

# RFID Access Control System

## Amilia Addendum to the System

### Overview Document

By: Jim Schrempp, Bob Glicksman and Mike Calyer; v1, 8/13/2023

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# **FORWARD.**

This document is an addendum to the RFID\_ACS\_Overview\_Document that can be found in this repository; see:

[https://github.com/makernexus/RFID\\_System/blob/main/Documents/RFID\\_ACS\\_Overview\\_Document.pdf](https://github.com/makernexus/RFID_System/blob/main/Documents/RFID_ACS_Overview_Document.pdf)

This document amends the RFID\_ACS\_Overview\_Document to include the changes that have been implemented in order to replace EZ Facility with Amilia SmartRec.

## **AMILIA BACKGROUND.**

Maker Nexus has been using EZ Facility as our CRM system since we opened in 2019. The CRM system is crucial to the operation of Maker Nexus and EZ Facility met the initial needs of the business. However, the expansion and growth of Maker Nexus has revealed limitations in EZ Facility's ability to support our continuing business. A decision was made to explore alternatives to EZ Facility and the team assigned to this project ultimately chose Amilia SmartRec<sup>1</sup> as the replacement for EZ Facility. Amilia allows Maker Nexus to better support our growing education mission and integrates membership management, billing and payment for memberships, facilities and classes, equipment reservations for members, and class management, all in one application.

As with EZ Facility, Amilia is required to be the sole source of truth for member information that is needed to implement access control rules via the RFID system. Amilia provides a REST API that is similar to EZ Facility. However, there are a number of differences between Amilia's member data model and that of EZ Facility. There are also a number of differences in the behavior of the API. Consequently, changes to the RFID firmware, webhooks and the PHP scripts in the Facility Database are necessary in order to integrate the Maker Nexus RFID system with Amilia and have it function similarly to its legacy functionality with EZ Facility. This document describes these changes:

- Mapping of the EZ Facility data model to Amilia's data model, as far as the RFID system is concerned.
- Behavioral differences in the event of error conditions between the EZ Facility and Amilia APIs.
- Differences in handling member images between EZ Facility and Amilia.

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<sup>1</sup> <https://www.amilia.com/>

# **EZ FACILITY - AMILIA FIELD MAPPING FOR RFID.**

## **OAUTH2 Bearer Tokens.**

Both EZ Facility and Amilia use OAUTH2 bearer tokens to provide secure access to the API. EZ Facility's bearer tokens expire after one hour whereas Amilia's bearer tokens are good for one year. Both EZ Facility and Amilia require a client to present secret information in order to obtain the necessary bearer token. The secret information differs between these applications. In the case of Amilia, a special administrative user is established for RFID system API access and this user's credentials must be submitted to Amilia in order to obtain a bearer token.

The specific information needed to obtain a bearer token for both EZ Facility and for Amilia is contained within the "GetToken" webhook in the Maker Nexus RFID Particle account. The RFID station firmware checks for token expiration and automatically requests a new token when needed, or wherever the station is rebooted (automatically, once per day). Hence, the station firmware does not need to be changed to obtain a bearer token for Amilia.

## **Member Number.**

Both EZ Facility and Amilia assign their own, internal, person identifier as the primary key into a person's information within the CRM system. In addition, both of these systems have a provision to store an external organization-assigned identifier for each person in their database. Originally, it was anticipated that Maker Nexus would assign its own membership number to each member. The Maker Nexus membership number was used to query EZ Facility for basic member information that was needed to "burn" an RFID card for that member. EZ Facility's internal "Client ID" was obtained via the API and then burned onto each RFID card. This "Client ID" was thereafter used for access control information queries to EZ Facility.

Maker Nexus never found a need to assign our own member number to members. Consequently, it was decided to NOT try and migrate the old EZ Facility member numbers into Amilia. Rather, Amilia's internal unique identifier ("Person ID") is used, exclusively, going forward.

The RFID Amin App requires the user to enter the person's "member number" and it passes this through the station firmware to the "ClientByMemberNumber" webhook. For Amilia, admins now enter the Amilia "Person ID" into the app for the "member number" and the app will receive and re-display the Amilia "Person ID" as the "Client ID"; the latter is subsequently burned onto the member's RFID card, as before.

The Admin App is not changed. Admins are trained to enter the Person ID where the app asks for the member number. The "ClientByMemberNumber" webhook queries Amilia using the

Amilia Person ID. Owing to differences in error handling if the requested person is not found in the CRM system, it is necessary to set the “errorResponseTopic” in the webhook and to support this with error handling code in the station firmware.

