# eCryoTag reader
## User Manual
*V1.1*

# Content

# 1. Description

The eCryoTag reader is used to track sample containers or **devices,** stored in cryogenic conditions (or at room temperature), in particular in the field of macromolecular crystallography (MX) and cryo electron microscopy (Cryo-EM). The reader can be easily installed in laboratories or at (MX) beamlines. It is powered from a standard 110-230 VAC/ 12 VDC supply and communicates via Ethernet. An embedded web server with easy-to-use Graphical User Interface (GUI) offers straightforward commissioning (no software installation needed). A string-based socket server is provided for M2M communication.

The tracking information is stored in the RFID tags embedded in the devices to track. The information includes:

- A **Device ID** composed of a **Manufacturer ID** + a **Serial Number**
- A **Device Type**
- Optional **User Information**
- A **Tag UID** (Unique ID set by the RFID tag factory)

> ⚠️ **Manufacturer IDs** are centralised and attributed upon request by the **RFID for life science consortium** in order to ensure unique Device IDs. Refer to **RFID for life science** tab on:
> https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/

> ⚠️ **Devices Types** are centralised and attributed upon request by the **RFID for life science consortium**. Refer to **RFID for life science** tab on:
> https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/

The eCryoTag reader consists of a control box and 'application-dependent' antennas plugged in through a socket connector to read/write RFID tags at room or cryo temperature:

- Single antenna support – To read/write single tags or uni-pucks.
- Double antenna support – To read/write single tags, uni-pucks, SC3 (SPINE), miniSPINE, NewPin, and Cryo-EM pucks.
- CryoProbe – To reads tags on Cryo-EM boxes in liquid nitrogen.

## 1.A. Control box

1. Antenna socket connector (female SubD9)
2. LED
3. Buzzer
4. Reset button – Restores all configurations to default
5. Ethernet port
6. Power Jack (12VDC)
7. Mounting inserts
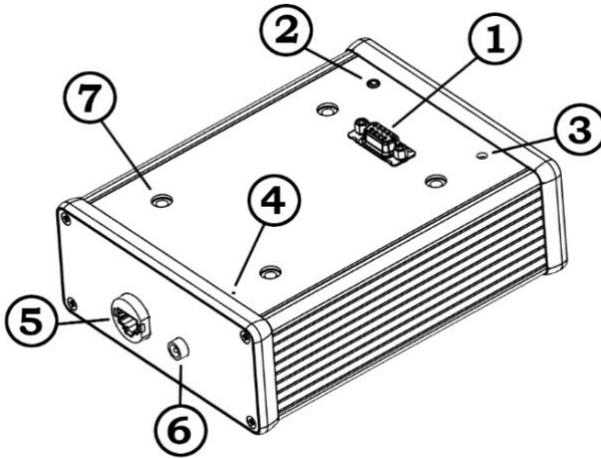


## 1.B. Single Antenna support

8. R/W antenna (top view)
9. Puck guiding bolts (top view)
10. Puck detection sensor
11. Mounting holes (top view)
12. Antenna connector (male SubD9) (bottom view)
13. Spacer fitting (bottom view)



Top View
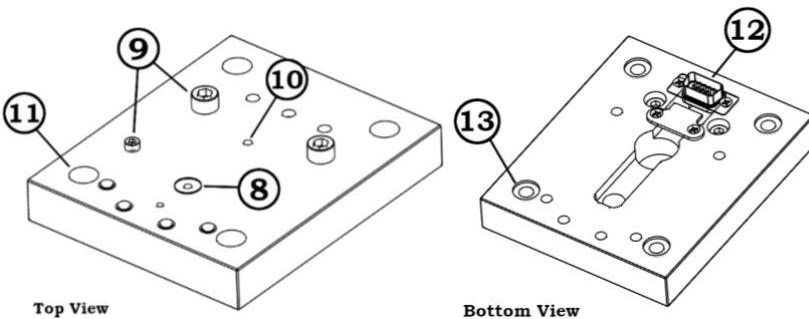
Bottom View

## 1.C. Double Antenna support

8. Horizontal and Vertical R/W antennas (top view)
9. Puck guiding bolts (top view)
10. Puck detection sensor (top view)
11. Mounting holes (top view)
12. Antennas connector (male SubD9) (bottom view)
13. Spacer fitting (bottom view)



**Top View**                    **Bottom View**
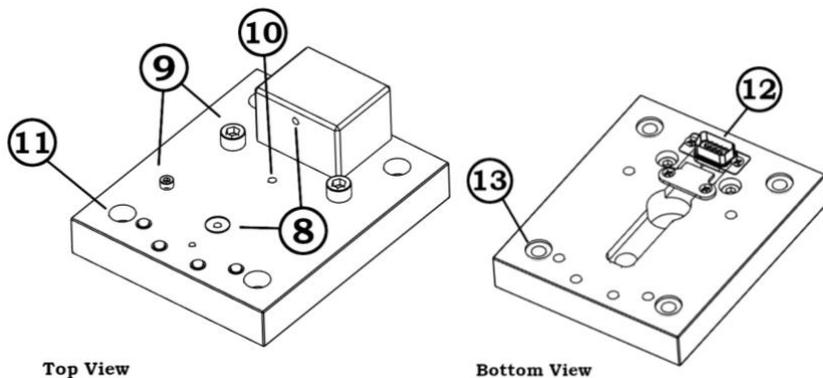
## 1.D. CryoProbe

14. Antenna
15. Push-button – triggers tag reading
16. Antenna connector (male SubD9)
17. Fastening screws
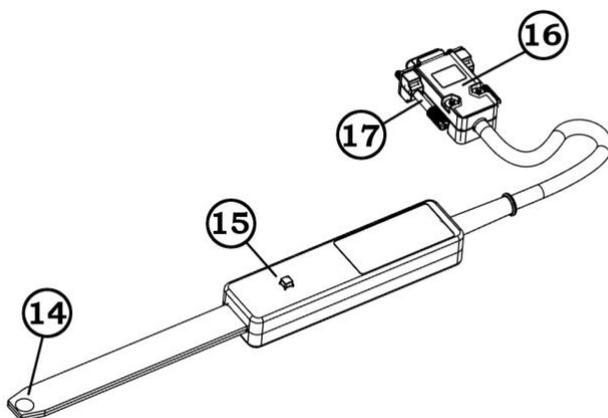
# 2. Mounting Instructions

