Monodraught

# Zero Control Board VCP Protocol

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# Contents

# 1 Introduction

This document provides a comprehensive summary of all commands that can be sent to the Zero Control Board via the VCP (Virtual Comm Port) interface and their expected responses. The various options to power the board when communicating with it are also shown, along with a list of which features will be functional. This is due to the different power supply requirements for the range of functions the board provides.

# 2 Connecting to the Zero Control Board

To connect to the Zero Control Board, you will need to connect a USB micro-B cable between a computer and the board you are communicating with. It should be natively supported by Windows and will appear as a Virtual Comm Port.

## 2.1 Power

There are 3 power supply options for the control board:

1. Mains
2. Aux 24V
3. USB

### *2.1.1 Mains*

Providing 240V AC power to the Zero Control Board provides full functionality of the PCB but has a **risk of electric shock**. Ensure that the PCB is safely installed in a protective enclosure or product and that there are no electric shock or short-circuit risks.

### *2.1.2 Aux 24V*

Supplying the PCB with 24V via the Aux Power connection (J33) provides most of the functionality of the PCB, except for the fan power. On Zero Plus Control Boards, the non-isolated fan connector is not functional as well.

### *2.1.3 USB*

Connecting a USB micro-B cable to the board from a computer will power the microcontroller, MonoComms data ports, and temperature sensors. The I2C and UART ports *may* work depending upon the current draw of the connected devices. All servo ports, damper ports and fan control outputs will not be functional as they require 24V power.

### *2.1.4 Functionality summary table*

| Power Source | Functional | Not functional |
|---|---|---|
| Mains | Everything | - |
| 24V Aux Power | Microcontroller, MonoComms, Temperature Sensors, I2C, UART, Relay, Inhibit, Dampers, Servos | Fan power, Non-isolated Fan (Zero Plus board only) |
| USB 5V | Microcontroller, MonoComms, Temperature Sensors, I2C*, UART* | Relay, Inhibit, Dampers, Servos, Fan power, Non-isolated Fan (Zero Plus board only |

* May not operate correctly depending upon current draw of connected devices

## 2.2 USB/VCP Connection

The connection parameters are not critical as it isn't a physical serial port, but the typical connection parameters are:

- Baud Rate: 115200
- Data bits: 8
- Stop bits: 1
- Parity: N
- Flow control: None

Trying to use a baud rate too high will likely cause issues as the underlying USB transport for the VCP has bandwidth limits.

# 3 Virtual Comm Port Commands

## 3.1 Command Format Notes

1. **Case sensitivity:** All commands are case-sensitive
2. **Based roughly on JSON format**
3. **Single parameter format:** Stored as key-value pairs: `"key":value`
4. **Multiple parameters:** Multiple JSON parameters can be sent in a single get/set command
5. **Arrays:** Use `"key":[value1,value2,...]` format for array values
6. **File operations:** File system commands operate on internal flash storage
7. **Line endings:** All command responses use `\r\n` line endings
8. **Error handling:** Invalid commands or parameters will not return a response
9. **Limits:**
    - Maximum 50 key/value pairs per set/get command
    - Maximum 20 characters for filenames
    - File read chunks limited to 1-10000 bytes

## 3.2 File System Commands

### *3.2.1 readfilesize <filename>*

- **Purpose:** Get the size of a file on the internal file system
- **Parameters:** `<filename>` - Name of file to check (max 20 characters)
- **Returns:**

```
File Size:    <filename>
<size_in_bytes>
```

- **Example:** `readfilesize config.txt`

### *3.2.2 readfile <filename> <start> <chunksize>*

- **Purpose:** Read a portion of a file from the internal file system
- **Parameters:**
    - `<filename>` - Name of file to read (max 20 characters)
    - `<start>` - Starting byte position
    - `<chunksize>` - Number of bytes to read (1-10000)
- **Returns:**

```
Read File:    <filename>  Size:   <actual_chunk_size>
<file_content>
*EOF
```

