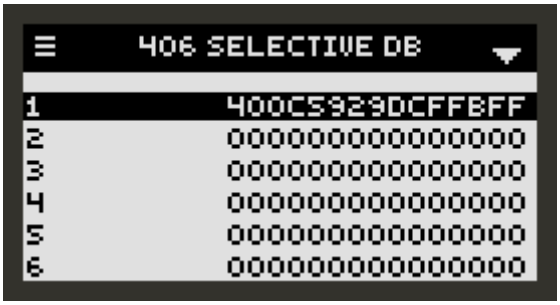
NOTE:

An RSS alert can only be raised when RSS alerts have been enabled in the ALERTS menu.

RSS output is more intuitive when both FREQ A and FREQ B are set to the same frequency.

© WTE Limited, 2026 – Christchurch New Zealand

406 Selective DB Sub Menu



Allows setting of the 406 beacon database. This is a patented feature that allows a database of known beacons to be loaded for locally managed search and rescue. Once loaded in the database, a user in distress can raise a local alarm when the “TEST” button for locally managed rescue without involving nationwide agencies as when a beacon is fully activated. The entries correspond to 406 beacons Hex 15 IDs.

Entries in this menu will take no effect unless the 406 alerts option ACTIVE+DB has been selected.

© WTE Limited, 2026 – Christchurch New Zealand

AIS Collision Avoidance

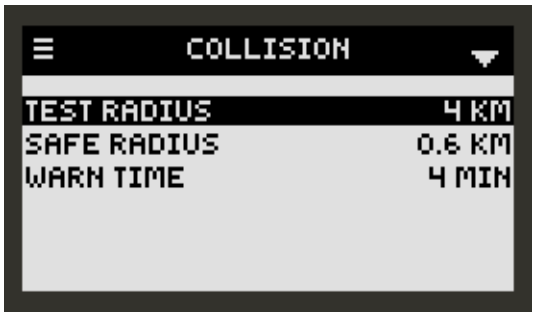
The collision avoidance system is a highly configurable feature that allows alerts to be raised should a collision condition arise.

If a vessel that is transmitting AIS data remains stationary and the MT-RX-4 is moving towards the vessel or the vessel continues on a collision course, then an alert can be raised.

In order to use the collision avoidance system:

1. Enable the collision avoidance alert from the ALERTS menu.
2. Configure the collision avoidance system found in MENU->AIS->COLLISION.
3. Set the TEST RADIUS. This is how far from the current location that vessels are evaluated for a collision condition. Setting the TEST RADIUS to a very large value such as 20 KM may not add any value and would result in unnecessary false alerts – unless perhaps if accidentally anchoring in a shipping lane.
4. Set the SAFE RADIUS (also described as CPA, or Closest Point of Arrival). Should a vessel be allowed to continue on its current course (or the vessel that the MT-RX-4 is part of) and the vessels may intersect within the SAFE RADIUS, then an alert may be raised.
5. Set the WARN TIME (also described as TCPA, or Time to Closest Point of Arrival) to define how long in advance an alert should be given. Having considered the speed and direction of the vessels, this is the prior notice that will be given before a vessel enters the SAFE RADIUS. NOTE: if the TEST RADIUS is very small, and the speed of the vessel is very high, then the full configured WARN TIME may not be possible.

   As with the TEST RADIUS, setting WARN TIME to a very large value, such as 60 minutes, may result in many unnecessary false alerts.



When a collision alert is notified via pop-up the collision alert can be cleared by either:

- Turning away from the object of likely impact (shown as the flashing “collision” icon).
- Or acknowledging the collision alert by pressing any button.

© WTE Limited, 2026 – Christchurch New Zealand

If the collision alert is cleared, turning away from the collision source, then turning back to a potential collision condition will result in the collision alert being raised again.

When a collision alert has been acknowledged, approaching a vessel without further alerts is possible. After acknowledging an alert, collision alerts from other vessels will still be raised.

© WTE Limited, 2026 – Christchurch New Zealand

AIS SART Transmission Logging

All message type 1 status 14 and 15 messages are logged to SD card. Logging is performed for all messages of the configured alert type regardless of whether they are duplicates.

All AIS SART data is stored to the file AIS-DAT.CSV and logged in the format:

```
#16:25 00/00,548206000,-43.6050 172.7154,!AIVDM,1,1,,2,18:kmd>000<F`>IW38j:O6522000t0,4*57
```

where each entry begins with the '#' character, followed by time and date, SART ID (usually MMSI), position and full legal AIS type 1 message that generated the alert.

© WTE Limited, 2026 – Christchurch New Zealand

GPS Anchor

The GPS Anchor allows for an alert to be raised when a GPS position has been set and then the vessel drifts from that set location.

To use the GPS Anchor:

1. In MENU->ALERTS->GPS ANCHOR set how far the MT-RX-4 is allowed to “drift” before raising an alert. This setting is saved, and needs only to be configured once.
2. Enable the GPS Anchor. This can only be performed from the GPS screen and if there is a current GPS fix available. From the GPS screen press the square button.

Pressing the square button again will unset the GPS anchor, and allow a new position to be set when the square button is pressed again.

The GPS ANCHOR field on the GPS screen will now display the distance in meters from the set position and confirms that the GPS anchor feature is active. Removing power to the MT-RX-4, then applying power again will result in the GPS anchor alert being cleared.

© WTE Limited, 2026 – Christchurch New Zealand

406 Beacon Transmission Logging

All COSPAS-SARSAT 406 messages are logged to SD card. Logging is performed for all messages of the configured alert type regardless of whether they are duplicates.

All 406 data is stored to the file 406-DAT.CSV and logged in the format:

```
*10:10 16/01,C00B19F875940D1,-43.6050 172.7154,FFFED060058CFC3ACA068FABCF9C8F14CDBC
```

where each entry begins with the '*' character, followed by time and date, 406 Hex 15 ID, position and full binary content of the transmission.

© WTE Limited, 2026 – Christchurch New Zealand

406 Serial Messages

MT Serial Out Packet Format

Data provided from the MT-RX via serial ports/TCP is in the following format:

MT1UUUNNNTFHHHHHHHHHHHHHHHHSS112233N4445566WYYYY

Where:

MT1 is fixed and actually “MT1”

UUU- is a 3 character MT-RX configurable ID – by default this is “001”

NNN -is a 3 decimal digit cycling packet sequence number from 000 to 511. This sequence number increments after each new test or distress message is received. After 511 the sequence cycles to 000 and begins again.

T – is a single character message type 'T' or 'A' (test or distress alert)

F – is a single character format flag 'S' or 'L' (short or long) – this relates to the 406 beacon transmission specification.

HHHHHHHHHHHHHHH – is a 15 character hex code used to define beacon owner and beacon capabilities as per the 406 beacon specification.

SS – is a 2 character signal strength indication – “00” if not used.

11 – is a 2 decimal character latitude degrees

22 – is a 2 decimal character latitude minutes

33 – is a 2 decimal character latitude seconds

N – is 'N' or 'S'

444 – is a 3 decimal character longitude degrees

22 – is a 2 decimal character longitude minutes

55 – is a 2 decimal character longitude seconds

W– is 'W' or 'E'

YYYY – is a 4 character checksum (calculated from M – the first character)

If all location characters are '-' then there is no location information available.

Legitimate example packet:

MT1001000AL400C592753572B323433212S1723756E4706

© WTE Limited, 2026 – Christchurch New Zealand

Raw Data Serial Out Packet Format

From firmware revision v1.88 the raw data output packet is supported.

Data provided from the MT-RX is in the following format:

MT6UUUNNNRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRYYYY

Where:

MT6 is fixed and actually “MT6”

UUU- is a 3 character MT-RX configurable ID – by default this is “001”

NNN -is a 3 decimal digit cycling packet sequence number from 000 to 511. This sequence number increments after each new test or distress message is received. After 511 the sequence cycles to 000 and begins again.

RRR.. is 36 characters of raw data in a hex format.

YYYY – is a 4 character checksum (calculated from R – the first raw data character)

Legitimate example packets:

MT6001001*FFFE2FA00E0000CBAB959DB0903788C71B79****F84B***

MT6001001*FFFE2FA0062C93A9AB959E55EE7788C71B79****1131***

Checksum Calculation

The 4 character rolling left checksum, starting at position 9 (start of the raw data payload).

```
short calculateChecksum(short packetLen, char* dataSource)
{
        short checksum;
        short i;

        checksum = 0;

        for (i = 0; i < packetLen; i++) {
            checksum ^= dataSource[i];

         /* Roll left */
         if (checksum & 0x8000) {
             checksum = (checksum << 1) | 0x01;
         } else {
             checksum <<= 1;
            }
        }

        return checksum;
}
```

Example Usage:

```
if (calculateChecksum(36, “FFFE2FA00E0000CBAB959DB0903788C71B79”) == 0xf84b) {
        return CHECKSUM_GOOD;
} else {
        return CHECKSUM_BAD;
}
```

© WTE Limited, 2026 – Christchurch New Zealand

AIS Serial Messages

All AIS serial messages are provided in a standard raw format such as:

!AIVDM,1,1,,B,13PRrB0000OvbS@NhA9=oPbr0<0u,0*58

This output format is suitable for the connection to many PC-based AIS mapping applications. This is a standard output format for most AIS receivers – please consult internet resources for further information regarding these messages.

If there is a need to be provided with fully decoded AIS sentences via the serial port, such as MMSI, vessel name etc, please contact info@wte.co.nz

All messages of all types are decoded up to a length of two AIS sentences – for further information regarding the decoding of AIS messages consult the AIS specifications that are available on the internet.

© WTE Limited, 2026 – Christchurch New Zealand

DSC Serial Messages

DSC messages are provided serially as several NMEA sentences such as:

$CDDSC,12,3380400790,12,06,00,1423108312,2019,,,,*7C

$CDDSE,1,1,A,3380400790,00,45894494*1B

$CDDSV,503123456,112,112,DTR,107,4117.35,S,17446.12,E,1430*25

When examining the following NMEA sentences, refer to the DSC protocol standard described in ITU-R Recommendation M.493-16 for more information if required. The standard however does not define the following NMEA sentences.

CDDSC — DSC Information

Purpose
$CDDSC carries the primary decoded DSC call information. It is the main sentence used to present the DSC format, addressed station, call category, call detail codes, position, and time in a single NMEA sentence. The field order is based on the standard NMEA DSC sentence structure.

Sentence format
$CDDSC,<Format>,<Address>,<Category>,<Detail1>,<Detail2>,<Position>,<UTC>,<DistressMMSI>,<DistressNature>,<Ack>,<Expansion>*hh

Field definitions

1. **Format**
   Two-digit DSC format specifier. This is the two least-significant digits of the internal DSC format code.
2. **Address**
   Address field associated with the call. This is normally the called or calling MMSI, commonly sent as a 10-digit field. For a standard 9-digit MMSI, a trailing zero may be used in standard DSC/NMEA formatting.
3. **Category**
   Two-digit DSC call category. Typical values represent routine, safety, urgency, or distress classes.
4. **Detail1**
   Primary call detail code. For distress-related calls this is typically the nature-of-distress code. For other call types this field may be used as the first telecommand.
5. **Detail2**
   Secondary call detail code. For distress-related calls this is typically the type-of-

© WTE Limited, 2026 – Christchurch New Zealand

communication code. For other call types this field may be used as the second telecommand.

6. **Position**
   Encoded position field. In this implementation it is sent as a 10-digit compact DSC position block:
   - 1 digit quadrant
   - 2 digits latitude degrees
   - 2 digits latitude minutes
   - 3 digits longitude degrees
   - 2 digits longitude minutes

   Quadrant coding used by the firmware:
   - `0` = North / East
   - `1` = North / West
   - `2` = South / East
   - `3` = South / West

   This matches the DSC compact latitude/longitude concept used in standard DSC position fields.
7. **UTC**
   Time associated with the position, in HHMM UTC format.
8. **DistressMMSI**
   Reserved standard DSC field used for distress acknowledgement / relay related cases. In the current implementation this field is transmitted blank.
9. **DistressNature**
   Reserved standard DSC field used in specific distress-related cases. In the current implementation this field is transmitted blank.
10. **Ack**
    Acknowledgement indicator. Standard values are:
    - R = Acknowledge request
    - B = Acknowledgement
    - S = End of sequence / neither

    In the current implementation this field is transmitted blank.
11. **Expansion**
    Expansion indicator. Standard value:
    - E = A CDDSE sentence follows immediately

    In the current implementation this field is transmitted blank.

© WTE Limited, 2026 – Christchurch New Zealand

Example sentence
$CDDSC,12,3380400790,12,06,00,1423108312,2019,,,,*7C

Example meaning

- `12` = format specifier
- `3380400790` = address / MMSI field
- `12` = category
- `06` = primary call detail code
- `00` = secondary call detail code
- `1423108312` = compact position
- `2019` = 20:19 UTC
- remaining fields blank

CDDSE — Expanded DSC

Purpose
$CDDSE carries additional DSC expansion data and is used when extra information must be sent beyond the main CDDSC sentence. It follows the standard NMEA DSE structure. In this implementation it is used for enhanced position resolution.

Sentence format
$CDDSE,<Total>,<Number>,<Mode>,<MMSI>,<DataCode>,<Data>*hh

Field definitions

1. **Total**
   Total number of CDDSE sentences in the expansion block. In the current implementation this is always `1`.
2. **Number**
   Sequence number of this CDDSE sentence within the expansion block. In the current implementation this is always `1`.
3. **Mode**
   Query / reply mode:
   - Q = Query
   - R = Reply
   - A = Automatic

   In the current implementation this is always A, meaning the expansion data is transmitted automatically.

© WTE Limited, 2026 – Christchurch New Zealand

4. **MMSI**
   Vessel MMSI associated with the related CDDSC sentence. This should match the associated DSC address field.
5. **DataCode**
   Two-digit expansion data set code. In this implementation the value is `00`, which corresponds to ITU-R M.821 data specifier `100` for enhanced position resolution.
6. **Data**
   Expansion data payload for the selected data set. For `DataCode = 00`, the payload is 8 digits:
   - first 4 digits = extra decimal resolution of latitude minutes
   - last 4 digits = extra decimal resolution of longitude minutes

   These digits represent the tenths, hundredths, thousandths, and ten-thousandths of minutes for latitude and longitude.

Example sentence
$CDDSE,1,1,A,3380400790,00,45894494*1B

Example meaning

- `1` = one expansion sentence in total
- `1` = this is sentence 1
- A = automatic transmission
- `3380400790` = associated MMSI
- `00` = enhanced position resolution
- `45894494` = extra minute resolution:
  - latitude extra digits = `4589`
  - longitude extra digits = `4494`

CDDSV — DSC Summary

Purpose
$CDDSV is a compact product-specific summary sentence used to present the most useful decoded DSC values in a single easy-to-parse record. It is intended for host software, logging, and user interface display. This sentence is application-defined and is formatted in the same NMEA style as the standard sentences.

Sentence format
$CDDSV,<MMSI>,<Category>,<Format>,<CallType>,<Nature>,<Latitude>,<N/S>,<Longitude>,<E/W>,<UTC>*hh

Field definitions

1. **MMSI**

© WTE Limited, 2026 – Christchurch New Zealand

The 9-digit MMSI associated with the decoded DSC event.