## Unique ID for Persons.

Both EZ Facility and Amilia use internally assigned unique identifiers for each person in the CRM. EZ Facility calls these unique identifiers “Client ID” and Amilia calls them “Person ID”. Aside from the name of these unique identifiers, their purpose and function within the CRM systems is the same. These unique identifiers are burned onto a member’s RFID card and are used for API queries to the CRM system in order to obtain that person’s membership and skill information. The “ClientByClientID” webhook is changed to use a different URL and the “mustache code” is changed to support some differences in the data model. It is also necessary to set the “errorResponseTopic” in the webhook and to support this with error handling code in the RFID station firmware.

NOTE: The “ClientByClientID” webhook is only triggered by the station firmware when an RFID card is presented to the station. We would not normally expect a “person not found” error because the unique ID burned onto the RFID card came from the CRM when the card was made and therefore should always represent a valid user in the CRM system’s database. However, the transition from EZ Facility to Amilia means that both EZ Facility and Amila RFID cards may be present for some time during the extended transition period. Therefore, it is possible that a member may try and check-in with an EZ Facility RFID card, in which case the unique identifier on the card will not match any record in Amilia. We made the aforementioned changes to the station firmware and the webhook “errorResponseTopic” in order to detect and properly process this potential error condition.

## Revocation Code.

The RFID system provides a mechanism for automatically revoking old RFID cards whenever a new card is made. An administrator is required to change the contents of a particular field in the CRM prior to burning a new card for a Maker Nexus member. The specifics of the change is not important; only that the changed data differs from the previous data. This particular field is burned onto the RFID card and it is thereafter used to check that the card presented to an RFID station matches the data in the CRM before the card is accepted by the RFID system. This effectively and automatically revokes old cards.

EZ Facility offered three unused fields in its user model that an organization can use for any purpose. We used “custom field 1” for this revocation code. Amilia does not have custom fields, but it does have a field called “External ID” that can be obtained using the API. The intended use for the External ID is as an external organization’s “member number”. Maker Nexus has decided not to issue our own member numbers (as described above) and therefore we use the External ID field for the revocation data.

Small changes to the mustache code in webhook “ClientByClientID” are needed to support these changes. No firmware changes are necessary.

## Equipment Checkoffs.

Maker Nexus members are required to be “checked off” on certain items of industrial power equipment before they can use that equipment. Members can receive a checkoff by taking an appropriate class or by demonstrating their prior expertise to a certified instructor. Maker Nexus used “packages” in EZ Facility to designate the equipment checkoffs owned by a member; the equivalent concept in Amilia is “skills”.

EZ Facility required a special API query in order to obtain the packages for a member. The “PackagesByClientID” webhook was used for this purpose. Amilia returns a member’s “skills” along with membership and other personal data. However, we have retained both webhooks for backward compatibility purposes. The “mustache code” in the “ClientByClientID” webhook filters out all but essential membership status information for the station firmware, whereas the “PackagesByClientID” filters out all but the “skills” information, so that the firmware sees the same equipment checkoff information from Amilia as it obtained from EZ Facility. The station firmware is not changed to support this function in Amilia.

## Membership Status.

EZ Facility and Amilia have totally different concepts about a person’s “membership(s)”. EZ Facility has the concept of a person having a single membership in the organization that is hosting their CRM on EZ Facility. A person can have a membership that is in one of several statuses: e.g. active, inactive, suspended, etc. Amilia’s data model provides for a person to have many memberships (in different sub-organizations within the larger organization hosted by Amilia) and a person either has or does not have a membership in a particular sub-organization. Amilia does not have any notion of a person’s “status” within a sub-organization; a person is either a member or not.

We assign a “membership” within Amilia to designate that a person is a member in good standing of Maker Nexus. Otherwise, the person’s record within Amilia does not have this membership. A person must be a member of Maker Nexus and be in good standing (particularly financially) in order to have this membership in their record. The “ClientByClientID” webhook and the station firmware have been modified to accommodate this change in the data model.

## Member Financial Status.

Maker Nexus requires that members be fully paid up in order to access the facility. The RFID system previously enforced this by denying the user the ability to check-in to Maker Nexus if their finances are in arrears. EZ Facility supported this logic by returning the member's "amount owed" information and the station firmware checked this information to determine if the member was in arrears.