#### 3.2.3 *filelist*

- **Purpose:** List all files in the file system
- **Parameters:** None
- **Returns:**

```
File List:
./data/<filename> <size>
./<filename>  <size>
...
*EOL
```

#### 3.2.4 *format*

- **Purpose:** Format the internal file system (erases all data)
- **Parameters:** None
- **Returns:** `Format`
- **Side effects:** Resets configuration to updated state

### 3.3 Configuration Commands

#### 3.3.1 *default*

- **Purpose:** Reset all configuration to factory defaults
- **Parameters:** None
- **Returns:** `Default`
- **Side effects:**
  - Resets all unit and room configurations
  - Updates Acuity system
  - Marks all configs as updated

#### 3.3.2 *config*

- **Purpose:** Get complete configuration dump as key/value pairs
- **Parameters:** None
- **Returns:**

```
Config Start
<config_line_1>
<config_line_2>
...
Config End
```

## 3.4 System Information Commands

### *3.4.1 `uid1`*

- **Purpose:** Get first part of STM32 unique identifier
- **Parameters:** None
- **Returns:** `"UID1":<numeric_id>`

### *3.4.2 `uid2`*

- **Purpose:** Get second part of STM32 unique identifier
- **Parameters:** None
- **Returns:** `"UID2":<numeric_id>`

### *3.4.3 `uid3`*

- **Purpose:** Get third part of STM32 unique identifier
- **Parameters:** None
- **Returns:** `"UID3":<numeric_id>`

### *3.4.4 `flash`*

- **Purpose:** Get flash memory manufacturer information
- **Parameters:** None
- **Returns:** `"Flash":<manufacturer_string>`

### *3.4.5 `uart`*

- **Purpose:** Test UART communication (loopback test)
- **Parameters:** None
- **Returns:** `"Uart":<received_count>`
- **Side effects:** Initiates 3 loopback attempts

## 3.5 Data Access Commands

### *3.5.1 `data`*

- **Purpose:** Get complete system data dump as key/value pairs
- **Parameters:** None
- **Returns:**

```
Data Start
<data_line_1>
<data_line_2>
...
Data Endset <key_value_pairs>
```

- **Purpose:** Set configuration or data values using key/value pairs
- **Parameters:** key-value pairs (up to 50 pairs)
- **Format:** `set "key1":value1,"key2":value2,...`
- **Returns:** Updated key/value pairs for each successfully set value
- **Side effects:**
  - Marks configuration as updated
  - Updates Acuity system for relevant changes
  - Updates system clock

### *3.5.2 `get <keys>`*

- **Purpose:** Get specific configuration or data values
- **Parameters:** keys (up to 50 keys)
- **Format:** `get "key1","key2","key3",...`
- **Returns:** key-value pairs for requested parameters
- **Side effects:** Updates system clock

## 3.6 Control Commands

### *3.6.1 `recalibrate`*

- **Purpose:** Recalibrate all dampers
- **Parameters:** None
- **Returns:** `Recalibrate`
- **Side effects:** Initiates damper recalibration sequence