2. **Category**
   Full 3-digit DSC category code from the decoder. Typical values used by the firmware include:
   - `100` = Routine
   - `108` = Safety
   - `110` = Urgency
   - `112` = Distress
3. **Format**
   Full 3-digit DSC format specifier from the decoder.
4. **CallType**
   Readable call type mnemonic generated by the firmware. Typical values are:
   - ACK = Acknowledgement
   - REL = Relay
   - TEST = Test call
   - POS = Position-related call
   - `IND` = Individual call
   - ALL = All-ships call
   - GRP = Group or geographic-area call
   - DTR = Distress-related call

   If no matching mnemonic is available, this field is left blank.
5. **Nature**
   Nature-of-distress code. This field is most meaningful for distress-related calls. For non-distress calls it may be blank or zero, depending on the decoded source data.
6. **Latitude**
   Latitude in `DDMM.mm` format:
   - DD = degrees
   - `MM` = whole minutes
   - `.mm` = fractional minutes
7. **N/S**
   Latitude hemisphere:
   - N = North
   - S = South
8. **Longitude**

© WTE Limited, 2026 – Christchurch New Zealand

Longitude in DDDMM.mm format:

- DDD = degrees
- MM = whole minutes
- .mm = fractional minutes

9. **E/W**
   Longitude hemisphere:
   - E = East
   - W = West
10. **UTC**
    Time associated with the decoded position, in HHMM UTC format.

Example sentence
$CDDSV,503123456,112,112,DTR,107,4117.35,S,17446.12,E,1430*25

Example meaning

- 503123456 = MMSI
- 112 = distress category
- 112 = distress format
- DTR = distress-related call
- 107 = undesignated distress
- 4117.35,S = 41°17.35' South
- 17446.12,E = 174°46.12' East
- 1430 = 14:30 UTC

All three sentences use standard NMEA framing:

- Start with $
- Fields separated by commas
- End with *hh
- hh is the XOR checksum of all characters between $ and *

© WTE Limited, 2026 – Christchurch New Zealand

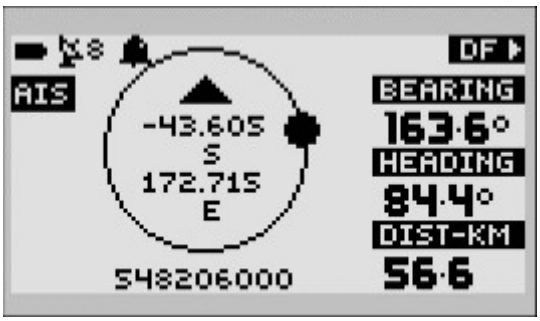
Target Setting

The MT-RX-4, when a GPS position is presented via internal or externally supplied NMEA sentence, can provide a bearing and distance to a specified target. When the MT-RX-4 is first powered on, the target is unset. Viewing the “DF” screen (direction find to target) the status “NO TARGET” will be shown.

If the current location is unknown through the absence of a NMEA RMC sentence, then determination of distance and bearing to target is not possible (unless a DF default position has been configured through the menu). When a distress message (406 or AIS) that matches the alert configuration settings for the MT-RX-4 (that would result in an alert being raised) is received the target and the target is currently unset, the target will automatically be set to the ID of that alert (even if the alert does not provide a position). When an alert is activated the “ALERT” pop-up is shown, and the active screen moves to either the top level 406 or AIS screen as appropriate.

Manually moving to the “DF” screen will show the bearing and distance to the target only if the current location is known AND the 406 or AIS transmission has provided a valid position.

Optionally a waypoint can be manually entered through the menu system (MENU->DF). Any waypoint can be entered that will then be shown as a DF target of “WAYPOINT”.



© WTE Limited, 2026 – Christchurch New Zealand

When a new alert message is decoded, the target will **NOT** be updated if the target has a different ID (but an alert will still be raised). If a new message has the same ID the location of the target will be updated.

To set a new target the square “ENTER” button must be pressed while on the top level 406 or AIS screen. Using this method it is possible to browse through the file history of decoded 406 or AIS messages and set any of those messages as a new target.

To Set a Target To Last 406 or AIS transmission:

1. Move to either the 406 or AIS screens.
2. To set this entry as the target now press the “ENTER” button.
3. The pop-up “TARGET SET” will be displayed.
4. The DF screen will now show bearing and distance to this new target.

To Set a Target From File:

1. Move to either the 406 or AIS screens.
2. Press the “UP” button until the log screen is shown.
3. Press the “DOWN” button to select the ID of the transmission to VIEW (target has not been set yet).
4. Press the square “ENTER” button.
5. The screen will automatically move to the top level display screen and show details for that file entry (showing the record number at the top instead of the current time).
6. To set this entry as the target press the “ENTER” button.
7. The pop-up “TARGET SET” will be displayed.
8. The DF screen will now show bearing and distance to this new target.

© WTE Limited, 2026 – Christchurch New Zealand

While on the target screen periodic voice messages will be announced indicating the distance and required bearing to target.

© WTE Limited, 2026 – Christchurch New Zealand

406 Selective Decode

The WTE patented selective decode feature allows a database to be built of beacon hex ID codes within the decoder.

This means that the decoder will only activate the alert output when a 406 transmission has been received by beacons with the matching unique ID.

Using this technology, new systems can be developed using powerful 406 beacons to instantly provide a distress alert, either using the test button or fully activating the beacon. In many cases immediate assistance can be provided without the need to notify search and rescue.

These systems are secure, and will not result in a false activation from beacons being tested or that have been activated in the wider surrounding area.

Because the MT-RX-4 can lock to a 406 signal anywhere in the 406 band extremely quickly (due to its DSP architecture), only a single transmission is required to operate the MT-RX-4 relay – this means that only a single "Test" transmission is required in order to operate.

406 Selective Decode Applications

Man-Overboard Alarm

The MT-RX-4 is perfectly suited as the foundation of a marine 406 man overboard system, providing an instant alert, with very high range capability.

A vessel for example may have 20 crew, all with PLB devices fitted to life jackets. Each of the PLB hex codes can be programmed into the MT-RX-4 decoder. This means that the decoder on a vessel can be alerted by the press of the test button from any of the crew members, or by full activation of the beacon. The MT-RX-4 will not produce any false alarms from other beacons in the wider surrounding area.

A PLB has a much higher power output than most other man overboard systems, so can have a higher range from the vessel. PLBs are also becoming increasingly more affordable, and are now a similar price to traditional Man-Overboard transmitters. The decoder when used for this application can still provide position information to crew members on the vessel, that can then be processed by a connected mapping tool. All activations would be logged normally.

Diver Resurfacing Alert

© WTE Limited, 2026 – Christchurch New Zealand

The MT-RX-4 is well suited to provide a diver resurfacing alert. A resurfacing diver, if carrying a PLB, can in distress press the test button on a beacon and signal for assistance from the dive boat with or without notifying the emergency services.

There is no chance of false alerts from beacons being tested or activated in the wider surrounding area, messages are all logged and notification is instant. If a beacon is fully activated, the position can be provided by the decoder allowing early diver location in an emergency situation.

Yacht Club Distress Monitor

A shore-based MT-RX-4 receiver can be programmed with the 406 PLB or EPIRB hex codes assigned to yacht club boats or assigned to individuals.

In a distress situation, an alarm can be raised before a situation escalates to a point that would require the involvement of the emergency services. The test button can be pressed on the 406 beacon, or a full emergency alert raised. Notification to the MT-RX-4 receiver is instant. The MT-RX-4 can be configured to control a siren, light or if connected to the supplied PC application display the beacon hex ID or alert position.
The MT-RX-4 will not suffer from false alerts from other beacons being tested or activation in the wider surrounding area.

Anti Theft Vessel Control

A PLB programmed into the selective database can provide a method to disable a vessel or active a tracking device from a considerable distance from a vessel.

Any standard 406 beacon of any kind can be used.

Note: Alert position is not provided by the test button press of all 406 beacons. Typically 406 transmitters that support sending of location information in the test transmission require a different mode of activation, such as holding the test button for 5 seconds.

© WTE Limited, 2026 – Christchurch New Zealand

Installation

The MT-RX-4 should be situated away from direct sunlight, extreme vibration and heat sources, and high power transmission sources.

An external antenna correctly designed to operate at 406MHz will result in best performance (if 406 is of primary importance), otherwise use an antenna that best suits such as 162MHz (for AIS) – performance will be degraded at other frequencies but will still operate acceptably in most cases. Do not situate the antenna immediately next to the antenna of a high power transmission source – position it more than 2 m from any other antenna. Mount the external antenna with as much elevation as possible for best results (see “Antenna Elevation” below).

Maximum tolerated input power into the decoder BNC connector is 17dBm. Connecting directly to a 406 beacon will result in certain damage. Signal strength measurements are accurate to within 0.5dB, but are relative and not calibrated. Power strength recording can be performed by using a reference beacon and comparing results against the tested or calibrated reference.

Connecting to the MT-RX-4

The minimum required connections for a usable system:

1. Connection to an antenna.
2. Connection to a 12V supply.

Optionally the MT-RX-4 may also connect to:

- An external GPS source.
- A chart plotter or navigation system (that can also be a GPS source).
- A PC based mapping system.
- External sounder controlled via the on-board relay.
- A network through the Ethernet port.

© WTE Limited, 2026 – Christchurch New Zealand

Configuration Methods

There are several methods to configure the MT-RX-4 unit, such as:

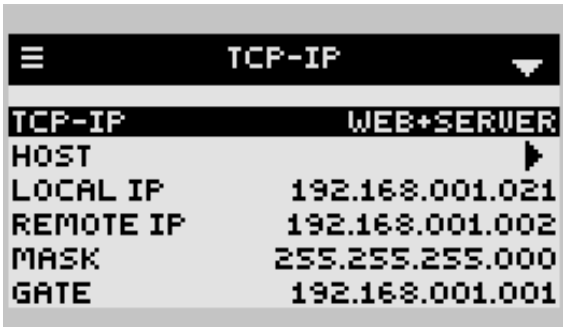
- Directly from the front panel
- Via a web browser (mirrors the LCD and buttons).
- Via Serial terminal over the RS232, RS422 and or RS485.
- Via a TCP terminal or socket (either client or server)
- USB connection and editing of the CONFIG.INI configuration file.

© WTE Limited, 2026 – Christchurch New Zealand

Web Browser Configuration

For web browser configuration to be possible (using “Chrome”), the Ethernet/IP must be ENABLED via the menu (ENABLED by default). This is located in SYSTEM->IP. In this menu section network parameters can be configured such as the IP, Mask and gateway.

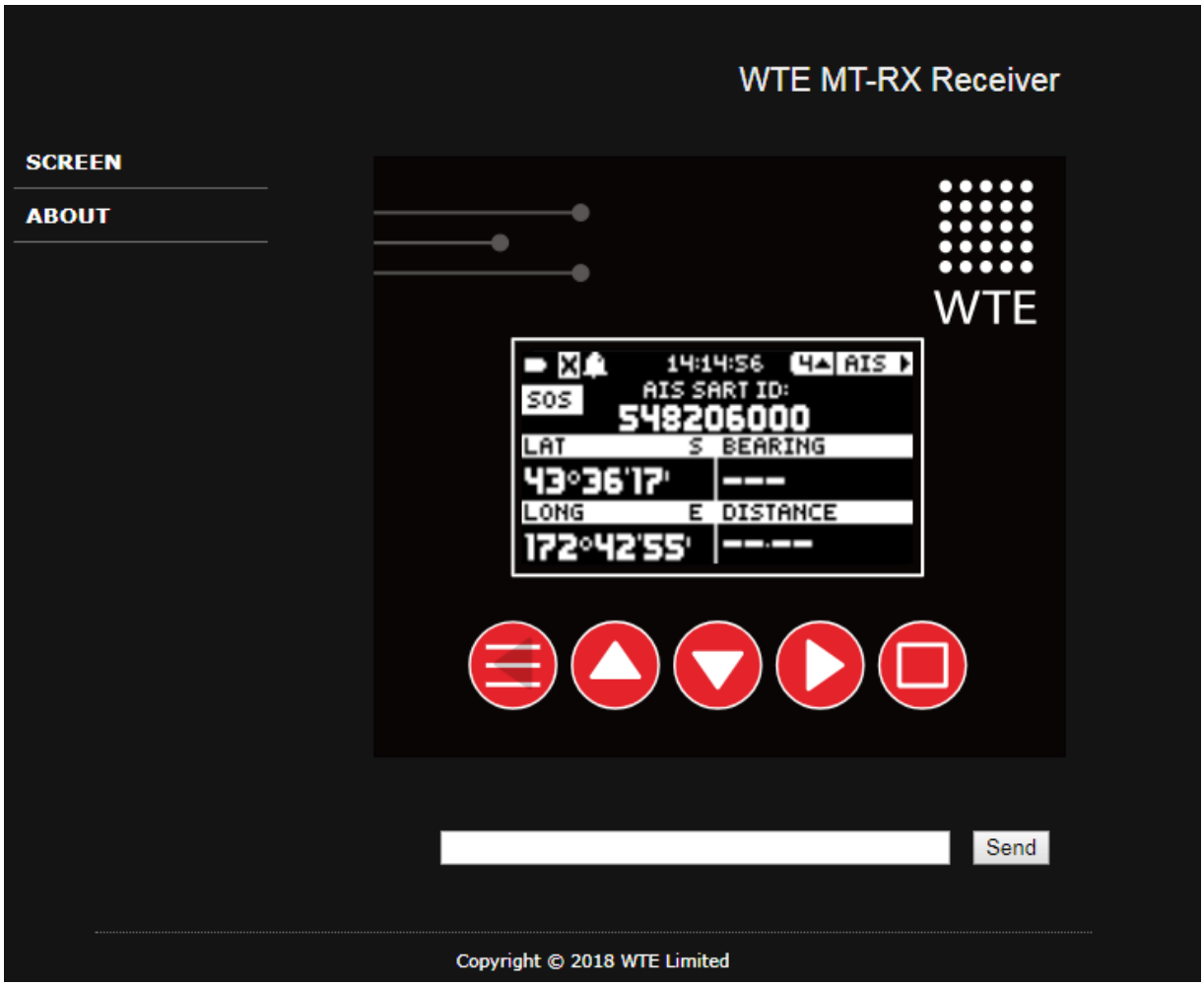
Only a single connection to the MT-RX-4 should be allowed. Multiple connections will result in impaired responsiveness.



© WTE Limited, 2026 – Christchurch New Zealand

After the unit has been enabled to be use over the web, a web browser address matching the configured IP should be used. e.g.

http://192.168.1.21



Serial Command Configuration

Most items that can be changed via the MENU can also be changed through serial commands or through direct modification of SD card configuration items.

Refer to the application note MT-RX-AN003.pdf for a full list of serial commands.

There are some additional commands that make the MT-RX-4 more usable when being managed via a serial connection. These are listed immediately below.

*USERPASS

Sets the web and TCP user and password. User must be at least 3 letters and password must be at least 4 letters. These credentials are requested for each new web and TCP connection.

**USERPASS=admin:MT-RX-4<CR>*

When prompted for a login when using a TCP connection (not through web browser), login with the full user and password together.

e.g. in response to "login:"

enter

"admin:MT-RX-4"

The MT-RX-4 will immediately report if successfully logged in.

