

WTE LIMITED

MT-RX Series Receivers



AN003 Serial Output Module Application Note

Introduction

This application note describes the RS232 serial output that should be typically expected from MT-RX receivers. When the MT-RX has been supplied without a keypad and display, this application note describes the very limited configuration options that are possible, and how to interface and decode packets from the MT-RX.

Connecting to the MT-RX

Power Supply

The MT-RX will operate from a 5VDC supply, but for reliable relay operation (if the relay has been fitted), the supply should be between 6 and 8V DC. The relay can be removed if required.

The MT-RX is protected against reverse polarity connection, and is fitted with a self resetting fuse that will operate should the MT-RX draw more than 250mA. If the self resetting fuse operates, remove power, then restoring after a short period will allow the unit to operate again (unless a fault condition still exists.)

Connecting a 406 beacon directly to the aerial input will **destroy** the unit. Max direct connected input power is 0 dBm.

Status LED

After applying power to the MT-RX, after start-up is complete (approximately 5 seconds) the status LED will change state every second to indicate that the unit is operating.

RS232 Output

406 and AIS messages are decoded and sent out the serial port at full RS232 levels.

By default the serial output is at the rate 9600:N:8:1, but if AIS messages are being decoded the default rate is 38400:N:8:1 (as is the case for MT-RX-3 modules). These rates can be changed through modification of the CONFIG.INI file on the SD Card.

Audio Out

An 8 Ohm speaker can be fitted to the module, and will allow alerts to be heard if raised.

Configuration Changes

All settings are stored on the SD card. If an SD is not fitted the unit will default to output all 406 and AIS messages out the serial port at the rate 38400:N:8:1.

Configuration items are normally changed using the menu system that is controlled via keypad and display. Configuration items can also be changed by either:

- Connecting to the USB connector. The MT-RX should be detected as a mass storage device, and the file CONFIG.INI should be able to be seen.
- Removing the SD card, and reading the contents using a SD card reader.
- Sending configuration item settings via the serial port. All serial commands can be issued in the same form as stored in the config.ini file. e.g. *C30,1<CR>. All commands issued via the serial port are temporary only, and lost after reset.

The command *C90,1 writes all configuration changes back to the SD card. The command *C90,2 writes all current config settings out to the serial port, without writing to the SD card and also internal flash.

NOTE: firmware revision 1.88 onwards does not require an SD card to store configuration data (except for the storage of 406 beacon data).

Configuration Items

If the MT-RX is fitted with a new SD card, a default CONFIG.INI will be created. If there was an SD card already present the following should be seen.

#406-SD-2 Config

```
*C02,3           // Relay Close Time in seconds
*C04,1           // Relay operational Mode when receiving 406 messages
*C24,1           // Relay operational mode when receiving AIS messages
*C30,10          // Backlight on time in seconds
*C31,60          // How long sounder operates for when an alert is raised.
*C32,1           // System sound enable
*C33,3           // Alert duplicate reject time in seconds
*C34,60          // Target voice prompt repeat time in seconds
*C35,0           // Enables true bearing to target instead of relative bearing to target.
*C36,1           // Enables RSS alerts
*C37,60          // RSS alert squelch threshold in 0.5dB steps.
*C38,3           // RSS alert debounce period in seconds (signal must exceed the squelch for this period)
*C39,121500000   // RSS operative frequency in Hz
*C41,0           // Use the default GPS position (allows bearing to be determined without a GPS module fitted)
*C42,-43.530     // Default GPS Latitude
*C44,172.620     // Default GPS Longitude.
*C45,0.0         // Default GPS position heading
*C46,0           // Enable NMEA Output
```

