MECHANO TRANSFORMER
Specialist of Precision Piezo-Actuators

PAMC-204/PAMC-204-RJ

PIEZO ASSIST MOTOR CONTROLLER

OPERATION MANUAL

Revision History

Version number	Date	Revised content	Edited by	Approved by
1	20250225	English First Edition Ver0.1	Muhammad Anas Muhammad Hadi	Chee Sze Keat
2	20250423	Software manual addition	Muhammad Anas	Chee Sze Keat

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Mechano Transformer Corporation Calling Procedure

If there are any defects in material or workmanship or any failure to meet specifications, promptly notify Mechano Transformer Corporation Department by calling 03-5297-6088 or by visiting our website at www.mechano-transformer.com within the warranty period**, r**eturn the product to Mechano Transformer Corporation. Mechano is not responsible for damage occurring in transit and is not obliged to accept products returned if the warranty seals are broken.

E-mail: info@mechano-transformer.com

When contacting Mechano Transformer Corporation for technical support, it is essential to provide specific details to help the customer care representative diagnose:

1. Your Contact Information, including your name, phone number, and email address
2. Product's serial number or original order number
3. Describe the issue, specifying whether it relates to hardware or software.

Additionally, be prepared to answer diagnostic questions, such as whether the system is used for manufacturing or research and development, and what the system's state was before the issue occurred. If the problem has been encountered before, mention how frequently it happens. It is also important to indicate whether the system can still operate despite the issue or if it has become non-functional. Lastly, identify any changes or events that may have contributed to the problem, such as recent updates, modifications, or environmental factors. Providing these details will allow the technical support team to analyze the situation thoroughly and offer an effective solution.

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1 Product Overview

PAMC-204 and PAMC-204RJ driver are specifically designed for driving Piezo Assist Motor (PAM). One driver can be connected to 4 motors and can drive 1 motor at a time. By using USB and tools capable of serial communication like Tera Term, the driver can be controlled from PC easily. The output voltage of PAMC-204 can be adjusted with command to get more precise movement.

Features of PAMC-204/PAMC-204-RJ

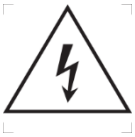
- Stackable driver for compact installment
- Plug-and-play USB interface
- RS485 interface
- Overheat protection
- Adjustable output for different movement speed

2 Safety Precautions

The following terms and symbols are used in this documentation and appear on the Model PAMC-204 and PAMC-204RJ Controller/Driver where safety related issues occur.

2.1 Definitions and Symbols

2.1.1 Electric Shock



The Electrical Shock Symbol shown in this manual and on the product is a warning sign for hazardous high voltage. Mishandling the equipment could lead to serious damage, injury, or even death. Please handle with caution and follow all safety guidelines.

2.1.2 Potential Burn Hazard

The Hot Surface Symbol shown in this manual and on the product warns of high temperatures. Touching the surface may cause burns or injury. Please handle with care and follow all safety precautions.

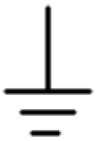
2.1.3 ON Switch Symbol

The symbol shown in the figure indicates the power switch position on the Model PAMC-204. It signifies that the device is in the Power On state.

2.1.4 OFF Switch Symbol

The symbol shown in the figure indicates the power switch position on the Model PAMC-204 and PAMC-204RJ. It signifies that the device is in the Power Off state.

2.1.5 GROUND

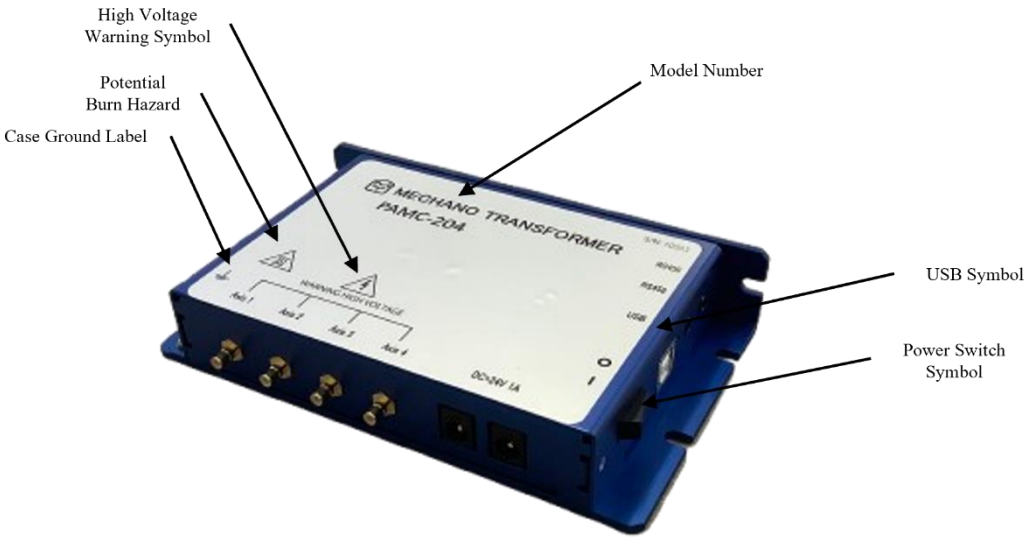


The symbol above appears on the Model PAMC-204/PAMC-204RJ to indicate the screw to be used to ground the case of the unit. This symbol identifies the frame or chassis terminal.

2.2 Warnings and Cautions

1. Please read and understand the User Manual before usage.
2. Only experienced technicians should handle the driver.
3. Do not disassemble or modify the driver.
4. Do not use the driver near any flammable materials or locations with high moisture or humidity.
5. Turn off the driver power supply if abnormal smell, noises, overheating, heat dissipation are detected.
6. Ensure the driver's power switch is switched off before connecting to power source.
7. Do not turn on the driver after dropping or applying shock to driver.
8. Do not touch the PAM during the operation.
9. Do not operate with wet hands.

