

# SPID Elektronik

**Driver MD-02**



**MD-02**

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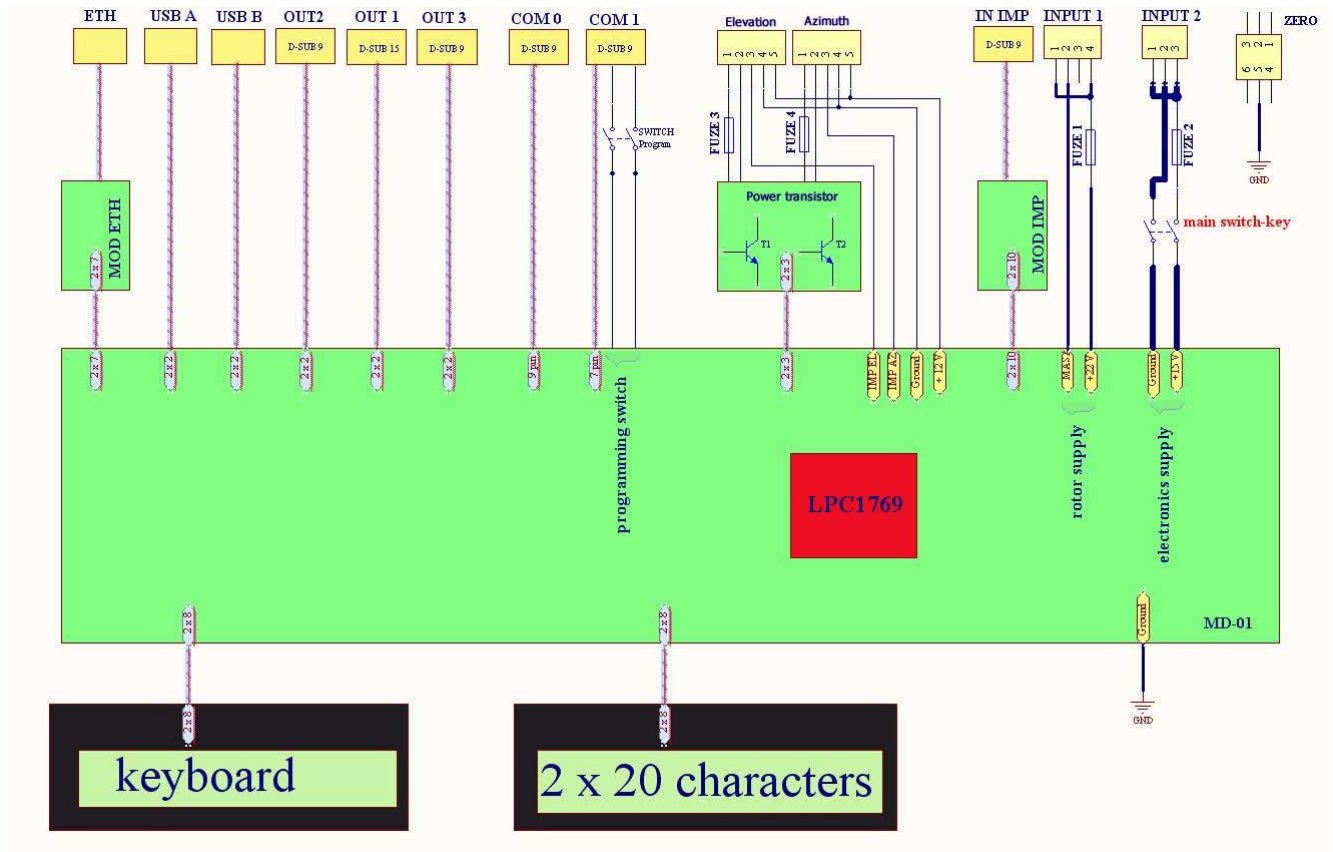
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## Introduction

MD-02 is an electronic driver used for turning rotors. It is a multifunctional device, allowing for various combinations of work setting. The driver may be connected to two single rotors (e.g. two Azimuth rotors) or double (one Azimuth / Elevation rotor). The basic circuit provides operation with direct current motors.

