MaxAir Technical – Basic Fault Finding

MaxAir relies on a number of services in order function and is built on a LAMP (**L**inux, **A**pache, **M**ySQL, **P**HP) platform. The setup process is performed by executing **php /var/www/setup.php**, which will check that the platform requirements are met before installing the software and configuring the initial database.

Services

pihome_jobs_schedule

This service manages the running of a periodic tasks, to check it is functioning from the command prompt execute:

systemctl status pihome_jobs_schedule.service

The expected response should be similar to the following:

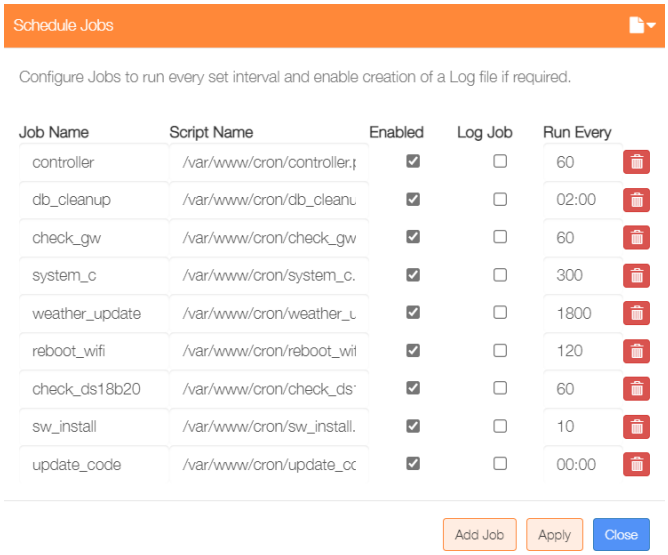
```
● pihome_jobs_schedule.service - Schedule
   Loaded: loaded (/lib/systemd/system/pihome_jobs_schedule.service; enabled; vendor preset: enabled)
   Active: active (running) since Tue 2021-08-31 21:55:58 BST; 15h ago
 Main PID: 3175 (python3)
    Tasks: 3 (limit: 1126)
   Memory: 85.2M
   CGroup: /system.slice/pihome_jobs_schedule.service
           ├─3175 /usr/bin/python3 /var/www/cron/jobs_schedule.py
           ├─3508 python3 /var/www/cron/gpio_ds18b20.py
           └─8237 python3 /var/www/cron/gateway.py
```

The screen above shows that the service is running and controlling the scheduling of the 'jobs' job_schedule.py, gpio_ds18b20.py and gateway.py.

If the service is not running, the MaxAir setup process has failed in some way. A complete re-install is recommended.

Jobs

The scheduler service executes a number of jobs on a periodic basis, these jobs will be installed as part of the setup process.



The installed jobs can be views from the 'Jobs' menu item in the 'Settings/System Configuration menu.

jobs_schedule

This job manages the running of the other periodic tasks, to check it is functioning from the command prompt execute:

ps -ax | grep jobs_schedule.py | grep -v grep

The expected response should be similar to the following:

3175 ? Ss 0:47 /usr/bin/python3 /var/www/cron/jobs_schedule.py

If nothing is returned, then this indicates that the scheduler function is not operating

gateway

This job manages collection of sensor data and the setting of relay states, to check it is functioning from the command prompt execute:

ps -ax | grep gateway.py | grep -v grep

The expected response should be similar to the following:

8237 ? S 0:09 python3 /var/www/cron/gateway.py

If nothing is returned indicating that the gateway is not operational, try starting it manually using the following command, which may give some clues as to why it has not started:

python3 /var/www/cron/gateway.py

ds18b20

This job manages collection of 1-wire sensor data, to check it is functioning from the command prompt execute:

ps -ax | grep gpio_ds18b20.py | grep -v grep

The expected response should be similar to the following:

3508 ? S 0:00 python3 /var/www/cron/gpio_ds18b20.py

If nothing is returned indicating that the 1-wire sensors are not operational, try starting it manually using the following command, which may give some clues as to why it has not started:

python3 /var/www/cron/gpio_ds18b20.py

controller

This job is the main engine for MaxAir, it controls the zones by reading and writing to message queues shared with the gateway job and by reacting to 'state' information provided by operating mode and schedule settings.

The jobs scheduler is configured to execute a 'watch-dog' script check_sc.php once every 60 seconds, to check that the controller script is running and if not restart it. This script can be executed manually using the following command:

php /var/www/cron/check_sc.php

The actual controller script is /var/www/cron/controller.py, which can be executed manually manually using the following command:

python3 /var/www/cron/controller.py

The response shown below is for a two zone system, operating in 'Boiler Mode', with an active schedule.