2.3 Locations of Labels and Warnings.



3 Compositions

3.1 Included Items

The following items are included in the standard package:

1. PAMC-204 Driver
2. USB Type A – Type B Cable (USB cable)

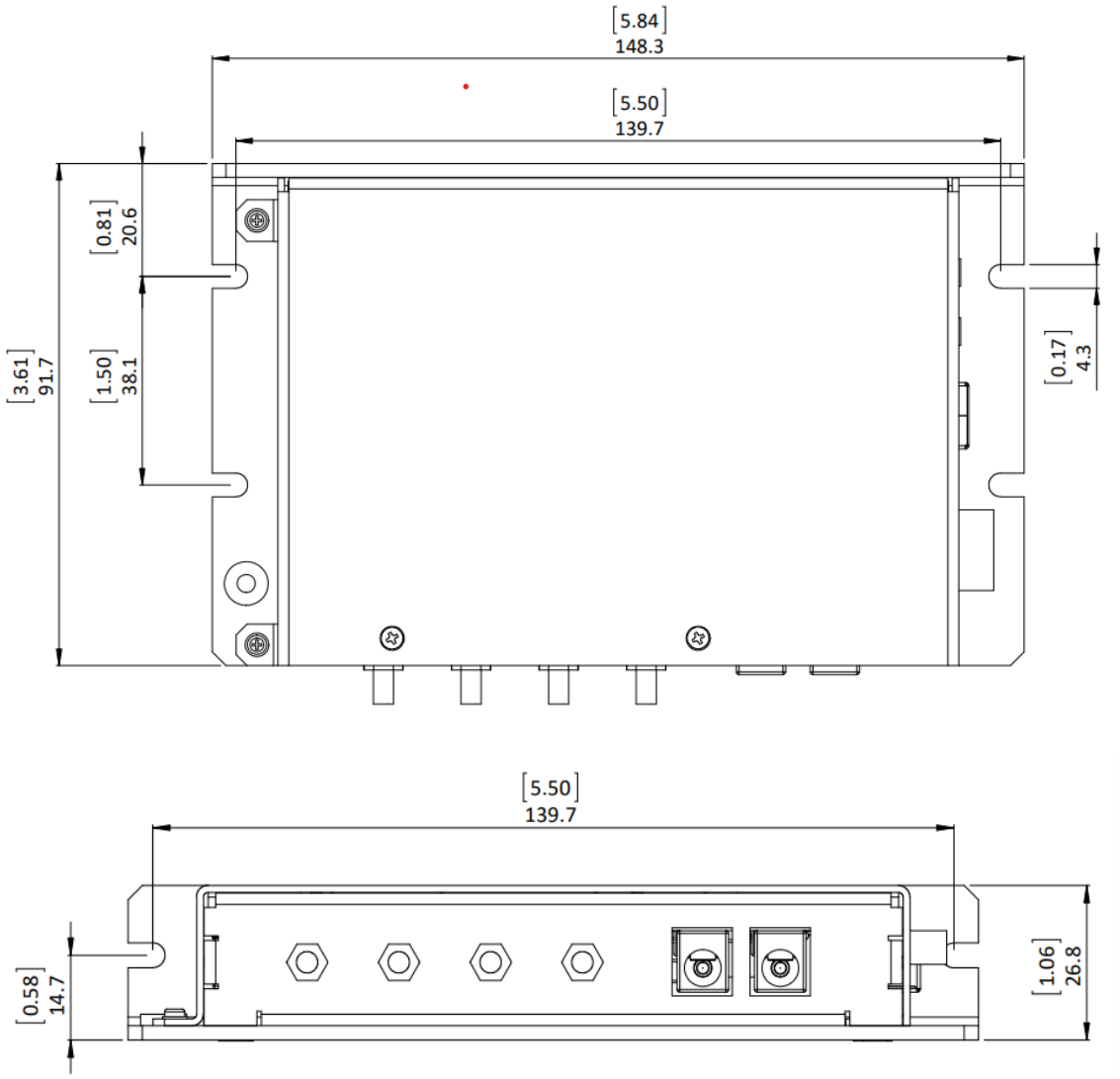
3.2 Optional Accessories

1. MT-UNI345-2419-PL03B (DC 24V 1.9A Power Adapter)
2. MT-DCB-AKI08 (3.5mm audio cable for 485 communication)
3. DC-PWR-LINK-200 (2.1mm DC connector 200mm cable)

4 Weight and Dimensions

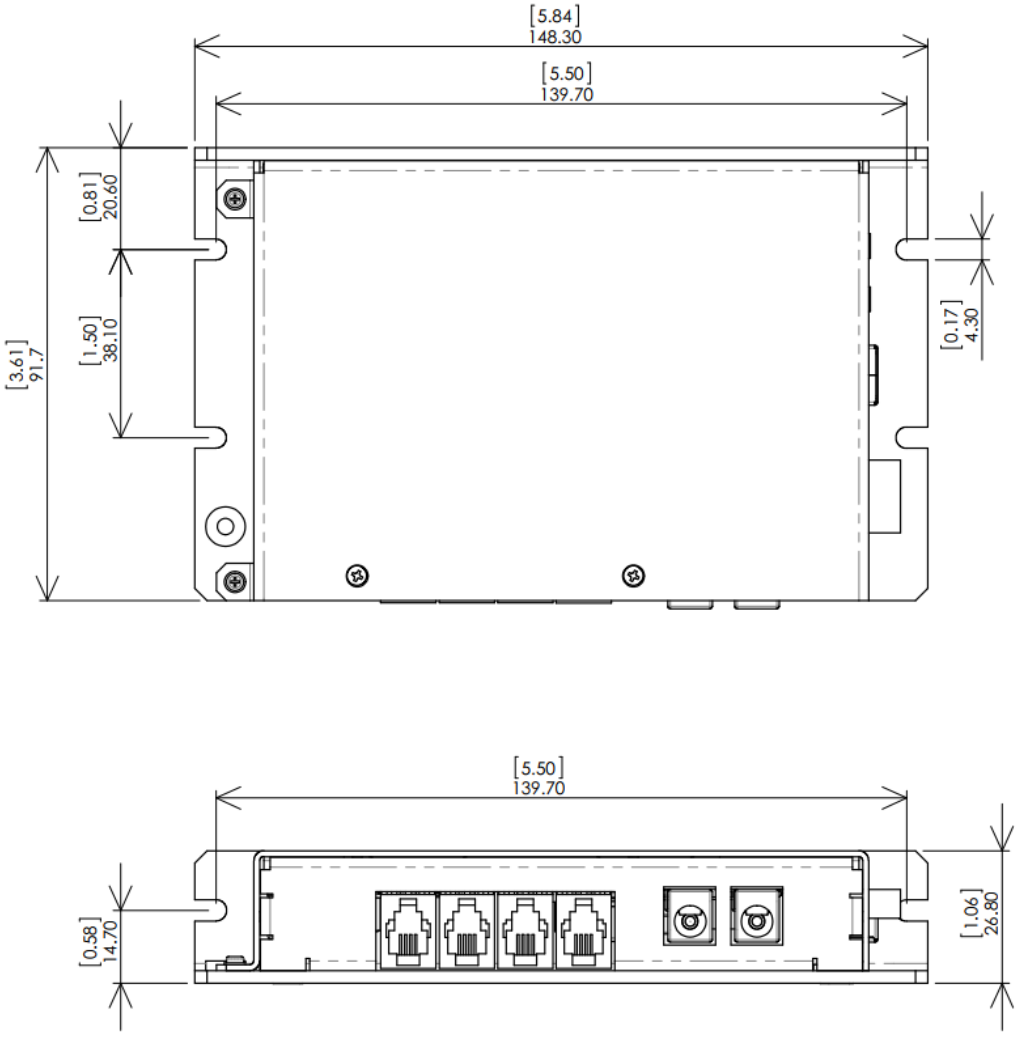
4.1 PAMC-204

Weight	350 g (12.35 oz)
Dimensions	(L x W x H) 5.84 in x 3.61 in x 1.06 in 148.3 cm x 91.7cm x 26.8 cm



