RFID System Administration Manual

This manual is intended for the technically sophisticated person who is responsible for the configuration and maintenance of the RFID system. This person needs a broad understanding of the facility's CRM system, policies, and objectives in using the RFID System. This person needs a working knowledge of MySQL, PHP, FTP, Particle.io, Arduino programming, and GitHub. If you do not have these skills, you will need access to resources who can help you with tasks.

This manual assumes you have built and installed the RFID System. This includes:

1. Building the RFID Station hardware (ref: *RFID Build and Installation Instructions* document in the "hardware" folder of the repository).
2. Setting up the facility's Particle.io account (ref: *Configure Particle.io* in the "Software/Particle_SW/ParticleCloudSoftware" folder of the repository).
3. Creating the Facility Database and associated website on a cloud server (ref: *Facility Database Admin Help* document in the "Software/Facility_Database_SW/" folder of the repository).
4. Installed and configured the two Android control apps (ref: *RFID_Administrator_User_Manual* in the "Software/Android_Apps" folder of the repository).
5. Configured your CRM system to interface to this RFID System (we document connecting it to EZFacility in *Configure EZFacility for API Access* in the "Documents" folder of the repository).

Theory of Operation

RFID Stations accept taps of RFID cards. The stations validate the card against the CRM system to decide if the card is valid and to obtain other information about the associated member. The stations will perform their operation, provide feedback to the user, and log information in the Facility Database. The Facility Database website generates various reports from the logged information.

Each RFID Station is configured to have a particular operation. The configuration is specified by a Station Type Number and the RFID Station stores this number in non-volatile memory. Upon boot up the RFID Station will request configuration parameters from the Facility Database for its Station Type Number. (To set a Station to a particular type see *RFID_Administrator_User_Manual* in the "Software/Android_Apps" folder of the repository.)

The Station Types fall into four categories:

Type	Description
0 New	A brand new RFID Station will boot up in this state. All lights are on and the LCD shows characters. This is used for validating your hardware build and firmware installation. A station of this type displays “Undefined” on the LCD.
1 Check In	Check In Station. Tapping a valid RFID card on this station will check for a valid membership in the CRM system and add a record to the Facility Database noting that this member is now checked-in. Tapping an RFID card for the same member will add a record to the Facility Database noting that this member is now checked-out. This can be repeated over and over in one day. An idle station of this type displays “Tap to CheckIn” on the LCD.
2 Admin	Admin Station. This type is meant to be controlled by the Android admin app. An idle station of this type displays “Use Android App” on the LCD.
Area Stations	These stations are assigned to a particular area or machine. Tapping a valid RFID card on this station will check the CRM system to verify member permission and add a record to the Facility Database noting that the user has tapped the station. These stations obtain their configuration from the Facility Database when they boot up. These stations all have similar operation.

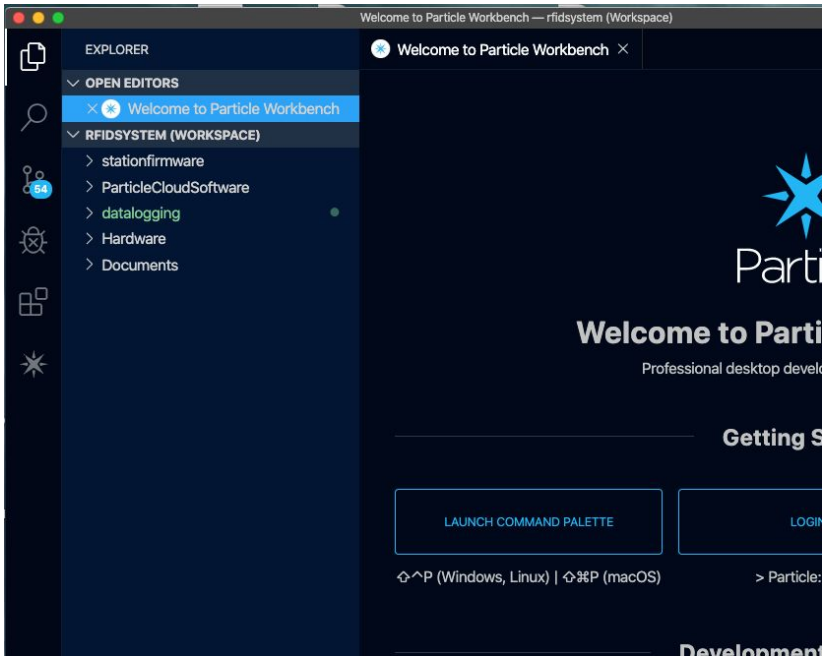
Install Firmware

To install the RFID System firmware you must download and install the Particle.io Workbench development environment. This environment is based on Visual Studio Code. It is freely available at https://www.particle.io/workbench