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```
*C47,0 // NMEA Output Type
*C48,-43.450 // NMEA Test Latitude
*C49,172.200 // NMEA Test Longitude
*C50,1 // AIS – Display ALL
*C51,4800 // System baud rate
*C52,0 // AIS Enable RS232 output
*C53,0 // AIS Enable Proximity alert (processor intensive – disable when not used)
*C54,300 // AIS Proximity Alert Distance
*C55,1000 // AIS Proximity Warn Distance
*C56,3 // RSS Alert Sweep pattern detect (0 disable else duration in seconds sweep must be seen for)
*C57,5 // Config file version.
*C58,0 // Enable auto shutdown (useful when powered from a battery) Set in minutes.
*C59,-43.550 // Waypoint latitude
*C60,172.300 // Waypoint Longitude
*C61,0 // Language
*C62,0 // Use expansion module
*C63,0 // AIS Enable Collision alert. (processor intensive – disable when not used)
*C64,4000 // AIS Collision Test Radius (in meters) – only evaluate vessels within this radius
*C65,600 // AIS Collision Safe Radius (in meters) – vessels outside this radius are not considered a threat.
*C66,240 // AIS Collision Warn time (in Seconds). - How much warning before a vessel enters the Safe radius
*C67,40 // GPS Anchor Distance.
*C68,0 // Default Active screen that is normally displayed.
*C69,0 // Default Page on the default Active Screen.
*C70,1 // GPS update period – how often GPS sentences are sent from the unit.
*C71,0 // Power source.
*C72,0 //RSS Scan rate
*C73,0 // RSS Serial Out
*C74,0 // Bluetooth Dropout - raise alert on loss of Blue tooth connection to device.
*C06,1$GPWPL,[],#* // NMEA Sentence when configured.
*D000,0000000000000000 // This entry reserved for license key
*D001,0000000000000000 // All other entries are HEX IDs used by the patented 406 Test alert feature.
*D002,0000000000000000
*D003,0000000000000000
*D004,0000000000000000
*D005,0000000000000000
*D006,0000000000000000
*D007,0000000000000000
*D008,0000000000000000
*D009,0000000000000000
```

To change the default baud rate:

Change the line :

*C51,38400 to either 2400, 4800, 9600 or 38400.

Be careful changing to lower rates when decoding AIS messages. Due to high AIS message rates, decoded messages may be lost if the serial output rate is too low – serial output rate should be 38400 when decoding AIS messages.

To Disable AIS serial output:

*C52,0 (disables AIS serial Output)

*C52,1 (enables AIS serial Output)

To Change Frequency (dynamically without saving to file):

*C39=NNNNNNNNN<CR>

where NNNNNNNNN is a frequency between 120MHz and 470MHz.

To Read the RSSI on the configured frequency:

*C92=0;

for configuration of other items, please examine the MT-RX-3 manual then contact info@wte.co.nz for the features of the MT-RX that you wish to configure. Most aspects of the MT-RX operation can be controlled from this file.

Alternatively, using the PC simulator software, or with the keypad and display fitted, make any desired changes through the menu system, then compare the generated config.ini file to examine which parameters are responsible for each change.

Decoded 406 Message Serial Output

Serial Out Packet Format

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

MT1UUUNNTFHHHHHHHHHHHHHHSS112233N4445566WYYYY

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.

HHHHHHHHHHHHHHHHHH – 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 location characters are all '*' then this is a default position. If all location characters are '-' then there is no location information available.

Legitimate example packet:

MT1001095TLC009028155C319131412233N0645536WB47C

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 you wish to be provided with fully decoded AIS sentences via the serial port, such as MMSI, vessel name etc, please contact sales@microtechnologies.co.nz

All messages of all types are decoded up a length of 2 AIS sentences – for further information regarding the decoding of AIS messages consult the AIS specifications that are available on the internet.

Signal Strength Serial Messages

V1.87 firmware allows signal strength serial messages to be sent out the serial port. These may be enabled to allow the signal strength to be sent out between every 100ms and 3 seconds. When the RSS serial out option has been enabled, then there will also be signal strength output when the signal strength exceeds the RSS squelch setting.

The serial output format for the RSS frequency is:

SS,1,NNN<CR>

where NNN is a value between 0 and 255. This value is not calibrated, but is approximately:
 $-130 + (NNN / 2)$ dBm.

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

SS,A,NNN<CR>

The signal strength can also be polled at any time and at any rate using the command:

*C92=0<CR>

Startup Serial Output

On startup the MT-RX will output the message:

“MT-RX-3 SN:001 V1.85”

or something similar indicating a model number and firmware revision. There will also be some basic factory related serial output.

Once startup is complete, and the status LED is flashing, the message

“Startup Complete...”

The MT-RX will now only output decoded AIS or 406 messages.

Serial Commands Accepted by the MT-RX

All serial commands are at the configured baud rate, which is 38400:N:8:1 by default. Where the character <CR> is printed, this is a single carriage return character (\r).

Normal Commands:

***SN?<CR>**

This command allows communication to the MT-RX to be checked and also the firmware revision to be obtained.

Typical Response:

SN:001 V1.86

***SD1,1<CR>**

This command allows information regarding the last 406 transmission to be obtained from the SD card. ***SD1,4<CR>** will return the 4th most recent.

Typical Response:

00:00 00/00,400C592753572B3,43 32.200S 172 37.934E,FFFE2FA0062C93A9AB959E55EE77

If the entry does not exist, the response will be
NOENTRY

This response includes the time and date of the alert (if time and date are known from a GPS input source), the beacon hex id, the position and the full raw data packet of the 406 beacon transmission.

***SD2,1<CR>**

This command allows the next oldest 406 decoded message to be returned in the same format as the SD1,1 command. The SD1 command must have been used or the response NOSD1 will be returned.

The command SD2,1 may be called repeatedly until all entries have been returned. When there are no more entries, the message

NOENTRY

will be returned.

Test Commands:

Raw 406 beacon data can be sent into the MT-RX as if it had been received as part of a transmission from a 406 beacon.

Packets that begin with FFFED0 are full alert 406 distress transmission – changing this to FFFE2F will change the transmission to a “Test” transmission – all other parts of the packet including error correcting information remain the same.

Command

```
*T12FFED0A0062C94EE7FDFF975503783E0F66C909D868D000000<CR>
```

Where *T12 indicates that raw 406 beacon data follows.

Typical response:

```
MT1001000TL400C5929DCFFBFF23-----N-----E8443
```

NOTE:

Test messages using the *T12 command will result in 406 beacon messages being logged to the SD card.

example 406 beacon raw transmissions (note that not all 406 beacon transmissions are the same length):

```
FFFE2FA0062C93A9AB959E55EE7788C71B79  
FFFED060058CFC3ACA068FABCF90  
FFFE2F6004EB28140AA68B369B50  
FFFE2FA0027A12B0AB959E46E73788C71B79  
FFFED0600720019600000AD29210  
FFFE2F600720019600000AD29210  
FFFED0A0062C84B37FDFF985D23783E0F66C
```

Disclaimer

This documentation has been provided in good faith to allow the MT-RX receiver to be used as a simple serial output module, without the need for keypad and display.

Every attempt has been made to provide accurate information, and examples where provided have been tested. However WTE Ltd. reserves the right to add or remove features without notice.

When supplied, MT-RX modules have been tested but it is the responsibility of the user to ensure that this module is periodically retested, when part of a system, using methods that are deemed appropriate to the system designer.