4.2 PAMC-204-RJ

Weight	350 g (12.35 oz)
Dimensions	(L x W x H) 5.84 in x 3.61 in x 1.06 in 148.3 cm x 91.7cm x 26.8 cm



5 Product Specifications

5.1 Electrical Characteristics

Electrical Characteristics	PAMC-204/204 RJ
Input Voltage	24 V
Current consumption	0.5 A max
Operating temperature	5~40 °C
Storage temperature	-20~60 °C[1)]
Storage humidity	20~80%
Weight	0.35kg
Number of axis	4
Maximum frequency	1500Hz
Output Voltage	70~150V[2)]

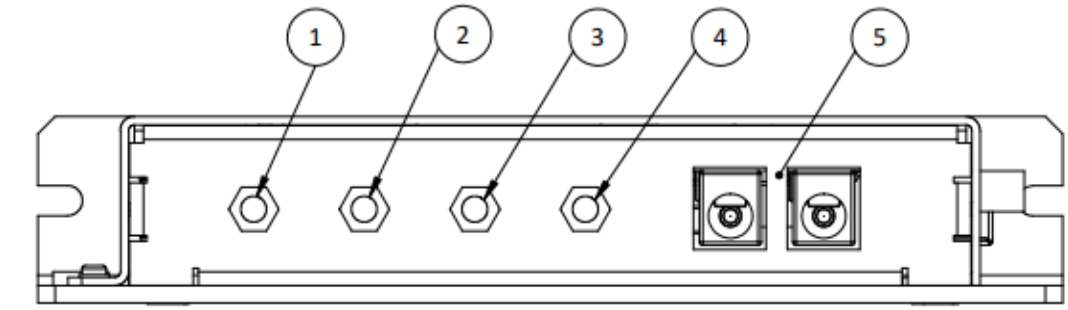
Refer Below:

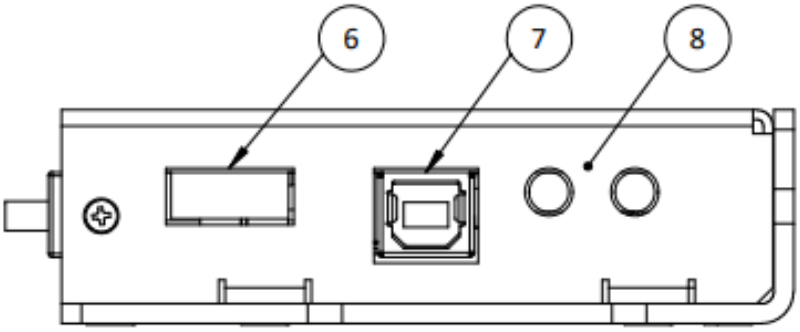
1) **No condensation**
2) **Output voltage adjustable by command**

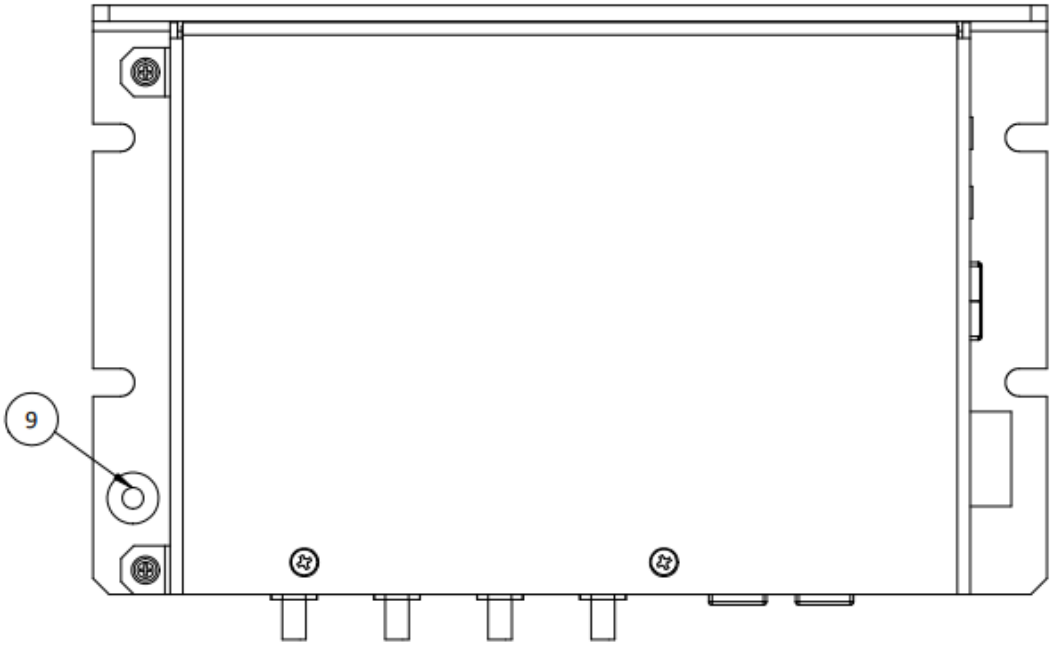
5.2 Communication Specifications

Communications	PAMC-204/204 RJ
Interface	USB Serial/485 protocol
Baud Rate	115200 bps
Data Bit	8 Bit
Parity	None
Stop Bit	1 Bit
Flow Control	None
Delimiter	CR + LF

