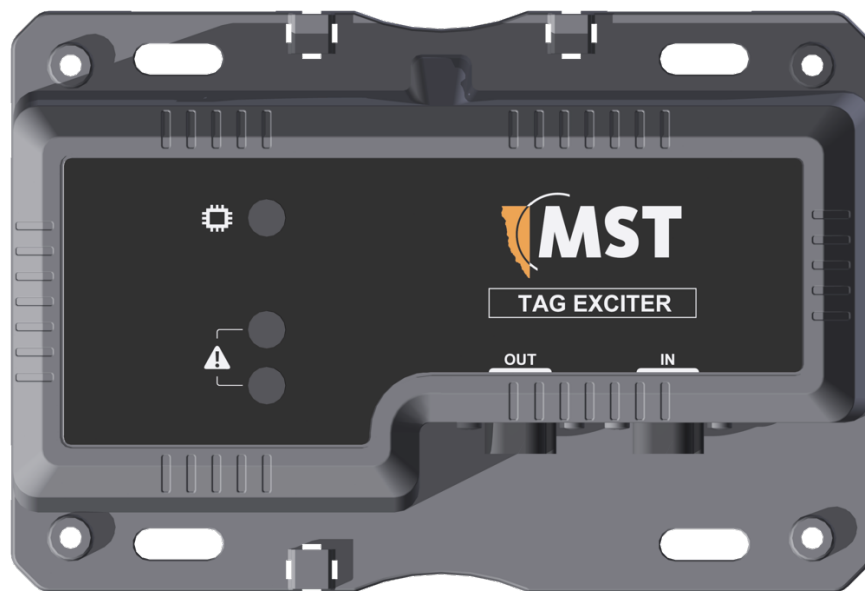


MST Tag Exciter

User Guide

Revision B – 2nd July, 2015



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Revision History

Revision	Change	Date
A	Initial Release	17 June, 2015
B	Added FCC Statement	2 July, 2015

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Safety and Compliance

Safety Aid: not a replacement for normal safety practices

No tampering. No user replaceable parts. Only to be opened by an authorised service representative.

Service: MST Exciter contains parts operating at high voltage. Do not open.

FCC Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) This device must accept any interference received, including interference that may cause undesired operation.

Please take attention that changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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

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

This equipment should be installed and operated with a minimum distance 20cm between the radiator and your body.

Introduction

The MST Tag Exciter is a core hardware component of the MST Tracking Solution. It is a device that enables consistent and accurate identification of MST Tracking Tags within its immediate vicinity.

The Tag Exciter creates a magnetic field which Tracking Tags within 10-15m (dependent on deployment) will detect.

Tracking Tags respond to the Tag Exciter magnetic field by changing their output. Devices that read the Tracking Tag output are aware that the Tracking Tag is in range of the Tag Exciter, and make inferences to the position of tracked elements.

The Tag Exciter can be deployed in either a fixed location, or as part of a mobile platform such as a vehicle.