Additional debugging information is available by executing with an additional argument eg:

python3 /var/www/cron/controller.py 1

```
 __  __                    /\     (_)
|  \/  |                  /  \     _   _ __
| \  / |   __ _  __ __   / /\ \   | | | '__|
| |\/| |  / _` | \ \/ /  / ____ \  | | | |
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|_|  |_|  \__,_| /_/\_\ /_/    \_\ |_| |_|

        S M A R T   T H E R M O S T A T

*********************************************************************
*   System Controller Script Version 0.01 Build Date 19/10/2020     *
*   Update on 18/08/2021                                            *
*                                   Have Fun - PiHome.eu            *
*********************************************************************

2021-09-02 08:09:45 - Controller Script Started
2021-09-02 08:09:45 - Operating in Boiler Mode
2021-09-02 08:09:45 - Day of the Week: 4
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - Zone: Sensor Reading     18.50
2021-09-02 08:09:45 - Zone: Weather Factor     0.5
2021-09-02 08:09:45 - Zone: DeadBand           0.5
2021-09-02 08:09:45 - Zone: Cut In Temperature        19
2021-09-02 08:09:45 - Zone: Cut Out Temperature       19.5
2021-09-02 08:09:45 - Zone: Mode       81
2021-09-02 08:09:45 - Zone ID: 38
2021-09-02 08:09:45 - Zone: Central Heating Controller: 0 Controller Child: 13 Zone Status: 1
2021-09-02 08:09:45 - Zone: Central Heating Start Cause: Schedule Started - Target C:20 Zone C:18.50
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - Zone: Sensor Reading     40.80
2021-09-02 08:09:45 - Zone: Weather Factor     0.5
2021-09-02 08:09:45 - Zone: DeadBand           0.5
2021-09-02 08:09:45 - Zone: Cut In Temperature        41
2021-09-02 08:09:45 - Zone: Cut Out Temperature       41.5
2021-09-02 08:09:45 - Zone: Mode       81
2021-09-02 08:09:45 - Zone ID: 39
2021-09-02 08:09:45 - Zone: Hot Water Controller: 0 Controller Child: 11 Zone Status: 1
2021-09-02 08:09:45 - Zone: Hot Water Start Cause: Schedule Started - Target C:42 Zone C:40.80
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - System Controller Expected End Time: 2021-09-02 09:00:00
2021-09-02 08:09:45 - System Controller ON Time: 28 seconds
2021-09-02 08:09:45 - System Controller Active Status: 1
2021-09-02 08:09:45 - System Controller Hysteresis Status: 0
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - Purging marked records.
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - Controller Script Ended
***********************************************************************************************
```

The Controller output display shows:

- The Mode of Operation – Boiler or HVAC
- A block of information for each enabled zone
- A block of information for the System Controller
- If any database records have been marked for deletion and deleted this will be indicated. This usually happens because 'old' zone/system controller log records have been deleted.

From the example above the current status of the Central Heating Zone can be determined:

```
-----------------------------------------------------------------------------------------------
2021-09-02 08:09:45 - Zone: Sensor Reading      18.50
2021-09-02 08:09:45 - Zone: Weather Factor      0.5
2021-09-02 08:09:45 - Zone: DeadBand            0.5
2021-09-02 08:09:45 - Zone: Cut In Temperature         19
2021-09-02 08:09:45 - Zone: Cut Out Temperature        19.5
2021-09-02 08:09:45 - Zone: Mode        81
2021-09-02 08:09:45 - Zone ID: 38
2021-09-02 08:09:45 - Zone: Central Heating Controller: 0 Controller Child: 13 Zone Status: 1
2021-09-02 08:09:45 - Zone: Central Heating Start Cause: Schedule Started - Target C:20 Zone C:18.50
-----------------------------------------------------------------------------------------------
```

1. The temperature sensor reading for the zone is 18.5°C
2. The weather factor is 0.5°C
3. The zone deadband is 0.5°C
4. The zone will cut in at 19.0°C
5. The zone will cut out at 19.5°C
6. The current zone state is 81, from the table below this indicates that the zone is being controller by a schedule and is currently running
7. The Zone ID is 38
8. The controller relay for this zone has a node_id of 0 (the GPIO interface) and a node_child_id of 13 (pin 13 of the GPIO interface), it current state is 1 (activated).
9. The zone start cause is it that it has an active scheduled, which has been started, the target temperature is 20.0°C and the current temperature is 18.5°C

After the information for each zone, the System Control status is show:

```
-----------------------------------------------------------------------------------------------
2021-09-02 08:29:12 - System Controller Expected End Time: 2021-09-02 09:00:00
2021-09-02 08:29:12 - System Controller ON Time: 1195 seconds
2021-09-02 08:29:12 - System Controller Active Status: 1
2021-09-02 08:29:12 - System Controller Hysteresis Status: 0
-----------------------------------------------------------------------------------------------
```

1. The end time is set by the current schedule.
2. The time that the System Controller's relay has been activated is shown.
3. The current System Controller state is shown (1 = ON).
4. The Hysteresis state is shown (1 = System Controller is waiting for hysteresis timer to expire).