5.3 PAMC-204 Parts

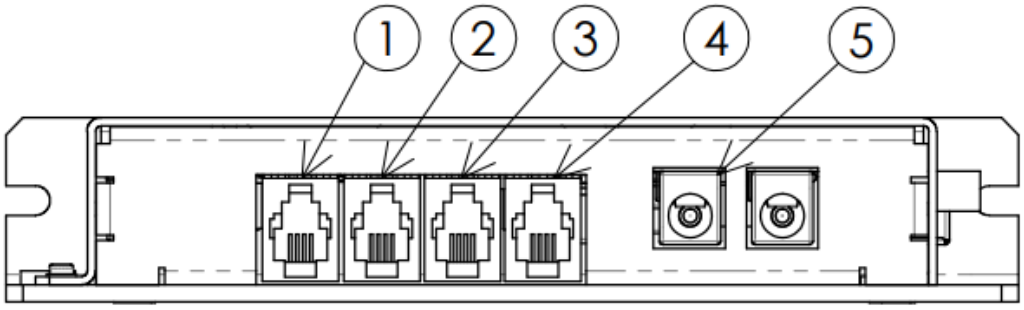


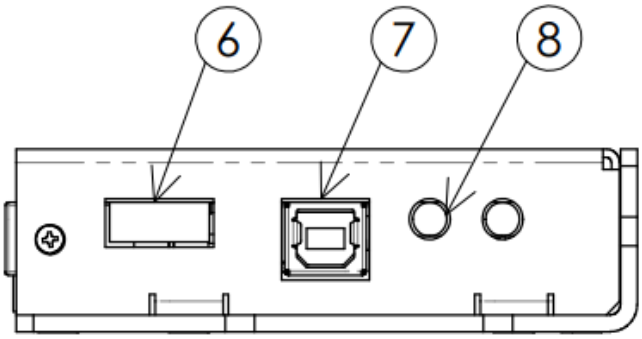


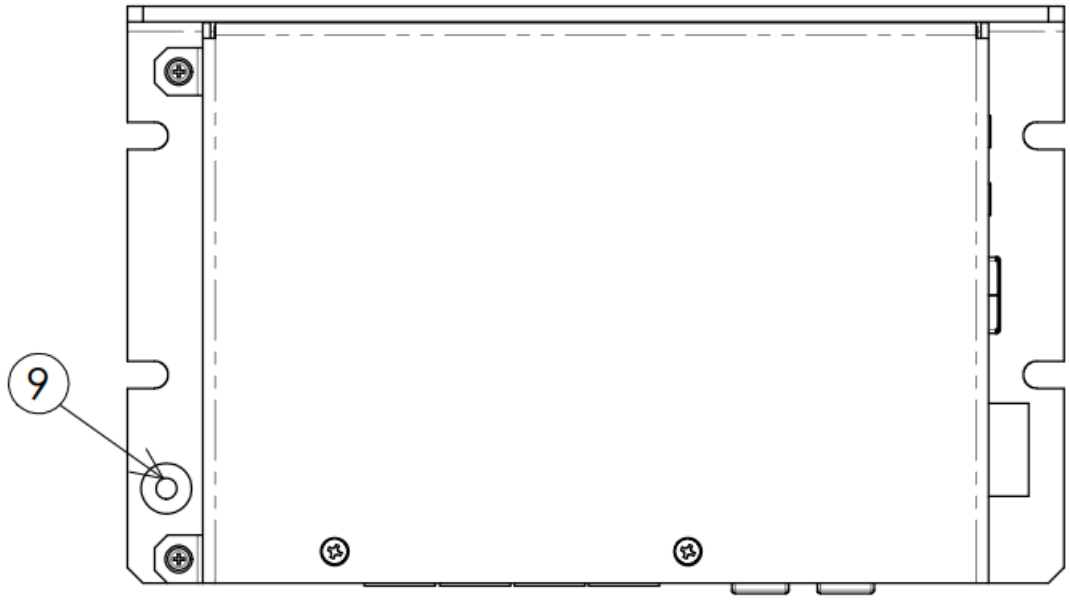


Item No	Parts Description
1	Axis 1
2	Axis 2
3	Axis 3
4	Axis 4
5	DC Power Terminal
6	Switch
7	USB Port
8	485 Communication Port
9	Case Ground

5.4 PAMC-204-RJ Parts





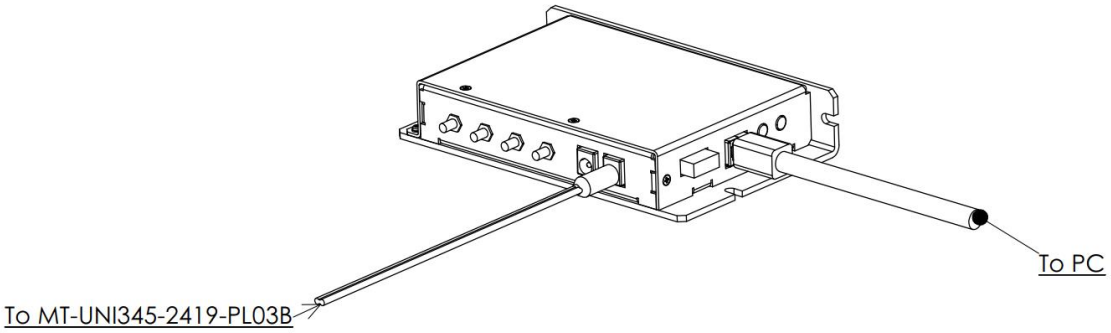


Item No	Parts Description
1	Axis 1
2	Axis 2
3	Axis 3
4	Axis 4
5	DC Power Terminal
6	Switch
7	USB Port
8	485 Communication Port
9	Case Ground

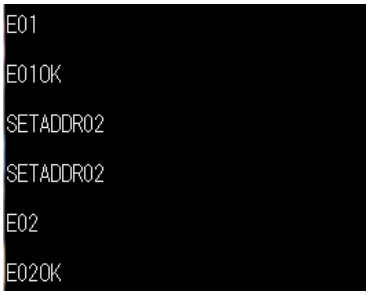
6 Control Manual

6.1 Before Using

All drivers' address in factory setting is **E01**. In the case of using the driver in the daisy chain set up, change the address of each driver using the following steps.

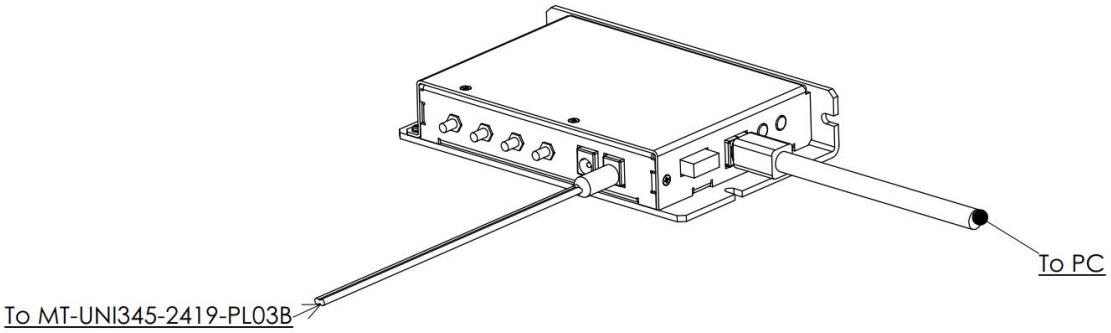


1. Connect only one driver to the PC. (Same as single driver setup)
2. Use Tera term or a similar tool to communicate with the driver.
3. Use the command "SETADDRXX" to change the address. (XX: 01 ~ 32, refer to section 6.4 and section 6.5 for more details on command)



