MReX-5B
MESSAGING TRANSMITTER

User Manual

Table of Contents

Wireless Technologies

Introduction

Thank you for choosing the MReX-5B.

The MReX-5B is a portable, 5 button messaging and control transceiver. The MReX-5B incorporates the MReX-460 telemetry module.

MReX-5B Features

- Sends 512, 1200 and 2400 baud POCSAG paging messages.
- Transmits DMR Tier 1 text messages (optional).
- Configured inputs can be programmed to send messages when triggered.
- Firmware upgradable.
- High stability oscillator ensuring minimal drift over the entire specified temperature range.
- Output power up 100mW.
- "Polite" operation, checking the channel is clear before transmission.
- Operates from 2 AA batteries.
- Approved for use as a mobile or base station transmitter.
- Approved for use at rates up to 9600 bps for fast telemetry control.
- Approved for use with any antenna - allows the user to choose between size, performance or elevated external antennas.
- Transmit LED and sounder.

MReX Versions

The MReX can be supplied as these variants:

- MReX-460 (421MHz to 480MHz) Telemetry and Messaging Module.
- MReX-460-SF Store and Forward Repeater with IO.
- MReX-460-5IO Telemetry and messaging Transceiver.
- MReX-460-5B 5 Button Handheld Messaging Transmitter.

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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 a potential personal 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.

⚠WARNING

LOSS OF CONTROL
- The designer of any control scheme must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure. Examples of critical control functions are emergency stop and over travel stop.
- Separate or redundant control paths must be provided for critical control functions.
- System control paths may include communication links. Consideration must be given to the implications of anticipated transmission delays or failures of the link.

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

⚠WARNING

To comply with both **FCC RF Exposure** requirements in section 1.1310 of the FCC Rules and EN50383, antennas used with this device must be installed to provide a separation distance of at least 8 cm from all persons to satisfy RF exposure compliance.

DO NOT:

- Operate the transmitter when someone is within 8cm of the antenna. EN50383 regulatory limits have deemed that 8cm is a safe clearance distance from this product while operating at full power.

- Operate the transmitter unless all RF connectors are secure and any open connectors are properly terminated.

- Use within 15cm of sensitive electronic devices and medical equipment while operating at full power.

- Operate the equipment near electrical blasting caps or in an explosive atmosphere. All equipment must be properly grounded for safe operations.

⚠WARNING

THIS EQUIPMENT IS NOT INTENDED FOR MAINS VOLTAGES

- The MReX was **NOT** designed to operate and/or be connected directly to live main voltages. The MReX 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 will be damaged if signals greater than 13 dBm are injected/received. • Do not connect any other transmitter to the RF connector or share the antenna with any other device. • Extreme Heat or High temperatures can damage MReX 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 MReX IP rating is IP-51. This product 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.

NOTICE
CARE REQUIRED WHEN TRANSPORTING Safety and care must be taken when transporting, handling, installing and/or replacing radio equipment. • Packaging should be adequate to ensure connectors are not damaged • Store and handle the radio equipment in dry, clean safe environment • Handle the equipment with care • Care when stacking MReX boxes must be taken to not damage part of the radio, such as connectors.

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.

End user products that have this device embedded must be installed by experienced radio and antenna personnel, or supplied with non-standard antenna connectors, and antennas available from vendors specified by the equipment supplier. Please contact the equipment supplier for end user antenna and connector recommendations.

Exposure to RF energy is an important safety consideration. The FCC has adopted a safety standard for human exposure to radio frequency electromagnetic energy emitted by FCC regulated equipment as a result of its actions in General Docket 79-144 on March 13, 1996.

This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 11cm between the radiator and any part of your body

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.

Operation

The MReX-5B will illuminate the red front panel LED while transmitting. Prior to transmitting an audible beep will be heard.

Under normal operation, on start-up there is a sign-on message sent out the 3.3V TTL serial port. 10 seconds after power is applied. The sign on message indicates the firmware revision, serial number other software related information.

Commands may be issued and firmware updated from this 3.3V TTL serial port. Messages and frequency can be preconfigured on order, or a serial may be purchased for qualified end user configuration.

Replace AA cells if LED does not light or sounder does not operate.

Ensure an antenna is attached before transmitting.

DMR Messaging

The MReX supports the transmission of short Digital Mobile Radio text messages, allowing direct messaging to DMR radios. This is an optional feature.

The MReX has a partial implementation of the ETSI TS 102 361-1 DMR standard allowing for DMR "Tier 1" messaging and therefore cannot be used in systems that have repeaters.

This is not a full implementation, and as a result has the following restrictions:

- Messages are limited to a maximum length of 50 characters.

DMR messages can be sent when an input is triggered or through use of the WT protocol in a similar manner as sending POCSAG paging messages. Refer to WT Protocol for usage information.