Amilia does not return financial information about a person in any available API query. In addition, the simple financial model for a member being paid up is no longer applicable to Maker Nexus. Maker Nexus now has several types of memberships, each with a different subscription price, and a member's account may have additional recurring charges, e.g. rentals. The transition to Amilia has caused us to rethink this access control rule and, for the immediate future, a person's Amilia record will only have the Maker Nexus membership in it if they are a member in good standing in all regards (including financial). The Maker Nexus membership-in-good-standing rules are henceforth handled externally to the RFID system. The firmware and the webhook "ClientByClientID" mustache code have been changed to reflect this new handling of a person's valid active membership in Maker Nexus.



## **OTHER DIFFERENCES BETWEEN EZ FACILITY AND AMILIA.**

### **Member Not Found Error Handling.**

If EZ Facility is queried using a member number that is not in its database, EZ Facility returns a JSON formatted response to this effect. The http response code is 200, indicating that EZ Facility understood and implemented the query. The legacy RFID station firmware processed all responses from EZ Facility as JSON format and handled the “member not found” error response in this manner.

If Amilia is queried using a Person ID that is not in its database, Amilia returns a similar JSON formatted response, but the http response code is 404 (“resource not found”). In both cases, the return message and response code is to the Particle webhook that initiated the query.

When the Particle cloud receives a normal response from a webhook query, it returns the response data to the station that initiated the query in the “response Topic” that is configured in the webhook (default “response Topic” is the event that triggered the webhook). When the Particle cloud receives an http response code in the 400 or 500 series, it formats an error message and returns the error message to the station that initiated the query on the “error Response Topic” that is configured in the webhook (the default “error Response Topic” is blank). The message that Particle returns on the “error Response Topic” in the case of “member not found” by Amilia is “error status 404 from [www.amilia.com](http://www.amilia.com)”. Particle does not return the JSON formatted error message provided by Amilia.

Certain changes to the webhooks that query Amilia and to the RFID station firmware were required to handle the “member not found” error. The webhooks that query Amilia were all changed to include an “error Response Topic”. For simplicity, the “error Response Topics” were set the same as the normal “response Topics”. The firmware that handles these webhook responses was modified to test for this non-JSON error message and handle the error accordingly.

### **Member Picture Storage and Management.**

Each Maker Nexus member has a photograph that is used to identify the member on the Facility Display. The member photographs were stored on the EZ Facility server in a directory that EZ Facility makes url-accessible by file name. Each member’s photograph is identified by its file name: <member Client ID>.jpg.

Amilia has the capability to store a photo for each person, however the photos are only accessible by a complex url containing a bearer token that has a short term expiration. Amilia

also requires an account to have one photo that is shared with all organizations. Maker Nexus requires that photos conform to a certain standard and we felt that our standard might conflict with standards from other organizations that the account belongs to. We determined that it is more acceptable to store our member's photos in jpeg files on the Facility Database hosting server (not in the database itself) and identify each member's photo by <PersonID>.jpg. Migration of legacy member photo files was simplified under this approach and no changes are required to the PHP script that is used to display member check-ins on the Facility Display consoles, only a change to our FDB site configuration file.

## **DESIGN CHANGES FOR AMILIA.**

This is a top level description of the changes to the Maker Nexus RFID Access Control System that have been made to implement the change from EZ Facility to Amilia.

### **Station Hardware.**

No changes to the RFID station hardware are needed to support Amilia.

### **Station Firmware.**

There are a number of changes to the RFID station firmware that were needed to accommodate the differences between Amilia and EZ Facility. Among these are:

- support “404 error” responses on the “error Response Topic”.
- changes to support the presence or absence of Make Nexus membership in Amilia vs. membership status and financial information from EZ Facility.
- changes in the initialization of the webhooks to use the new names for the webhooks.

### **Webhooks.**

All webhooks that query EZ Facility have been renamed for Amilia and the urls have been changed to Amilia AI endpoints. The “error Response Topic” has been added to each of these webhooks so that 400/500 series http response codes can be processed by the RFID station firmware. Various changes have been made to the mustache filters for webhook responses to make them as compatible as possible with the legacy station firmware. Most (but not all) of the differences between EZ Facility’s API data model and Amilia’s API data model are handled in this manner.

### **Facility Database and PHP Scripts.**

The structure of the Facility database has not changed and most of the PHP scripts are unchanged as well. The URL for obtaining member photos has been changed in the site configuration file.