## 2.A. Antenna(s) support

1. Place four spacers (included) over each threaded insert on the control box.
2. Fit four M6x25 bolts (included) on each mounting hole on the antenna plate and place it over the control box using the spacers as guidelines. Make sure the antenna socket snaps in correctly and the spacers are centred with the fitting holes.
3. Tighten the bolts gently for a secure connection.
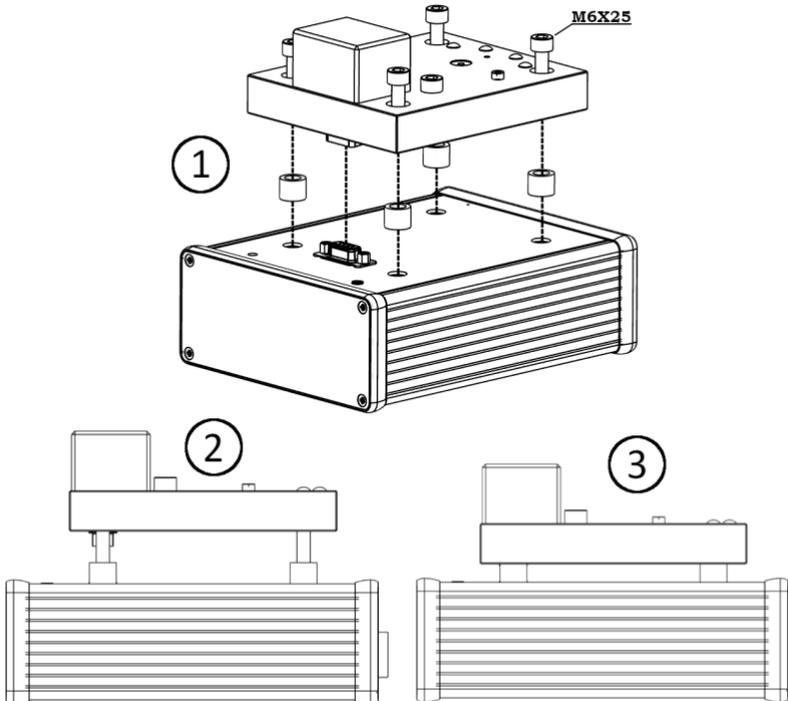
## 2.B. CryoProbe

1.  Connect the CryoProbe to the antenna socket.
2.  Tighten the fastening screws for a secure connection.
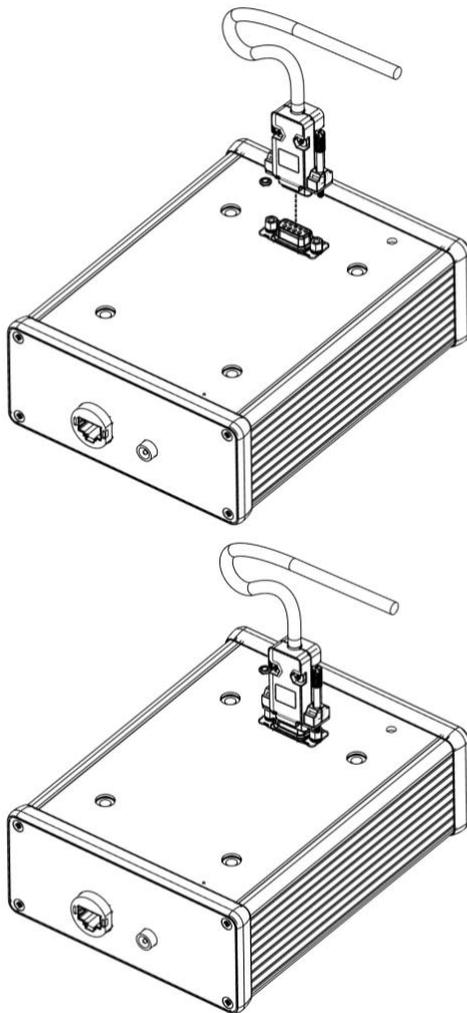
# 3. Graphical User Interface

## 3.A. GUI through an internet browser (Firefox, Chrome, Microsoft Edge)

The eCryoTag reader has a Graphical User Interface (GUI) accessible from a standard internet browser (Firefox, Chrome, Microsoft Edge) for plug-and-play use. Its default IP address is **10.0.0.2**.

Follow these steps to connect to the embedded GUI:

- Connect the eCryoTag reader to the network card in a PC using a standard Ethernet cable.
- Power up the control box using the DC power supply provided and wait for the LED to light up
- Change the IP address of the PC (internet adapter) to the same network as the eCryoTag reader (Use any IP address except 10.0.0.2, e.g. 10.0.0.1).
  - o Under Windows go to:
    - Settings > Network and Internet > Change adapter options
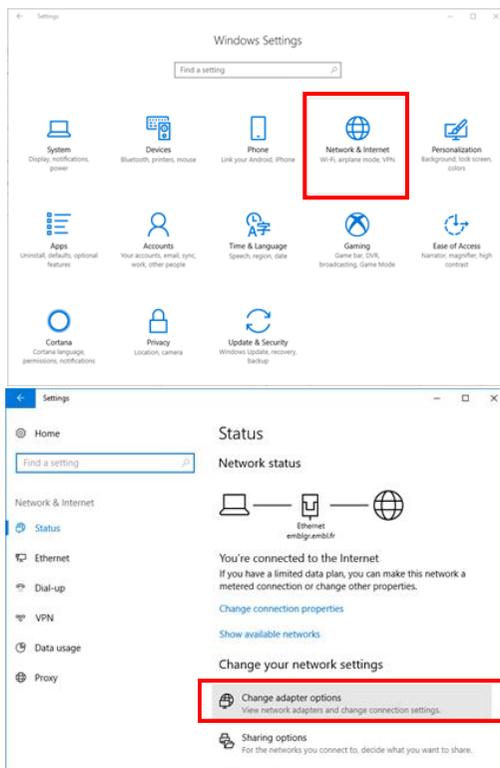
- Right click on the adapter connected to the eCryoTag reader and select **Properties**.
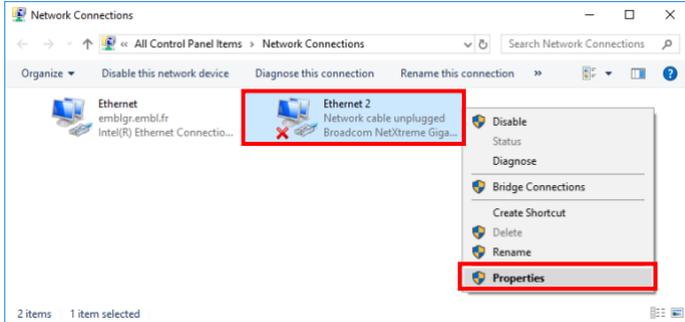