The MReX concurrently supports POCSAG and DMR paging, allowing an input to send messages to both legacy paging systems and newer DMR radios.

Different DMR manufacturers have interoperability limitations. The MReX is similar in this regard. Please refer to the Specification section for a list of tested DMR radios. The MReX WT protocol allows for switching between supported radio types to allow support for Hytera, Kirisun and other brands.

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Configuration

Parameters can be changed using any common serial terminal program. A free serial terminal program that also allows saving and loading of configuration files can be downloaded from wte.co.nz/tools.html

Start-up operation is always at 9600:8-N-1.

The MReX-5B integrates the MReX-460 module, therefore has available the MReX-460 command set. However, only a subset of those commands are relevant to the MReX-5B. Relevant commands are listed below.

All configuration commands always start with the asterisk '*' character.

All messages that do not start with the * character are processed by the protocol decoder.

All messages are terminated by a Carriage Return character, shown in this manual as <CR>

All commands that accept a value, can have that value read back by using the '?' suffix. E.g.

> *TX_FREQ?

Returns

> *TX_FREQ=460000000 (for example)

There are some commands that support multiple entries (such as the same command but for different inputs). In this case the question mark can be followed by the parameter to be interrogated. E.g.

> *IN_CONFIG_L?<CR>

Returns (lists all ranges)

> *IN_MSG_L=1:WT1234560A10 IN_LOW_1
>
> *IN_MSG_L=2:WT1234560A10 IN_LOW_2
>
> *IN_MSG_L=3:WT1234560A10 IN_LOW_3
>
> *IN_MSG_L=4:WT1234560A10 IN_LOW_4
>
> *IN_MSG_L=5:WT1234560A10 IN_LOW_5

To find the first range only, usage would be:

> *IN_CONFIG_L ?1<CR>

Returns

> *IN_CONFIG_L=1:WT1234560A10 IN_LOW_1

Note: It is a good practice to restart the unit after changing configuration. This can be achieved by removing power to the unit or sending the *REBOOT<CR>* command.

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Transmit Commands

*TX_FREQ

*TX_FREQ specifies the transmit frequency in Hz e.g.

*TX_FREQ=458600000<CR>

*TX_MODE

*TX_MODE specifies the transport method of the transmitter (how the information is transmitted over the air).

- POSCAG_A must be used in order to transmit alphanumeric messages.
- POSCAG_N must be used in order to transmit numeric messages.
- WTE_EN must be used in order to transmit 8 bit characters (POSCAG_A transmits 7 bit characters only).

Accepts POSCAG_A, POCSAG_N and WTE_EN. E.g.

*TX_MODE=POSCAG_A<CR>

*TX_PREAMBLE

*TX_PREAMBLE set the preamble length in multiples of 32 bits.

Short preambles allows the messages to be transmitted quickly.

Long preambles are typically used in conjunction with a matching receiver to save battery power when the receivers is in deep sleep mode.

The POCSAG standard uses a setting of 18 (576 bits). This very long preamble means that paging receivers need only to wake once per second (at 512 baud) in order to check for an incoming message. If the receiver is always powered and receiving, then much shorter preambles can be used, and in some cases halve the channel activity.
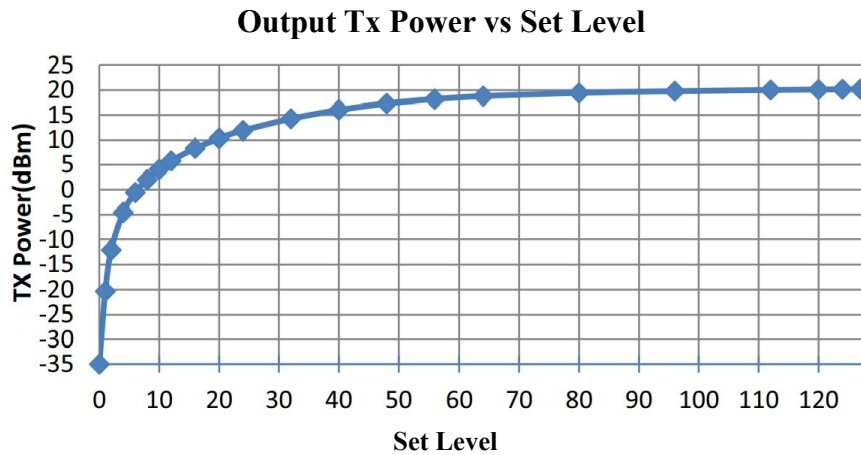
Typical usage:

TX_PREAMBLE=18<CR>

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*TX_PWR

*TX_PWR set the Transmitter Power Output levels. Levels value ranges from 0 to 127, please use the following graph to determine the transmitter level value to use. Note that settings above 80 will have very little effect on output power.