6.2 Driver setup

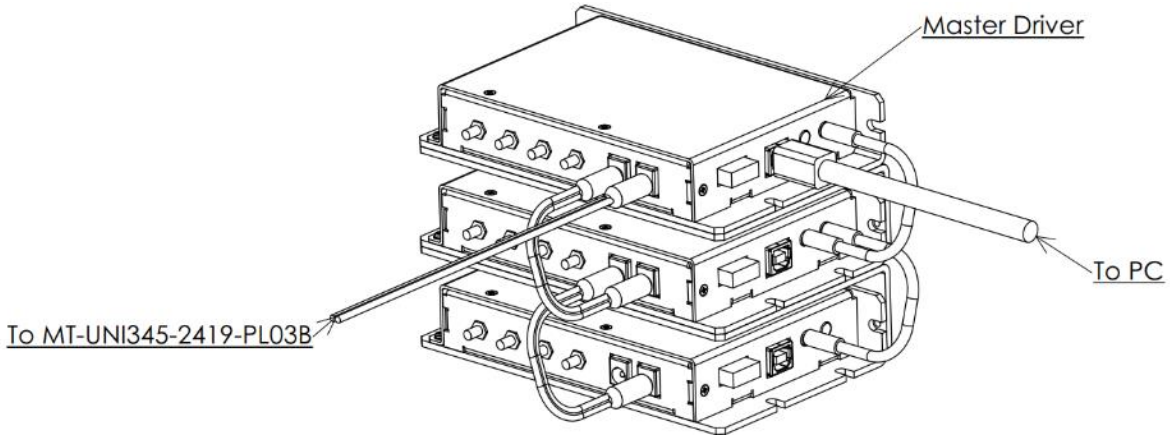
6.2.1 Single Driver Setup

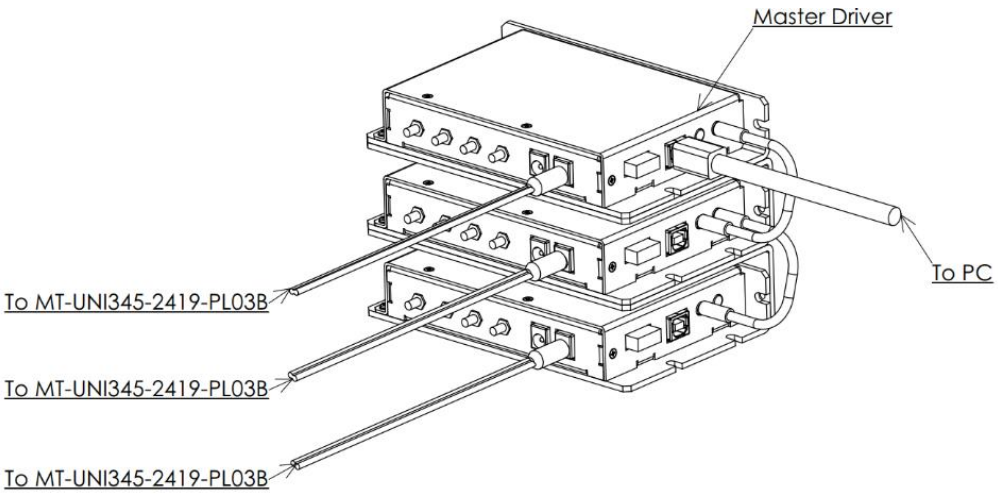


1. Connect the driver to the power adapter (UNI345-2419), PC and motor.
2. Turn on the power switch.
3. Open serial connection to driver using Teraterm or similar tool.
4. Send command to the driver.

Note: Ensure that the driver's power switch is switched off before connecting power source.

6.2.2 Daisy Chain Setup





1. Connect power adapter (UNI345-2419) to the DC power terminal of the first driver and link the DC power terminal of other two drivers with the DC connector.
2. Connect the drivers to the motors.
3. Connect the first driver's USB port to the PC.
4. Connect all the drivers' RS485 port using the cable.
5. Send command to the respective driver.

Note: The optional item MT-UNI345-2419-PL03B and DC-PWR-LINK-200 can only support up to 3 drivers at a time. For 4 or more drivers, please use additional power adapters and cables.

6.3 Controlling the driver.

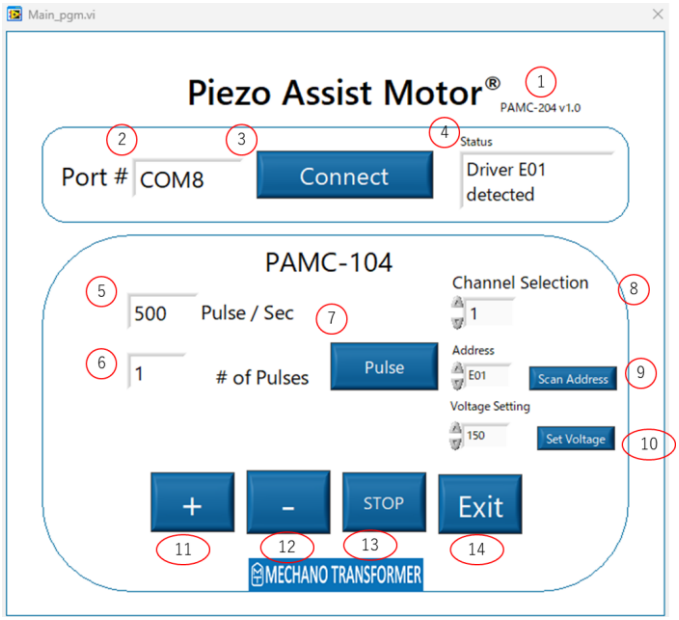
6.3.1 Using PAMC-204 Software

Software Installer

**PAMC-204 Software Installer can be downloaded from the link below.

->https://github.com/mechano-transformer/PAMC-204

Software window explanation.