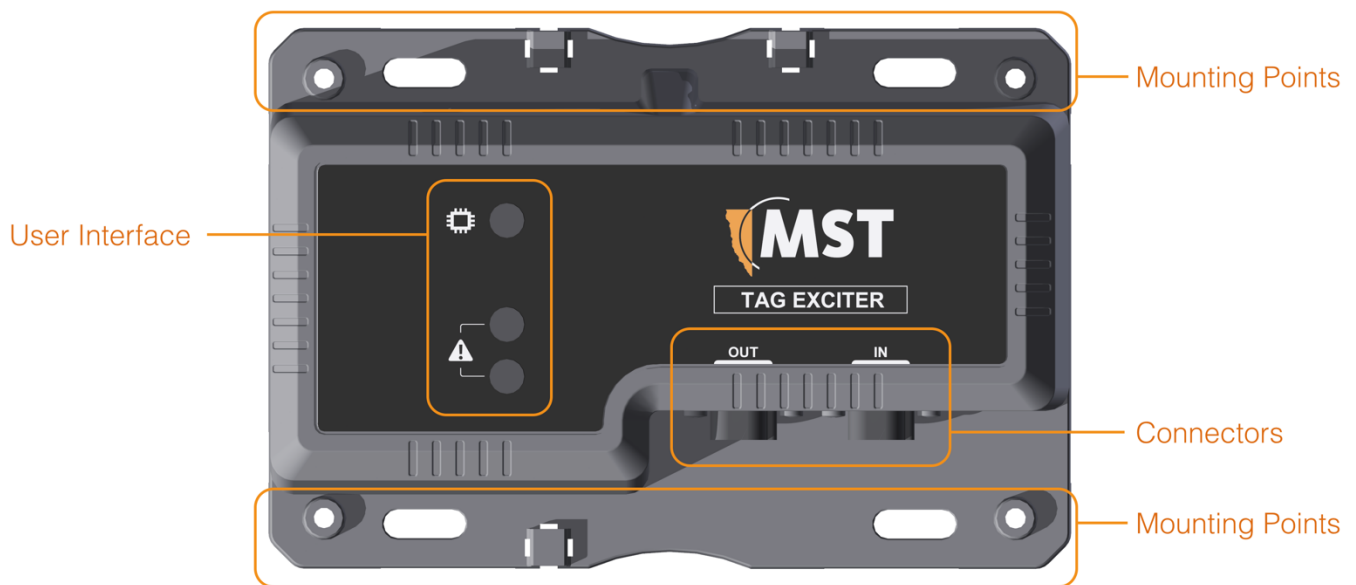
- A Tag Exciter deployed in a fixed location is used to accurately position mobile Tracking Tags that pass it
- A Tag Exciter deployed on a mobile platform is used to accurately position the platform when it passes fixed location Tracking Tags

Hardware

Overview

The MST Tag Exciter is a ruggedised device designed to be deployed into a mining environment, or onto a vehicle.

It includes a minimal user interface to allow confirmation it is operating correctly, fit for purpose connectors for power, and a range of mounting fixtures.



User Interface

The MST Tag Exciter displays details of its current operating state on three coloured LEDs that are positioned along the top face of the unit.

Status	LED
Operating	Green
Medium Severity Warning	Orange
High Severity Warning	Red

The Tag Exciter uses these LEDs to display to the user the following operating states:

Event	Display
Powering up	• All LEDs: flash once to confirm they are working • Green LED: flash quickly until power up complete
Running as configured	• Green LED: on, flash off on every magnetic field transmit
Communicating over CAN port (including firmware upgrades)	• Green LED: solid
Error in configuration or operating state	• Orange LED: flash if error is temporary • Red LED: flash if error requires device reboot or service

Connectors

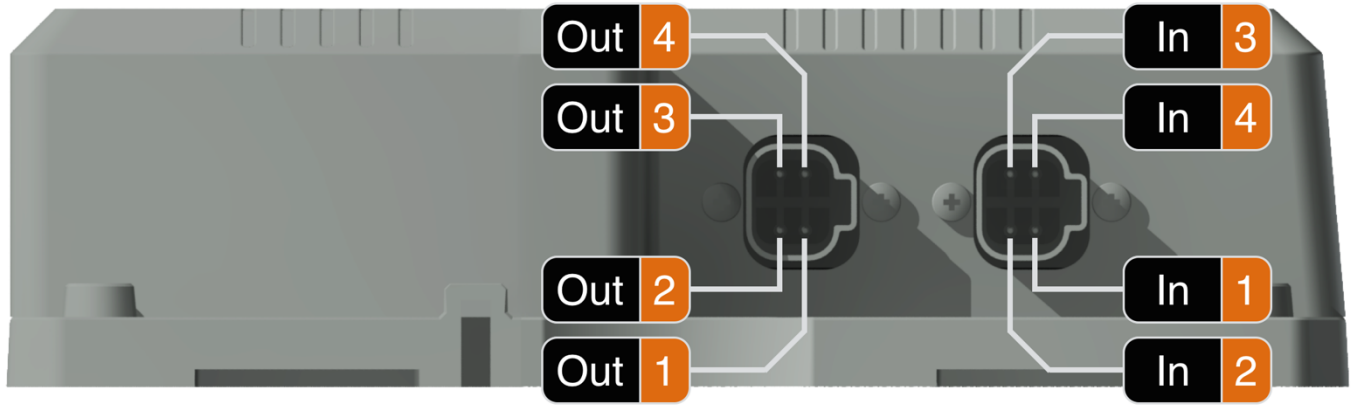
Ports

The MST Tag Exciter has two socket connectors for power and data in and out of the unit.