- Select ***Internet Protocol Version 4*** from the list and click ***Properties***.
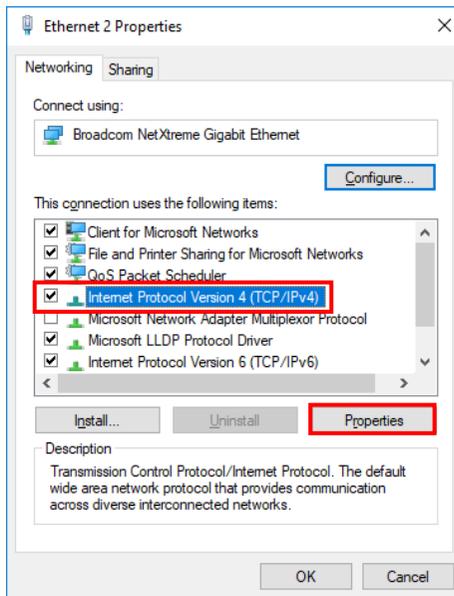


- Select ***Use the following IP address*** radio button and enter the *IP address* 10.0.0.1 and *subnet mask* of 255.255.255.0. Leave *default gateway* empty.
- Click OK.
- To open the eCryoTag reader embedded GUI, type the following address into your web browser: http://10.0.0.2/index/

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> ⚠️ If the IP address has been modified and forgotten, press the reset button to restore the IP to default (10.0.0.2). This will reboot the eCryoTag reader. The LED will turn on once the system is ready

There are four main tabs on the GUI:

- User
- (device) Manufacturer
- Network Settings
- Preferences
- Update

## 3.A.a User tab



- Read Device ID:
    - Reads the device ID (Manufacturer ID + serial number)
- Read Device Type:
    - Please refer to the annex *eCryoTag tag programming protocol* in section 6 to identify the correct device Type codes.
- Read/Write User Field:
    - There are 196 characters available in total for user information in this field.
- Read tag UID:
    - This unique ID cannot be changed (Factory set RFID tag UID).
- Read All:
    - Reads all fields at once. It may take a couple of seconds, do not move nor remove the tag during the reading or writing process.
- Clear All Fields:
    - Clears all fields from the GUI. It only clears the text displayed on the GUI. This does not erase the information in the tag.

## 3.A.b Manufacturer tab

This tab gives access to the modification of the protected fields of the RFID tag, like the device ID and device Type.

To log in as manufacturer use the credentials attributed by the RFID for life science consortium (HTTPS….).



Once logged in, the panel will show the following:
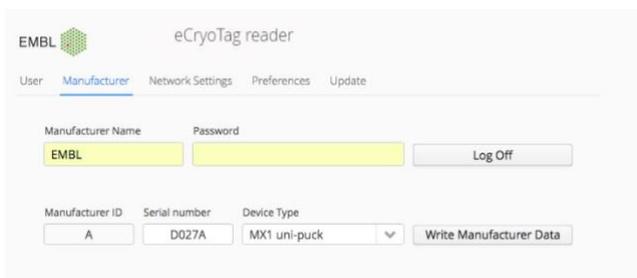


- Manufacturer ID field:
    - This cannot be changed to avoid duplicates between device manufacturers. Each manufacturer has a given manufacturer ID letter. This cannot be changed. Therefore, the manufacturer ID letter is automatically assigned after logging in and it will appear in the read-only text field.

- Device serial number field:
    - This field can be edited as needed.
    - Note that the Device ID is composed as follow:
        - Manufacturer ID + Serial Number
- Device Type:
    - This is a drop-down list. Choose the corresponding device Type in this list before proceeding. A device can be added upon request to the RFID for life science consortium:
      https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/
- Write Manufacturer Data button:
    - This button writes the data to the RFID tag.
    - Note that RFID tags are not write-protected, therefore new data can be rewritten in case of any mistake.

- Log Off button:
    - This button logs off from administrator mode and disables writing feature.

## 3.A.c Network Settings tab

This tab enables the configuration of the network parameters of the eCryoTag reader.



On the first line, the MAC address of the reader is shown.

- Dynamic IP
    - Provided with the MAC address, an IT support team can assign a dynamically distributed IP for the eCryoTag reader. This will enable the reader to connect from any Ethernet plug and be accessed from any computer on the network using the address http://*<IP address>*/index
- Static IP
    - This is the default IP address of the eCryoTag reader.
    - By default, values for IP address and mask are:
        - IP address: 10.0.0.2
        - Mask: 24 (255.255.255.0)
- Save Config:
    - Applies the changes to the reader. It will automatically reboot the reader with the new network settings. This may take a few minutes. Once booted, the buzzer will beep and the LED will turn on.