## Block diagram



## Parameters of the driver

- supply voltage of driver MD-02 15 VDC ( $I_{\max} = 2A$ ),
- supply voltage of rotors 12-14 VDC ( $I_{\max} = 40 A$ ),
- the maximum current of a single motor up to 20 A.
- 2 x RS232 ports
- 1 x USB host port
- 1 x USB device – visible in the system as the virtual COM port.
- 1 x Ethernet RJ45 port.

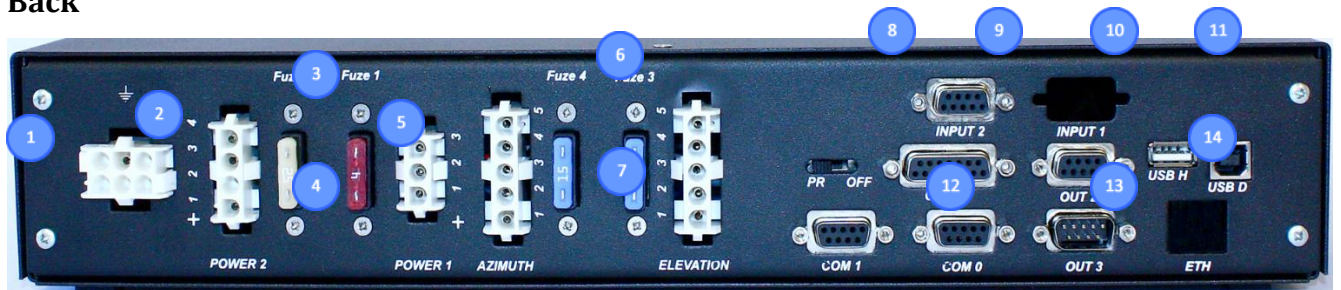
## Photos and description

### Front

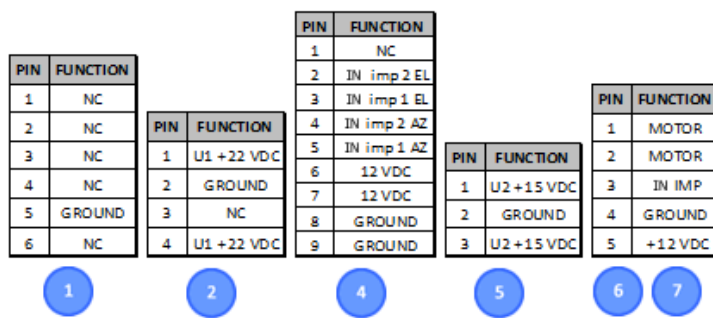


1. Keyboard.
2. 2x20 characters display.
3. Switch-key.

### Back



1. Plug-in socket to turn on Ground (the remaining NC PINs).
2. Rotor motor supply input (FUZE 40A).
3. NC, in the future planned for connecting modules, e.g. CAN, RS485, RS422 or analogue inputs.
4. Inching input for systems with two sensors type HALL.
5. Electronics supply input (FUZE 2A).
6. Supply outputs for Rotor BIG-RAS Elevation. PINs for motor supply. Elevation PINs from the motor (3,4), PINs in the driver (1, 2). Every output has its own FUZE (20A).
7. Supply outputs for Rotor BIG-RAS Elevation. PINs for motor supply. Elevation PINs from the motor (1,2), PINs in the driver (1, 2). Every output has its own FUZE (20A).
8. Switch used to update the driver software (FIRMWARE). To update the software we use COM0 (item 12), while we turn the switch OFF. Normal mode of the driver is when the switch is in the PR position.
9. Universal output – the possibility to connect inside the module driver with relays. Then the controller will have the function of antenna change-over switch.
10. I2C output – used to control SW-01 switch.
11. USB HOST port (type A plug) and DEVICE port (type B plug).
12. RS232 ports – COM0 and COM1. COM0 is also used to update the driver software (see item 8).
13. Input used to control a specially designed mouse.
14. Network input RJ45 (ETHERNET).