Port	Use
IN – 4 pin Deutsch receptacle	The Tag Exciter is to be provided with 24V DC power for correct operation. Data in is not required for standard operation. Data in is used for programming Tag Exciter settings, or when the Tag Exciter is being driven from an MST VIP unit (sold separately).
OUT – 4 pin Deutsch receptacle	Power out may be used to supply conditioned power to a second MST Tag Exciter. Data out may be used to enable an MST VIP unit (sold separately) to synchronise the timing of two or more MST Tag Exciters. This allows the deployment of multiple exciters with overlapping fields to operate without disrupting each others fields. This is a feature of the VIP and not covered in this manual.

Pins

Pinouts are defined as the following:



Pin	Use
1	Power +
2	Power -
3	Data N
4	Data P

IMPORTANT Care should be taken to ensure that power is correctly connected. All cabling and connectors should be electrically insulated using self-amalgamating rubber tape.

Mounting

Planning

Care should be taken when deploying the MST Tag Exciter to ensure that it achieves the solution goals. The following should be considered as part of this process:

Does the Tag Exciter magnetic field intersect with another MST Tag Exciter?

Tag Exciters deployed within less than 30m of each other have a chance of overlapping magnetic fields ranges which can degraded performance. Exciters should either be positioned a minimum of 30m apart from eachother, or should be deployed to have their field time sequence managed by an MST VIP unit.

Does the deployed location pose an environmental hazard to workers or other machinery?

The MST Tag Exciter creates a magnetic field that can interfere and be interfered with by other systems including proximity detection and health systems. Care should be taken to ensure that the deployed location ensures a safe environment for all personnel.

Is the deployed location suitable for this device?

The MST Tag Exciter is designed to withstand harsh environmental conditions but care should be taken when deploying into extreme temperatures (eg. direct sunlight in hot environment) or areas with considerable chemical splash (such as engine bays cleaned with degreasers) to ensure that all seals and cabling are not compromised.

Attachment

The MST Tag Exciter is intended to be either attached to a static location such as a pole or mounting plate, or to the body of a heavy vehicle.

In addition to mounting holes in the unit body, the device is compatible with magnetic mounts (provided separately) that facilitate attachment and easy removal from metal surfaces for deployment and testing.

Management Software

Overview

The MST Exciter Manager is a windows application that is used to configure settings and manage the firmware on MST Tag Exciters. The following sections describe how to install and configure the application, how to program Tag Exciter's settings, and how to upgrade a Tag Exciter's firmware.

Requirements

Before configuring an MST Tag Exciter please ensure the following software and hardware requirements are met.

Software Requirements

MST Exciter Manager software requires a PC running Microsoft Windows XP (or later), with .NET 4. A copy of the latest version of Exciter Manager is available from the internet at:

<https://support.mstglobal.com/releases/software/exciterManager/>

The application uses a virtual-serial port to communicate to the hardware over a USB-to-CAN cable. This requires the installation of software driver to support.

The software driver license prohibits its inclusion and distribution with other applications or products. It may be downloaded separately from the internet at:

<https://www.silabs.com/products/mcu/Pages/USBtoUARTBridgeVCPDrivers.aspx>

Download and follow the instructions to install the USB-to-Serial driver on the PC that will be running the Exciter Manager application.