Output Tx Power vs Set Level

Examples :

Setting MReX to transmit at 10mW (10dBm ±2dBm):

*TX_PWR=20<CR>

Setting MReX to transmit at 50mW (17dBm ±2dBm):

*TX_PWR=55<CR>

Setting MReX to transmit at 100mW (20dBm ±2dBm):

*TX_PWR=80<CR>

Wireless Technologies

Base Commands

*REBOOT

***REBOOT** forces the unit to immediately restart.

Usage:

> **REBOOT<CR>*

*CONFIG

***CONFIG** displays current configuration.

> **CONFIG<CR>*

*SAVE

***SAVE** saves all configuration settings (all config changes are restored on start-up).

Usage:

> **SAVE <CR>*

*LIST

***LIST** displays all available commands. This command also lists many specific field names that need to be used with listed commands.

Usage:

> **LIST<CR>*

*DEFAULTS

***DEFAULTS** forces to reset temporary to factory default settings.

Usage:

> **DEFAULTS<CR>*

*VER

*VER sends the MReX sign on message back to the user. This is useful to determine the model and serial number of the unit.

Usage:

      *VER<CR>

Input Commands

The input commands allow messages to be configured for transmission when changing state. Debouncing (how long an input is settled before acting on the new level) can be configured with the number of times to transmit the input message.

> **Note:** Even if an input is configured to transmit a certain number of messages, should the input level change before all messages are transmitted, then the remaining transmissions will be cancelled.

> Please refer to **Input Hardware Connection** section on this manual for examples of how to connect the input pins on the MReX board.

*IN_CONFIG_L

*IN_CONFIG_L specifies all input Low configuration parameters. Inputs are triggered by connecting the input to ground for a time exceeding the specified debounce period. The input message is configured using the ***IN_MSG_L** command. Usage is as follows:

*IN_CONFIG_L=I:N,D,R

Where:

I = The input to configure (1-5 valid)

: = the colon character ':'

N = number of transmissions (0 = no transmissions, 9 is max tx count)

, = the comma character ','

D = debounce in 100 ms steps (from 0-255)

, = the comma character ','

R = time in seconds between retransmissions.

Example. Configure input 1 to send two message after input is debounced by 300 milliseconds and repeat/retransmit this message 4 times.

IN_CONFIG_L=1:2,3,4<CR>

*IN_MSG_L

*IN_MSG_L specifies the low level message that will be transmitted if configured. E.g.

IN_MSG_L=1:WT1234560A10 IN_1_LOW<CR>

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WT Protocol

The **WT Protocol** is the default protocol used by WTE products. It allows for a variety of over the air transport methods (such as POCSAG paging) to be used and a variety of baud rates.

Transmitting Messages
Message format:

WTNNNNNNNABC<SPACE>MMMMM<CR>

Where:

> **WT** are the 2 characters WT
> **NNNNNNN** are 7 ASCII digits from 0000000-9999999
> **A** is the Transport method:
>> A = POCSAG Alpha
>>
>> N = POCSAG Numeric
>>
>> D = DMR Text Message
>>
>> D = DMR Text Message (directed to a group)
>>
>> d = DMR Text Message (directed to an individual)
>>
>> W= POCSAG WTE (WTE 8 bit format allowing all 8 bit characters to be transmitted)

> **B** is the Level 1-9. Note that POCSAG only supports levels 1-4 which is the same as the "Beep Level". When the Transport method is 'D' this is the DMR "colour code"

> **C** is the data rate (specified in channel width ranges):

> *25 kHz Channel Space Settings*
> 0 = 512 Baud 2 Level FSK
> 1 = 1200 Baud 2 Level FSK

> *12.5 kHz Channel Space Settings*
> A = 512 Baud 2 Level FSK
> B = 1200 Baud 2 Level FSK
> C = 2400 Baud 2 Level GFSK
> D = 4800 Baud 2 Level GFSK
> X = 9600 Baud 4 Level GFSK
> Y = 1800 Baud 2 Level GFSK

Wireless Technologies

6.25 kHz Channel Space Settings

a = 512 Baud 2 Level FSK

d = 4800 Baud 4 Level GFSK

<SPACE> is a single space character.

MMM... is the payload, up to 240 characters.

<CR> is the carriage return character

Example:

To send a 512 baud alpha message to 1234567 level 1 with payload of "TEST"

WT1234567A10<SPACE>TEST<CR>

After processing/transmitting responds with:

WT[NNN]<CR>

where:

NNN is the number of characters from W until, but not including <CR> , the test message above results in the following response

WT[017]<CR>

Support for Multiple Messages

The WT protocol allows for the same message to be sent to a variety of different radio types. This allows for an efficient way to send to several different RIC codes or technology types. Many message transmissions can be supported, until the max message length for the message is exceeded.

Example:

To send the message "TEST" to RIC codes 1234560 and 1222222 as a 512 baud POCSAG message.

