

Application Programming Interface: Low-Level Sockets V2

Contents

[Application Programming Interface: Low-Level Sockets V2](#)

[Overview](#)

[Configuring An IP Address](#)

[Opening a Connection](#)

[Commands Reference](#)



Application Programming Interface: Low-Level Sockets V2

Overview

This document details the commands that can be sent to your MachineMotion V2 using Ethernet TCP/IP protocol. This API uses sockets to exchange data. All information is packaged in string format and sent over the socket communication channel to port 9999 of the ethernet IP Address.

Configuring An IP Address

There are three physical ethernet connections available on the MachineMotion V2. The default ethernet port (labeled "To PC") will always have an IP address of 192.168.7.2. The second and third ethernet ports (labeled "LAN 1" and "LAN 2") may have a user configurable IP address. The configurable IP address can be set in one of three ways:

- Using a laptop and chrome web browser, navigate to 192.168.7.2, select the network configuration tab and enter the desired IP address.
- Using a laptop and the low level socket API, send the "ethernet configuration commands" to set the desired static IP commands.
- Use a pendant to connect to the Machine Motion control center, select the network configuration tab and enter the desired IP address.

Opening a Connection

A connection must be opened before any commands can be sent or received from the MachineMotion V2 ethernet port. How to open a connection will

depend on the programming language being used. Once the connection is open, the MachineMotion V2 will respond with “MachineMotion connection established”. It is recommended the first command sent is isReady to confirm a properly established connection.

User Agent	Direction	MachineMotion
Initialize TCP Connection	→	Accept
Receive	←	Send: MachineMotion connection established
Send: isReady;	→	Receive
Receive	←	Send: MachineMotion isReady=true;

Commands Reference

Continuous Move

Description

Moves a conveyor or rotary table axis continuously at a given speed and acceleration. This command is only available with MachineMotion software v1.16 and newer.

Format

SET im_conv_<axis> S<speed> A<acceleration>; Where <axis> is the axis (1, 2 or 3) to move as a (String). Where <speed> is the speed to move the axis in usteps/sec as a (String). Where <acceleration> is the acceleration to move the axis in usteps/sec² as a (String).

Usage

SET im_conv_3 S100 A400; Starts moving axis 3 at 100 usteps/sec with an acceleration of 400 usteps/sec². SET im_conv_3 S0 A400; Stops axis 3 using 400 usteps/sec² deceleration.

Response on Receive

Ack

Response On Complete

None

Define IP Address

Description

Define the IP address.

Format

de_ethernet_port_ip_config/<address>; Where <address> is the IPv4 address (###.###.###.###) as a string (String).

Usage

de_ethernet_port_ip_config/192.168.7.3/; Sets the IP address to 192.168.7.3.

Response on Receive

Ack

Response On Complete

None

Delayed Absolute Move

Description

Moves an axis to the specified absolute position after the `de_move_abs_exec` command is sent.

Format

SET `de_move_abs_<axis>/<value>/`; Where `<axis>` is the axis to move (1, 2 or 3) as a (String). Where `<value>` (String) is a position in mm.

Usage

SET `de_move_abs_1/50/` Will move axis 1 to absolute position 50mm after the `de_move_abs_exec` command is sent. SET `de_move_abs_2/150/`; Will move axis 2 to absolute position 150mm after the `de_move_abs_exec` command is sent. SET `de_move_abs_3/175/` Will move axis 3 to absolute position 175mm after the `de_move_abs_exec` command is sent.

Response on Receive

Ack

Response On Complete

None

Delayed Absolute Move Execute

Description

Executes the latest `de_move_abs_1`, `de_move_abs_2` and `de_move_abs_3` commands simultaneously.

Format

`de_move_abs_exec;`

Usage

`de_move_abs_exec;`

Response on Receive

Ack

Response On Complete

None

Delayed Configure Direction

Description

This is a delayed command. It loads the direction value of the axis. Pass -1 for counterclockwise or 1 for clockwise rotation. To configure the system using the loaded value, the command `de_axis_<axis>_config_exec` must be sent to the controller.

Format

SET `de_axis_<axis>_direction_config/<value>/`; Where `<axis>` is the axis to configure (1, 2 or 3) as a (String). Where `<value>` (String) is a 1 for clockwise rotation, -1 for counterclockwise rotation.

Usage

SET `de_axis_1_direction_config/1/`; Will load clockwise rotation to axis 1 direction configuration. `de_axis_1_config_exec` is required to update the direction to the loaded value. SET `de_axis_2_direction_config/-1/`; Will load counterclockwise rotation to axis 2 direction configuration. `de_axis_2_config_exec` is required to update the direction to the loaded value. SET `de_axis_3_direction_config/1/`; Will load clockwise rotation to axis 3 direction configuration. `de_axis_3_config_exec` is required to update the direction to the loaded value.