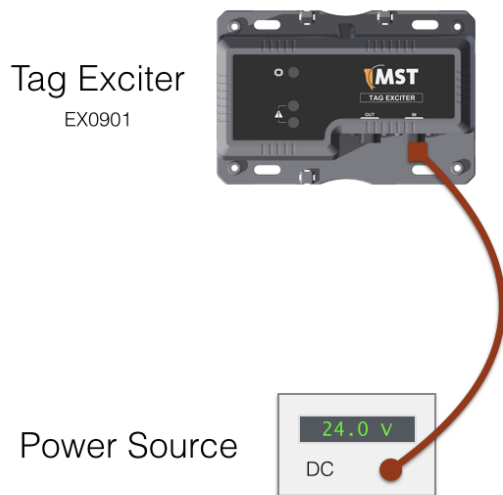
NOTE	Exciter Manager is only intended to be used to configure a single Tag Exciter. Configuring of chained Tag Exciters is out of scope, and specific to the Vehicle Intelligence Platform.
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Hardware Requirements

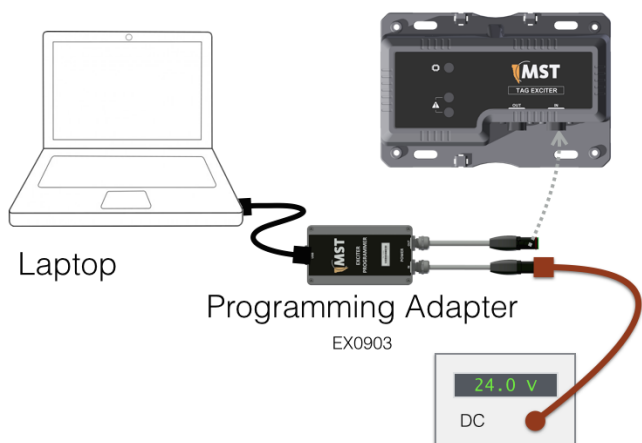
To physically connect a PC to an MST Tag Exciter requires a USB-to-Serial connector that is sold separately as MST part: **EX0904 Programming Adapter for Tag Exciter**

This adapter plugs in-line with the exciter's existing power supply (on the 'IN' port of the exciter), and into the PC's USB port.

Connected for operation, the MST Tag exciter is powered by 24V DC.



Connected for programming, Laptop running programming software is connected inline to the Tag Exciter power using an EX0904.



Installation

The Exciter Manager application is delivered as a compressed (zip) directory structure. This directory should be uncompressed and placed in an appropriate location, eg:

C:\Program Files\MST\Exciter Manager\

The software does not require an installation process, the executable ExciterManager.exe may be run from within the directory. Users may wish to create a short-cut to the executable on their desktop or other accessible location.

Software Setup

The Exciter Manager software needs to be configured with the address of the virtual comport that it should attempt to communicate to the Tag Exciter on. To determine this use the following procedure:

1. Close any running Exciter Manager applications
2. Plug the USB-to-CAN connector into the intended USB port
3. From Control Panel, open Device Manager
4. In Device Manager tree under Ports, record the COM port in use by the adapter
5. Close Device Manager and navigate to the Exciter Manager installation directory
6. In the Exciter Manager installation directory under the subdirectory /config open for editing the file Set.conf
7. Update the value of CanPort to match that records in Step 4
8. Save and close this file. Exciter Manager will look to communicate with the Exciter on this port, update this file if the port changes.

Connecting an Exciter

To ensure correct initialisation of the COM port, it is recommended that the MST Tag Exciter is connected to the PC using the following steps:

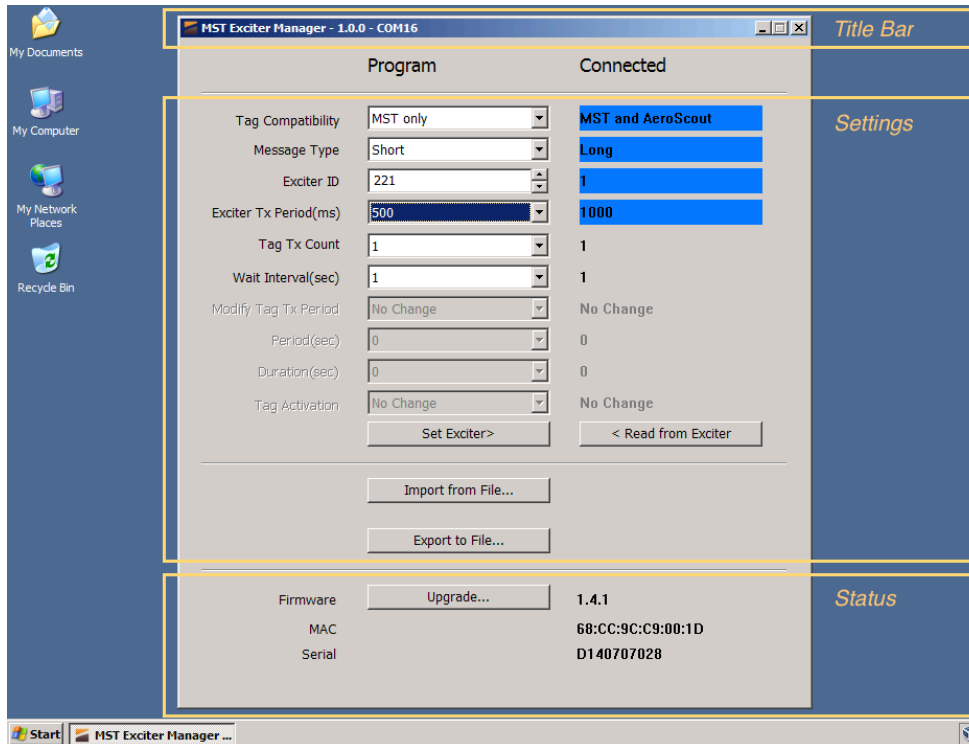
1. Ensure the Exciter is not powered and that the Exciter Manager software is not running
2. Connect the Programming Adapter inline with power
3. Connect the Programming Adapter to the Tag Exciter, the Exciter should power up
4. Connect the Programming Adapter to the PC USB port, the PC should detect the adapter as a COM port
5. Run the Exciter Manager software
6. User will notice that the Green blinking LED will stop blinking once communication between USB-to-CAN and Tag Exciter has been established

Exciter Configuration

The Exciter Manager software allows a user to view the exiting configuration of a Tag Exciter, to push new configuration to a Tag Exciter, and to update a Tag Exciters firmware.

Application Interface

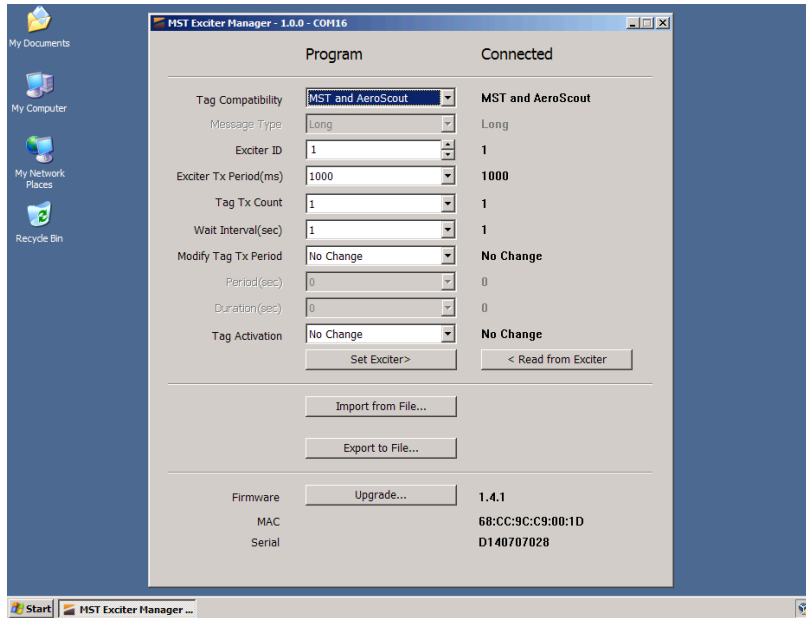
The image below shows the main form of the Exciter Manager application.