WT1234560A10*WT1222222A10<SPACE>*TEST<CR>

2 messages will be transmitted, batched in a single transmission.

Wireless Technologies

Note: The format is the standard WT Protocol format, but repeated without a space in-between headers.

Example:

To send the message "TEST" to RIC code 1234560 as a 512 baud POCSAG message and also a DMR message to group 1001, colour code 6 for a Hytera radio.

WT1234560A10*WT0001001D60*<*SPACE*>TEST<CR>

2 messages will be transmitted, as 2 transmissions. First message is in a POCSAG format, second transmission is in a DMR format.

Example:

To send the message "TEST" to RIC codes 1234560 and 1222222 as a 512 baud POCSAG message and also RIC codes 0201234 and 0005647 as a 1200 baud POCSAG message.

WT1234560A10*WT1222222A10***WT0201234A11***WT0005647A11*<*SPACE*>TEST<CR>

4 messages will be transmitted, batched in 2 transmissions, one for 512 baud messages and another transmission for the 1200 baud messages.

DMR Message Format

The WT Protocol can be used for sending DMR tier 1 messages. The protocol allows for an ID (group or individual), colour code, radio type and message to be specified.

Different DMR Radio manufacturers frequently have differing DMR implementations that often allows only same brand to same brand communication.

The WT protocol uses the commonly used "baud" field to set the DMR radio type. Sending a DMR message to an incorrect radio type may result in the radio not receiving messages, or the message being corrupted. Ensure that the group ID used is common to all same brand radios.

Basic Format:

WT1234567D6**x** TEST\r

Where all fields are previously defined, but '**x**' is now a DMR "Type".

Type '0' – This is a short message type, often used by Hytera.

Type '1' – This is a short message type, often used by Kirisun.

Example:

To send a DMR message to group ID 1001, colour code 6 with payload of "TEST MESSAGE" and to a type '0' radio (Hytera)

*WT0001001D6**0**<SPACE>TEST MESSAGE<CR>*

Example:

To send a DMR message to individual ID 104, colour code 6 with payload of "TEST MESSAGE" and to a type '0' radio (Hytera)

*WT00001041d6**0**<SPACE>TEST MESSAGE<CR>*

Wireless Technologies

Input Handling

Note: Please refer to **Input Hardware Connection** section on this manual for examples of how to connect the input and output pins on the MReX board.

The MReX-5B supports 5 programmable inputs. Each input can be programmed with a short message up to 50 characters in length. Input messages must always be formatted as **WT Protocol**.

On start-up each input is read. Only inputs that change from the start-up input state are processed.

Commands relating to input handling:

*IN_CONFIG_L specifies all input transition to low level configuration parameters.

*IN_MSG_L specifies the low level message that will be transmitted if configured.

The *IN_CONFIG_L command allows the input to specify:

- How many messages are transmitted once triggered.
- The debounce period (how long the input must be in a new state continuously in order to transmit) before the input is triggered.
- How long to wait until the message is retransmitted.

The *IN_MSG_L commands allow the input to specify the message which will be transmitted when the input is triggered.

Full example:

In this example both inputs are configured to transmit only when moving from high to low (no high level transmissions). Transmit 5 times, 10 seconds between each transmission. Debounce period is to be configured to 2 seconds (input must have transitioned from a stable low level to constant high level for two whole seconds).

The protocol being used is WT protocol, and the message for each input message is "IN 1 LOW" and "IN 2 LOW". Message is to be transmitted as POCSAG alphanumeric to cap code 1234560, beep level 1 and 512 baud.

Both input 1 and 2 are configured as per the full example details above.

> **IN_CONFIG_L=1:5,20,10<CR>*
>
> **IN_CONFIG_L=2:5,20,10<CR>*

Configured messages to be transmitted once triggered.