To completely disable all web and TCP connection user and passwords, enter

USERPASS=none:none**<CR>*

**SAVE<CR>*

*By default the user and password is set to "**none:none**"*

© WTE Limited, 2026 – Christchurch New Zealand

MT-RX-4 Firmware Upgrade

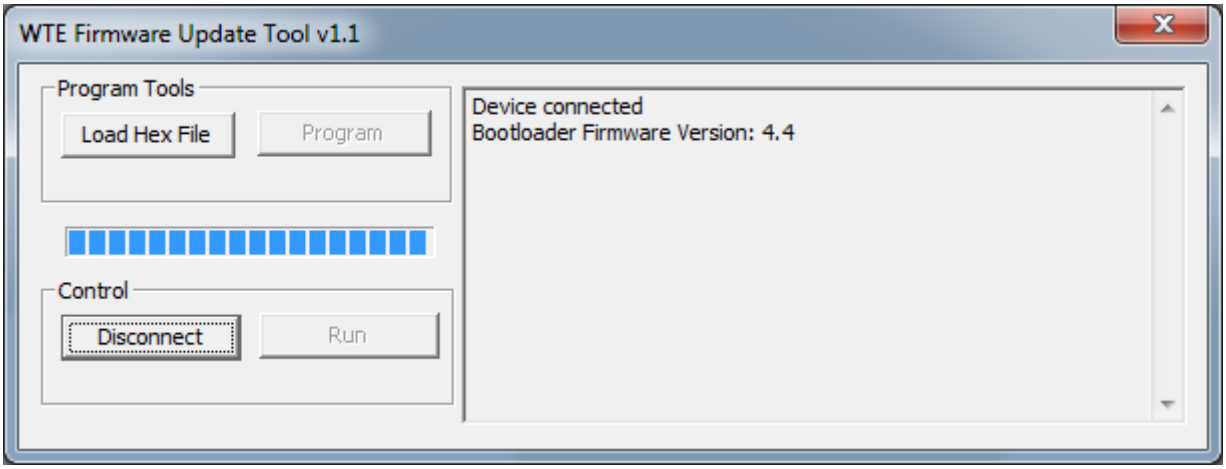
In order to update the MT-RX-4 primary firmware you will need:

1. The WTE Firmware Update Tool (available from http://www.wte.co.nz or provided if required from info@wte.co.nz).
2. One USB mini B or USB C cable (depending on model).
3. An appropriate encrypted hex file supplied by WTE Limited.

   Note: Attempting to load a hex file not intended for use with the MT-RX-4 will render the MT-RX-4 inoperable. Uploading firmware should only be performed if instructed to do so by WTE Limited or an authorised agent.

Firmware Upgrade Utility

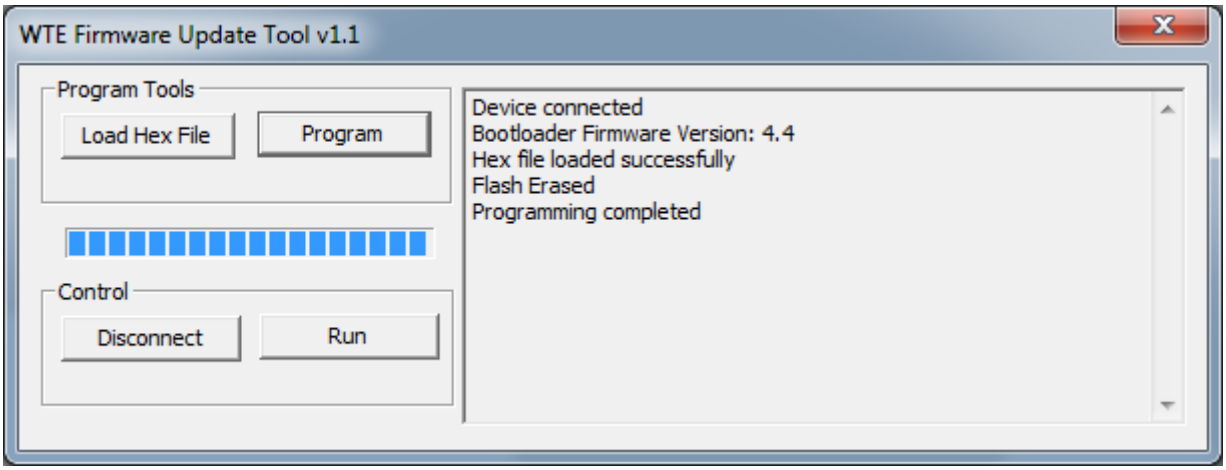
This bootloader software has been customised by WTE to simplify the firmware replacement process for the MT-RX-4, This application automatically handles erasing and verifying of uploaded firmware. This utility does not perform any decryption function (decryption is carried out by the MT-RX-4 itself).



© WTE Limited, 2026 – Christchurch New Zealand

Upgrade Process

1. Run the application WTE-UBL.exe – this is the WTE Firmware Update Tool as shown above.
2. **BEFORE** applying power to the MT-RX-4, press the “UP” button, and **HOLD** the button down.
3. Apply power to the MT-RX-4.
4. The MT-RX-4 backlight will flash on and off (approximately once every second) – **keep the “UP” button pressed**. You now have 10 seconds to press the PC application “Connect” button on the WTE Firmware Update Tool before the MT-RX-4 exits the bootloader mode of operation.
5. Press the WTE Firmware Update Tool “Connect” button. If connected, the PC application will display the message saying “Device Connected”. The MT-RX-4 backlight will now stay constantly on.
6. You can now **RELEASE** the MT-RX-4 “UP” button.
7. On the PC application press the “Load Hex File” button.
8. Select the supplied MT-RX-4 hex file. NOTE: the firmware used must MATCH the MT-RX-4 receiver variant. A MT-RX-4 can only be used with MT-RX-4 encrypted firmware. Failure to comply will leave the device inoperable.
9. Press the WTE Firmware Update Tool “Program” button.
10. Wait for the WTE Firmware Update Tool to indicate that programming has been completed.



11. When programming is complete press the “Run” Button, or remove power to the MT-RX-4 and apply power again.
12. If successful the MT-RX-4 will start normally when power is applied. If the MT-RX-4 does not correctly start, then repeat the procedure.

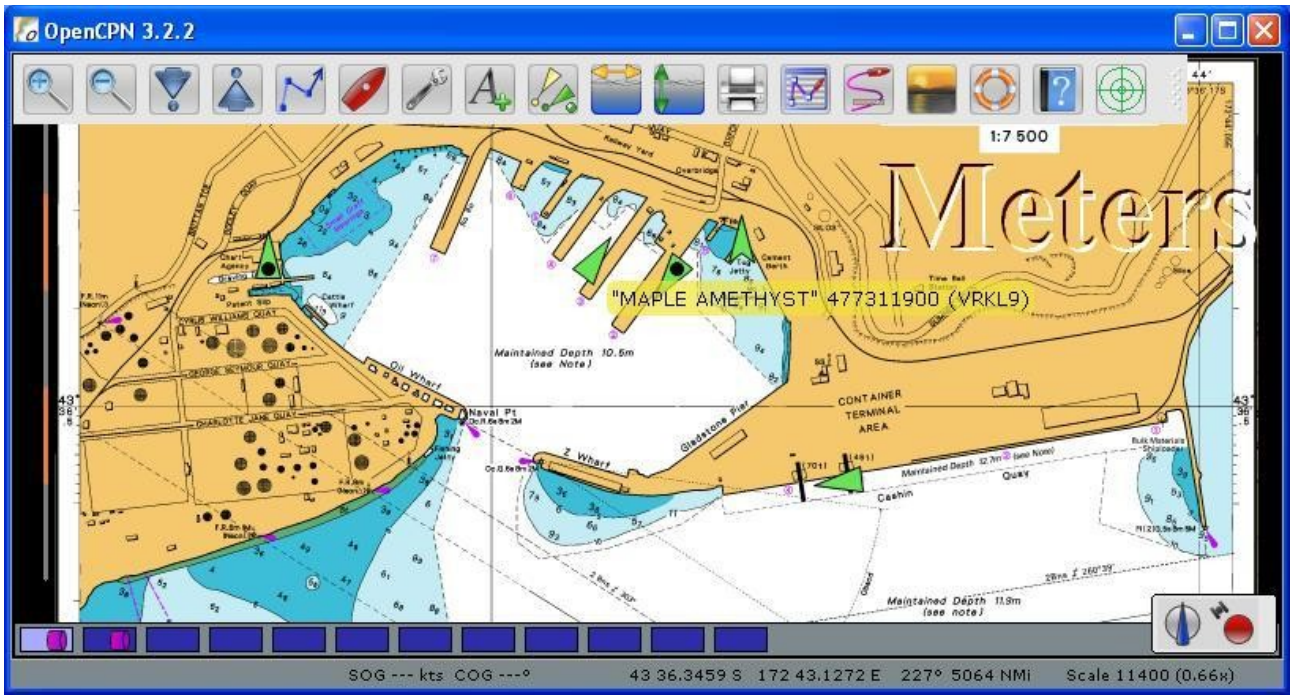
© WTE Limited, 2026 – Christchurch New Zealand

AIS OpenCPN Support

The MT-RX-4 has been tested with the free OpenCPN mapping PC application. In many cases free maritime maps are available, such as is the case for New Zealand.

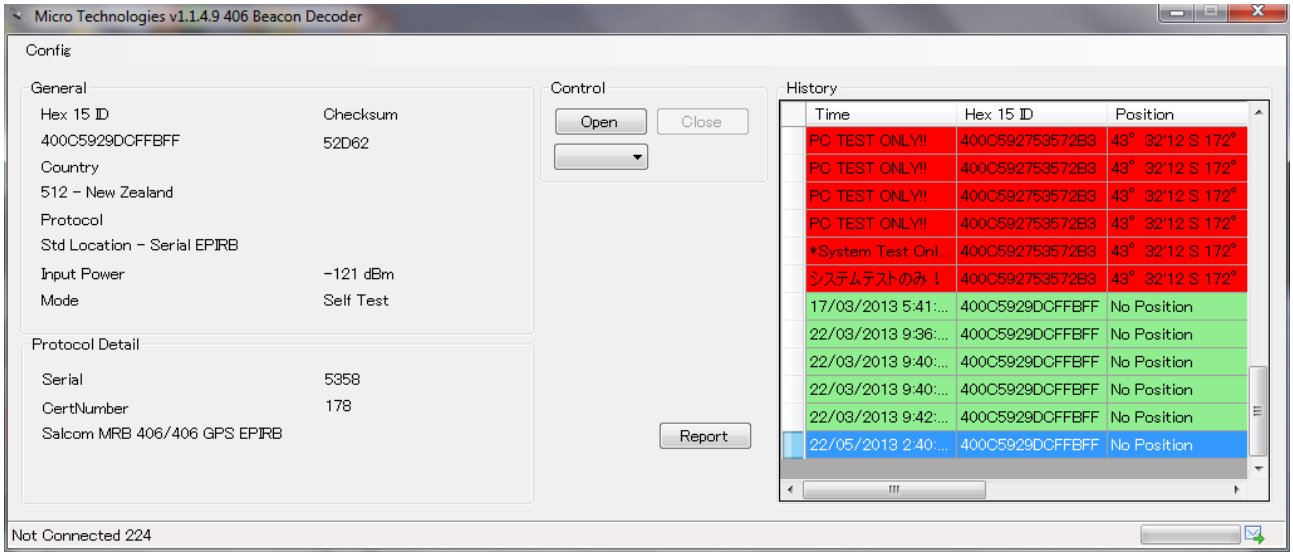
In order to use OpenCPN, ensure that AIS serial output has been enabled (MENU->AIS->RS232 OUT) and the RS232 baud rate has been set to a suitable rate for the application (MENU->SYSTEM->BAUD). Typically a baudrate of 38400 would be used for AIS receivers.

By default the MT-RX-4 is supplied with RS232 support, but can be provided with an optional RS422 internal module that may provide improved compatibility with some NMEA navigation systems.



406 Decoder PC Application

When connected to the optional 406 Decoder PC application (purchased separately), remote real-time notification of 406 transmissions is possible, decoding and displaying all beacon protocol parameters. Time-stamped messages are additionally stored on the PC that is integrated with both on-line OR off-line maps from many map providers to display the location of the alert when available. The 406 Decoder application, provides visual and audible alerts of 406 distress transmissions.



Through the configuration of a simple external language file, the application can be configured to operate in any language. Assistance can be provided for language translation if required.

© WTE Limited, 2026 – Christchurch New Zealand

Distress and test messages can be clearly differentiated. Distress messages are marked in red, test messages in green. New, incoming distress messages provide an audible alert until acknowledged.

When a history entry is highlighted that contains a valid position, a “Map” button is visible that when pressed, shows the location of the beacon transmission using the user selected integrated map.

Coma separated results are logged directly to file.

All information available in the history list is written to file, and time-stamped with the time written.

On application start-up the results file is loaded to allow browsing of entries and viewing of historical entry beacon parameters.

When a beacon certificate number has been decoded, the beacon model and manufacturer is displayed (produced from COSPAS-SARSAT registration reports).

The new beacon checksum is displayed (introduced in July 2012) that allows a more robust beacon registration method. This checksum is being adopted by some countries to ensure that the hex id is entered correctly during registration (there have been many cases of registration against the wrong ID).

© WTE Limited, 2026 – Christchurch New Zealand

Serial Port Configuration

Once the correct COM port has been selected, and the port has been opened, the status message will change from “Not Connected” to “Connected” when physically connected to the receiver. When the application is started again, the application will attempt to automatically connect using the last opened COM port. For PCs that lack RS232 COM ports, a USB to RS232 converter can be used.

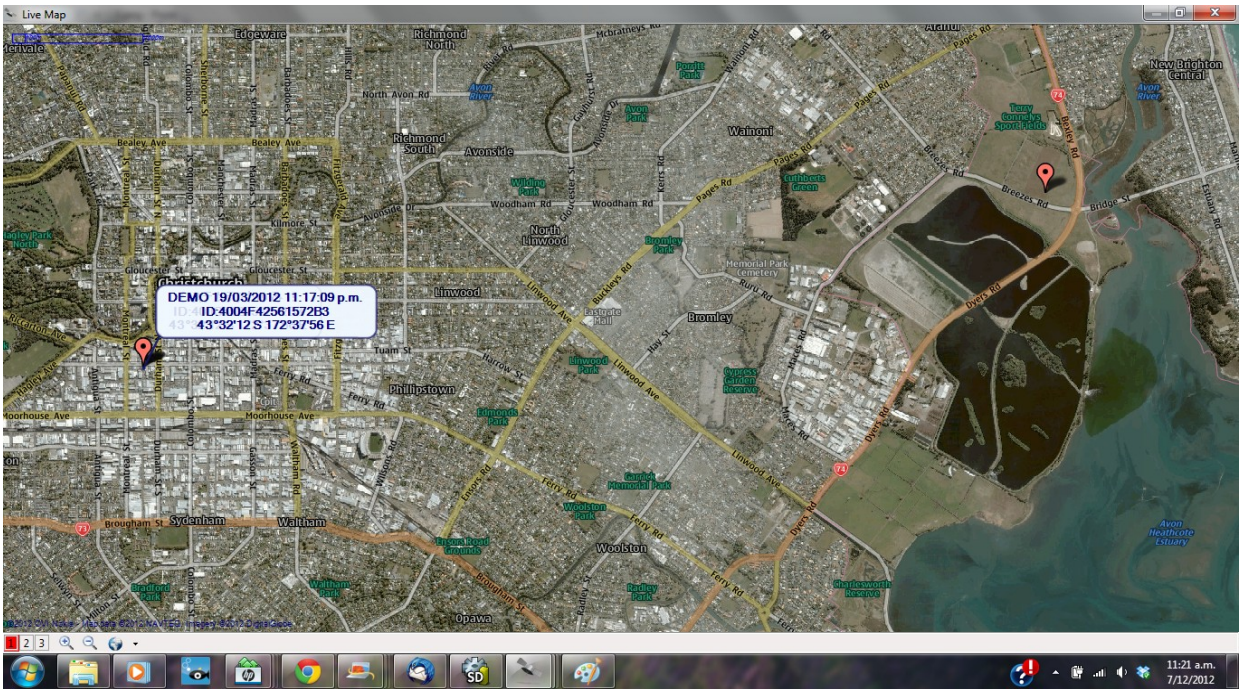
Integrated Mapping

The 406 Decoder PC application supports two modes of integrated mapping. These modes are either “Live”, where the map updates automatically when new messages are received, or static, by selecting any location message in the history list. Many map providers can be selected (such as “OpenStreetMap”, “ArcGIS”, “Bing” etc.), allowing map information to be switched rapidly to show information such as:

- Satellite Imagery.
- Topological details.
- Street information.