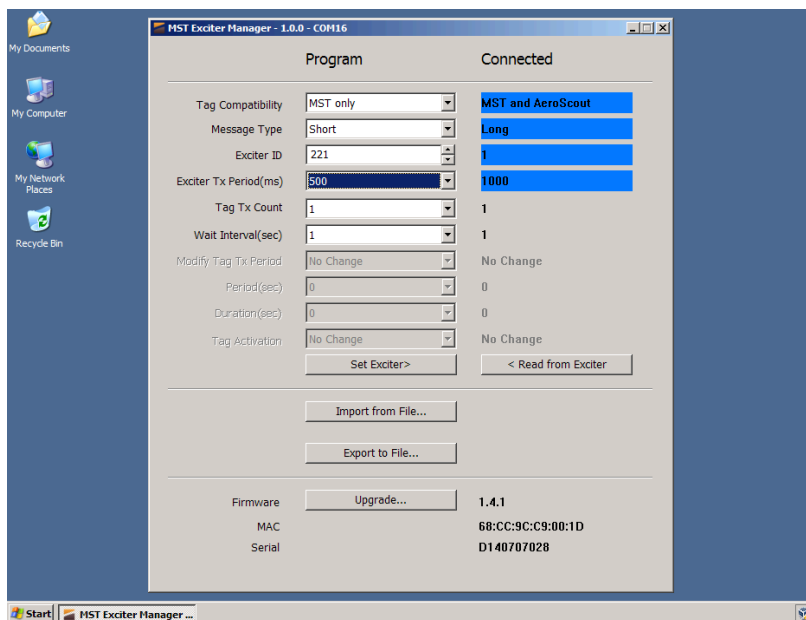
Section	Details
Title Bar	The form title-bar shows software version, and which COM port it is currently controlling.
Setting	The UI shows each configuration setting on a new row. Each setting has a label, a value that the User wants to program, and a value that any connected Tag Exciter is reporting. When the user selected setting differs from the Tag Exciter reported setting it will be highlighted. The Exciter Manager can import and export settings from file.
Status	Details of the connected Tag Exciter and a tool to allow firmware updates. Details shown are: - Firmware Version - MAC address of hardware - Hardware Serial number

Updating Settings

When the Exciter Manager starts up it will attempt to communicate with a connected Tag Exciter. If it succeeds it will read the Tag Exciter settings and display them on the screen.

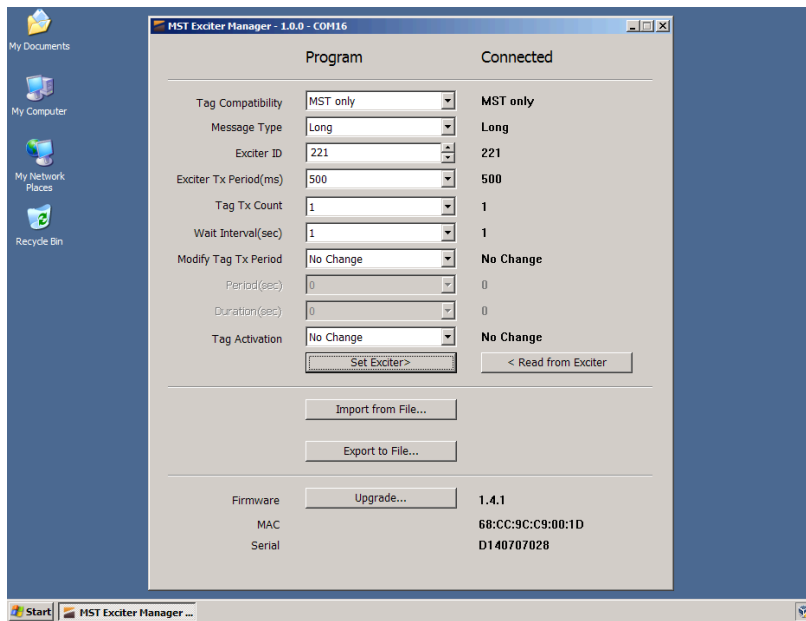


To change the settings of the connected Tag Exciter, select the appropriate value from the corresponding row of the Program column. If the selected value differs from the last value reported by the connected Tag Exciter, the value in the Connected column will be highlighted.