IN_MSG_L=1:WT1234560A10 IN 1 LOW<CR>

IN_MSG_L=2:WT1234560A10 IN 2 LOW<CR>

For more details on command usage please refer to the Configuration section if required.
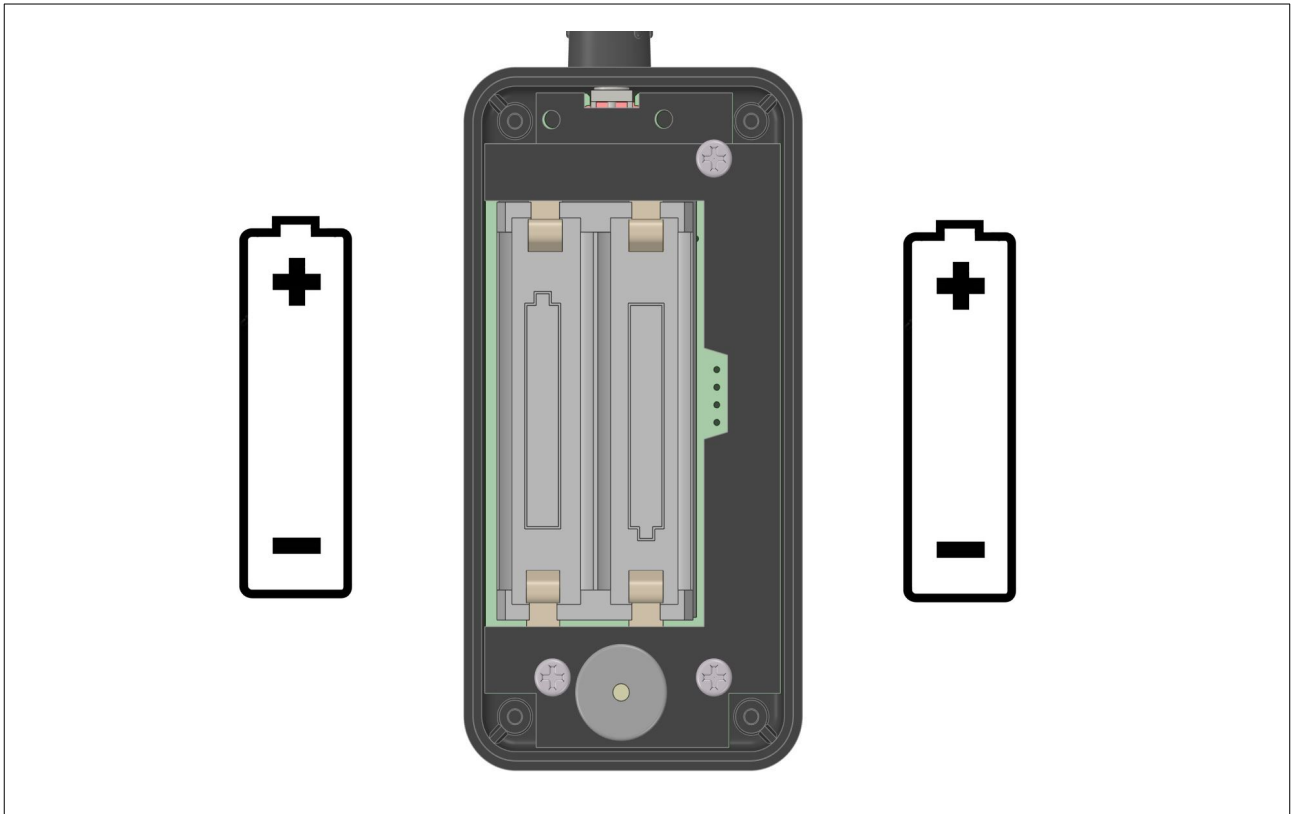
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Hardware and Configuration

In order to replace batteries and/or change the transmitter configuration please remove the screws on the back to access the battery compartment and programming header.
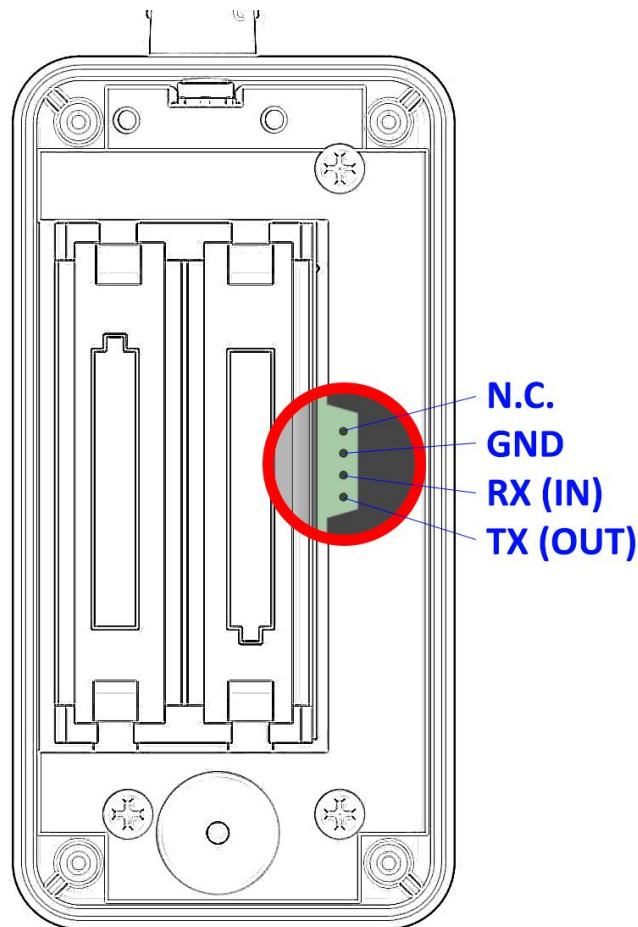
Battery Installation

**Note:** ESD precautions must be observed at all times when handling.

Loading Configuration

1. Remove 4 screws on the back cover.

2. Attach serial cable to the 4 pin serial port. Note pin 1 is the closest pin to the sounder, pin 4 is closest to the antenna. If the connection is loose, gently apply pressure to the side of the connector during the configuration loading process.