Depending on the map provider's conditions of acceptable use, some of these maps can be automatically stored on the computer by the PC application, allowing rapid screen updating and map updates without an internet connection being required.

Live Map Updates



When the “Live Map” option is selected through the “Config” menu the integrated map window is

opened. This map window is automatically updated and displays the position of the most recent received 406 transmissions containing a valid location. Details for each transmission can be viewed by “hovering” over the red map marker.

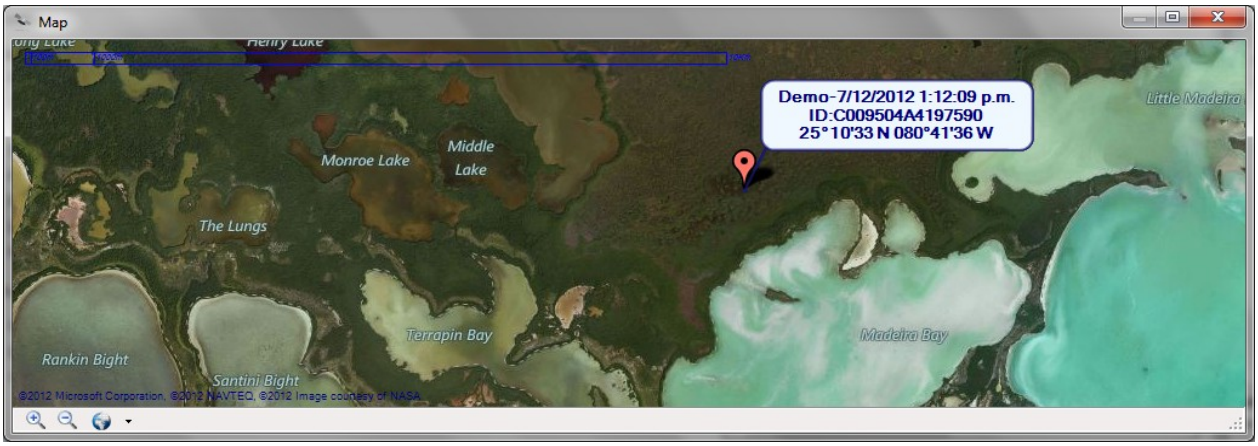
Static Map Button

When the “Map” button is pressed (only visible when an entry in the history list contains a valid location) the position is displayed using the selected map system.

By default the 406 Decoder PC application is configured to use “OpenStreetMaps”, which can be used without an internet connection free of charge.

NOTE: In order to use off-line maps (when there is not an internet connection available), the PC application must have previously viewed the area at the current zoom level WITH an internet connection. Once the area has been viewed, the map data will be stored for later retrieval.

Many map systems have been integrated and can be used to provide many differing useful views of the location decoded. These maps provide worldwide coverage.

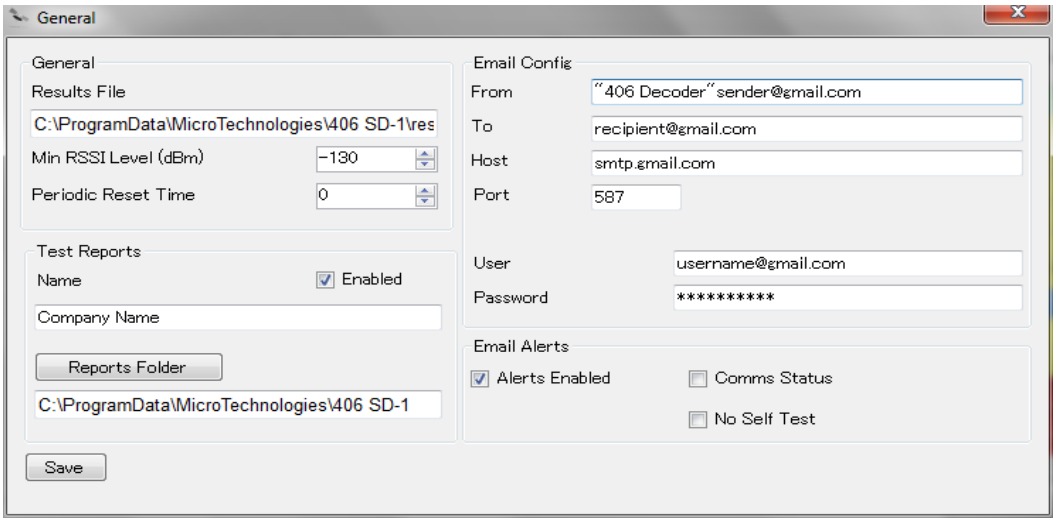


Shown below is an example of the integrated ArcGIS Topological map system.

© WTE Limited, 2026 – Christchurch New Zealand

Email Notification

The 406 Decoder PC application can be configured to automatically send email notifications when 406 messages are received or communication to the receiver is lost (either direct connection or if the receiver is being monitored remotely).



Emailing can be disabled completely or provide notification when communication to the unit has been lost and restored . Filtering can also be configured to not send self test messages.

The Min RSSI Level should normally be configured to be -130dBm. A low value (such as -130) means that all packets of even a very low signal strength are logged and emailed. Increasing the level may be preferable if there is an interest only in signals from closer beacons.

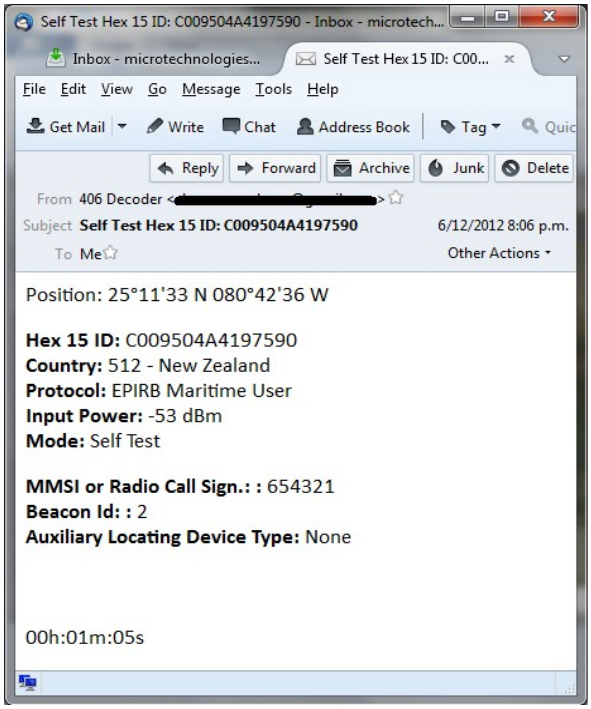
Obtaining a gmail account for the PC application is a simple way to send out email messages, and also keep a separate record of all emails sent by the application. The host and port settings shown will work well for gmail. Alternatively other SMTP email hosts can be used.

© WTE Limited, 2026 – Christchurch New Zealand

Testing Email Notification

Pressing the small button in the bottom right hand side of the bottom status bar generates a test distress message for demonstration purposes and confirming that email settings are correctly configured.

Typical email notifications appear as:



© WTE Limited, 2026 – Christchurch New Zealand

MT-RX-4 Customisation

The MT-RX-4 has been developed by WTE Limited, and therefore if a specific requirement exists, customisation of WTE products may be possible (at additional cost).

Examples of possible customisation:

- Changes to enclosure.
- Changes to serial output to better suit specific navigation equipment.
- Decryption of data parameters (e.g. for military use).
- Support of additional protocols.
- Support for different Languages.

© WTE Limited, 2026 – Christchurch New Zealand

Installation

The MT-RX-4 should be situated away from direct sunlight, extreme vibration and heat sources, and high power transmission sources.

An external antenna correctly designed to operate at your intended frequency of operation will result in best performance. Dual VHF/UHF antennas may operate acceptably for your requirements. Do not situate the antenna immediately next to the antenna of a high power transmission source – position greater than 2 M from any other antenna. Mount the external antenna with as much elevation as possible for best results (see “Antenna Elevation” below).

Maximum tolerated input power into the RF connector is 13 dBm. Levels above this will destroy the receiver RF input and invalidate the unit warranty.

Cables Supplied

By default NO cables are supplied on purchase. Because there are so many possible frequencies and variations in installation an antenna is NOT supplied by default. If an antenna is supplied, it will be a generic variety that will not perform as well as an antenna produced for the intended frequency of operation, or a high gain externally mounted type.

If cables are to be supplied, this must be ordered at time of purchase.

© WTE Limited, 2026 – Christchurch New Zealand

Connecting to the MT-RX-4

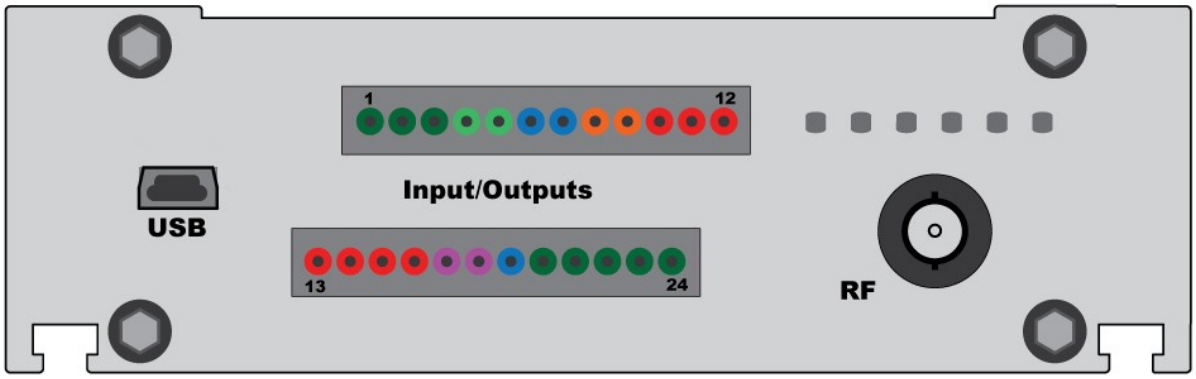
The minimum required connections for a usable system:

1. Connection to an antenna.
2. 12V, 1A supply connected to the power terminals

© WTE Limited, 2026 – Christchurch New Zealand

Connector Pin descriptions

RHS (Right Panel)



RF

BNC connector (50 ohms)

USB

Mini type B connector

Input/Output Connector:

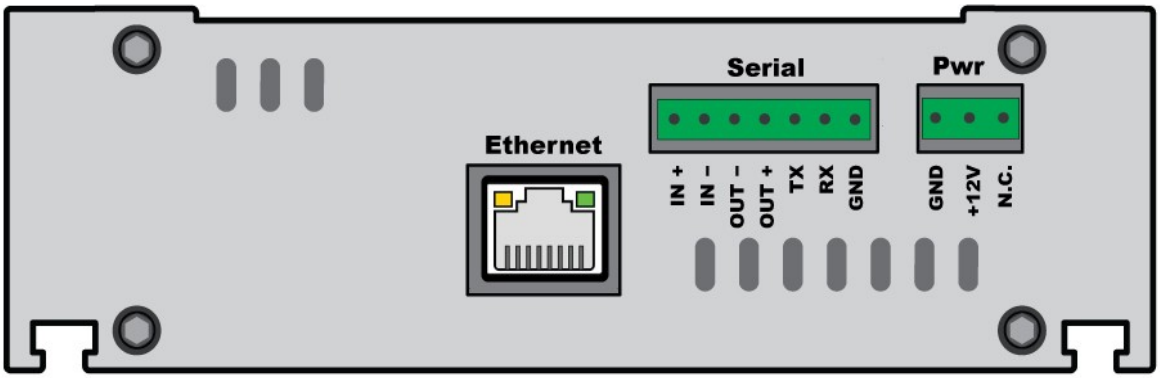
Inputs/Outputs Pin Number	Description
1-5	Not Used
6	GND
7	GND
8-9	Not Used
10	Output – Open Drain Alert Output
11-12	Not Used

Note: The second connector with pins 13-24 are fitted upside down. This means that the screw terminals are pointing down and wiring must be secured before inserting the connector.

© WTE Limited, 2026 – Christchurch New Zealand

Inputs/Outputs Pin Number	Description
13 - 16	Not Used
17	Relay CM (Alert Output)
18	Relay (NO / NC)
19	GND
20-24	Not Used

LHS (Left Panel)



Serial Connector:

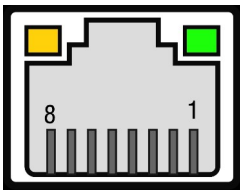
Serial Connector Pin Number	Description
1	RS422 RX+ (**IN+**)
2	RS422 RX- (**IN-**)
3	RS422 TX- (**OUT-**)
4	RS422 TX+ (**OUT+**)
5	RS232 TX
6	RS232 RX
7	Ground (**GND**)

© WTE Limited, 2026 – Christchurch New Zealand

Power Connector:

Power Connector Pin Number	Description
1	Ground (**GND**)
2	**+12V**
3	Not Connected (**N.C.**)

Ethernet Connector:



Connector Pin Number	Description
1	**TX+**
2	**TX-**
3	**RX+**
4	**NC**
5	**NC**
6	**RX-**
7	**NC**
8	**NC**

Note: pins: 4 and 5 are connected to ground via a 75R resistor

7 and 8 are connected to ground via a 75R resistor

© WTE Limited, 2026 – Christchurch New Zealand

Note: Do not connect a Power over Ethernet (PoE) connection to the MT-RX-4 Ethernet port as this will result in damage.

© WTE Limited, 2026 – Christchurch New Zealand

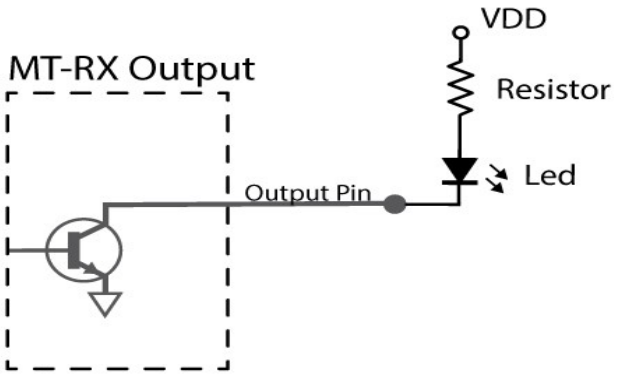
Output Hardware Connection

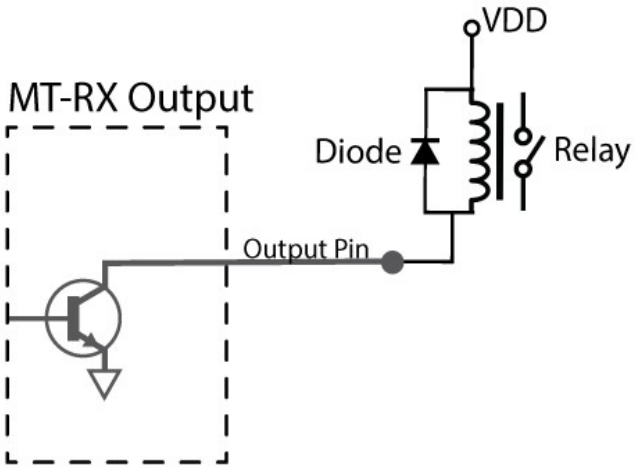
Examples of how to connect external devices to the MT-RX-4 output pins.