If a setting is not available to edit it will be disabled (grayed out) in the Program column. Settings may not be available due to combination of other settings, or due to features not being supported by the connected hardware.

When the Program settings match what should be sent to the Tag Exciter, click the "Set Exciter" button to update it. The Tag Manager will push changed setting updates to the Tag Exciter, and should update the Connected column when the Tag Exciter reports their new value.



Retrieving Settings

The Exciter Manager can also use the configuration of a connected Tag Exciter to populate the setting configuration. This feature is useful as it allows you to be confident that any changes pushed are from the existing configuration.

To retrieve the settings of a connected Tag Exciter click the "Read from Exciter" button. This will attempt to set the Program column of values to match the connected Tag Exciter.

Setting List

The table below lists each of the settings that a Tag Exciter can be configured with, along with possible values and a description.

Setting	Description
Tag Compatibility	The MST Tag Exciter can be configured to communicate to one or both of: • MST Tracking Tags • AeroScout Tracking Tags The primary advantage of selecting to activate only one type of Tag is that the Tag Exciter can be run at faster speeds. Some other settings are not available based on this selection.
Message Type	This option is only accessible when the Tag Exciter is configured to only send messages to MST Tracking Tags. The MST Tracking Tag supports a "Short" message which allows for faster excitation speeds in time critical solutions. Some other settings are not available based on this selection.
Exciter ID	The ID that the Exciter will broadcast to Tracking Tags that they in turn report to positioning engines.
Exciter Tx Period	The time in milliseconds between each pulse of the Tag Exciter's field. This can be set to a low number to ensure that Tags are reporting at the earliest opportunity when entering the field range, or to a higher number when the solution is not as time sensitive to allow tags to conserve battery.
Tag Tx Count	The number of times the Tag Exciter requests that any Tag send its RF response out. This can be raised to increase the chance that a Tag's response to seeing an Exciter's field has a better chance of being received, but has a corresponding degradation on Tag battery and airtime saturation.
Wait Interval (sec)	The number of seconds that a Tracking Tag should wait before again responding to this Exciter's magnetic field. If the Tag sees a different Exciter ID it will respond immediately.
Modify Tag Tx Period	When using a Short Message Type, this setting is fixed to No Change. This setting will be one of: • No Change • Change for Duration Stop for Duration

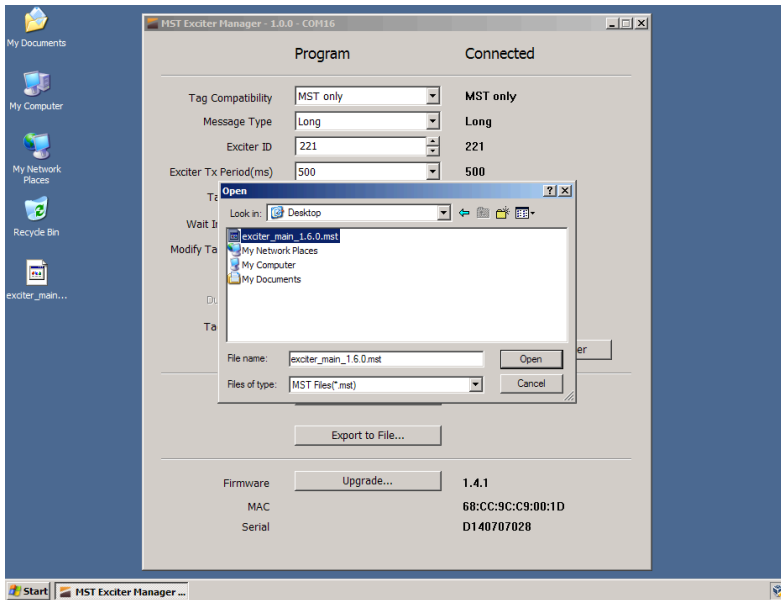
	Any setting other than No Change results in the Tag's default chirp period (time between transmissions when not in range of an Exciter field) being changed. Change for Duration setting will temporarily modify the default chirp time of Tags when outside Exciter range. This setting can be used to have tags chirp faster or slower after passing a point to allow for better tracking accuracy or better battery life respectively. The new chirp rate is defined by the Period(sec) setting, and the time the Tag will use this adjusted setting is defined by the Duration(sec) setting. Stop for Duration requests that Tags stop sending chirps for a nominated time. This can be used to conserve battery or radio saturation in areas where Tags do not need to be tracked. The time a Tag will stop chirping for is defined by the Duration(sec) setting.
Period(sec)	This option is only accessible when Modify Tag Tx Period is set to Change for Duration. This defines the number of seconds a Tag should now wait between individual chirps.
Duration(sec)	This option is only accessible when Modify Tag Tx Period is not set to No Change. This defines the time in seconds that a Tag's chirp default is changed from, either to a new chirp rate or disabled completely depending on the value of Modify Tag Tx Period.
Tag Activation	This setting will be one of: • No Change • Deactivate Tag • Activate Tag Tags that are not activated do not chirp, and only respond to Tag Exciter fields when explicitly told to activate. Deactivating Tags may be required for transport and will also offer the highest level of battery and radio spectrum conservation.