Response on Receive

Ack

Response On Complete

None

Delayed Configure Execute

Description

Execute the latest delayed Microstep `de_axis_<axis>_microsteps_config`, Mechanical Gain `de_axis_<axis>_mechanical_gain_config` and Direction `de_axis_<axis>_direction_config` configurations for a given axis.

Format

`de_axis_<axis>_config_exec`; Where `<axis>` is the axis to configure (1, 2 or 3) as a (String).

Usage

`de_axis_1_config_exec`; Will set axis 1 Microstep, Mechanical Gain and Direction configuration that was previously loaded. `de_axis_2_config_exec`; Will set axis 2 Microstep, Mechanical Gain and Direction configuration that was previously loaded. `de_axis_3_config_exec`; Will set axis 3 Microstep, Mechanical Gain and Direction configuration that was previously loaded.

Response on Receive

Ack

Response On Complete

None

Delayed Configure Mechanical Gain

Description

This is a delayed command. This command loads the gain value of an axis in mm/turn. This allows the software to know the linear distance an axis will move for every rotation of the motor. To configure the system using the loaded value, the command `de_axis_⟨axis⟩_config_exec` must be sent to the controller.

Format

`SET de_axis_⟨axis⟩_mechanical_gain_config/⟨value⟩/;` Where `⟨axis⟩` is the axis to configure (1, 2 or 3) as a (String). Where `⟨value⟩` (String) is the mechanical gain of the axis in mm/turn.

Usage

`SET de_axis_1_mechanical_gain_config/150/;` Will load 150mm/turn to axis 1 mechanical gain configuration. `de_axis_1_config_exec` is required to update the mechanical gain to the loaded value. `SET de_axis_2_mechanical_gain_config/150/;` Will load 150mm/turn to axis 2 mechanical gain configuration. `de_axis_2_config_exec` is required to update the mechanical gain to the loaded value. `SET de_axis_3_mechanical_gain_config/150/;` Will load 150mm/turn to axis 3 mechanical gain configuration. `de_axis_3_config_exec` is required to update the mechanical gain to the loaded value.

Response on Receive

Ack

Response On Complete

None

Delayed Configure Microsteps

Description

This is a delayed command. It loads the microstep setting of the software. This value must match the hardware setting that is set on the motor driver. Possible values here are: 1, 2, 4, 6, 8 and 16. To configure the system using the loaded value, the command `de_axis_⟨axis⟩_config_exec` must be sent to the controller.

Format

`SET de_axis_⟨axis⟩_microsteps_config/⟨value⟩/;` Where `⟨axis⟩` is the axis to configure (1, 2 or 3) as a (String). Where `⟨value⟩` (String) is a Number of microsteps. It must be the same as the microstep setting given by the drives DIP switches. Default value is 8, but may be set to 1, 2, 4, 8 or 16

Usage

`SET de_axis_1_microsteps_config/8/;` Will load 8 into axis 1 microstepping configuration. `de_axis_1_config_exec` is required to update the microstep setting to the loaded value. `SET de_axis_2_microsteps_config/8/;` Will load 8 into axis 2 microstepping configuration. `de_axis_2_config_exec` is required to update the microstep setting to the loaded value. `SET de_axis_3_microsteps_config/8/;` Will load 8 into axis 3 microstepping configuration. `de_axis_3_config_exec` is required to update the microstep setting to the loaded value.

Response on Receive

Ack

Response On Complete

None

Delayed Relative Move

Description

Move an axis relative to the its current position by the distance specified in the distance parameter after the command `de_move_abs_exec` is sent.

Format

`SET de_move_rel_<axis>/<value>;` Where `<axis>` is the axis to move (1, 2 or 3) as a (String). Where `<value>` (String<!--<mark-->) is a position change in mm.

Usage

`SET de_move_rel_1/-50/;` Will move axis 1, 50 mm in the negative direction after the `de_move_rel_exec` command is sent. `SET de_move_rel_2/100/;` Will move axis 2, 100 mm in the positive direction after the `de_move_rel_exec` command is sent. `SET de_move_rel_3/-75/;` Will move axis 3, 75 mm in the negative direction after the `de_move_rel_exec` command is sent.

Response on Receive

Ack

Response On Complete

None

Delayed Relative Move Execute

Description

Executes the latest `de_move_rel_1`, `de_move_rel_2` and `de_move_rel_3` commands simultaneously.

Format

`de_move_rel_exec;`

Usage

`de_move_rel_exec;`

Response on Receive

Ack

Response On Complete

None

Get Position

Description

Queries the current position of an axis.

Format

`GET im_get_controller_pos_axis_<axis>;` Where `<axis>` is the axis to get position from (1, 2 or 3) as a (String)

Usage

GET im_get_controller_pos_axis_1 Returns position of axis 1. GET im_get_controller_pos_axis_2 Returns position of axis 2. GET im_get_controller_pos_axis_3 Returns position of axis 3.