⚠️ If the IP address has been modified and forgotten, press the reset button to restore the IP to default (10.0.0.2). This will reboot the eCryoTag reader. The LED will turn on once the system is ready

### 3.A.d Preferences tab – Reading Preferences:

This first part of the Preferences tab sets the configuration of the default reading protocol launched upon puck detection when using an antenna support, or upon push-button activation when using the CryoProbe.
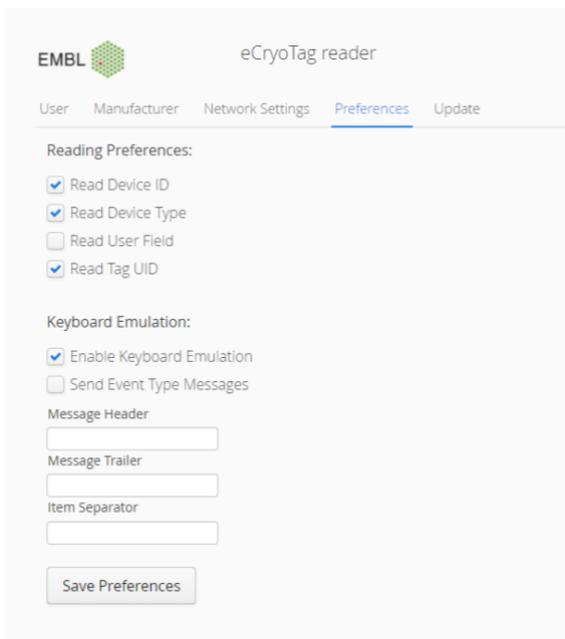


There is a check box for each field of the RFID tag. Mark the corresponding checkbox to add a field to the reading procedure. In the example above, the default reading procedure will contain the *Device ID*, the *Device Type* and the *Tag UID*. These fields will be updated automatically on the user panel once the reading procedure is finished.

This information is preserved and do not need any reconfiguration after rebooting the reader.

Note that the reading of the User Field can take up to 2 seconds. Therefore, for a quick reading, it is advised to uncheck this field.

**IMPORTANT**: The selected fields will be sent by *EVENT* message (refer to section 6*: Low-level socket server*) upon a successful reading.

### 3.A.e Preferences tab – Keyboard Emulation

This second part of the Preference tab enables the Keyboard Emulation. The information selected in the Reading Preferences is read by the computer as if it was written by a keyboard. This can be useful for filling up text fields in some applications.

If *Send Event Type Messages* is selected, the text burst sent is composed like so:

*(header)EVENT_RESET_FIELDS(separator)(trailer)*
*(header)EVENT_ID(separator)AD055A(trailer)*
*(header)EVENT_TYPE(separator)MX1 uni-puck(trailer)*
*(header)EVENT_TAG_UID(separator)7BC05419012416E0(trailer)*

Where *(header)*, *(separator)* and *(trailer)* are the texts filled in the corresponding configuration field. As in the previous example, this message contains the *Device ID*, the *Device Type* and the *Tag UID*.

Note that when a reading is triggered, whether coming from a puck placed on the plate or from pressing the push-button of the CryoProbe, an *EVENT_RESET_FIELDS* event is sent.

This mode requires the external device **MorphStick Ethernet 2 Keyboard**, manufactured by Keelog, properly configured, connected via Eth to the eCryoTag reader and via USB to a free USB port in the PC.



In order to properly configure the MorphStick, download MS Tools from **download.morphstick.com** and follow these steps:

- Run MS Tools and click on *Configure device*.

- Follow the instructions displayed and click on *Search for devices*.



- Fill up the fields as this and click on the >> button.



*eCryoTag reader User Manual R11.docx - Preliminary information*
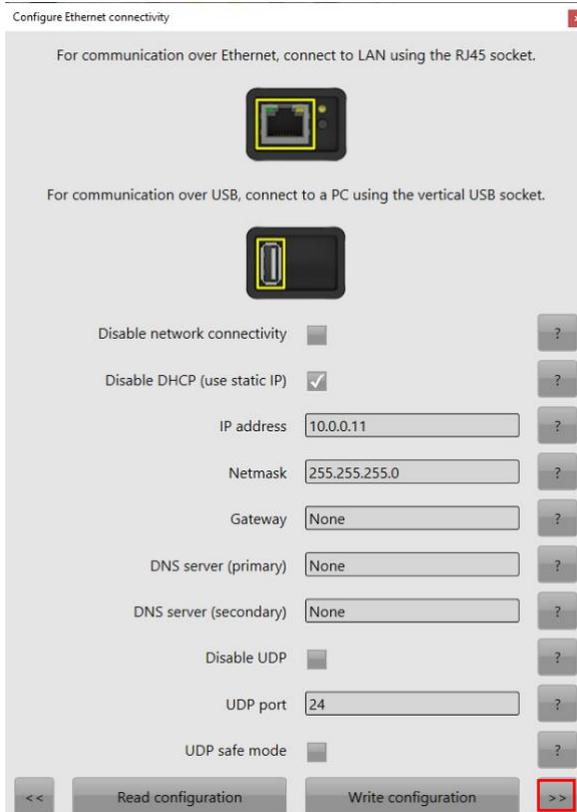
- Select the proper Keyboard, **that should match your system current keyboard layout**, and click on the >> button.
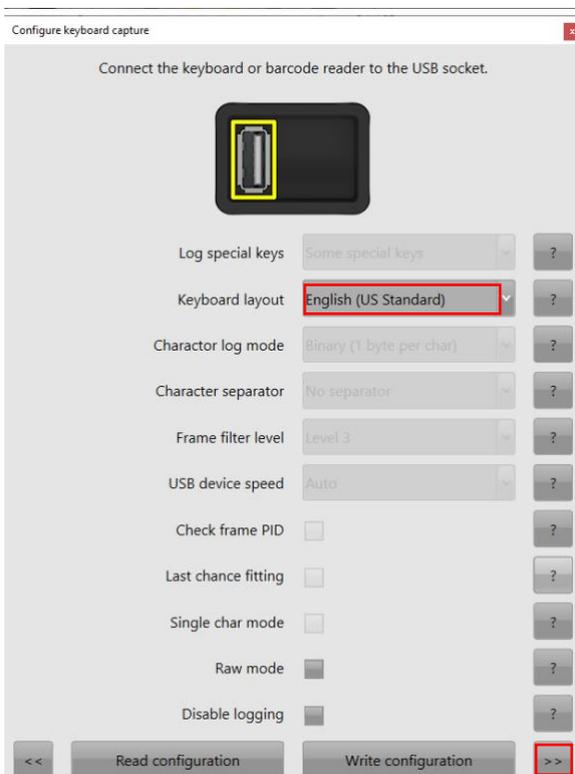
- Click on the *Write Configuration* button.
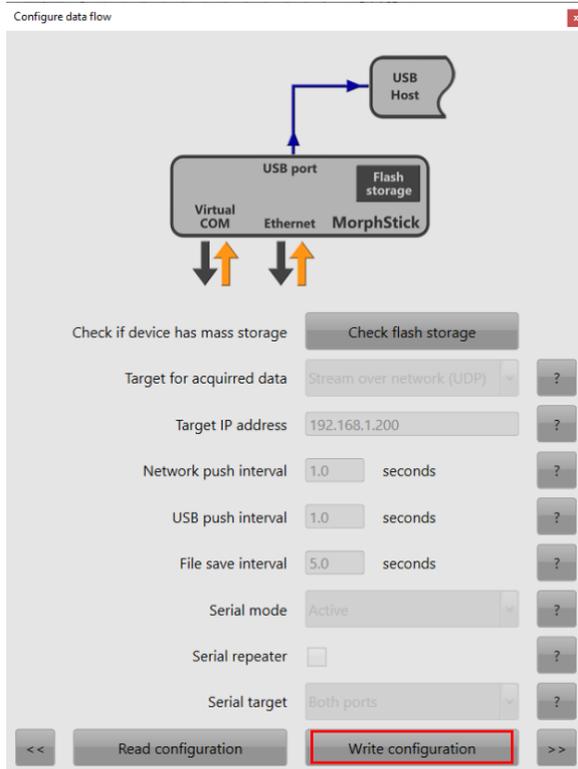