The MT-RX-4 contains 3 outputs, where 2 are open collector and one is a clean contact to an internal relay.

Care must be taken to ensure the sinking output current does not exceed 30mA. When using inductive loads, such as relay coils, flyback diodes must be fitted to prevent damage to the MT-RX-4.

Open Collector Outputs





© WTE Limited, 2026 – Christchurch New Zealand

Serial Connections

RS-232

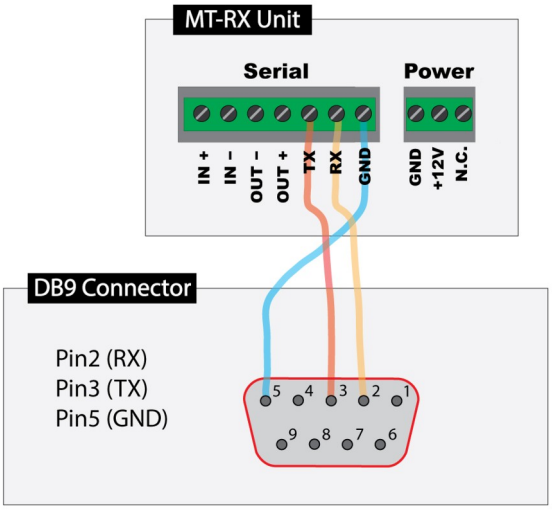


Illustration 1: MT-RX-4 RS-232 DB9 Connector as DTE

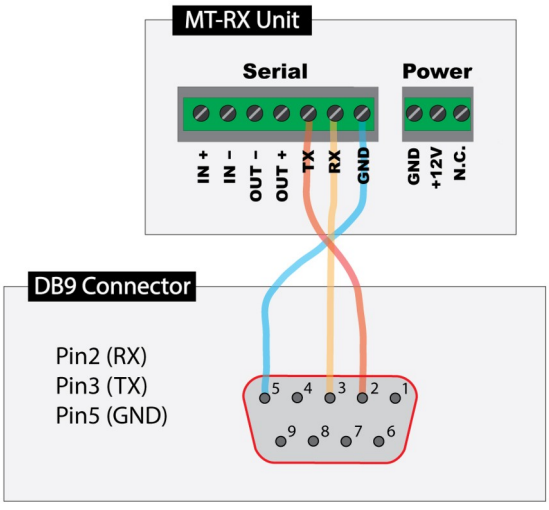


Illustration 2: MT-RX-4 RS-232 DB9 Connector as DCE

© WTE Limited, 2026 – Christchurch New Zealand

RS-422/RS-485

RS-422 and RS-485 use a differential electrical signal, as opposed to unbalanced signals referenced to ground as used by RS-232. Differential transmission uses two lines each for transmit and receive signals which results in greater noise immunity and longer distances between devices. These advantages make RS-422/RS-485 a better fit for industrial applications.

RS-422 is point to point interface that allows for up to 10 receivers but only a single transmitter. This would be a common serial interface for NMEA devices all sharing GPS data from a single GPS receiver for example.

RS-485 is a multipoint interface that allows each device to be a transmitter and also a receiver. This interface also allows for more devices to be connected on a common serial bus. Because each device on the same bus can transmit, each device must be capable of setting all transmit lines to a high impedance state when not in use to ensure that all devices have the ability to transmit. RS-485 interfaces can be presented as 4 or 2 wires. When there are 2 wires required, the RS-485 device must also be able to isolate its own receiver when transmitting to prevent looping data back to itself.

The MT-RX-4 satisfies the requirements for both 4 and 2 wire RS-485 communications. The MT-RX-4 will also be able to operate on a RS-422 bus.

© WTE Limited, 2026 – Christchurch New Zealand

RS-485/RS-422 Point To Point

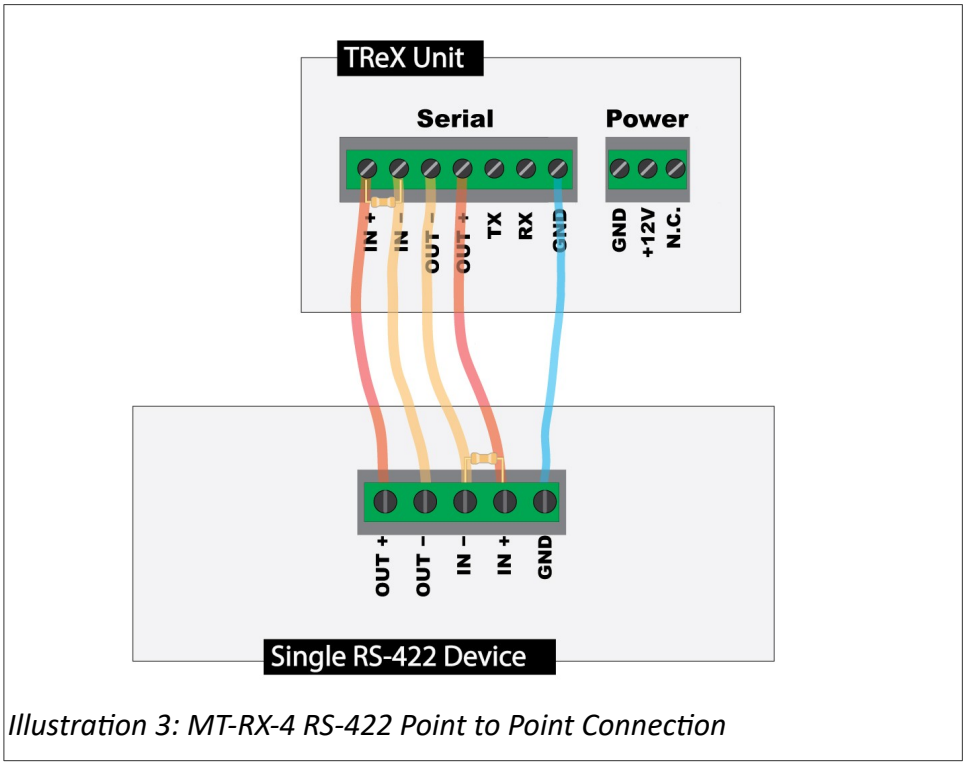


Illustration 3: MT-RX-4 RS-422 Point to Point Connection

RS-485/RS-422 Multi-Point

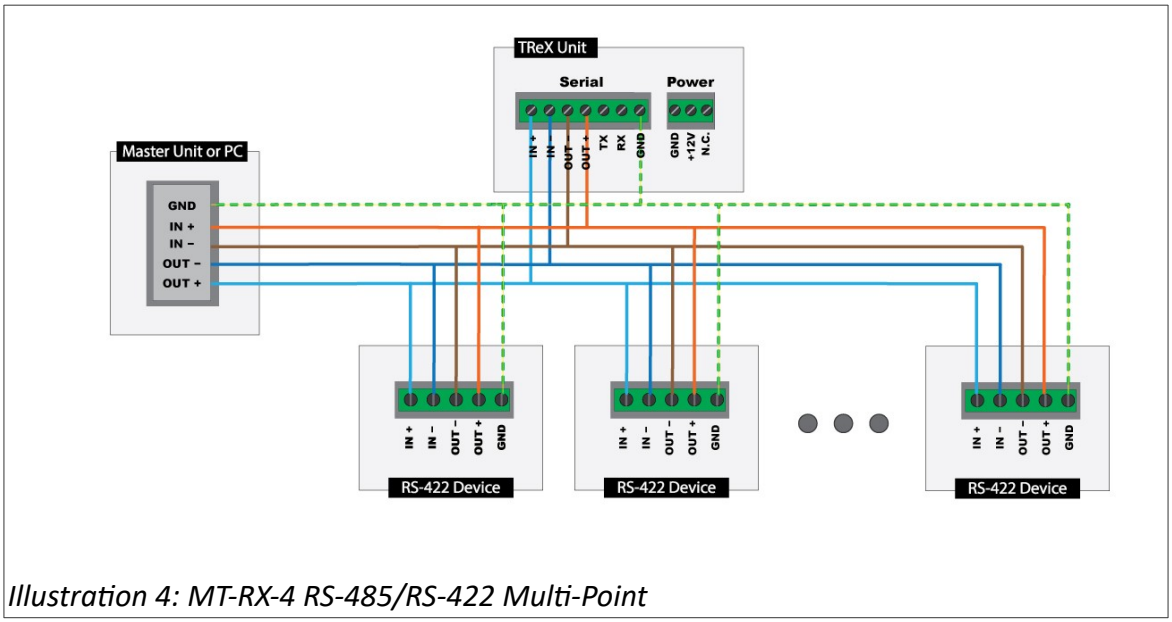


Illustration 4: MT-RX-4 RS-485/RS-422 Multi-Point

© WTE Limited, 2026 – Christchurch New Zealand

Note: *this configuration only applies if driving less than 10 listeners/receivers when using RS-422 devices or less than 32 devices for RS-485 devices.*

RS-485 Multi-Point – 2 Wire

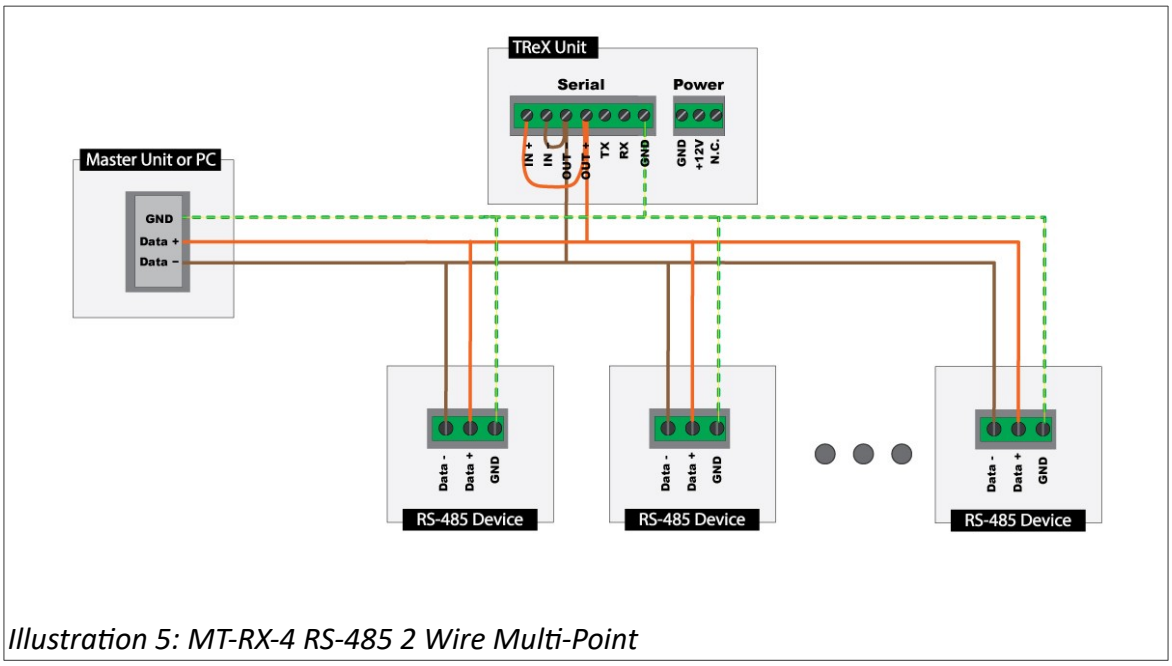


Illustration 5: MT-RX-4 RS-485 2 Wire Multi-Point

Note: *the MT-RX-4 must have wire links fitted as shown in order to operate correctly in this configuration.*

Bus Terminating Resistor

RS422/RS485 may require the fitting of a terminating resistor. The purpose of termination is to match the impedance of a transmission line to the hardware impedance of the interface it is connected to. There is more than one way to add termination to an RS485/422 serial connection. The most commonly used is DC Termination, accomplished by attaching a resistor between the signal lines on the extreme ends of the transmission line.

The rule of thumb for termination is:

- If the propagation delay of the data line is much less than one bit (pulse) width, termination is not needed.

This assumes reflections will damp out in several trips back and forth on the data line.

© WTE Limited, 2026 – Christchurch New Zealand

Typically for slow speeds of 9600bps or below, no termination resistor is required.

If termination is required a resistor value of 120Ω or greater should be used, and no more than 2 termination resistors should be used, one at each end of the RS422 transmission line.

Do not use termination resistors with a value of less than 90Ω.

There are many online references available to calculate these resistors if required.

© WTE Limited, 2026 – Christchurch New Zealand

RF Connections

A 50 ohm matched load should be fitted to the MT-RX-4 antenna port.

Note: Earth the antenna tower, feeders and lightning protection devices in accordance with the appropriate local and national standards. Use grounding kits as specified or supplied by the coaxial cable manufacturer to properly ground or bond the cable outer.

!CAUTION
Lightning will destroy electronic equipment. To avoid this risk, install primary lightning protection devices on any interfaces that are reticulated in the local cable network. You should also install a coaxial surge suppressor on the radio antenna port. If required, please consult your local antenna specialist.

© WTE Limited, 2026 – Christchurch New Zealand

Power Connections

Power to the MT-RX-4 is achieved via the power connector as described in the section **Installation** in this manual.

!WARNING
EXPLOSION HAZARD MT-RX-4 was **NOT** designed to operate and/or be connected to a supply voltage exceeding the specified maximum for this unit. **Failure to follow these instructions can result in death or serious injury**

© WTE Limited, 2026 – Christchurch New Zealand

Ethernet Interface

The MT-RX-4 supports a 10/100 Base-T Ethernet connection.

To simplify network setup, the MT-RX-4 supports auto-negotiation and auto-sensing MDI/MDIX crossover.

General	Interface	RJ45
	Cabling	CAT-5/6 UTP, supports auto MDIX (Standard Ethernet)
	Bandwidth allocation	The Ethernet capacity maximum is determined by the available radio link capacity.
	Ethernet mode	10Base-T or 100Base-TX Full duplex or half duplex (Auto-negotiating and auto-sensing)
Diagnostics	Green LED	Off: No data present on the interface. On: Data present on the interface.
	Orange LED	Off: no Ethernet connection On: Ethernet signal received

© WTE Limited, 2026 – Christchurch New Zealand

Omni or Directional Antenna

It is common in radio systems to consider an omni or directional antenna. Both have their advantages and disadvantages as follows.

If in doubt, consult a local antenna specialist who will be able to advise and construct an antenna best suited to your application.

Omni antenna

Omni antenna have the advantage of transmitting and receiving signals equally well in all horizontal directions. This means that if the transmitter or the receiver moves, the antenna will not need to be changed/adjusted to compensate.

This is the common antenna used in cellular phones and handhelds radios.

Directional antenna

Directional antenna have the ability to focus energy in a particular direction. This advantage increasing the maximum distance between transmitter and receiver units. Since the signals are focused/concentrated into a direction it also increase the overall performance of the system.

This is mainly used for fixed transmitter and receiver locations.

© WTE Limited, 2026 – Christchurch New Zealand

Antenna Elevation

As with any radio receiver, raising the height of either the transmitter or receiver antenna will result in dramatic improvements to the maximum possible receive distance. Although a high power transmission will increase distance, the installed height of the receiver antenna is the key to a high performing system.