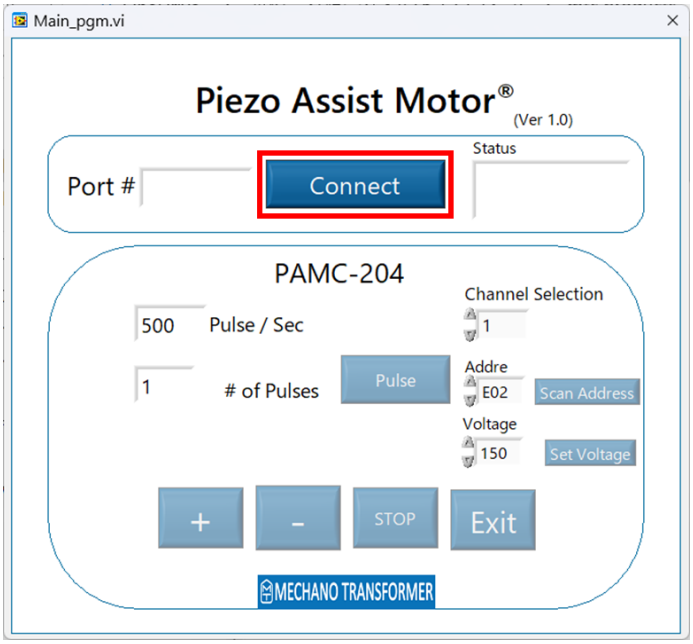


No	Name	Function
1	Version	Shows the software's version number
2	Port#	Currently connected serial port
3	Connect	Port selection
4	Status	Shows whether the address exists in the drivers' network or driving channel and direction
5	Pulse/Sec	Set the frequency of the driver. The frequency range is 1-1500.
6	# of Pulses	Set the number of pulses to drive during pulse driving mode. The maximum pulse is 9999.
7	Pulse/Continuous	Driving mode selection

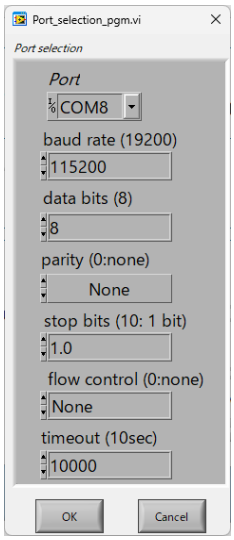
8	Channel Selection	Choose which axis to output
9	Address/Scan address	Select the address of the driver to output. If the address does not exist in the network, all other buttons will be disabled. [Scan address] can scan the addresses of all connected drivers
10	Voltage Setting/Voltage set	Change the output voltage. Use this button to adjust the output voltage to higher value for faster movement or smaller value for minute movement. *Note: the button [set voltage] must be pressed to apply the change.*
11	+	Drive the motor for plus rotation.
12	-	Drive the motor for minus rotation.
13	STOP	Stop the driving operation.
14	EXIT	Close the software.

Using the software.

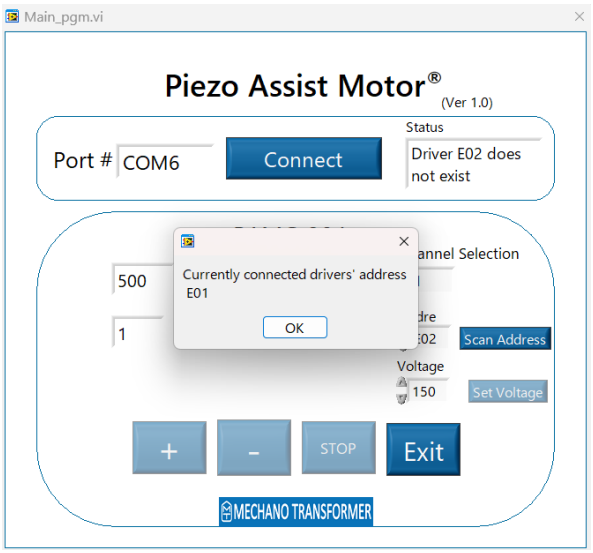
1. Connect the driver to the PC using USB cable or using RS485 line.
2. Open the software.
3. Press the connect button to open serial port setting window.



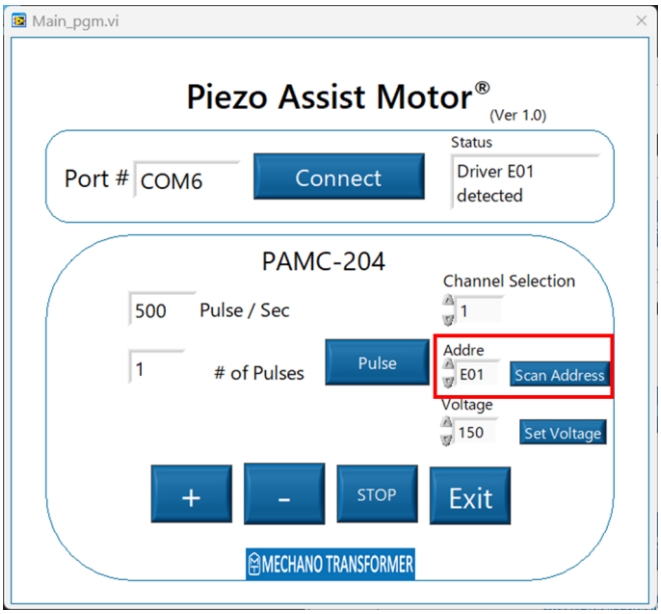
4. Select the port of the driver and press OK



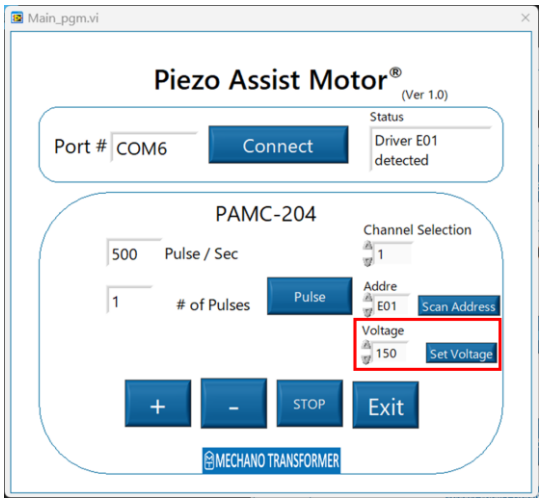
5. If successful, the window will show the addresses of connected drivers.



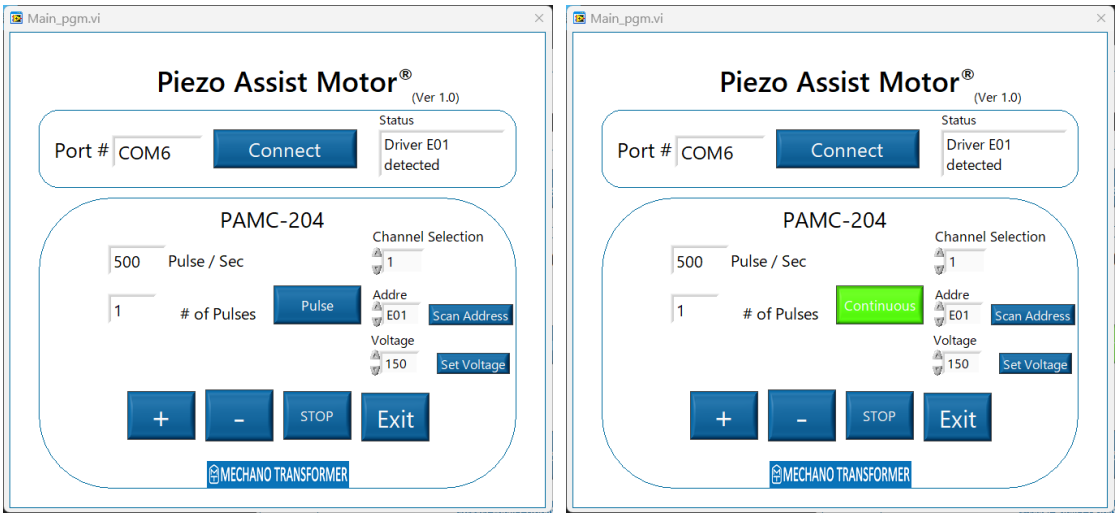
6. Select the address of the desired driver.