Descriptions of PINs of sockets in the back panel

## Operation

MD-02 Driver may be operated with the use of a keyboard or a computer.

MD-02 module has two modes (MODE).

- NORMAL – normal mode.
- MOTOR ANGLES – calibration mode.

To change the mode, use the **[F]** key.

### Normal mode (NORMAL)

In this mode the driver may be operated with the [Right], [Left], [Up] and [Down] buttons or receives the command from PC. The driver supports communications protocols such as SPID ROT1, SPID ROT2, SPID MD02, BRITE, YAESU and HyGain, which you can attribute to each communications port (COM0, COM1, USB D and ETH) in the settings.

The **[Right]** and **[Left]** buttons are used to rotate the antennae in the azimuth.

The right direction – the antennae turns in a clockwise direction, the value of the angle in the display increases.

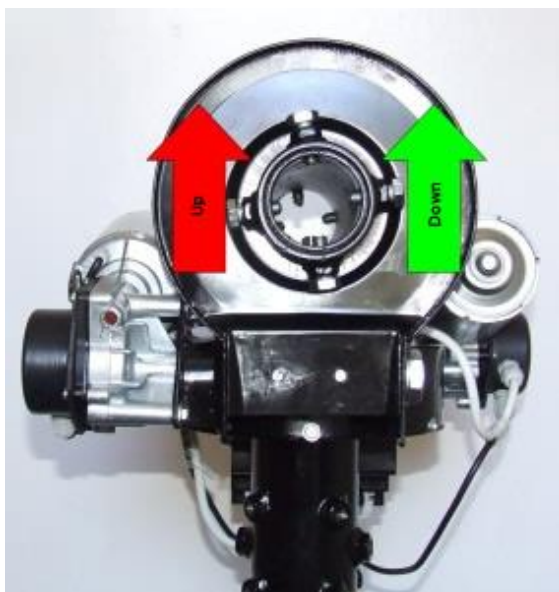
The left direction – the antennae turns in an anticlockwise direction, the value of the angle in the display decreases.

The **[Up]** and **[Down]** buttons are used to rotate the antennae in the angle of elevation.

The up direction – the rotor turns right from the point of view of the front. The value of the angle in the display increases.

The down direction – the rotor turns left from the point of view of the front. The value of the angle in the display decreases.

The directions of antennae rotation are shown in the picture:



## Calibration mode (MOTOR ANGLES)

To switch-over the driver in the calibration mode use the button **[F]**. In this mode you can set any value of the angle in the azimuth and in the elevation angle without turning the antennae. This mode is needed to preliminary calibrate the antennae.

To set the azimuth angle to zero, push the **[F1]** and **[Left]** buttons simultaneously. In order to set the elevation angle to zero, push the **[F1]** and **[Up]** buttons simultaneously.

To set any azimuth angle use the buttons **[Left]** and **[Right]**, while to change the elevation angle use the buttons **[Up]** and **[Down]**.

After setting any azimuth angle use the buttons **[Left]** and **[Right]**, while to change the elevation angle push the buttons **[Up]** and **[Down]**.

After completing the calibration you need to leave the calibration mode and come back to the normal mode by pushing the **[F]** button.

## Driver MD-02 configuration

When driver MD-02 is in NORMAL mode you can use button **[S]** to enter configuration.

The structure of driver configuration is modular. Select module using buttons **[Left]** or **[Right]**. When you select module you can use button **[S]** to enter in its parameters. Moving between parameters is done with buttons **[Left]** or **[Right]**. Value of parameter can change with buttons **[Up]** or **[Down]**.

Button **[F]** is used for exiting configuration. After pushing button there is question about writing current configuration. If we want to confirm changes we are pressing button **[Left]**, if we want to go back to previous configuration we are pressing **[Right]**.