Response on Receive

None

Response On Complete

(<position>) Where <position> is the position in mm units.

Immediate Absolute Move

Description

Moves an axis to the specified absolute position.

Format

SET im_move_abs_<axis>/<value>; Where <axis> is the axis to move (1, 2 or 3) as a (String). Where <value> (String) is a position in mm.

Usage

SET im_move_abs_1/50; Immediately Moves axis 1 to absolute position 50mm SET im_move_abs_2/100; Immediately Moves axis 2 to absolute position 100mm SET im_move_abs_3/200; Immediately Moves axis 3 to absolute position 200mm

Response on Receive

Ack

Response On Complete

None

Immediate Home All

Description

Returns all axes to their home locations sequentially: first axis 1, then axis 2, then axis 3.

Format

im_home_axis_all;

Usage

im_home_axis_all;

Response on Receive

None

Response On Complete

MachineMotion im_home_axis_all = completed

Immediate Home Axis

Description

Returns an axis to its home location.

Format

im_home_axis_<axis>; Where <axis> is the axis to home (1, 2 or 3) as a (String)

Usage

im_home_axis_1; Immediately Homes axis 1 im_home_axis_2; Immediately Homes axis 2 im_home_axis_3; Immediately Homes axis 3.

Response on Receive

None

Response On Complete

MachineMotion im_home_axis_<axis> = completed Where <axis> is the axis requested to home.

Immediate Relative Move

Description

Immediately moves an axis by the distance specified relative to the current location of the axis. The distance parameter can be negative.

Format

SET im_move_rel_<axis>/<value>; Where <axis> is the axis to move (1, 2 or 3) as a (String) Where <value> is a position value in mm as a (String)

Usage

SET im_move_rel_1/50/; Immediately Moves axis 1, 50mm in the positive direction from its current position. SET im_move_rel_2/-100/; Immediately Moves axis 2, 100mm in the negative direction from its current position. SET im_move_rel_3/200/; Immediately Moves axis 3, 200mm in the positive direction from its current position.

Response on Receive

Ack

Response On Complete

None

Immediate Stop

Description

Immediately stops motion on all axes.

Format

```
im_stop;
```

Usage

```
im_stop;
```

Response on Receive

Ack

Response On Complete

```
MachineMotion im_stop = complete
```

is Busy

Description

Queries MachineMotion to know if it is busy processing commands or if its command buffer is full.

Format

```
isBusy;
```

Usage

```
isBusy;
```

Response on Receive

None

Response On Complete

```
MachineMotion isBusy = true
```

is Motion Completed

Description

Queries MachineMotion to determine if motion is currently being executed. This function is useful for waiting for the completion of a movement.

Format

```
isMotionCompleted;
```

Usage

```
isMotionCompleted;
```

Response on Receive

None

Response On Complete

MachineMotion isMotionCompleted = true or MachineMotion isMotionCompleted = false

is Ready

Description

Queries MachineMotion to know if it is ready to receive commands. This function indicates if the MachineMotion system is initialized and ready for operation after a connection event.

Format

isReady;

Usage

isReady;

Response on Receive

None

Response On Complete

MachineMotion is Ready = true

Move to Closest Angle

Description

Moves a rotary table axis to a given angle without making a full rotation. This makes it easier to move the axis after multiple full rotations. The axis will take the shortest path to the new position. This command is only available with MachineMotion software v1.16 and newer.

Format

moveToClosestAngle/<axis>/<position>/request; Where <axis> is the axis (1, 2 or 3) to move as a (String). Where <position> is the angle command in degrees as a (String).

Usage

moveToClosestAngle/2/45/request; Moves axis 2 to the 45 degree position. For example, if the axis was previously at 365 degrees, it would move to 405 degrees after this command. This differs from the absolute move command, which would move the axis from 365 degrees to 45 degrees.

Response on Receive

Ack moveToClosestAngle/<axis>/<position>/request Where <axis> is the requested axis to move. Where <position> is the requested angle (in degrees).

Response On Complete

None

Read Digital Input

Description

Reads a digital input from a Digital IO Module. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

io-expander/<module>/digital-input/<pin> Where <module> is the address (1, 2 or 3) of the Digital IO Module (String). Where <pin> is the terminal on the Digital IO Module (0, 1, 2 or 3) as a (String).

Usage

io-expander/2/digital-input/0; Returns the current state of pin 0 on the Digital IO Module with address 2.

Response on Receive

None

Response On Complete

(<value>) Where <value> will be 0 or 1

Read E-Stop Status

Description

Reads the current status of the e-stop. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

estop/status;

Usage

estop/status;

Response on Receive

None

Response On Complete

true When e-stop is engaged. false When e-stop is not engaged.