Zone Mode

Zone Main Mode	
0	Idle
10	Fault
20	Frost
30	Over temperature
40	Holiday
50	Night Climate
60	Boost
70	Override
80	Scheduled
90	Away
100	Hysteresis
110	Add-On
120	HVAC
130	Under Temperature
140	Manual
Zone Sub Mode	
0	Stopped (within deadband)
1	Heat Running
2	Frost
3	Stopped (coop start waiting for the System Controller)
4	Manual Operation - ON
5	Manual Operation – OFF
6	HVAC – Cooling Running
7	HVAC Fan Only

Checking GPIO Relay Operation

Relays are controlled by the gateway job, which reserves any configured relays and hence they are not available for any other use.

A test program is available, which temporarily stops the gateway job to enable setting relays either ON or OFF. For example if a relay is connected to pin 13 of the GPIO header and is switched ON by applying a HIGH level trigger, then to switch the relay ON, from the command line execute:

python3 /var/www/cron/gpio_relay_test.py 13 1

to switch the relay OFF, from the command line execute:

python3 /var/www/cron/gpio_relay_test.py 13 0

If the relay is switched ON by applying a LOW level trigger, then to switch the relay ON, from the command line execute:

python3 /var/www/cron/gpio_relay_test.py 13 0

to switch the relay OFF, from the command line execute:

python3 /var/www/cron/gpio_relay_test.py 13 1

Zone and Controller Logging

State changes for both zones and the system controller are saved in the MySQL table ‘controller_zone_logs’, examples of state changes for a 3 zone configuration are shown below, zone_id = 1 is used for the system controller, zone_id = 38 is used for the hot water zone, zone_id = 39 is used for the downstairs zone and zone_id = 57 for the upstairs zone, zone_id = 0 is used to capture system controller startups.

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

Schedule Started on all zone

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	2024-01-10 07:56:45	Schedule Target C Achieved (35.00)	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

Hot Water Zone has reached target temperature

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:30:00	Schedule Finished	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	NULL	NULL	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	2024-01-10 07:56:45	Schedule Target C Achieved (35.00)	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

Schedule has ended for Upstairs Zone

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:30:00	Schedule Finished	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	2024-01-10 07:56:45	Schedule Target C Achieved (35.00)	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

Max Running time exceeded for Downstairs Zone and System Controller has turned off

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13185	0	0	1	2024-01-10 08:36:02	Schedule Started	NULL	NULL	2024-01-10 09:30:00
Edit Copy Delete	13184	0	0	39	2024-01-10 08:36:02	Schedule Started	NULL	NULL	2024-01-10 09:30:00
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:30:00	Schedule Finished	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	2024-01-10 07:56:45	Schedule Target C Achieved (35.00)	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

Downstairs Zone and System Controller restarted after Hysteresis timeout

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13186	0	0	38	2024-01-10 08:53:30	Schedule Started	2024-01-10 09:03:54	Schedule Target C Achieved (35.00)	2024-01-10 09:30:00
Edit Copy Delete	13185	0	0	1	2024-01-10 08:36:02	Schedule Started	2024-01-10 09:30:00	Schedule Finished	2024-01-10 09:30:00
Edit Copy Delete	13184	0	0	39	2024-01-10 08:36:02	Schedule Started	2024-01-10 09:30:00	Schedule Finished	2024-01-10 09:30:00
Edit Copy Delete	13183	0	0	1	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13182	0	0	57	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:30:00	Schedule Finished	2024-01-10 08:30:00
Edit Copy Delete	13181	0	0	39	2024-01-10 07:33:02	Schedule Started	2024-01-10 08:33:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13180	0	0	38	2024-01-10 07:33:02	Schedule Started	2024-01-10 07:56:45	Schedule Target C Achieved (35.00)	2024-01-10 08:30:00
Edit Copy Delete	13179	0	0	1	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13178	0	0	57	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13177	0	0	39	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13176	0	0	38	2024-01-10 06:30:01	Schedule Started	2024-01-10 07:30:02	Max Running Time Exceeded - Hysteresis active	2024-01-10 08:30:00
Edit Copy Delete	13175	0	0	1	2024-01-09 21:06:24	Boost Active	2024-01-09 22:06:24	Max Running Time Exceeded - Hysteresis active	2024-01-09 22:06:23

All Schedules finished

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13188	0	0	1	2024-01-10 10:38:59	Boost Active	NULL	NULL	2024-01-10 11:08:58
Edit Copy Delete	13187	0	0	38	2024-01-10 10:38:59	Boost Active	NULL	NULL	2024-01-10 11:08:58

Boost activated for Hot Water Zone

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13188	0	0	1	2024-01-10 10:38:59	Boost Active	2024-01-10 10:39:56	Boost Finished	2024-01-10 11:08:58
Edit Copy Delete	13187	0	0	38	2024-01-10 10:38:59	Boost Active	2024-01-10 10:39:56	Boost Finished	2024-01-10 11:08:58

Boost finished for Hot Water Zone

+ Options

	id	sync	purge (Mark For Deletion)	zone_id	start_datetime	start_cause	stop_datetime	stop_cause	expected_end_date_time
Edit Copy Delete	13168	0	0	0	2024-01-09 20:42:43	Controller Script Started	NULL		NULL

System Controller startup entry