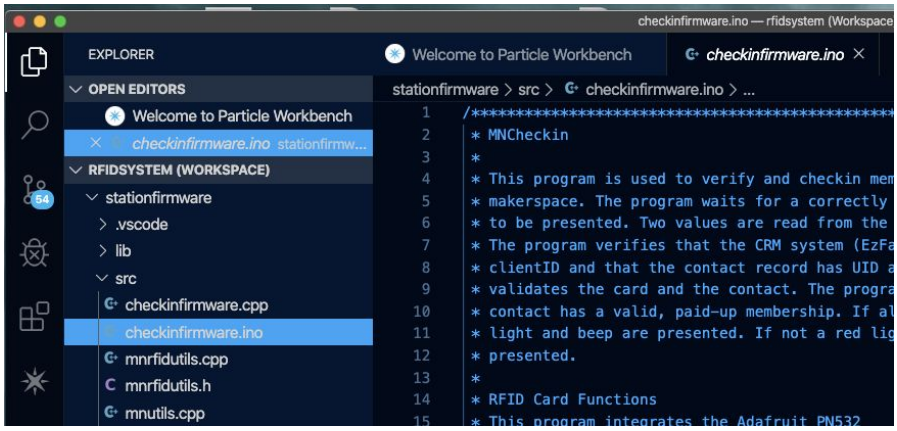
Visual Studio Code Tips

Visual Studio Code runs a plug-in from Particle. Here are a few tips to get you started.

When you start VSC you should open the workspace: rfidsystem.code-workspace in the repository. You should see this:

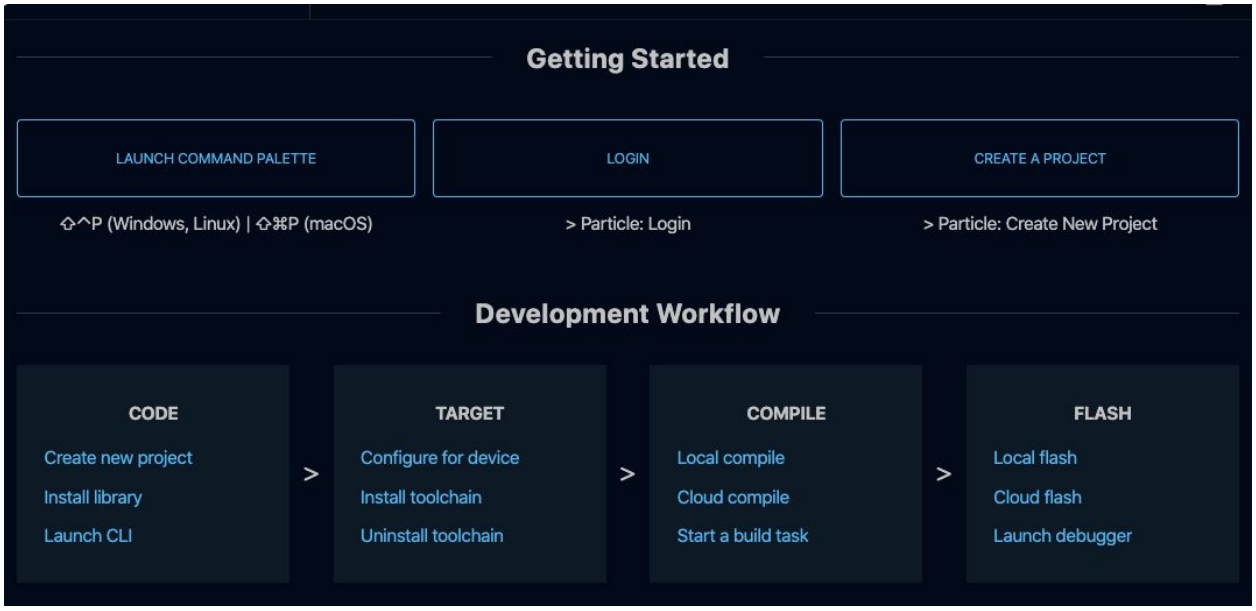


Click the top most left icon and open EXPLORER. Navigate to the checkinfirmware.ino file and open it:



Open the Particle plug-in with the lowest icon on the left hand navigation menu.

Scroll down in the Particle Workbench tab to see this:



Click > Particle Login and supply your Particle.io account credentials

Under TARGET, click Configure for device. Select the OS firmware version (if you don't know then just select the most recent recent version. Then type in the name you assigned to the Argon you are using for development.

Under COMPILE, click Local compile. If the code does not successfully compile, then you need to figure out why. Once the local compile works...

Under FLASH, click Cloud flash. See your Argon updated with the code!

Tests

1. Push the current code to your Argon. (If you followed the VSC tips above, then you just did this.)
2. Use the Particle Console to make it DeviceType 1
3. Tap each card in turn on your device, see the result and note that it corresponds to what is written on the card. If each card works, then you are ready to go.
4. Look at the test logging database to see if your taps have been recorded: http://rfidsandbox.makernexuswiki.com/rifdhome.html

Adding a New Station Type

Each station type number has a record in the Facility Database table stationConfig. The Android station configuration app retrieves a list of valid station numbers and names to present to the admin user.