3. Operate a terminal program using COM port settings 9600:N:8:1. A free serial terminal is available from https://www.wte.co.nz/tools.html. This terminal program (wte_serialterminal) also allows loading and saving of WTE product configuration files.

4. Press and hold any button, and keep the button depressed.

5. The MReX-5B will beep as a message is transmitted.

6. There should be a message such as WT[013] seen on the terminal program. If this message is not seen, then there is a problem with either the serial connection or terminal program port settings.

7. Issue any command as listed below (such as *CONFIG<CR>). For changes to the configuration to become permanent, the command *SAVE<CR> must be issued.

8. Release the depressed button.

Wireless Technologies

9. Load configuration file if required. Select the configuration file that has been saved previously using the top right "Load Config" button.
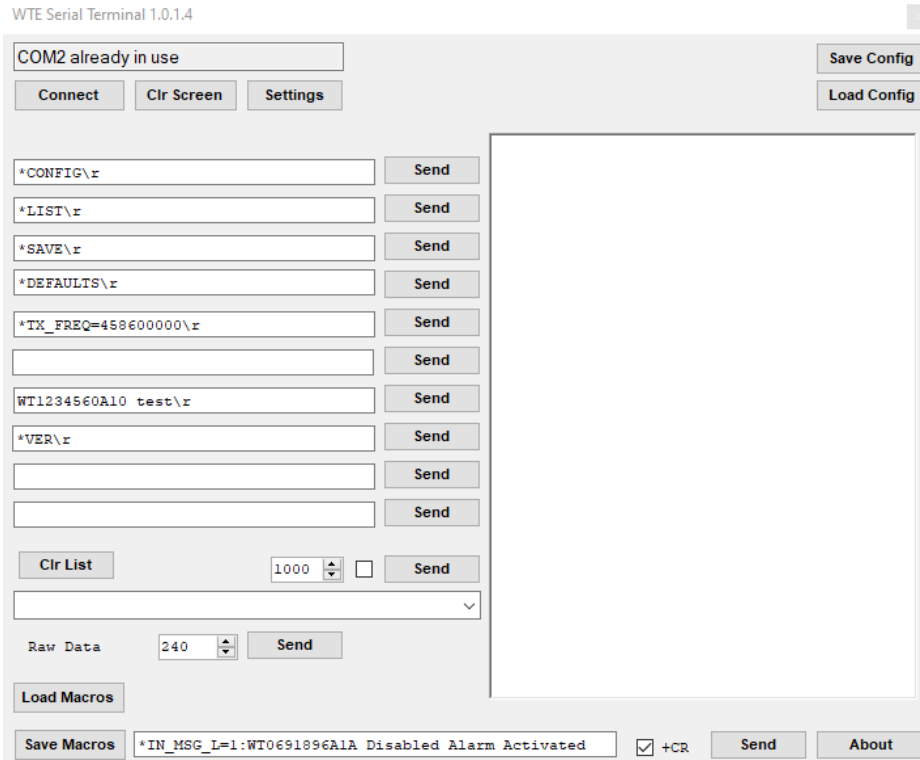
10. After 60 seconds of serial port activity, the MReX-5B will exit its configuration mode and return to normal low power operation.
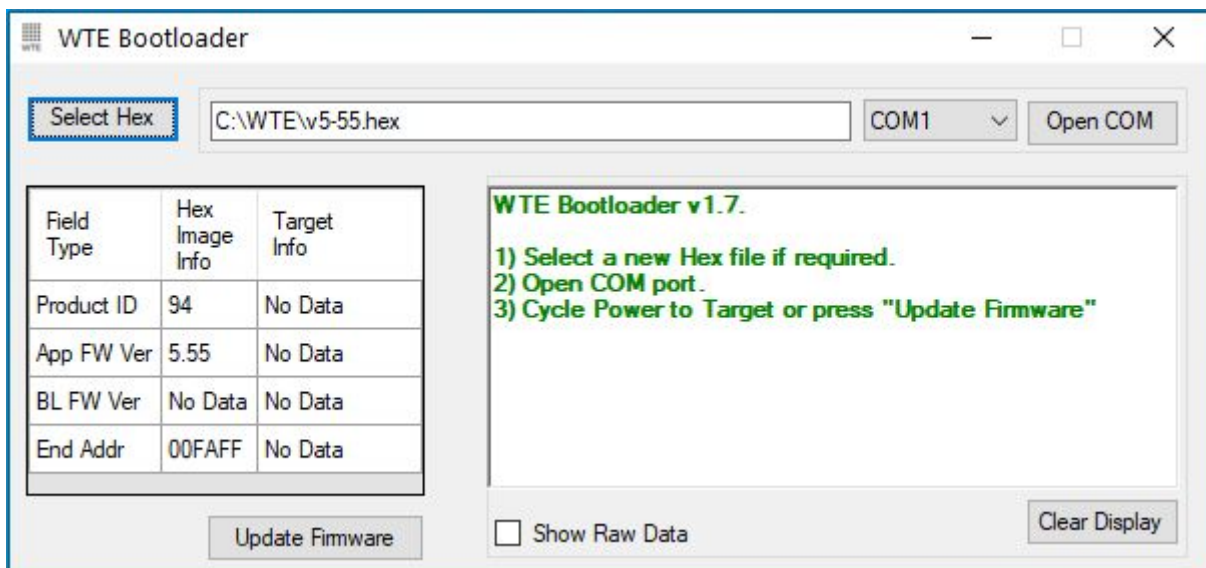
Firmware Upgrading