Firmware Updates

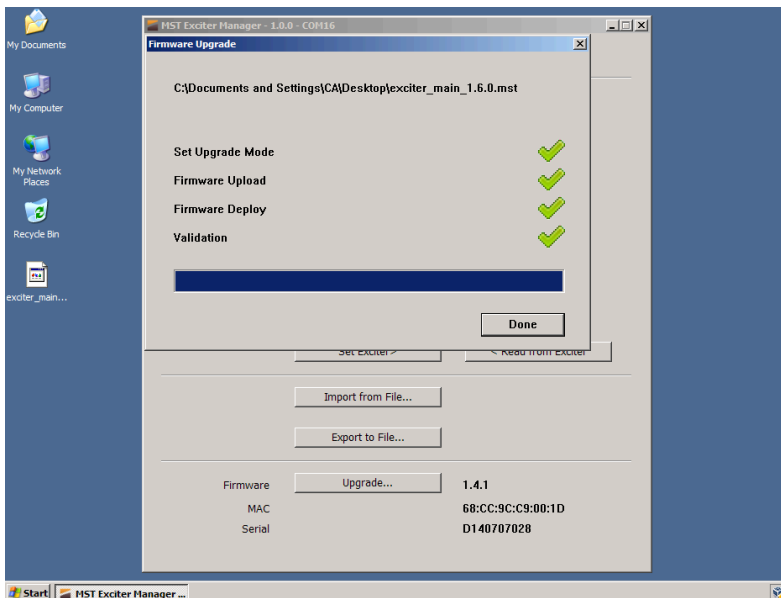
The Exciter Manager can update the firmware that the Tag Exciter runs. MST regularly releases firmware updates to add new features and capabilities to their system, the latest version of the MST Tag Exciter firmware can be downloaded from:

<https://support.mstglobal.com/releases/firmware/EX09/>

To update the firmware of a connected Tag Exciter, click the "Upgrade..." button and select the .mst file of the firmware you wish to deploy.



The Exciter Manager will go through a four step process to update the firmware, the progress of the update is shown in a modal popup window.



Please do not close the application or disconnect the Tag Exciter during this process.

When the upgrade process is complete click the "Done" button to close the popup. You may need to click the "Read From Exciter" button to repopulate the exciter status to show the new firmware version.

Repair and Maintenance

It is recommended that all MST Tag Exciters, cables, and connectors be inspected at regular intervals for wear and damage to ensure safe and reliable operation.

A maintenance checklist should includes check that cover:

Component	Check
Structural	• Inspect outer case for any structural damage • No excessive marking or wear to case
Display LEDs	• All LEDs show during powerup • When running, the Green LED is flashing at the expected field transmit rate
Connectors	• All cable plugs are secure • All unused plugs are capped
Cables	• Cables free of obvious damage or wear • Cables securely fastened
Field signature	• Tag Exciter activates Tracking Tags within the expected field range

Please contact the local distributor for all maintenance and repair enquiries.