When close to the ground the major obstacle to overcome, since radio signals are mainly "line of sight", is the curvature of the earth. The typical distance to expect can be approximately calculated as follows:

$$D=\sqrt{\frac{2r_0h_f}{6076.1\beta_0}}$$

Where:

D is the distance to the horizon in NM,

r_0 is the mean radius of the earth (3440.1 NM),

h_f is the height of your antenna,

β_0 (0.8279) accounts for terrestrial refraction.

This formula can be simplified to:

$$d=1.17*\sqrt{h_f}$$

Where:

d = range in nautical miles,

h_f = the height of your antenna in feet.

Working with metric units this formula becomes:

$$km=2.17*\sqrt{0.305*h_m}$$

Where:

km = range in kilometres,

h_m = the height of your antenna in metres.

© WTE Limited, 2026 – Christchurch New Zealand

Therefore:

Antenna Elevation (metres)	Clear Line of Sight Distance (km)
1	1.2
5	2.7
100	12

The Antenna Elevation is the combined elevation of both the transmitter and the receiver (transmitter at 1m and receiver at 9m will behave similarly as the transmitter at 5m and receiver at 5m.

Changes in power level will help to address a less than ideal antenna or poor line of sight conditions.

When line of sight or elevation is poor, the range can also be approximately doubled with every 6dB increase in link budget (either increase in TX power, or increase in RX sensitivity).

From testing, these ranges can be expected from a 20dBm transmitter at the indicated elevation.

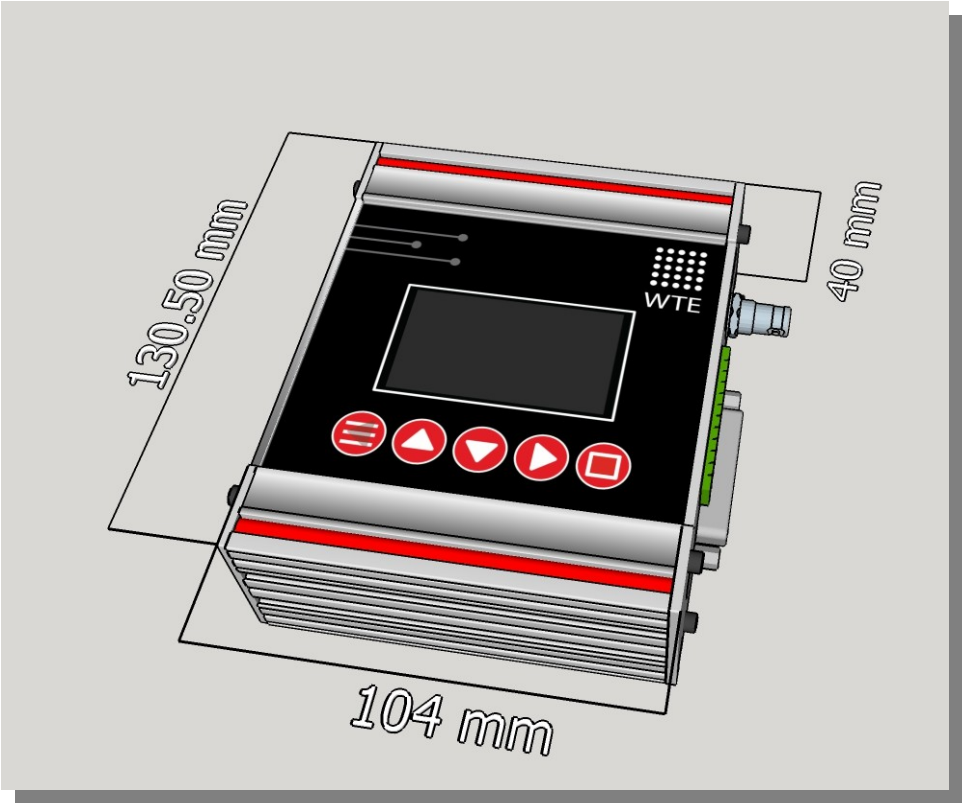
(credit to www.offshoreblue.com for some range calculation details)

© WTE Limited, 2026 – Christchurch New Zealand

Physical Dimensions

MT-RX-4 physical dimensions are 104 mm x 130.5 mm x 40 mm (length x width x height)

Weight: 550 grams



© WTE Limited, 2026 – Christchurch New Zealand

Mounting Hardware

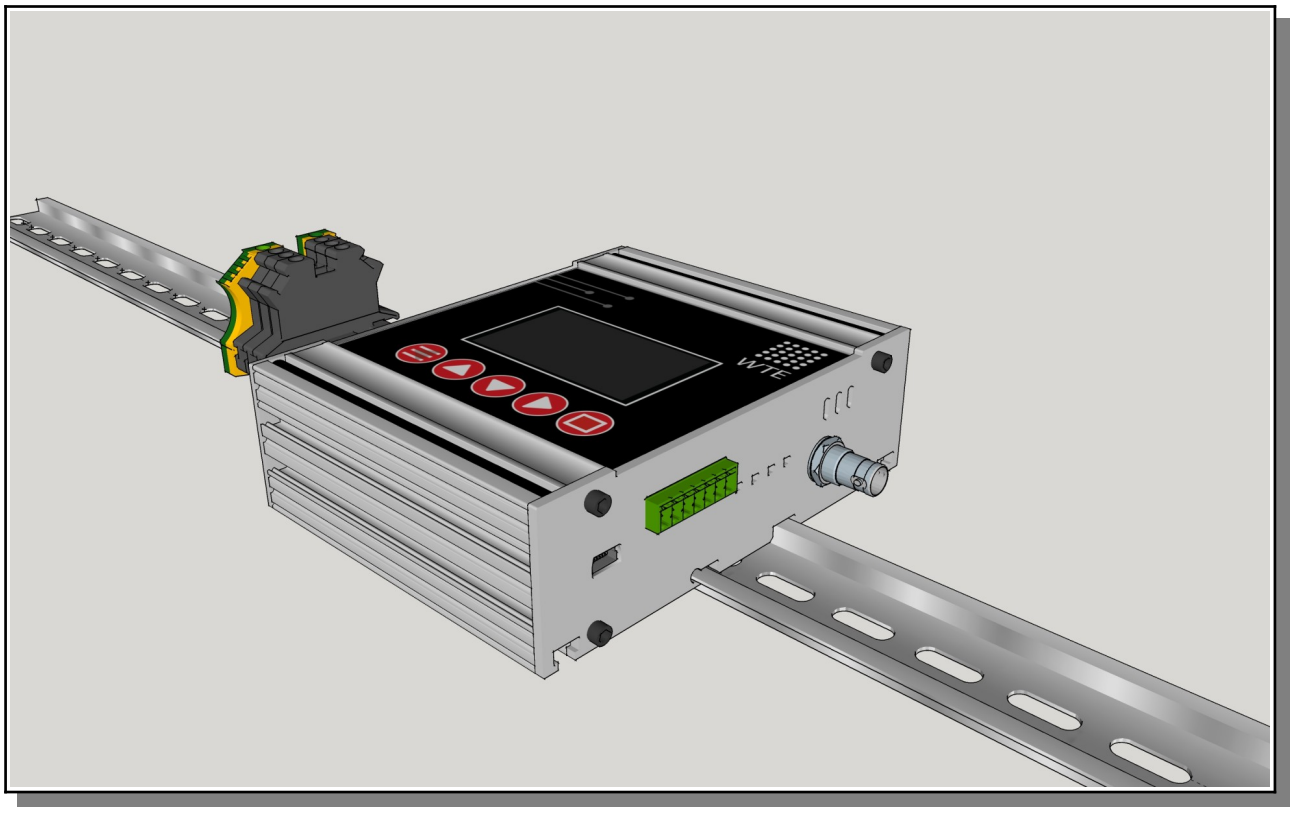
The MT-RX-4 enclosure was designed to be mounted via:

- DIN Rails
- Left or right M4 nut-and-bolt channels
- Top or bottom M4 nut-and-bolt channels

Please refer to the following images and descriptions to correctly mount the MT-RX-4.

DIN Rail

The MT-RX-4 custom extrusion incorporates a DIN rail slot for easy snap-fit DIN rail mounting.



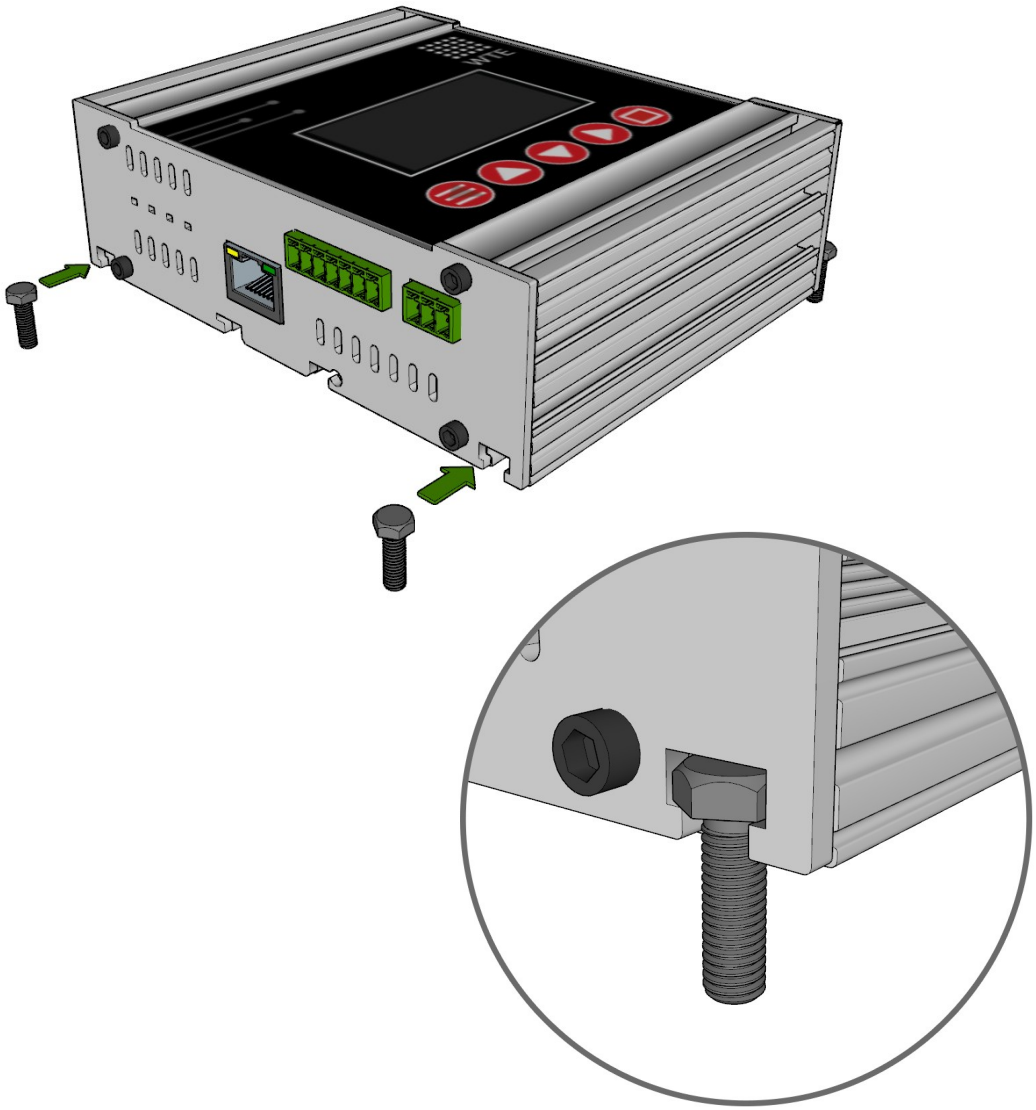
© WTE Limited, 2026 – Christchurch New Zealand

Mounting Channels

The MT-RX-4 has channel strips on the front, rear, top and bottom. In order to access the front, top and bottom channels (less common mounting options), the end plate on the power-cable side must first be removed using a hex key. Mounting from the rear does not require the removal of the end plate.

The mounting channel allows an **M4 bolt** head or **M4 nut** to lock inside, as shown below.

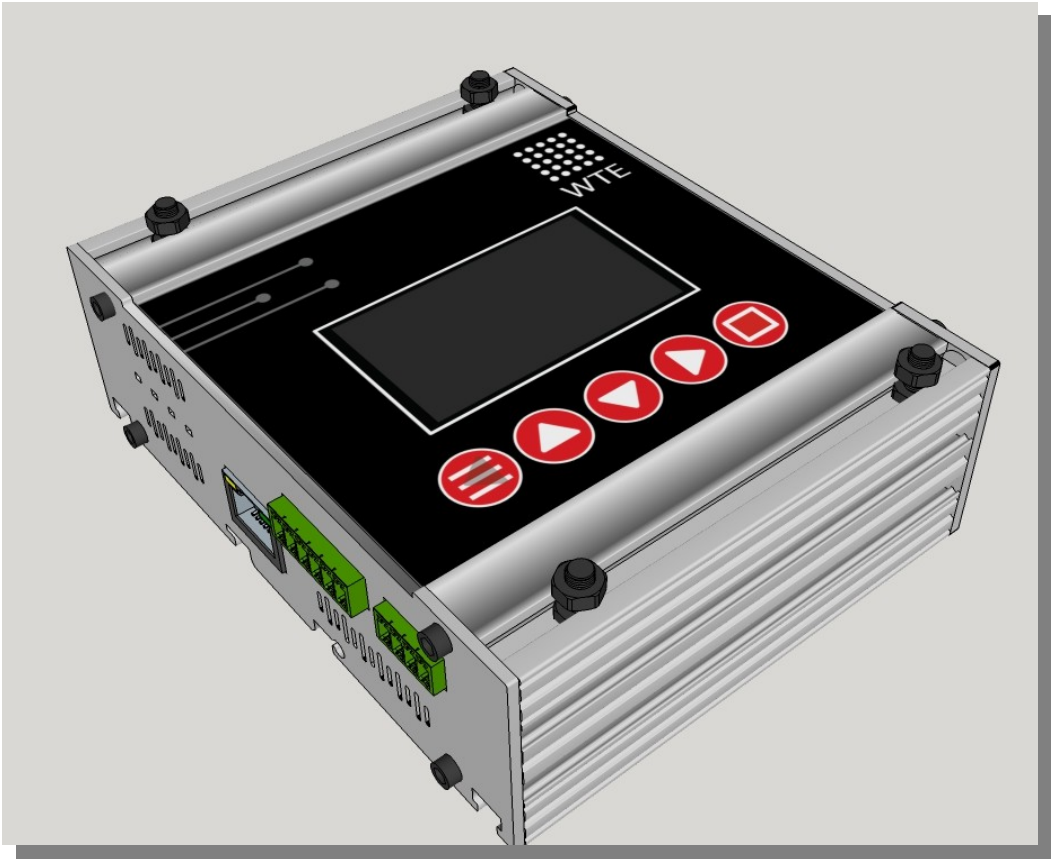
If an M4 nut is used inside the channels (instead of a M4 bolt head) care must be taken to NOT use a bolt or screw longer than the channel depth. Failure to observe this requirement may result in damage to the MT-RX-4 and invalidate the product warranty.