In order to update the MReX firmware you will need:

1. The WTE Bootloader Tool (available from http://www.wte.co.nz or provided if required from info@wte.co.nz).
2. Serial TTL cable.
3. An appropriate encrypted hex file supplied by WTE Limited.

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

## *Firmware Upgrade Utility*

Bootloader software has been customised by WTE to simplify the firmware replacement process for the MReX. The application automatically handles erasing and verifying of uploaded firmware.

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Firmware Upgrade Process

1. Run the application WTEBoot.exe – this is the WTE Firmware Update Tool as shown above.

2. MReX must be connected to a TTL serial cable, please refer to the "**Loading Configuration**" section of this manual for more information.

3. Press the "**Select Hex**" button on the WTE Firmware Update Tool and select the appropriated MReX firmware file.

4. Confirm that the App FW Ver displayed is the version described in the file name.

5. Select the correct COM port on the WTE Firmware Update Tool

6. Press "**Open COM**" button on the WTE Firmware Update Tool

7. Press a button on the MReX-5B that will result in a transmission, and then keep that button pressed.

8. Press "**Update Firmware**" on the WTE Firmware Update Tool to send the new firmware to the MReX.

9. Button may be released now.

10. Wait for the WTE Firmware Update Tool to indicate that programming has been completed.
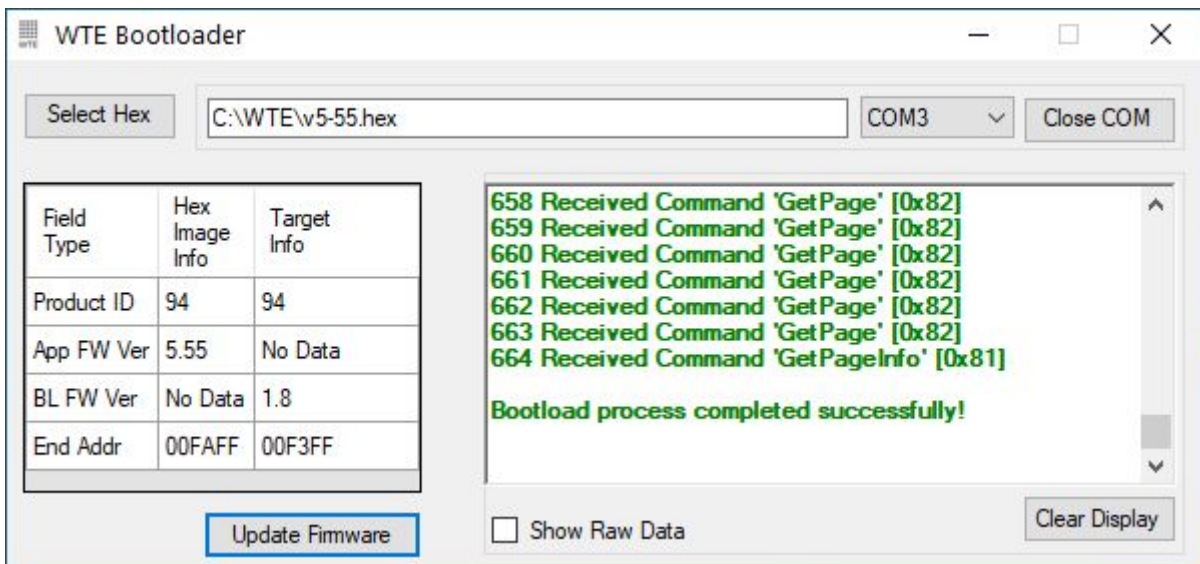
The MReX now is ready and the WTE Firmware Update Tool can be closed.

Wireless Technologies

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 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.