## Motor configuration

The number before the ":" in the name of the template determines which connector on the rear panel must be connected motor:

1. AZIMUTH
2. ELEVATION

### TEMPLATE

Type of motors connected to the controller is pre-set by templates:

- **1:NC, 2:NC** - no motors connected to the controller,
- **1:AZ, 2:NC** - a motor is connected on the rear panel of controller on connector AZIMUTH. Motor rotates only in azimuth,
- **1:NC, 2:EL** - a motor is connected on the rear panel of controller on connector ELEVATION. Motor rotates only in elevation,
- **1:AZ, 2:EL** - there are two motors connected to the controller. Motor 1 (connector AZIMUTH) rotates in azimuth, and Motor 2 (connector ELEVATION) - rotates in elevation,



- **1:AZ, 2:AZ** - there are two motors connected to the controller, which is rotated in azimuth only.

## Start

Motors run mode:

- **MAX SPEED** - motor starts with max speed, that is set for each motor separately in modules **SET MOTOR 1** and **SET MOTOR 2**, described later,
- **SOFTLY** – so-called soft start. For each motor set in the module **SET MOTOR 1** and **SET MOTOR 2**, described later.

## Stop

Motors stop mode:

- **IMMEDIATELY** – at once,
- **SOFTLY** – so-called soft stop. For each motor set in the module **SET MOTOR 1** and **SET MOTOR 2**, described later.

## External control (CONTROL xx)

This parameter specifies the communication port driver that is used to control the connected motors. Appears only if the chosen template is different from **1: NC, 2: NC**. If the latter is chosen template **1: AZ, 2: AZ**, then for each motor, you can choose another port for control.

On display of controller can show few descriptions it depends of selected motors template:

- **CONTROL A1** – motor template **1:AZ, 2:NC** or **1:AZ, 2:AZ**,
- **CONTROL E2** – motor template **1:NC, 2:EL**,
- **CONTROL AE** – motor template **1:AZ, 1:EL**,
- **CONTROL A2** – motor template **1:AZ, 2:AZ**.

**CONTROL** parameter value:

- **NONE** - no external control. Motor controlled manually with buttons on driver,
- **COM 0** - external control with selected protocol. Can be controlled manually,
- **COM 1** - external control with selected protocol. Can be controlled manually,
- **USB** - controlled throughout USB D with selected protocol. Can be controlled manually,
- **ETH** - controlled throughout ETHERNET with selected protocol. Can be controlled manually.

## Protocol (PROT. xx)

Communication protocol between the controller and the control device (it may be, for example, a PC program):

- SPID ROT1
- SPID ROT2
- SPID MD02 - in the future. New communication protocol from SPID Elektronik
- YAESU - in the future.
- BRITE - in the future. New protocol created by SPID Elektronik firm and Space Analysis Center in Warsaw.
- HyGain - in the future.

## Set motors (SET MOTOR 1, SET MOTOR 2)

### STATE

Read only. Depends on a TEMPLATE configured motors (see Motor configuration -> TEMPLATE). It defines if motor is switched on or switched off.

### TYPE

Type of motor return signal:

- **DIGITAL** – controller counts pulses,
- **ANALOG** – in the future. Controller measures the voltage.

### KIND

Read only. Depends on a TEMPLATE configured motors (see Motor configuration -> TEMPLATE):

- **AZIMUTH** – motor rotates in azimuth,
- **ELEVATION** – motor rotates in elevation.

### INPUT

Sensor type of driver MD-02 (only when the input type is **DIGITAL**):

- **ELECTRONIC** - using electronic motion sensors (without vibration),
- **MECHANIC** - in the future. Mechanical switches (vibration).

### GEAR

Gear motor.

### MIN ANGLE

Minimum angle, it is possible to be turned for which motor.

### MAX ANGLE

Maximum angle, it is possible to be turned for which motor.