- Press the blue button on the Morphstick to relaunch with the new configuration.

## 3.A.f Update tab

The *Device Type* code list and the *Manufacturer ID* can be updated using the following procedure:

1. Download the latest release of the **config.zip** file from the eCryoTag consortium website (https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/)
2. Connect your reader and go to the Update tab (see figure below)
3. Click on the *Choose File* button and select the previously downloaded **config.zip** file
4. Click the *Upload* button
5. After a successful update the reader will restart automatically (This can take a few minutes).
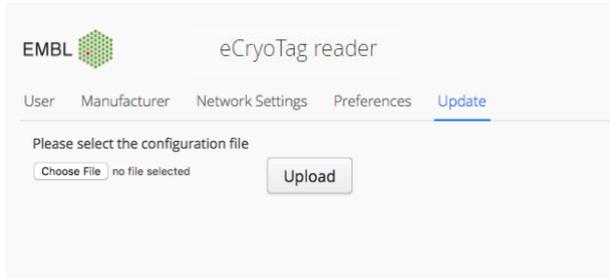
# 4. Use

The eCryoTag reader can be installed close to a sample storage Dewar, a sample changer in a beamline, or similar application environment where retrieving the ID of a sample storage device is of importance. User information can also be written in the memory of the device RFID tag, and retrieved afterwards. This can be done using the GUI of the eCryoTag reader or via low-level socket commands in machine to machine (M2M) communication.

## 4.A. Connections

Two connections are available on the connection side of the control box: an RJ45 socket and a 12V DC power socket.

- Connect the RJ45 socket to the ethernet port of a PC.
- Power up the control box using the DC power supply provided.
- **Wait until the blue LED lights up**. This means the eCryoTag reader is ready to operate.
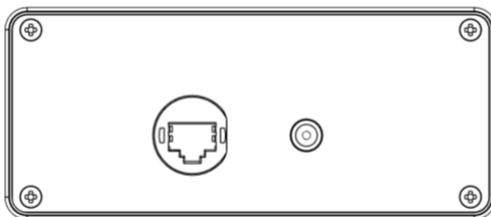
## 4.B. CryoProbe

The CryoProbe **is designed to read tag information from Cryo-EM boxes stored in liquid nitrogen**. It can be used to read/write any field of a tag in any support at either room or Cryogenic temperature. However, as the design is not optimized for tags surrounded by metal, the operation may take several attempts. Make sure the tip of the CryoProbe is as close as possible to the tag and that it does not move during the process.

**Note that the antenna is placed on the very tip of the CryoProbe**.

- Get the tip of the CryoProbe close to the tag and click on the button. The blue LED will blink during the reading and the buzzer will indicate when the reading is done. Upon a successful reading, the fields selected on the Preferences tab are sent to the host computer and displayed on the GUI (if the web page is open).



*Example - Reading the tag on a Cryo EM box.*

# 4.C. Single antenna support

In single antenna configuration, the eCryoTag reader can be used to read and write single tags and uni-pucks at either room or cryogenic temperature.

## 4.C.a Tags

- *Mainly used for tag programming via the GUI of the eCryoTag reader.*
- Place the tag in the slot indicated by yellow in the image below.
- In the GUI, click on the button corresponding to the field to be read/written.
- The blue LED will blink and the buzzer will indicate when the reading/writing is successful.
- The fields selected on the Preferences tab are sent to the host computer and displayed on the GUI (if the web page is open).
- Writing: With the tag in position, click on the corresponding field to be written on the GUI.

## 4.C.b Uni-pucks

- Place the puck on the plate with its groove aligned with the screw indicated by yellow in the image below.
- The base of the puck must be in contact with the two other screws.
- The puck is detected and reading starts. The blue LED blinks and the buzzer indicates when the reading is successful.
- The fields selected on the Preferences tab are sent to the host computer and displayed on the GUI (if the web page is open).
- Writing: With the puck in position, click on the corresponding field to be written on the GUI.
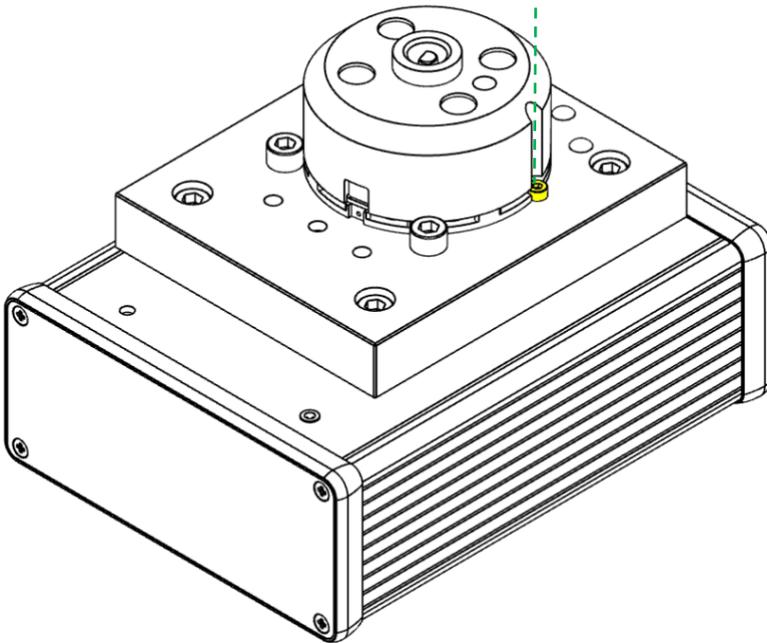
# 4.D. Double antenna support

In a double antenna configuration, the eCryoTag reader can read and write single tags, Uni-pucks, and SC3 (SPINE) pucks at room or cryogenic temperature.