Read Encoder

Description

Read the encoder value from a given AUX port.

Format

im_get_encoder_pos_aux_<port>; Where <port> is the port where the encoder is plugged in (1, 2 or 3) as a (String).

Usage

im_get_encoder_pos_aux_2; Reads the encoder value on AUX 2 port.

Response on Receive

None

Response On Complete

im_get_encoder_pos_aux_<port>-- <value> Where <port> is the AUX port number requested. Where <value> is the encoder reading in mm.

Read Push Button

Description

Read Push-Button for module [1-8]. Button 0 is the black button, button 1 is white

Format

push-button/<module>/digital-input/<button>;

Usage

push-button/2/digital-input/0;

Response on Receive

None

Response On Complete

push-button/<module>/digital-input/<button> <pushed|released>

Release E-Stop

Description

Releases software generated e-stop. It must be followed by a estop/systemreset/request command. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

estop/release/request;

Usage

estop/release/request;

Response on Receive

Ack estop/release/request

Response On Complete

None

Set All Axes Acceleration

Description

Configures the travel acceleration of the system in mm/min². For single-axis movements, the travel acceleration of the axis will be equal to this setting. For multi-axis synchronous moves, the overall motion acceleration will be equal to this setting.

Format

SET acceleration/<value>; Where <value> is an acceleration value in mm/min² as a (String)

Usage

SET acceleration/100/; Sets acceleration for all axes to 100mm /min²

Response on Receive

Ack

Response On Complete

None

Set All Axes Speed

Description

Configures the travel speed of the system in mm/minute. For single-axis movements, the travel speed of the axis will be equal to this setting. For multi-axis synchronous moves, the overall motion speed will be equal to this setting.

Format

SET speed/<value>; Where <value> is a position value in mm/minute as a (String)

Usage

SET speed/300/; Sets speed for all axes to 300 mm/minute

Response on Receive

Ack

Response On Complete

None

Set Encoder

Description

Sets the current position of an encoder to a new value (μm).

Format

SET im_set_encoder_pos_aux_<axis>/<value>; Where <port> is the port where the encoder is plugged in (1, 2 or 3) as a (String). Where <value> (String) is a position in μm .

Usage

SET im_set_encoder_pos_aux_1/1000/; Sets the encoder on the port AUX 1 to a position of 1000 μm .

Response on Receive

Ack

Response On Complete

None

Set Position

Description

Sets the current position of an axis to a new value (mm).

Format

SET im_set_controller_pos_axis_<axis>/<value>; Where <axis> is the axis to set position (1, 2 or 3) as a (String). Where <value> (String) is a position in mm.

Usage

SET im_set_controller_pos_axis_1/0/; Sets the current location of axis 1 as position 0 mm SET im_set_controller_pos_axis_2/0/; Sets the current location of axis 2 as position 0 mm SET im_set_controller_pos_axis_3/0/; Sets the current location of axis 3 as position 0 mm

Response on Receive

Ack

Response On Complete

None

Set Power Switch

Description

Write a state (on or off) to a power switch module

Format

power-switch/<module>/digital-output/<"on"|"off">;

Usage

power-switch/3/digital-output/"off"

Response on Receive

None

Response On Complete

power-switch/3/digital-output/"off"

System Reset

Description

Resets the system, this must be done after all e-stop event. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

estop/systemreset/request;

Usage

estop/systemreset/request;

Response on Receive

Ack estop/systemreset/request

Response On Complete

None

Trigger E-Stop

Description

Sets the e-stop. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

estop/trigger/request;

Usage

estop/trigger/request;

Response on Receive

Ack estop/trigger/request

Response On Complete

None

Wait On Push Button

Description

Wait for a button [0-1] on module [1-8] to achieve a certain state [pushed or released]. Button 0 is the black button, button 1 is white

Format

```
push-button/<module>/wait-on/<button>/<pushed|released>;
```

Usage

```
push-button/2/wait-on/0/pushed;
```

Response on Receive

None

Response On Complete

```
push-button/<module>/digital-input/<button> <pushed|released>
```

Write Digital Output

Description

Writes a digital output to a Digital IO Module. This command is only available with MachineMotion software v1.14_hotfix_200325 and newer.

Format

io-expander/<module>/digital-output/<pin> <value>; Where <module> is the address (1, 2 or 3) of the Digital IO Module (String). Where <pin> is the terminal on the Digital IO Module (0, 1, 2 or 3) as a (String). Where <value> is the desired state of the output (0 = 0V, 1 = 24V) as a (String).

Usage

```
io-expander/3/digital-output/2 1; Sets state of pin 2 to the value of 1 on the Digital IO Module with address 3.
```

Response on Receive

None

Response On Complete

None