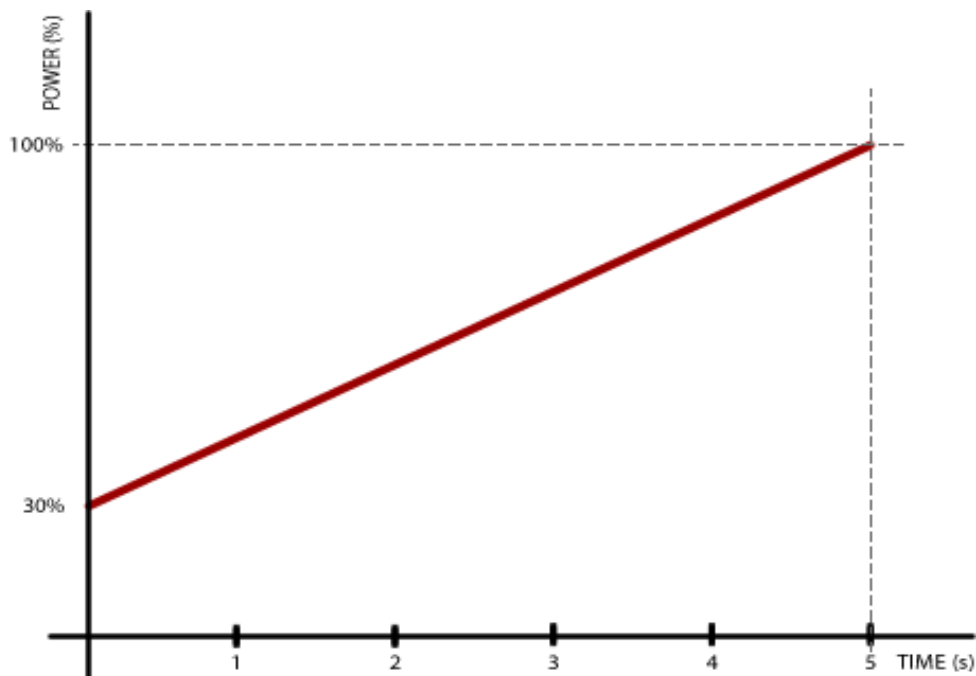
## MAX POWER

Maximum power in a percent's of full power, which the driver can provide rotor.