## 4.D.a Uni-pucks

- Place the puck onto the plate, with its groove aligned with the spot indicated by yellow in the image below. Slightly turn the puck clockwise and counterclockwise in this position to ease the reading.
- When the puck is detected, reading starts. The blue LED blinks and the buzzer indicates when the reading is successful.
- The fields selected on the Preferences tab are sent to the host computer and displayed on the GUI (if the web page is open).
- Writing: With the puck in position, click on the corresponding field to be written on the GUI.
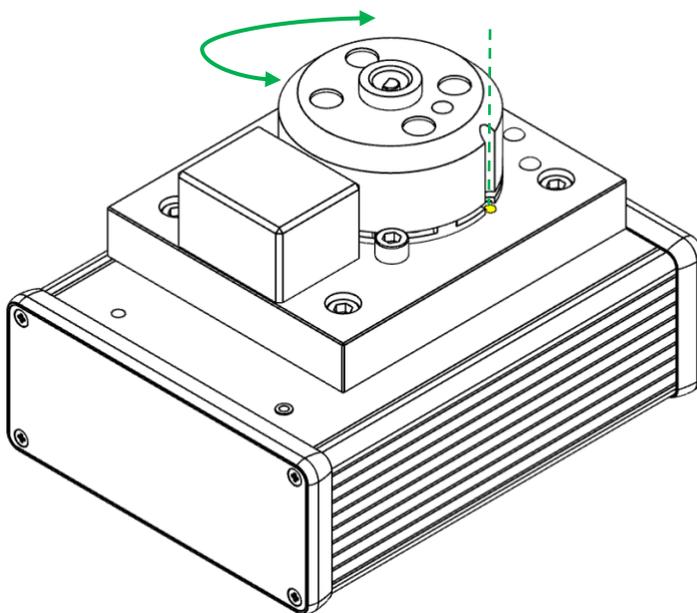
## 4.D.b SC3 (SPINE) pucks and Cryo-EM pucks.

- Place the puck on the plate, with its tag aligned with the middle of the vertical antenna support
- The base of the puck must be in contact with the two other screw heads.
- Slightly turn the puck clockwise and counterclockwise in this position to ease the reading. When the puck is detected reading starts.
- The blue LED blinks and the buzzer indicates when the reading is successful.
- The fields selected on the Preferences tab are sent to the host computer and displayed on the GUI (if the web page is open).
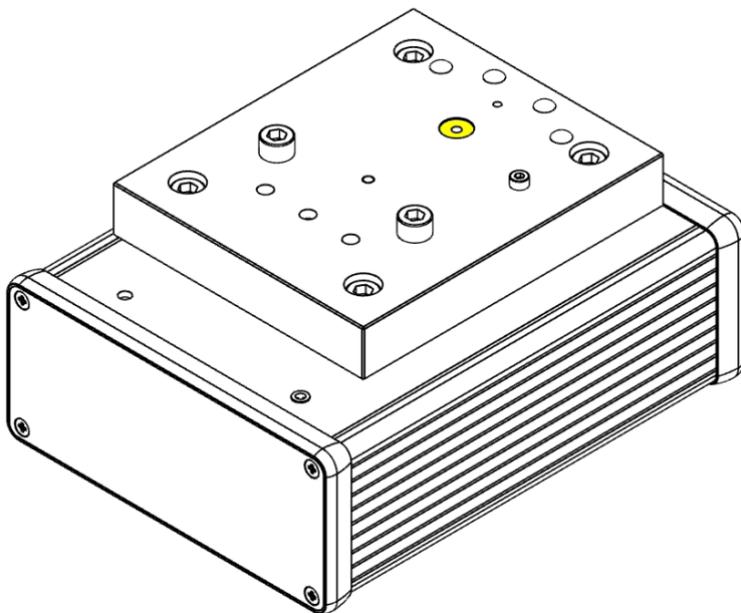- Writing: with the puck in position, click on the corresponding field to be written on the GUI.
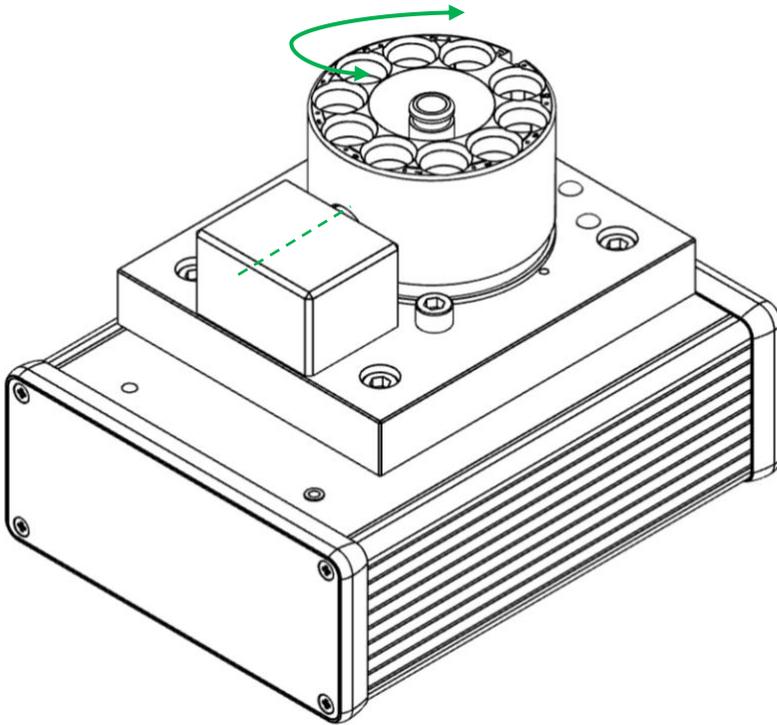
# 5. Low-level socket server:

The eCryoTag reader also offers a low-level Socket server for an easy integration to M2M communication. The low-level socket server accepts several connections at the same time and sends events to every connected client. It is exposed on the port 9002.