## 3.7 Available Data Parameters

### *3.7.1 Unit Data (Real-time sensor/control data)*

- **Temperature sensors:** `"Temp Ext"`, `"Temp Int"`, `"Temp Mix"`, `"Temp Coil"`, `"Temp HX"`, `"Temp 6"`, `"Ext Filter"`
- **Fan data:** `"Fan Supply Out"`, `"Fan Extract Out"`, `"Fan Supply Tach"`, `"Fan Extract Tach"`, `"Raw Fan Speed 1"`, `"Raw Fan Speed 2"`
- **Servo data:** `"Servo 1 Out"`, `"Servo 2 Out"`, `"Servo 3 Out"`, `"Servo 4 Out"`, `"Servo 1 Pos"`, `"Servo 2 Pos"`, `"Servo 3 Pos"`, `"Servo 4 Pos"`
- **Damper outputs:** `"Damper Ext Out"`, `"Damper Exhaust Out"`, `"Damper Mix Out"`, `"Damper Grille Out"`
- **Damper positions:** `"Damper Ext Pos"`, `"Damper Exhaust Pos"`, `"Damper Mix Pos"`, `"Damper Grille Pos"`
- **Damper currents:** `"Damper Ext Current"`, `"Damper Exhaust Current"`, `"Damper Mix Current"`, `"Damper Grille Current"`
- **Damper steps:** `"Damper Ext Steps"`, `"Damper Exhaust Steps"`, `"Damper Mix Steps"`, `"Damper Grille Steps"`
- **Control levels:** `"Damper Level"`, `"Valve Level"`, `"Bypass Level"`
- **Control demands:** `"Damper Demand"`, `"Valve Demand"`
- **System status:** `"Inhibit"`, `"Relay"`, `"Fault"`, `"Critical Fault"`, `"Cool Active"`, `"Heat Active"`, `"Config Read"`
- **Control modes:** `"Control Mode"`, `"Raw Mode"`, `"Unit Override"`, `"Override Source"`
- **Auxiliary temperatures:** `"Aux 1 Temp"`, `"Aux 2 Temp"`, `"Aux 3 Temp"`, `"Aux 4 Temp"`
- **Actuators:** `"Actuator Ext Exhaust Pos"`, `"Actuator LPC Pos"`, `"Actuator Airtightness Pos"`, `"ActiveLouvre Out"`, `"ActiveLouvre Pos"`
- **Water availability:** `"Hot Water"`, `"Cold Water"`
- **Configuration status:** `"UnitConfigModified"`

### *3.7.2 Room Data (Room control parameters)*

- **Demands:** `"Cool Demand"`, `"Heat Demand"`, `"CO2 Demand"`
- **Levels:** `"Cool Level"`, `"Heat Level"`, `"CO2 Level"`
- **Time:** `"Date"`, `"Time"`
- **Control modes:** `"Mode"`, `"Season"`, `"Strategy"`
- **Environmental settings:** `"Draught"`, `"Hot Day"`
- **Configuration status:** `"RoomConfigModified"`

### *3.7.3 Modena Data*

- **Fan control:** `"Manual Fan"`, `"Fan Setpoint"`
- **Grille control:** `"Grille Mode"`, `"Grille Setpoint"`
- **Louvre control:** `"Louvre Mode"`, `"Louvre Setpoint"`
- **Environmental:** `"Room CO2"`, `"Room Temp"`, `"Temp Adjust"`
- **Overrides:** `"UI Override"`

### *3.7.4 Acuity Data*

- **Environmental:** `"AcuityExtTemp"`
- **Overrides:** `"Acuity Override"`
- **External conditions:** `"Fire"`, `"Rain"`, `"BMS En"`

### *3.7.5 Configuration Data (System settings)*

#### *3.7.5.1 Room Configuration*

- **Basic settings:** `"Room Name", "Cool Setpoint", "Heat Setpoint", "CO2 Setpoint"`
- **Timing:** `"Preheat Start", "Day Start", "Day End", "Weekends"`
- **Night Cooling:** `"Night Cooling", "Night Setpoint", "Night Start", "Night End"`
- **Advanced Features:** `"Adaptive Preheat", "Preheat Rate", "Frost Protect", "Time Zone", "Purge Start", "Purge End", "BMS Timeout"`
- **Strategy settings:** `"Adaptive Strategy", "Hot Strategy Temp", "Average Ext Temp", "Hot Day Enable", "Northern Hem"`
- **Auxiliary settings:** `"Aux Cool Setpoint","Aux Heat Setpoint",`
- **Setback settings:** `"Setback Setpoint","Setback"`

#### *3.7.5.2 Unit Configuration*

- **Identity:** `"FW Version","HW Version","Model","Serial Number","Config Version"`
- **Hardware features:** `"HX","Cool Valve","Heat Valve","Coil","Extract Only", "Use Inhibit", "Relay Type"`
- **Network settings:** `"Parent","Assigned","ID"`
- **Servo configuration:** `"Servo 1 Type","Servo 2 Type","Servo 3 Type","Servo 4 Type"`
- **Damper limits:** `"Ext Limit","Exhaust Limit","Mix Limit","Grille Limit"`
- **Damper types:** `"Ext Type","Exhaust Type","Mix Type","Grille Type"`
- **Control parameters:** `"Draught Temp","Max Supply Day","Max Extract Day","Heating Supply"`
- **PID control gains:** `"Damper P Gain","Damper I Gain","Valve P Gain","Valve I Gain"`
- **Special features:** `"LPC Fan Scaling","Headers Support","Ventsair Max","Acoustic Fan"`