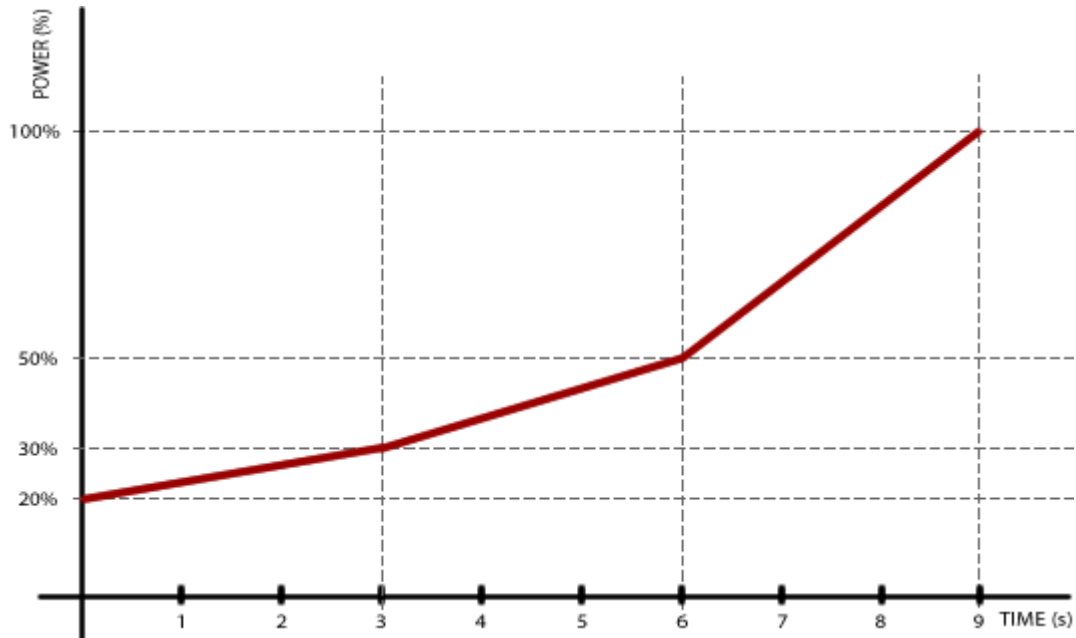
## START POWER, START TIME

We use if we want to obtain a so-called soft-start. We can set one, two or three-stage motor start (START POWER 1, POWER START 2, START and START POWER 3 TIME 1, TIME 2 START, START TIME 3). Power (START POWER) is introduced as a percentage of full power, which can provide a driver for the rotor. Time (START TIME) enter in seconds.

**Example: One-step** - set the initial speed of rotation of the motor START POWER 1 = 30%, time to reach maximum power (MAX POWER) START TIME 1 = 5s and START TIME 2 = 0s - in this way, we specify that the engine start is a single step. MAX POWER = 100%. This means that the motor is started with 30% power, and within five seconds linearly increases power to 100%.



**Example 2: three-step** - set the POWER START 1 = 20% START POWER 2 = 30%, START POWER 3 = 50%, START TIME 1 = 3s, START TIME 2 = 3s, START TIME 3 = 3s, MAX POWER = 100%. This means that the rotor starts with 20% power, within 3 s power reaches 30%, followed by 3s power reaches 50% and last 3 s power up to 100%.



### STOP POWER, STOP TIME

Use, if we want to obtain a so-called soft stop. It works the same way as soft start so that the other way.

### STOP AT

Specifies how many degrees before the specified angle (for example, sent by a computer program like Orbitron) is to start the motor stopping. It matters if it is selected in the parameter mode STOP softly module MOTOR CONFIGURATION.

### PULS TIMEOUT

Specifies how long the motor has run off its power, if it does not come from the motion sensor pulses. Applies only to motors of type **DIGITAL**.

### SET COM 0, SET COM 1

### STATE

Read only. Possible values: ON or OFF.

### BAUD

Possible values: 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 and 460800.

#### **DATA BITS**

Possible values: 4,5,6,7 or 8 bit.

#### **STOP BITS**

Possible values: 1 or 2 bit.

#### **PARITY**

Possible values: none, odd or even.

### **SET USB COM**

#### **STATE**

Read only. Possible values: ON or OFF.

#### **BAUD**

Possible values: 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 and 460800.

#### **DATA BITS**

8 bit.

#### **STOP BITS**

1 bit.

#### **PARITY**

NONE.