The Android Station CStation Types other than 0, 1, and 2 retrieve their configuration parameters from the Facility Database when they boot up.

You add a new type, or change the behavior of an existing type, by altering the stationConfig table in the Facility Database.

How to Add a Station Type

To add a new Station Type, use PHP Admin or another MySQL tool to insert or update records in this table.

Field Definitions

stationConfig Table

Each field in the database has a comment explaining its use. This is reproduced here with some elaboration:

recNum

An automatically created unique number and should never be changed. If you understand databases, then you understand why we have this. If not, you should be careful about what you do in this database.

Active

If <> 0 this is the active record for the deviceType. There must be only one active record for each deviceType. This field allows the administrator to change a device type by adding a new record and marking the old record with Active = 0, thus preserving the previous configuration in case you need to quickly revert.

deviceType

This is the number used by a Station when asking for its configuration parameters. The system will return the active configuration for this deviceType.

deviceName

When Stations of this type make log entries in the Facility Database they will use this name to identify its type. Typical values are: “checkin”, “admin”, “woodshop”, “3D printer”, etc.

LCDName

When idle, Stations of this type will display this value on their LCD displays. The value should be less than 16 characters. Typical values are: “Woodshop”, “Laser Cutter”, “Bandsaw”, etc.

photoDisplay

When a user taps on a Station of this type, the Station will log this value in the Facility Database. This value will eventually be displayed under the member’s name on the Checked In photo display web page. To keep the web page clean, this value should be very short. Typical values are: “Wood”, “3D”, “Laser”, etc.

OKKeywords

This field provides the tie between your RFID System and your CRM member certification system. You must set up your member certification choices in a way that allows you to define keyword groups that will work in your RFID system to achieve your objectives.

A comma delimited list of keywords. Stations of this type retrieve member certification information from the CRM system (in EZFacility these are called “packages”) and scan that certification information for these keywords as substrings. If any of the keywords is found then the member is assumed to have permission to access the area or equipment associated with this type of RFID Station. For instance, a “woodshop” Station might look for the keyword “wood” in the certification information.

Typical values are: “wood”, “3D”, “consew”, etc.

logEvent

Devices of this type will use this as the Particle Event Name when they log information to the Facility Database. It may be used in reporting. Typical values are: “wood allowed”, “textile allowed”, etc.

This field may seem redundant at this time, but we include it to allow for possible future expansion of the Station operations.

dateCreated

Defaults to CURRENT_TIMESTAMP and should not be overwritten.

Test and Troubleshooting

At this point you have

- Built your hardware and tested it per the documentation
- Installed your database and website and tested it per the documentation
- Installed your Particle.io webhooks and tested them per the documentation

Now you are ready to test the overall system.

Configure a Station

Use the Android Admin app to configure an RFID Station as an Admin Station. Use the webpage `rfidclientactivity.php` to verify that reboot log messages are making it into the database.

1. If the Admin app does not show a choice of Station Types
    a. goto URL
    http://<<YOUR FDB WEBSITE>>/fdbGetStationConfig.php
    Does the returned JSON contain the list of station types and names?
    b. In the Particle.io console
        i. Look at the history of the Integration `fdbGetStationConfig`. If this has not been triggered then your Argon is not communicating with the cloud for some reason.
        ii. Look at the event history for your device. Read the Debug events for any errors.
2. If the reboot messages do not show up on the web page then use the Particle.io console
    a. Look at the history of your device to see that events have been sent to the database.
    b. Look at the history of the Integration `RFIDLogging`. In particular, look at the response and see if there is a PHP or MySQL error in the website response.

Create RFID Cards

Configure an Admin Station and create RFID cards for several members. Use the Identify Card function to verify that the cards were created correctly.

1. If the cards cannot be read, are they the correct RFID cards for this system? White ID cards all look alike, yet some operate on different frequencies and some are inert without any RFID functionality.

Check In

Configure a Check-In Station. Present the cards you created. The Check-In Station should read each card and log to the Facility Database. Use the website page `rfidcheckinlog.php` to verify that the check in worked. Use the website page `rfidcurrentcheckins.php` to see that the checked in members are shown. Tap a card again to check out a member. See that they disappear from the currentcheckins page.

1. If you get a red “denied” light, look at the Firmware procedure isClientOKToCheckIn(). This is where the decision is made.

Area Station

Configure an area station based on the configuration you established in the stationConfig table. See that the LCD displays the name. Tap one of the cards you created and see if the member is allowed or denied depending on the certifications you have set up in your CRM system. Use the website page `rfidcurrentcheckins.php` to see that the checked in members are shown with the Stations photoDisplay text displayed below their name.

1. If you get a red “denied” light, look at the Firmware procedure isClientOKForEquip(). This is where the decision is made.