## 3.8 Example Usage

### *3.8.1 File System Commands*

| Command | Expected Response | Description |
|---|---|---|
| `filelist` | `File List:`<br>`./data/config.json 1024`<br>`./data/logs.txt 2048`<br>`./system.cfg 512`<br>`*EOL` | List all files with sizes |
| `readfilesize config.json` | `File Size: config.json 1024` | Get file size in bytes |
| `readfile config.json 0 100` | `Read File: config.json Size: 100`<br>`{"Room Name":"Office","Cool Setpoint":24.0,"Heat Setpoint":20.0,"CO2 Setpoint":800,"Day Start":"`<br>`*EOF` | Read first 100 bytes of file |
| `format` | `Format` | Format file system (erases all data) |

### *3.8.2 Configuration Commands*

| Command | Expected Response | Description |
|---|---|---|
| `default` | `Default` | Reset to factory defaults |
| `config` | `Config Start`<br>`"Room Name":"Main Office"`<br>`"Cool Setpoint":24.0`<br>`"Heat Setpoint":20.0`<br>`"Night Setpoint":18.0`<br>`"CO2 Setpoint":800`<br>`...`<br>`Config End` | Get complete configuration dump |

### *3.8.3 System Information*

| Command | Expected Response | Description |
|---|---|---|
| `uid1` | `"UID1":1234567890` | First part of unique ID |
| `uid2` | `"UID2":987654321` | Second part of unique ID |
| `uid3` | `"UID3":192837465` | Third part of unique ID |
| `flash` | `"Flash":Winbond W25Q32JV` | Flash memory manufacturer |
| `uart` | `"Uart":3` | UART test result (loopback count) |

### 3.8.4 Data Access

| Command | Expected Response | Description |
|---|---|---|
| `data` | `Data Start`<br>`"Temp Ext":18.5`<br>`"Temp Int":22.1`<br>`"Temp Mix":20.3`<br>`"Fan Supply Out":65`<br>`"Fan Extract Out":0`<br>`...`<br>`Data End` | Get complete data dump |
| `get "Temp Ext","Temp Int","Room Temp"` | `"Temp Ext":18.5`<br>`"Temp Int":22.1`<br>`"Room Temp":21.8` | Read specific temperature values |
| `get "Servo 1 Out","Servo 1 Pos","Servo 2 Out","Servo 2 Pos"` | `"Servo 1 Out":45`<br>`"Servo 1 Pos":42`<br>`"Servo 2 Out":0`<br>`"Servo 2 Pos":3` | Read servo positions and outputs |
| `get "Damper Ext Out","Damper Ext Pos","Damper Ext Current"` | `"Damper Ext Out":80`<br>`"Damper Ext Pos":78`<br>`"Damper Ext Current":2.45` | Read damper status |
| `get "Fault","Cool Active","Heat Active","Relay"` | `"Fault":0`<br>`"Cool Active":false`<br>`"Heat Active":true`<br>`"Relay":true` | Read system status |
| `get "Date","Time"` | `"Date":"2025-11-06"`<br>`"Time":"14:32:15"` | Read current date and time |
| `set "Fan Setpoint":75` | `"Fan Setpoint":75` | Set fan speed |
| `set "Cool Setpoint":24.0,"Heat Setpoint":20.0` | `"Cool Setpoint":24.0`<br>`"Heat Setpoint":20.0` | Set temperature setpoints |

### 3.8.5 Control Commands

| Command | Expected Response | Description |
|---|---|---|
| `recalibrate` | `Recalibrate` | Recalibrate all dampers |