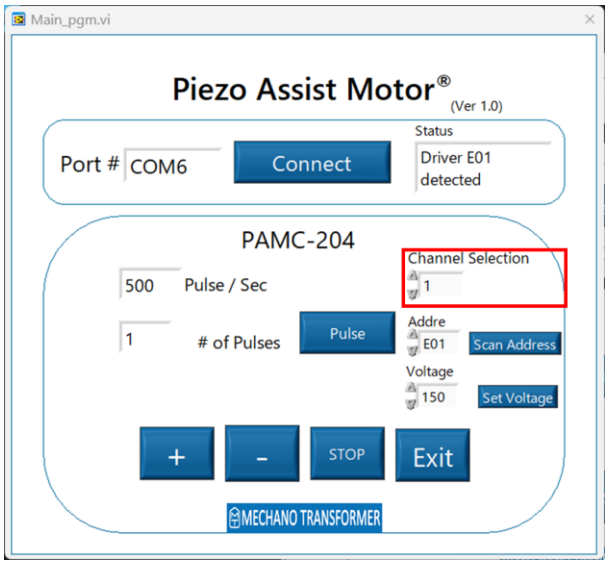
7. To change the output voltage, select the desired output voltage level and press the button [Set voltage]. If the button is not pressed, the output voltage will remain unchanged.



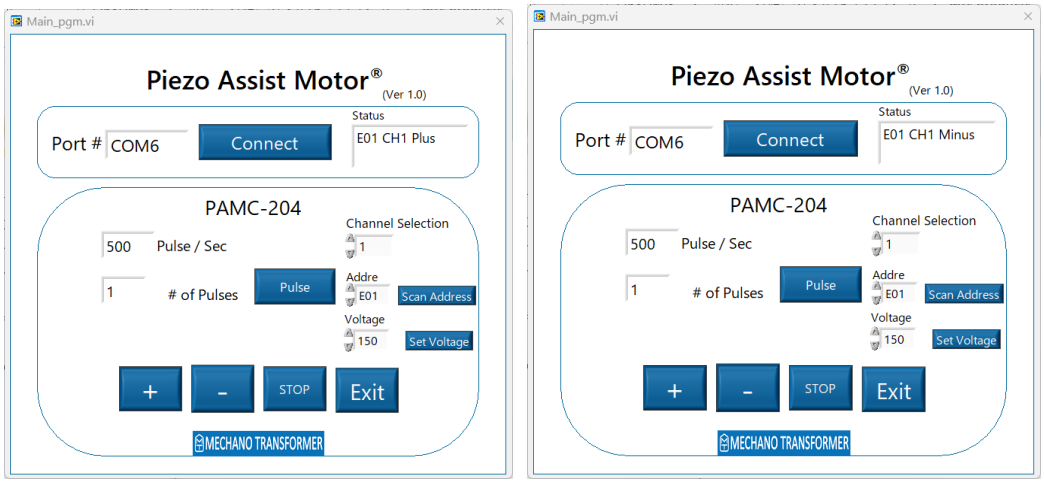
8. Set the frequency and driving mode between [Pulse] and [Continuous]. For pulse mode, set the desired number of pulses to drive.



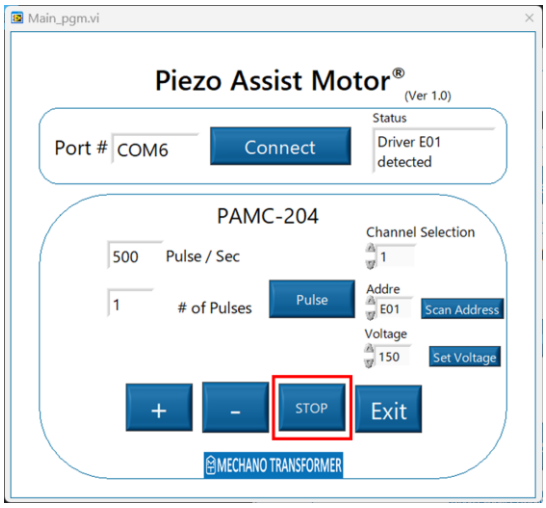
9. Select the desired channel.



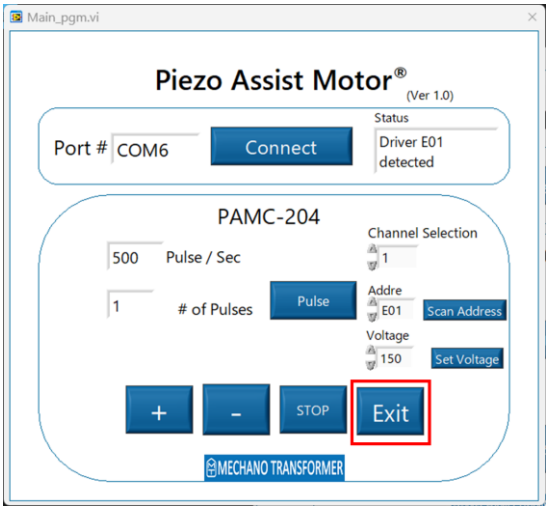
10. Press the [+] button for plus rotation or [-] button for minus rotation.



11. If the driving mode is continuous, press the [stop] button to halt the driving operation.

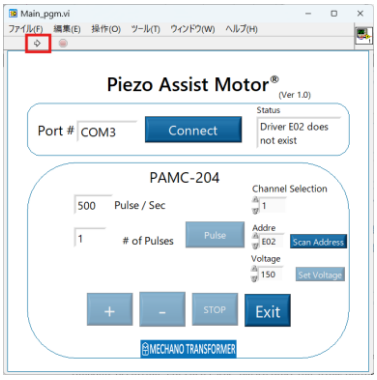


12. Press [exit] to shut down the software.



Note:

If the drivers are disconnected while using the software, there are risks of errors and timeouts occurring. For such cases, please press the arrow button as stated below or restart the software.