© WTE Limited, 2026 – Christchurch New Zealand

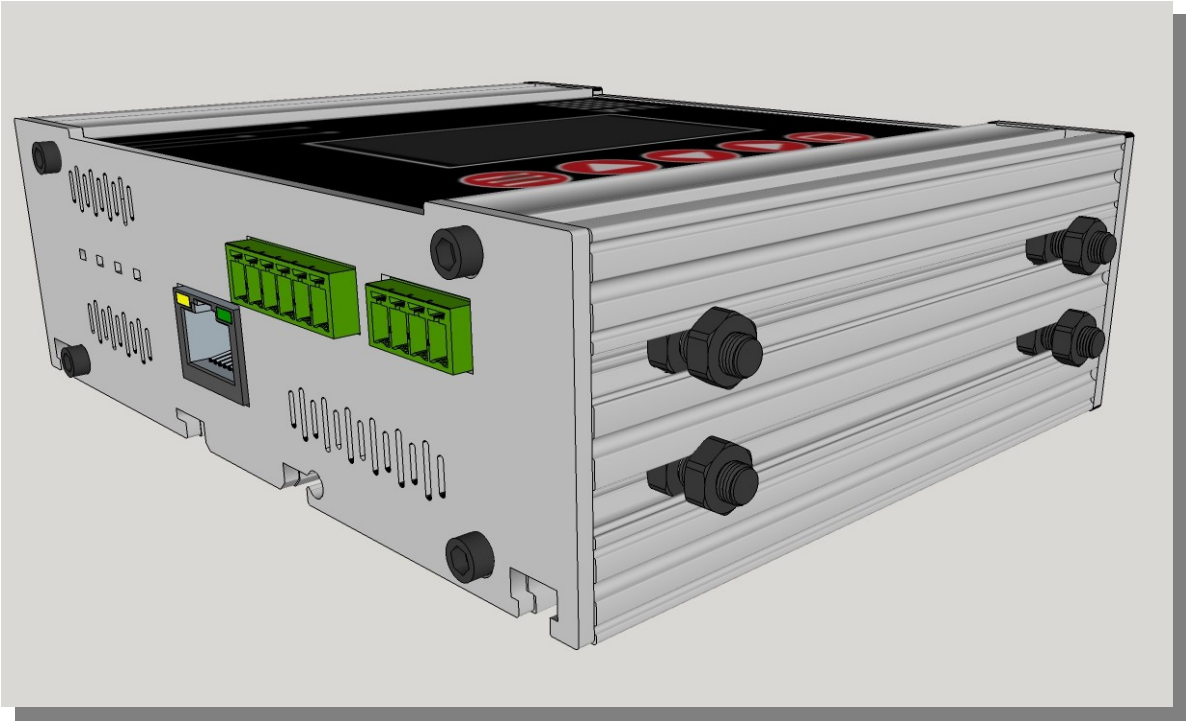
Top Mount

The flush-mount option is suitable for installation on the front panel of a case or cabinet.



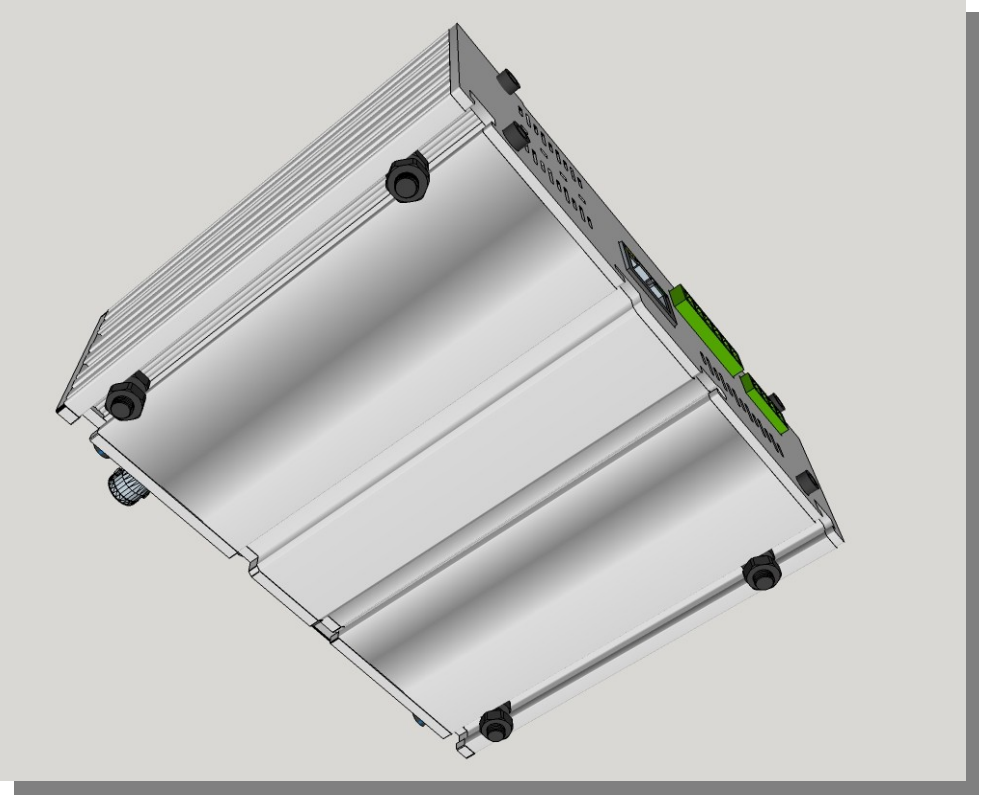
© WTE Limited, 2026 – Christchurch New Zealand

Side Mount



© WTE Limited, 2026 – Christchurch New Zealand

Bottom Mount



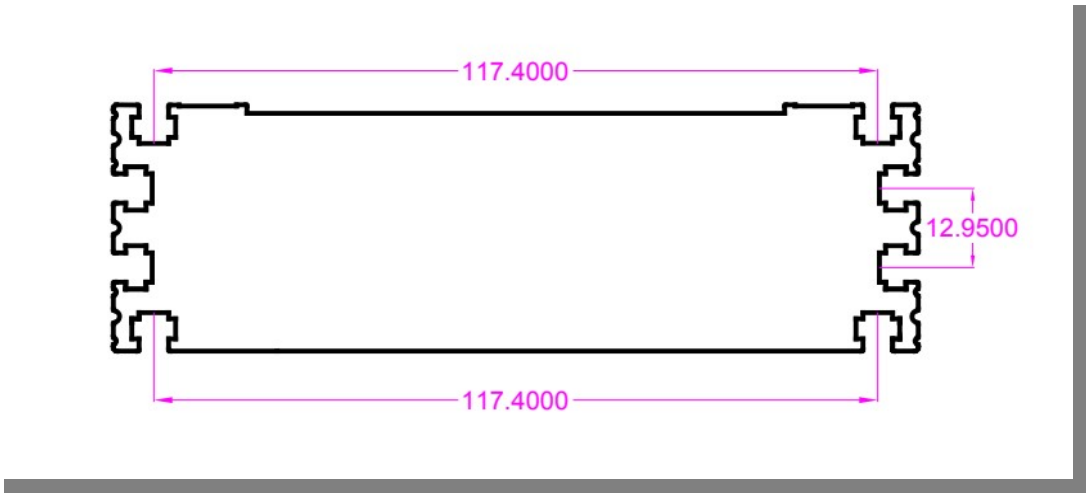
© WTE Limited, 2026 – Christchurch New Zealand

Mounting Bolts Dimensions

The top and bottom are symmetrical, as are the left and right sides of the MT-RX-4. This allows a wide range of mounting configurations.

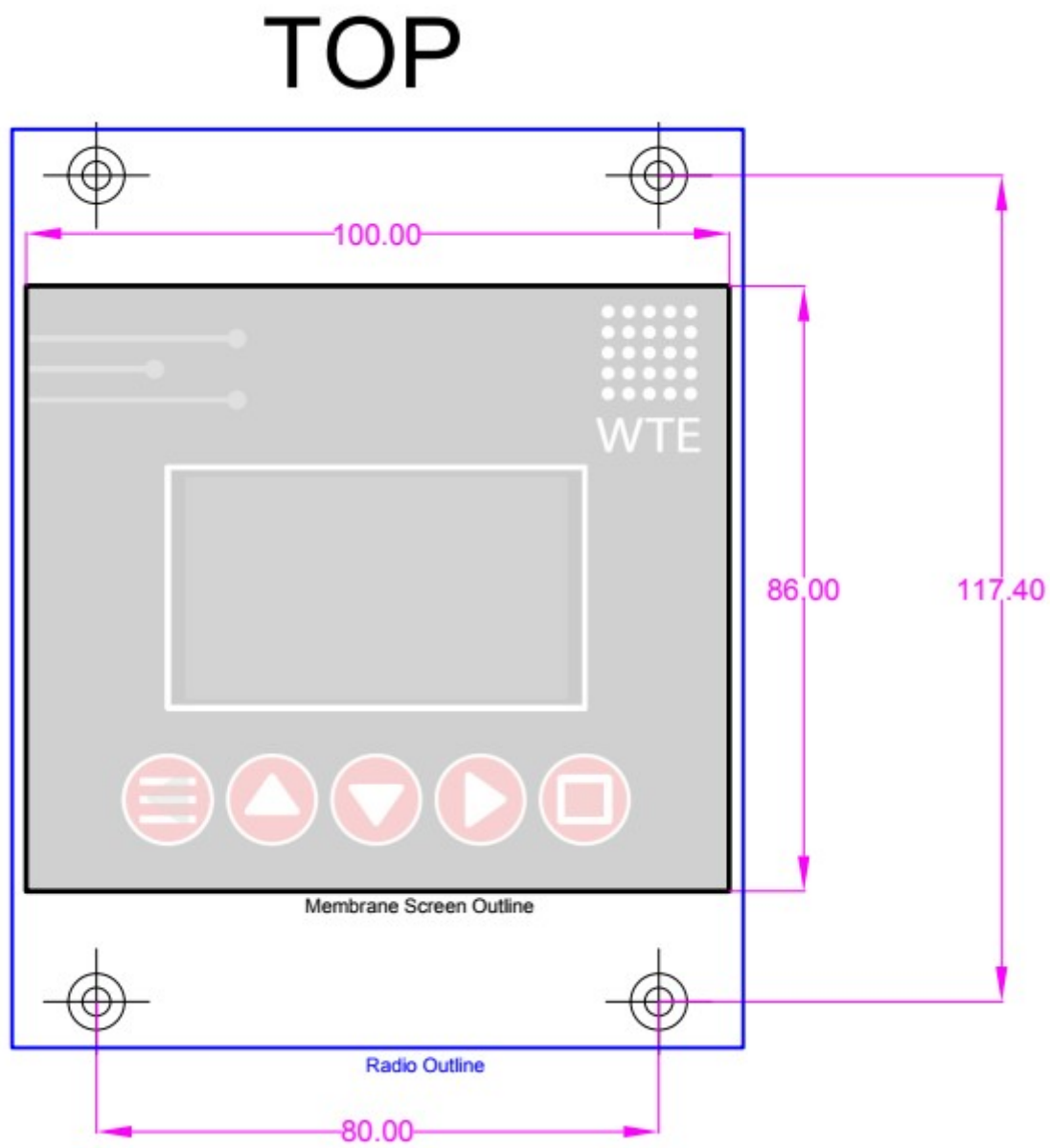
The centre-to-centre spacing between the channels on the top and bottom of the radio is 117.40 mm.

Dimensions are in millimetres.



© WTE Limited, 2026 – Christchurch New Zealand

Top and Bottom Drilling Template

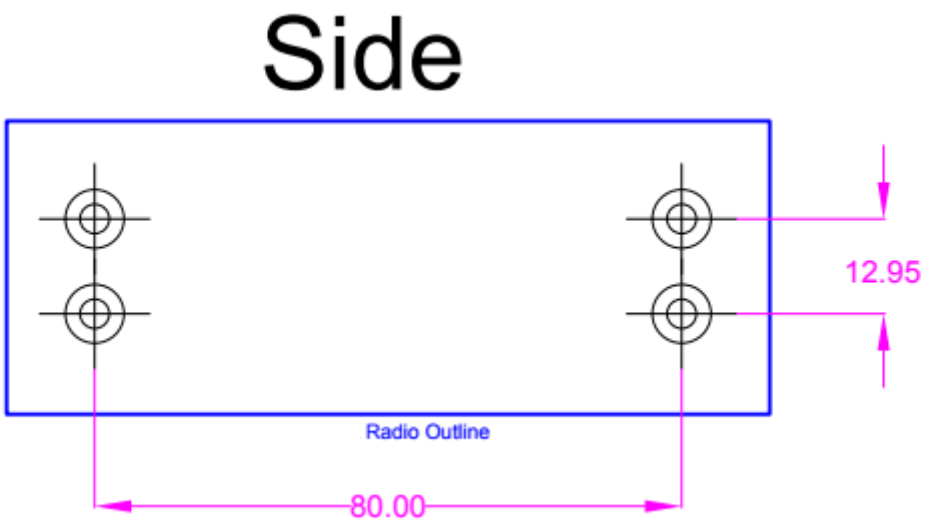


Note:

- All dimensions are in millimetres.
- The drilling template may not be to scale depending on your printer settings.

© WTE Limited, 2026 – Christchurch New Zealand

Side Drilling Template



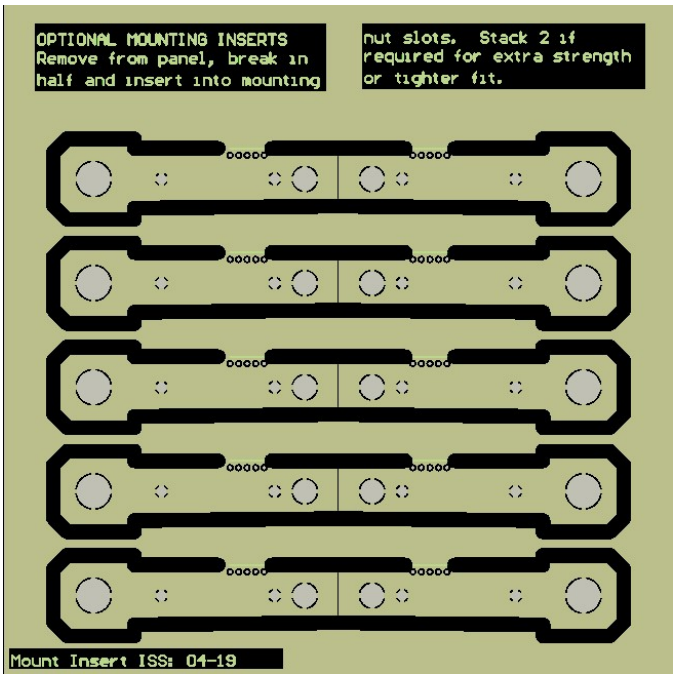
Note:

- All dimensions are in millimetres.
- The drilling template may not be to scale depending on the printing settings.
- Depending on the installation, not all mounting points may be required.

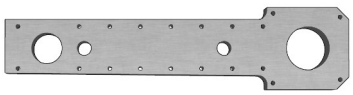
© WTE Limited, 2026 – Christchurch New Zealand

Optional Mounting Inserts

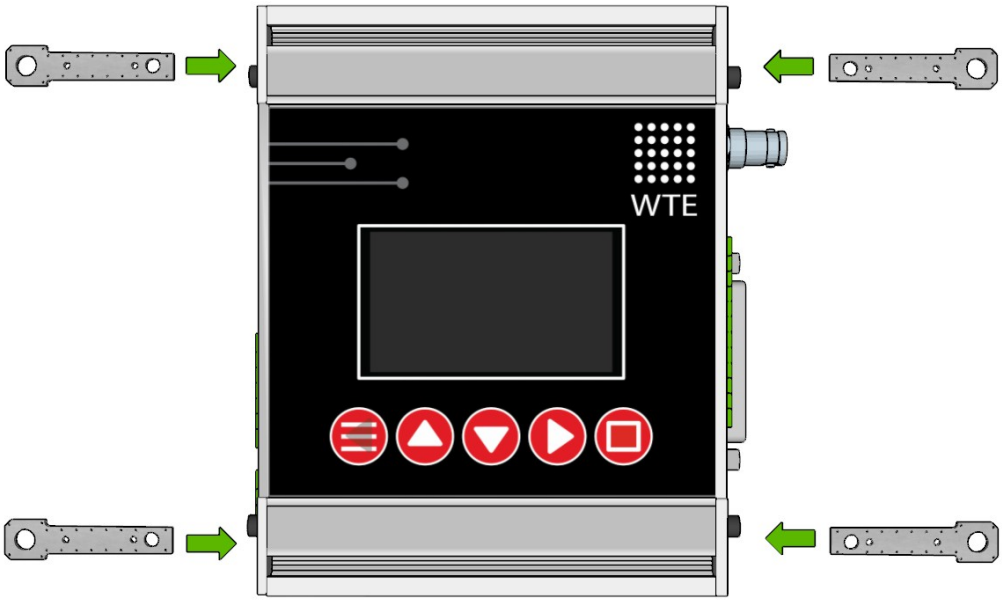
The optional mounting inserts, provided with the MT-RX, can be used to mount the MT-RX to a panel/enclosure using M4 screws as shown below.