Please note that the maximum permitted transmit power level may vary from country to country. It is the users responsibility to ensure local regulations are adhered to.

In no event shall WTE Limited be liable for any incidental, special, indirect or consequential damages, harm to any person, lost profits or lost data, harm to your equipment, cost of procurement of substitute goods, technology or services, any claims by third parties (including but not limited to any defense thereof), any claims for indemnity or contribution, or other similar costs.
The maximum financial liability is limited to the price paid for the supplied product.

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

RoHS and WEEE Compliance
MReX 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.

Manufacturing marking and labels

MReX serial number can found inside the unit, also serial number and model information are sent out the serial port serial on start-up.

Maintenance

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

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.

Product Warranty

WTE Limited products are warranted for a period of 12 months after purchase date against faulty workmanship or materials. Return the product, all freight paid by the customer and the product will be repaired or replaced. Unauthorised work carried out on products will invalidate the warranty.

The MReX can be damaged through improper handling and system integration. ESD handling precautions must be observed. Use in any system or product without the inclusion of ESD or over voltage devices or exposure to any condition outside the operating limits of the MReX will invalidate the warranty.

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Specification

Frequency Range:
- MReX-460: 421 - 480 MHz

Tx/Rx Frequency Accuracy:
- 0.5ppm. 235Hz max error at 470MHz over entire temperature range.

Battery Supply Voltage:
- 3V Internally fused at 250mA (not self resetting). Min normal operating voltage 2.7V. Max battery voltage 3.3V.

Buttons Inputs:
- Five.

Message Input message length:
- Input max configured message length 50 characters

Temperature Limits:
- -10 to + 55 degrees Celsius.

Max Tx Power (+/- 1dB)
- 20dBm (100mW)

Max Rx Input Power:
- 13dBm (any level above this will destroy the receiver)

Antenna Connector:
- SMA female.

Operating Current:
- Up to 95mA transmitting into matched 50 ohm antenna (depending on TX power setting).
- <300nA in transmit only standby when used with 3V battery (wake on input change).

Firmware:
- Field upgradable.

Physical Dimensions: (L x W x H)
- 102mm x 51mm x 28mm

Serial Output:
- Serial 9600:8-N-1 baud, 3.3V TTL.
- WTE protocol format.

POCSAG Encode Support:
- POCSAG 512 either alpha or numeric including batched.
- POCSAG 1200 either alpha or numeric including batched.
- POCSAG 2400 either alpha or numeric including batched.
- Adjustable POCSAG preamble from 64 to 5000 bits (576 default).

DMR Support:
- Partial ETSI TS 102 361-1 (Tier 1 direct mode).
- Short Message type, unconfirmed.
- Max message length 50.
- Tested DMR radios: Hytera PD565, Kirisun DP770, Kirisun TM840H

Modulations Supported:
25kHz Channel Width:
512 baud (FSK 4.4kHz), 1200 (FSK 4.4kHz)

12.5kHz Channel Width:
512 baud (FSK 2.2kHz), 1200 (FSK 2.2kHz), 1800 (GFSK 3kHz), 2400 (GFSK 2.2kHz), 4800 (GFSK 2.2kHz), 9600 (4GFSK)

6.25kHz Channel Width:
512 (GFSK 1.1kHz), 4800 (4GFSK)

Compliance Standards:
- EN 300 224-2. (base station and mobile transceiver compliant).
- EN 301 489,
- EN 62368
- EN 50385
- FCC part 90.217
- AS/NZ 4769

Laboratory Test Results
- Base and mobile station compliant. Testing completed March 2020. This product incorporates the WTE MReX-460 Telemetry Transceiver Module, upon which compliance is based.

Declaration of Conformity

CE

Manufacturer:

Wireless Technologies (WTE Limited)
Christchurch, New Zealand

WTE Limited hereby declares the MReX Telemetry, Data and Messaging Transceiver module satisfies all the technical regulations applicable to the product within the scope of Directive 2014/53/EU (Radio Equipment Directive) of the European Parliament and Councils.

The products covered by this declaration:
MReX-460, MReX-5B, MReX-SF and MReX-5IO

The basis on which conformity is being declared:
The products identified above comply with the above directive based on lab testing results from the EMC Competent Body: EMC Technologies (NZ) Ltd.

The manufacturer has applied the following harmonised standards:

- **EN 300 224-2. (base station and mobile transceiver compliant).**
  Electromagnetic compatibility and Radio spectrum Matters (ERM); On-site paging service

- **EN 301 489-1 V2.1.1 (2017-02)** Electro Magnetic Compatibility (EMC) standard for radio equipment and services.

- **EN 62368-1:2018** Safety of information technology equipment

- **EN 50385:2017** RF exposure compliance for base station equipment.

The CE mark was first applied in: May 2020

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Date: 05/05/2020

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Rodrigo Pellizzari
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