6.3.2 Using Teraterm

1. Connect to the driver using USB cable.
2. Set the terminal and serial port settings as follows:

Communications		PAMC-204/204 RJ
Newline	Receive	CR + LF
	Transmit	CR + LF
Local Echo		Check

Serial port settings

Communications	PAMC-204/204 RJ
Baud Rate	115200 bps
Data Bit	8 Bit
Parity	None
Stop Bit	1 Bit
Flow Control	None
Delimiter	CR + LF

3. Enter the desired command and press [ENTER]. (Refer to section 6.4 and section 6.5 for command list and details)

6.4 Command List

Below is a list of commands that can be sent to the driver.

No	Command	Details
1.	INF	Check Firmware Version
2.	Exx	Check if the driver with address exists in network
3.	SETADDRxx	Change driver's address
4.	ExxADCnnnn	Set drive voltage
5.	ExxNRnnnnyyyyz ExxNRnnnnXyyyyyyz	+Rotation drive Command
6.	ExxRRnnnnyyyyz ExxRRnnnnXyyyyyyz	-Rotation drive Command
7.	ExxS	Stop Command

6.5 Command Description

Below is the detailed description of commands listed in section 6.4.

INF

Function	Check firmware version	
Syntax	INF	
Detail	This command allows users to confirm the current firmware version of the driver. Use this command to read the firmware version for reference when contacting technical support.	
Example	INF	(Send command to driver)
	>PAMC-NEWTYPE **Ver:0.1.4(115200bps)**	(Driver reply with firmware version number)

Exx

Description Check if driver with xx address exist in network

Syntax Exx

Detail This command allows users to confirm if there is any PAMC-204 or PAMC-204-RJ connected to the network or PC.

Argument	Value	Description
xx	01~32	Driver's possible address

Example

E01	(Send command to driver)
>E01**OK**	(Driver replied back)
E02	(Send command to driver)
>	(No response)

SETADDRxx

Description Change the address of connected driver

Syntax SETADDRxx

Detail This command allows users to change the address of connected driver.
Note: Use a single driver setup (section 6.2.1) to change the address of the driver

Argument	Value	Description
xx	01~32	Driver's possible address

Example

SETADDR02	(Send command to driver to change address to E02)
>**SETADDR02**	(Driver replied, address change successful)

ExxADCnnnn

Description Change the voltage output of the driver

Syntax ExxADCnnnn

Detail This command allows users to change the output voltage of the driver. For precise minute movement, set the voltage level below 100V. It is recommended to set output voltage to 70V for minute movement. For fast movement, set the output voltage to 100V and above.

Argument	Value	Description
xx	01~32	Driver's possible address
nnnn	4095	150V
	3750	140V
	3450	130V
	3200	120V
	3000	110V
	2700	100V
	2450	90V
	2200	80V
	1900	70V

Example

E01ADC4095 (Send command to change driver E01 output voltage to 150V)

>E01**OK** (Driver replied, voltage change successful)

ExxNRnnnnyyyyz / ExxNRnnnnXyyyyyyz

Description +Rotation drive command

Syntax ExxNRnnnnyyyyz
ExxNRnnnnXyyyyyyz

Detail This command allows users to order a specific driver and one of its channels to drive the connected motor for + rotation movement. The range of frequency possible is between 1~1500Hz. The possible number of pulses is 0001~9999. The syntax X commands the driver to drive with number of pulses in range 000001~999999. If the number of pulse input is 0, the driver will drive the motor for + rotation movement continuously until stop command is given.

Argument	Value	Description
xx	01~32	Driver's possible address
nnnn	0001~1500	Driving frequency
yyyy	0000~9999	Number of pulses driven
yyyyyy	00000~999999	(Note: 0000 = continuous driving mode,
z	A~D	X: extension command for 6-digit pulses)
		Driving channel
		(A: CH1, B: CH2, C:CH3, D:CH4)

Example

E01NR15001500A
(Send command to driver E01 to drive the motor of CH1 to + rotation with frequency 1500HZ with 1500 pulse)

>**E01OK**
(Driver replied, command received successfully)

E01NR15000000A
(Send command to driver E01 to drive the motor of CH1 to + rotation with frequency 1500HZ continuously)

>**E01OK**
(Driver replied, command received successfully)

E01NR1500X100000A
(Send command to driver E01 to drive the motor of CH1 to + rotation with

>E01OK	frequency 1500HZ with 100000 pulses) (Driver replied, command received successfully)

ExxRRnnnnyyyyz / ExxRRnnnnXyyyyyyz

Description -Rotation drive command

Syntax ExxRRnnnnyyyyz
ExxRRnnnnXyyyyyyz

Detail This command allows users to order a specific driver and one of its channels to drive the connected motor for - rotation movement. The range of frequency possible is between 1~1500Hz. The possible number of pulses is 0001~9999. The syntax X commands the driver to drive with number of pulses in range 000001~999999. If the number of pulse input is 0, the driver will drive the motor for - rotation movement continuously until stop command is given.

Argument	Value	Description
xx	01~32	Driver's possible address
nnnn	0001~1500	Driving frequency
yyyy	0000~9999	Number of pulses driven
yyyyyy	00000~999999	(Note: 0000 = continuous driving mode,
z	A~D	X: extension command for 6-digit pulses) Driving channel (A: CH1, B: CH2, C:CH3, D:CH4)

Example E01RR15001500A	(Send command to driver E01 to drive the motor of CH1 to - rotation with frequency 1500HZ with 1500 pulse)
>**E01OK**	(Driver replied, command received successfully)
E01RR15000000A	(Send command to driver E01 to drive

	the motor of CH1 to -rotation with frequency 1500HZ continuously)
>**E01OK**	(Driver replied, command received successfully)
E01RR1500X100000A	(Send command to driver E01 to drive the motor of CH1 to - rotation with frequency 1500HZ with 100000 pulse)
>E01OK	(Driver replied, command received successfully)

ExxS

Description	Stop current driving operation	
Syntax	ExxS	
Remarks	This command allows users to stop the driving operation of the specific driver. This command is essential when driving the motor in continuous driving mode.	
Example	E01S	(Send stop command to driver E01 during continuous driving mode)
	>**E01FIN1456**	(Driver replied, stop command successful. The number of pulses driven will be returned to terminal)

6.6 Error Description

If an incorrect command or incorrect parameter was sent to the driver, the driver will reply with error message. Refer to the table below to determine the cause of error.

Error Message	Description
Error Value Range	Value of number entered during setting voltage is out of range
ERROR	Rotation argument is incorrect. Frequency argument is out of range. Channel set is out of range. No such command exists.
ERROR1	No such command exists.
ERROR4	When setting pulse number with 6 digits, the number of pulses is out of range
ERROR5	When setting pulse number with 4 digits, the number of pulses is out of range
BUSY	The driver is in a driving operation. Stop current operation before entering new command.