## 5.A. Command structure:

The typical structure of the commands is:

> <STX>Command<RS>Parameter1<RS>Parameter2 <ETX>

Where

> <STX> is start text character (ASCII code: 0x02)
>
> <ETX> is end text character (ASCII code: 0x03)
>
> <RS> is record separator character (ASCII code: 0x1E)

- The <RS> and the *parameters* are necessary only for a small number of commands

The eCryoTag reader responds using the same <STX> and <ETX> character delimited messages.

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> ⚠️ Note that the brackets < > around messages and control characters are only used for representation they are not part of the message.

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## 5.B. Error messages

If an error occurs, the reader will send an error message:

> <STX>ERROR<RS><error message><ETX>

## 5.C. Event messages:

Send EVENT messages with the following structure:

> <STX><EVENT_NAME><RS>facultative message<ETX>

Here is a list of EVENT messages:

### EVENT_RESET_FIELDS:

This event is sent when a *reading* procedure is started upon puck detection, or button activation. This can be used to reset all fields that are kept in memory as a new reading procedure has started. This event is used to clear the entire user panel on the GUI when a new puck is detected.

Message sent:

> <STX>EVENT_RESET_FIELDS<RS><ETX>

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### EVENT_ID

This message is used to send the detected Device ID.

Message:

>   <STX>EVENT_ID<RS><Device ID><ETX>

Example:

>   <STX>EVENT_ID<RS>AB123A  <ETX>

Where a device with the following ID has been detected: "AB123A  "

### EVENT_TYPE

This message is used to send the detected Device type.

Message:

>   <STX>EVENT_TYPE<RS><Device Type Code + « » + Device Type Name ><ETX>

Example:

>   <STX>EVENT_TYPE<RS>MX1 uni-puck<ETX>

Where a device with the following type has been detected: "uni-puck"

### EVENT_USR_FIELD

This message is used to send the detected User Field.

Message:

>   <STX>EVENT_USR_FIELD<RS><User Field text><ETX>

Example:

>   <STX>EVENT_USR_FIELD<RS>user field 123<ETX>

Where a device with the following user field has been detected: "user field 123"

### EVENT_TAG_UID

This message is used to send the detected tag UID.

Message:

>   <STX>EVENT_TAG_UID<RS><Tag UID><ETX>

Example:

>   <STX>EVENT_TAG_UID<RS>97035519012416E0<ETX>

Where a device with the following tag UID has been detected: "97035519012416E0"

# 5.D. List of commands:

## RD_ID

Read ID (device ID): Manufacturer ID followed by the device serial number.

Command:

> <STX>RD_ID<ETX>

Response:

> <STX><device ID><ETX>

Response Example :

> <STX>AB123A <ETX>

## WR_ID

Write ID (device ID): Manufacturer ID followed by the device serial number. There are eight characters reserved for this purpose in the RFID tag, but for the moment the device IDs are composed only of six characters. If there are fewer than eight characters in the device ID, it will be completed with blank spaces automatically.

WARNING: To write the device ID of the tag, administrator level log in is necessary. Please check LOGIN_ADMIN command.

Command:

> <STX>WR_ID<RS><device ID><ETX>

Response:

> <STX><device ID><ETX>

Response Example:

> <STX>AB123A <ETX>

## RD_TYPE

Read device type. Please refer to the annex *RFID tag programming protocol* in section 7 to identify the correct device type codes.

Command:

> <STX>RD_TYPE<ETX>

Response:

> <STX><device type code>  <device type name><ETX>

Response Example:

> <STX>MX1 uni-puck<ETX>

## WR_TYPE

Write device type. There are four characters reserved for this purpose in the RFID tag, but for this version, the device types are composed of only three characters. If there are less than four characters, it will be completed with blank spaces automatically.

WARNING: To write the device ID of the tag, administrator level log in is necessary. Please check LOGIN_ADMIN command.

Command:

> <STX>WR_TYPE<RS><device type><ETX>

Response:

> <STX><device type code ><ETX>

Response Example:

> <STX>MX1 <ETX>

### WR_ID_AND_TYPE

This command writes the device ID and device type.

Command :

   `<STX>WR_ID_AND_TYPE<RS>< device id><RS><device type><ETX>`

Response :

   `<STX><device type code><ETX>`

Response Example:

   `<STX>MX1 <ETX>`

### RD_USR_FIELD

Read user field. There are 196 characters reserved for this purpose in the RFID tag.

 Command:

   `<STX>RD_USR_FIELD<ETX>`

Response:

   `<STX><user field><ETX>`

Response Example:

   `<STX>USER FIELD 1234<ETX>`

### WR_USR_FIELD

Write User field. There are 196 characters reserved for this purpose in the RFID tag. The user field information is automatically completed with blank spaces if there are fewer than 196 characters in length.

Command:

   `<STX>WR_USR_FIELD<RS>< User field data to be written><ETX>`

Response:

   `<STX><user field><ETX>`

Response Example:

   `<STX>USER FIELD 1234<ETX>`

### RD_TAG_UID

Read tag UID. This is a read-only unique code and cannot be changed.

Command:

> <STX>RD_TAG_UID<ETX>

Response:

> <STX><hexadecimal UID code><ETX>

Response Example:

> <STX>A65BC002012416E0<ETX>

### RD_ALL

Read all fields. This command will launch a reading of device ID, device type and the user field.

Command:

> <STX>RD_ALL<ETX>

Response:

> <STX><device ID><RS><device type code>  <device type name><RS><user field><ETX>

Response Example:

> <STX>AB123A<RS>MX1  uni-puck<RS>USER FIELD 1234<ETX>

### LOGIN_MANUFACTURER

Manufacturer login. This command allows to log into the device as manufacturer. Use the manufacturer name and password provided with the reader.