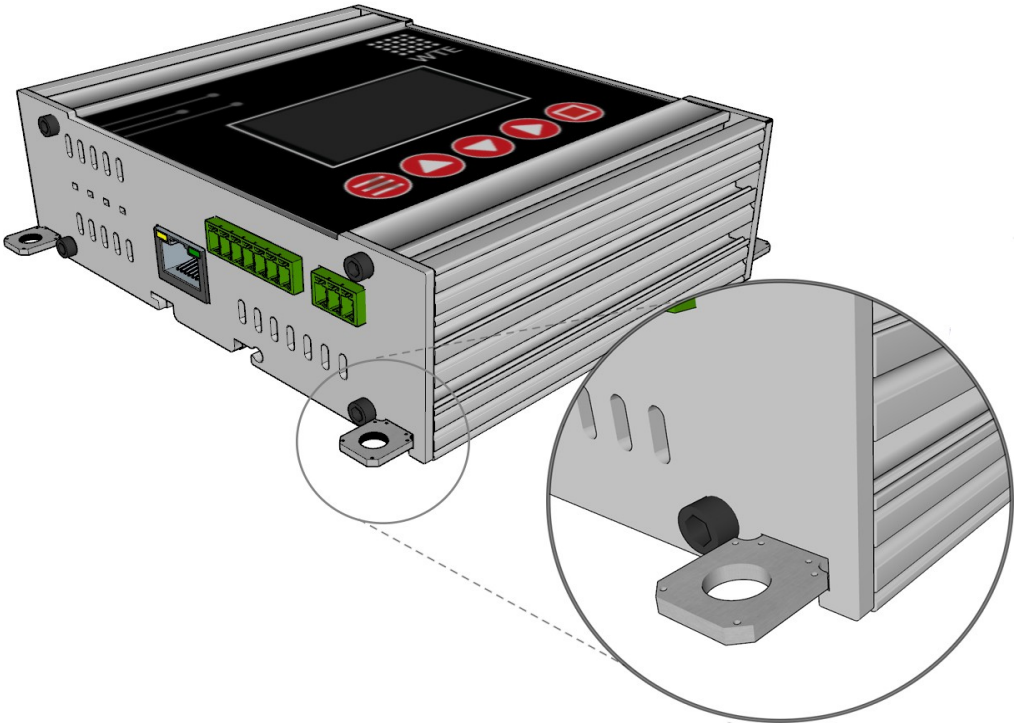


Remove mounting inserts from the panel before installation.



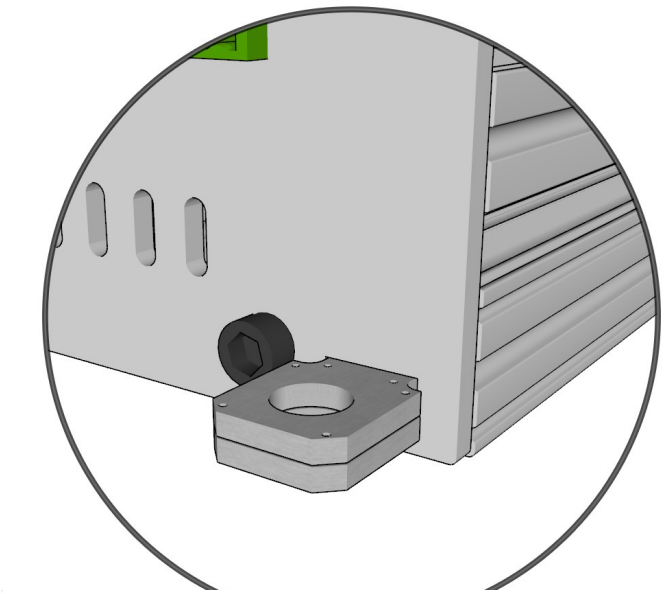
© WTE Limited, 2026 – Christchurch New Zealand

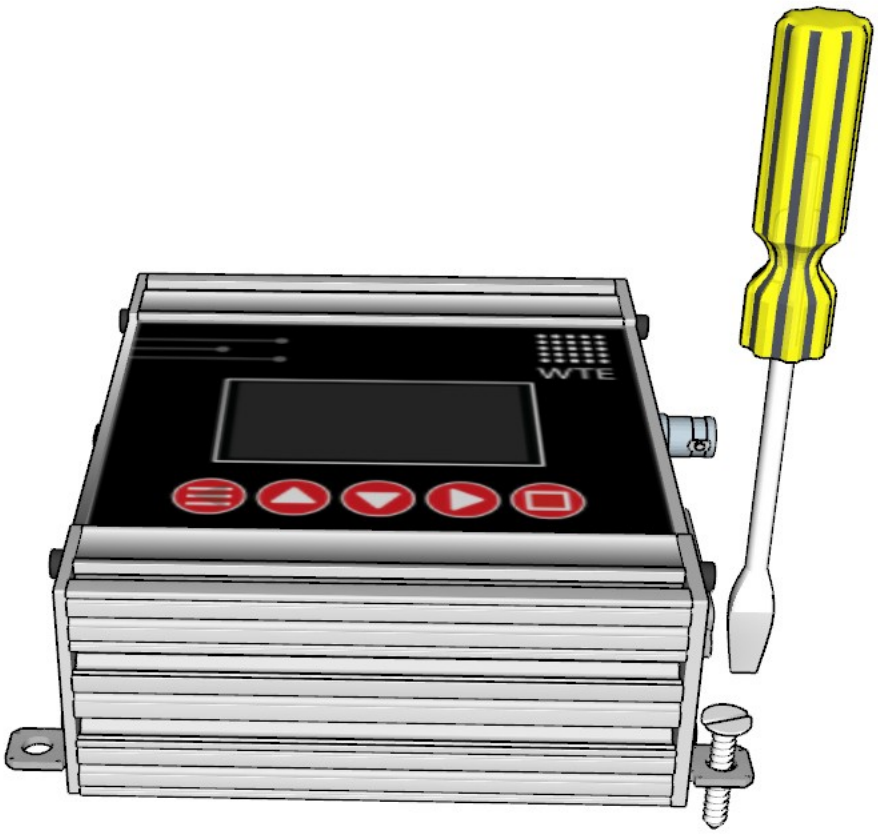




© WTE Limited, 2026 – Christchurch New Zealand

Optionally, two mounting inserts can be used for extra strength.





© WTE Limited, 2026 – Christchurch New Zealand

Disclaimer

THE RESPONSIBILITY LIES COMPLETELY ON THE USER TO ENSURE THAT THIS DEVICE IS TESTED, THROUGH METHODS THAT ARE APPROPRIATE, TO CONFIRM THAT ALL SYSTEM COMPONENTS (THAT THIS DEVICE AND PC SOFTWARE MAY BE PART OF) ARE WORKING CORRECTLY.

THIS DEVICE AND SOFTWARE ARE NOT INTENDED TO BE USED AS A PRIMARY LIFE-SAVING TOOL, BUT MAY BE USED TO COMPLEMENT OTHER EMERGENCY DETECTION TOOLS ONLY WHEN CORRECTLY CONFIGURED AND TESTED.

THE PRIMARY LIFE-SAVING MECHANISM FOR 406 BEACONS SHOULD ALWAYS BE CONSIDERED TO BE THE 406 SATELLITE NETWORK, FOR WHICH THE 406 BEACON HAS BEEN DEVELOPED.

The default enclosure is NOT waterproof; however, this device may be fitted inside any enclosure to achieve the degree of water protection required.

This document has been prepared in good faith and produced to assist in the use of this product; however, WTE Limited reserves the right to modify, add or remove features without notice.

When product is supplied, it is the user who is responsible for payment of any customs fees/taxes that are imposed on importation.

No User-Serviceable Components. There are no user-serviceable components within the radio.

RoHS and WEEE Compliance
MT-RX-4 is fully compliant with the European Commission’s RoHS (Restriction of Certain Hazardous
Substances in Electrical and Electronic Equipment) and WEEE (Waste Electrical and Electronic Equipment) environmental directives.

Restriction of hazardous substances (RoHS)
The RoHS Directive prohibits the sale in the European Union of electronic equipment containing these hazardous substances: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), and polybrominated diphenyl ethers (PBDEs).

End-of-life recycling programme (WEEE)
The WEEE Directive concerns the recovery, reuse, and recycling of electronic and electrical equipment. Under the Directive, used equipment must be marked, collected separately, and disposed of properly.

© WTE Limited, 2026 – Christchurch New Zealand

Manufacturing Marking and Labels

The MT-RX-4 serial number can be found on the unit. The serial number and model information are also displayed at start-up and can be accessed via:

MENU->SYSTEM->FACTORY.

FCC regulations allow for electronic labelling.

FCC details can be found via:

MENU->SYSTEM->REGULATORY

*Note: Publication 784748-D01, FCC Part 90, allows devices with an integrated display to omit a printed label containing this information.

Maintenance

No User-Serviceable Components. Servicing is to be performed only by WTE Limited or an agent appointed by WTE Limited. Servicing outside of the warranty period is at the discretion of WTE Limited.

© WTE Limited, 2026 – Christchurch New Zealand

Product End of Life

It is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and help ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, contact your local dealer or city council.

Please recycle this device responsibly. The MT-RX-4 has a residual scrap value that includes 400 g of aluminium.

© WTE Limited, 2026 – Christchurch New Zealand

Product Warranty

WTE Limited products are warranted for a period of 12 months from the date of purchase against defects in workmanship or materials. Return the product to WTE Limited, with all freight costs paid by the customer, and the product will be repaired or replaced.

The product warranty will be invalidated through evidence of:

- Unauthorised work carried out.
- Tampering, including evidence of removal of internal electronics from the case.
- Installation in wet or corrosive environments.
- Exposure to impact or excessive vibration.
- Use or installation outside of the specified operating parameters.

© WTE Limited, 2026 – Christchurch New Zealand

Abbreviations and Glossary

USB Universal Serial Bus

AES Advanced Encryption Standard

AGC Automatic Gain Control

ASCII American Standard Code for Information Interchange

BER Bit Error Rate

CBC Cipher Block Chaining

CCM Counter with CBC-MAC integrity

DCE Data Communications Equipment

DTE Data Terminal Equipment

EMC Electro-Magnetic Compatibility

EMI Electro-Magnetic Interference

ESD Electro-Static Discharge

ETSI European Telecommunications Standards Institute

FW Firmware

HW Hardware

IF Intermediate Frequency

IP Internet Protocol

I/O Input/Output

ISP Internet Service Provider

kbit/s kilobits per second

kHz kilohertz

DSC Digital Selective Calling

LAN Local Area Network

LED Light Emitting Diode

mA milliamps

MAC Media Access Control

Mbit/s Megabits per second

MHz Megahertz

ms milliseconds

PC Personal Computer

PLL Phase Locked Loop

ppm parts per million

PMR Public Mobile Radio

RF Radio Frequency

RoHS Restriction of Hazardous Substances

RSSI Received Signal Strength Indication

RX Receiver

SCADA Supervisory Control and Data Acquisition

SNMP Simple Network Management Protocol

SNR Signal to Noise Ratio

SWR Standing Wave Ratio

TCP/IP Transmission Control Protocol/Internet Protocol

TCXO Temperature Compensated Crystal Oscillator

TFTP Trivial File Transfer Protocol

TMR Trunk Mobile Radio

TX Transmitter

UTP Unshielded Twisted Pair

VAC Volts AC

VCO Voltage Controlled Oscillator

VDC Volts DC

WEEE Waste Electrical and Electronic Equipment

© WTE Limited, 2026 – Christchurch New Zealand

Specification

406 Beacon Frequency Range	All used 406 Beacon frequencies 406.020 MHz – 406.045 MHz (concurrently)
Mechanical	Length: 104 mm or 125 mm including BNC connector Width: 131 mm Height: 41 mm Weight: 550 grams
Supply Voltage	8-15 VDC Internally fused at 500 mA.
Relay Contacts	1 A . Maximum voltage 24 V.
Relay Closure	• On any 406 message, distress burst only or on reception of a specific beacon hex ID. • On AIS type 1 SART status message 14 or 15. • On RSS signal strength. • On 121.5MHz / 243 MHz sweep detection. • On AIS vessel proximity. • On AIS vessel collision alert. • On GPS Anchor drift alert. • On a DSC type 112 distress message..
Temperature Limits	-30 to + 70 °C.
Max Input Power	0dBm. Connecting a 406 beacon directly to the antenna input will result in certain damage.
121.5 MHz Receiver Sensitivity	-114 dBm.
406 MHz Receiver Sensitivity	-122 dBm
AIS (A) MHz Receiver Sensitivity	-122 dBm
AIS (B) MHz Receiver Sensitivity	-122 dBm
DSC Receiver Sensitivity	-117 dBm
Receiver Absolute Maximum Input Power	+13 dBm. Do NOT connect directly to a 406 beacon.
RSSI Range	-125 dBm to 0 dBm (not calibrated)
RSSI Resolution	0.5 dB
Antenna Connector	SMA
Operating Current @ 12 V Supply	150 mA plus 9 mA when relay energised. 30 mA when sounder operating (typical) 20 mA when backlight enabled.
Firmware	Field upgradable.
SD Storage Capacity	2 GB
406 Error Correction	Correction of up to 5 bit errors per 406 packet.

© WTE Limited, 2026 – Christchurch New Zealand

AIS Decode Support	Both 161.975MHz and 162.025MHz. Decoding of all AIS sentences. Alert only on type 1 SART status 14 or 15 as configured. Serial output as RS232, or RS422 / RS485 of all AIS messages. Configurable AIS vessel proximity and collision alert.
406 Location Protocol Support	All COSPAS SARSAT C/S T001 Issue 3 Rev 12 Location protocols. - User Location Protocol - Standard Location Protocol - Standard Test Location Protocol - National Location Protocol - National Test Location Protocol - RSL Location Protocol
DSC Decode Support (optional)	112,120,123,116,114,102
Spectrum Analyser (optional)	Frequency range: 142-175, 350 - 499 MHz RBW: 1 kHz / 25 kHz Span: 120 kHz / 3 MHz Continual or peak display. Min signal -120 dBm, max signal -10 dBm. Input Power accuracy: 421-480 MHz +/-8 dB, 120-175 MHz -2dB.
Compliance with Standards:	EN 301 489-3, EN 60950-1 satisfying the CE directives R&TTE 1999/5/EC, EMC 2004/108/EC and LVD 2006/95/EC. FCC part 15 Subpart A + B.
IP Rating	IP51.

© WTE Limited, 2026 – Christchurch New Zealand