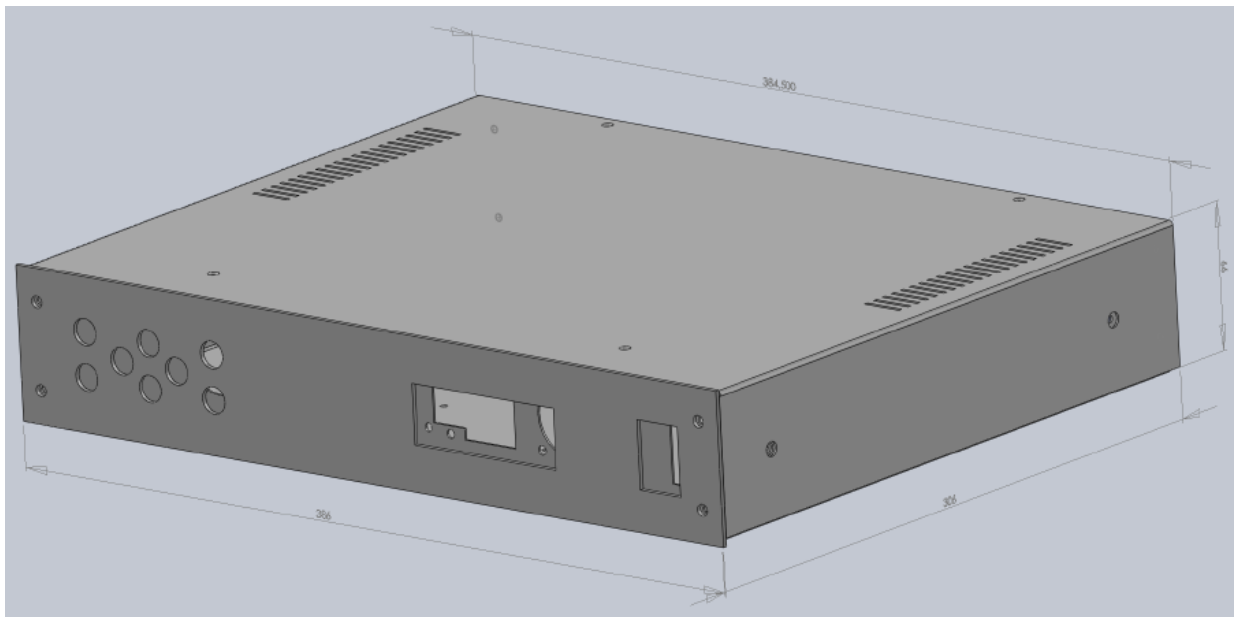
### **SET ETHERNET**

The Ethernet port is set to dynamic IP address. Communication with this port is done with the help of one of the protocols (MD02 SPID, SPID ROT1, SPID ROT2, Yaesu, or HiGain BRITE). For example, the MD-02 driver received the IP address from a DHCP server 192.168.0.10. It can connect to it, for example, Hyper Terminal by selecting the type of connection TCP / IP (Winsock), set host address 192.168.0.10 and port number to 23. Protocol can be BRITE or Yaesu, because they are text protocols.

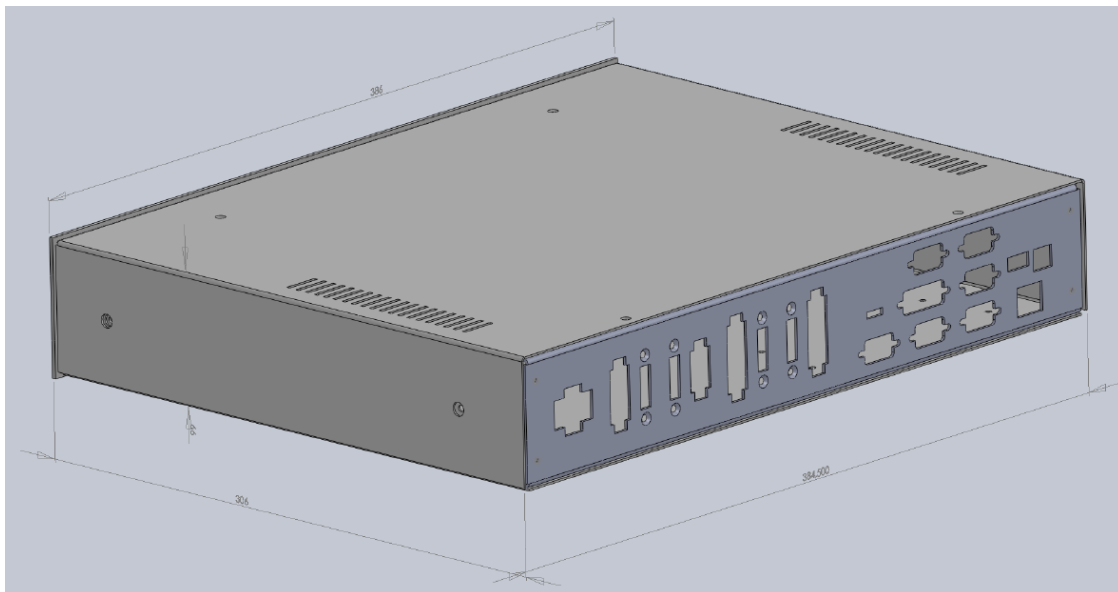
#### **STATE**

Read only. Possible values: ON or OFF.

## Controller Dimensions:



*Controller MD-02 Dimensions FRONT*



*Controller MD-02 Dimensions BACK*