Warning: If one user is logged in as manufacturer, all users are considered manufacturers. Use the LOGOFF_MANUFACTURER command to log off.

Command:

> <STX>LOGIN_MANUFACTURER<RS><manufacturer name><RS><password><ETX>

Response:

> <STX>LOGIN_OK<ETX>

If the password is not correct:

> <STX>ERROR<RS>Wrong password<ETX>

### LOGOFF_MANUFACTURER
Logs off from manufacturer mode.

Command:

>    <STX>LOGOFF_MANUFACTURER <ETX>

Response:

>    <STX>LOGIN_OFF<ETX>

Possible error message:

>    <STX>ERROR<RS>Wasn't able to log off<ETX>

### IS_MANUFACTURER
State of the ADMIN_LOGIN. Responds true if administrator rights are enabled or false otherwise.

Command:

>    <STX>IS_MANUFACTURER<ETX>

Response

>    <STX><Boolean><ETX>

Typical response:

>    <STX>TRUE<ETX>

### GET_DEVICE_TYPES
This command retrieves the existing device types.

Command:

>    <STX>GET_DEVICE_TYPES <ETX>

Response:

<STX> MX0 SC3_puck <RS> MX1 uni-puck <RS> MX2 SPINEplus_puck <RS> MX3 miniSPINE_puck <RS> MX4 NewPin36_puck <RS>MX5 NewPin64_puck <RS> MP1 CryoEM_puck <RS> MB1 CryoEM_box <ETX>

This command returns to the default reading procedure configuration.

Command:

        <STX>GET_READER_CONF<ETX>

Response:

<STX><Device ID default reading Boolean><RS><Device Type default reading Boolean><RS><user field default reading Boolean><RS><tag UID default reading Boolean><ETX>

Typical response:

        <STX>true<RS>false<RS>true<RS>true<ETX>

## SAVE_READER_CONF

Sets and saves the configuration for default reading.

Command:

<STX>SAVE_READER_CONF<RS><device ID default read Boolean><RS><device type default read Boolean><RS><user field default read Boolean><RS><tag uid default read Boolean><ETX>

Response:

        <STX>Config Saved<ETX>

## GET_MANUFACTURER_ID

This command returns the manufacturer ID letter. If the device is not logged on as a manufacturer, the response will be an empty String.

Command:

        <STX>GET_MANUFACTURER_ID<ETX>

Response

        <STX><manufacturer ID letter><ETX>

Typical response:

        <STX>B<ETX>

### GET_MAC

Requests for the MAC address of the device.

Command:

> <STX>GET_MAC<ETX>

Response

> <STX><Mac address of the machine><ETX>

Typical response:

> <STX>b8:27:eb:cc:e7:8a<ETX>

### GET_NETWORK_CONF

Gets the state of the network configuration of the reader.

Command:

> <STX>GET_NETWORK_CONFIG<ETX>

Typical Responses

<STX>dynamic<ETX> - if the eCryoTag reader gets its IP address from the network

<STX>static<RS>10.0.0.2<RS>24<ETX> - if the IP address is a static 10.0.0.2 and the mask is 255.255.255.0

### SAVE_NETWORK_CONF

Saves the network configuration of the reader.

WARNING: After a network reconfiguration, the Reader will automatically reboot. This can take a few minutes.

Typical commands:

To enable the dynamic IP addressing:

> <STX>SAVE_NETWORK_CONF<RS>TRUE<ETX>

To enable static IP addressing with 10.0.0.2 IP address and mask of 255.255.255.0

> <STX>SAVE_NETWORK_CONF<RS>FALSE<RS>10.0.0.2<RS>24<ETX>

Typical responses

<STX>dynamic<ETX>   if dynamic addressing was requested

<STX>10.0.0.2<ETX>   if static addressing was requested

# 6. Annex

## 6.A. Tag programming protocol

The memory of the tag is organized in pages. One page can store 4 bytes (32 bits). Programming is in **ASCII** (four characters/page)

The identification includes three fields:

- The unique ID (UID)
- The device type
- The user field

### 6.A.a The UID

The UID has been defined to avoid duplicated IDs between different manufacturers. It is composed of eight alphanumerical characters. Only six characters are used, the last two being reserved for future extension. The first letter identifies the manufacturer and it is attributed according to the table published on the **RFID for life science** consortium website:

https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/

It is up to each manufacturer to follow up on the distribution of the remaining five characters to ensure unique IDs in its own production.

**The UID is stored in the memory pages 0 and 1 of the RFID chip** that contain eight characters in total.

Space characters (ASCII character:  32 decimal base, 20 hexadecimal base) should fill the last two characters in the eight character UID.

Example: AX123A ID corresponds to "AX123A␣␣" into the chip memory.

## 6.A.b Device type

The device type allows automated handling systems to recognize a device, e.g. in MX, the different pucks that fit in the same Dewar slot.

**The device type is stored in the memory page 2 of the RFID chip**, which contains 4 characters in total.

Example: the ID for an SC3 (SPINE) puck corresponds to "MX0_" into the chip memory.

The latest device type code list together with the corresponding configuration file are published on the **RFID for life science** consortium website.

https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/

| Device type | Type code |
|---|---|
| SC3 puck | MX0 |
| Uni-puck | MX1 |
| SPINEplus puck | MX2 |
| miniSPINE puck | MX3 |
| NewPin36 puck | MX4 |
| NewPin64 puck | MX5 |
| … | |
| Cryo-EM puck | MP1 |
| … | |
| Cryo-EM box | MB1 |
| … | |

Example: Writing the code "AX123A" into the chip of an SC3 (SPINE) puck:

| | Page 0 | | | | Page 1 | | | | Page 2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ASCII character | A | X | 1 | 2 | 3 | A | | | M | X | 0 | |
| Code in memory (hexadecimal) | 41 | 58 | 31 | 32 | 33 | 41 | 20 | 20 | 4D | 58 | 30 | 20 |

### User field

The used field can be used for any purpose. It starts on page 3.

For more information please visit the **RFID for life science** consortium website:

https://www.embl.org/groups/grenoble-instrumentation/standards-consortiums/