

Instruction Manual for Motion Checker Series

Warning Read this manual before use for safe operation.
After reading, please keep this manual where you can refer to it anytime.

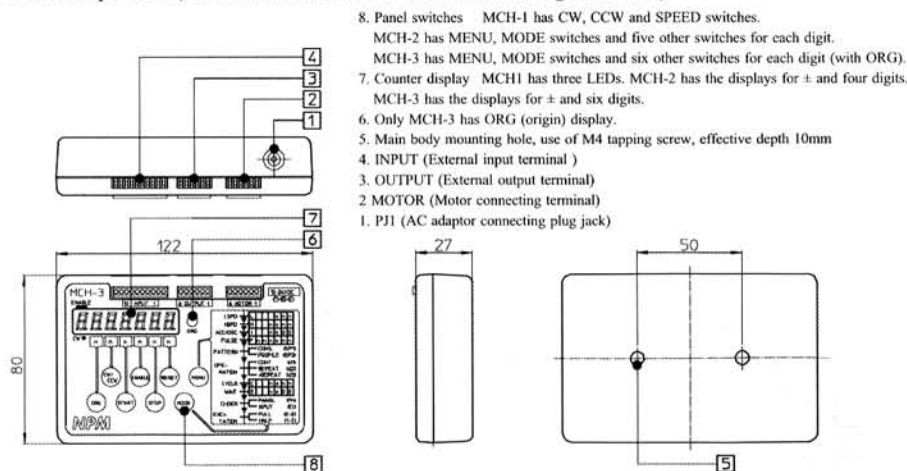
1. Safety precautions

- Do not use in damp areas or areas where the temperature is always high.
- If an electric current is supplied continuously to the motor, the motor will get hot. Be careful not to get burned or to distort resins.
- To avoid electric shock hazards, do not disassemble or modify the device.
- A malfunction or a failure may occur on electrical products.
- When using the product, caution must be taken not to damage human life, body or property.
- If a foreign matter gets into the body case, pull out the power cord first and remove the foreign matter.
- Use a motor that is within the rated range. Otherwise, a fuse may be blown or the motor may overheat, causing a burn.
- Tighten the screw on a lead wire to the terminal block so that the stripped portions of adjoining lead wires do not come in contact with each other. If they come in contact, it may cause a failure.
- If an abnormality (unusual noise, foreign odor or smoking) occurs, pull out the power cord.
- Do not touch the AC adapter with a wet hand. It may cause electric shock hazards.
- Do not cover the machine body or the AC adapter with a blanket, etc.
- It may cause a deformation of the case or a fire.

2. Check the contents

- Check the contents of the product. Each one of the following parts is included:
- MCH main body
 - AC adapter (DC12V, 2A)
 - Power cord (2-prong plug for domestic J specification, 3-prong plug for overseas E specification)
 - Stepping motor (PFCU25 type for U specification, PFCU20 type for B specification)
 - Motor connecting cable (5 leads for U specification, 4 leads for B specification)
 - Flat head screwdriver
 - Instruction Manual

3. Names of portions (The illustration below is an outline drawing of MCH-3)



8. Panel switches MCH-1 has CW, CCW and SPEED switches. MCH-2 has MENU, MODE switches and five other switches for each digit. MCH-3 has MENU, MODE switches and six other switches for each digit (with ORG).
7. Counter display MCH1 has three LEDs. MCH-2 has the displays for ± and four digits. MCH-3 has the displays for ± and six digits.
6. Only MCH-3 has ORG (origin) display.
5. Main body mounting hole, use of M4 tapping screw, effective depth 10mm
4. INPUT (External input terminal)
3. OUTPUT (External output terminal)
2. MOTOR (Motor connecting terminal)
1. P/J1 (AC adaptor connecting plug jack)

4. Product specifications

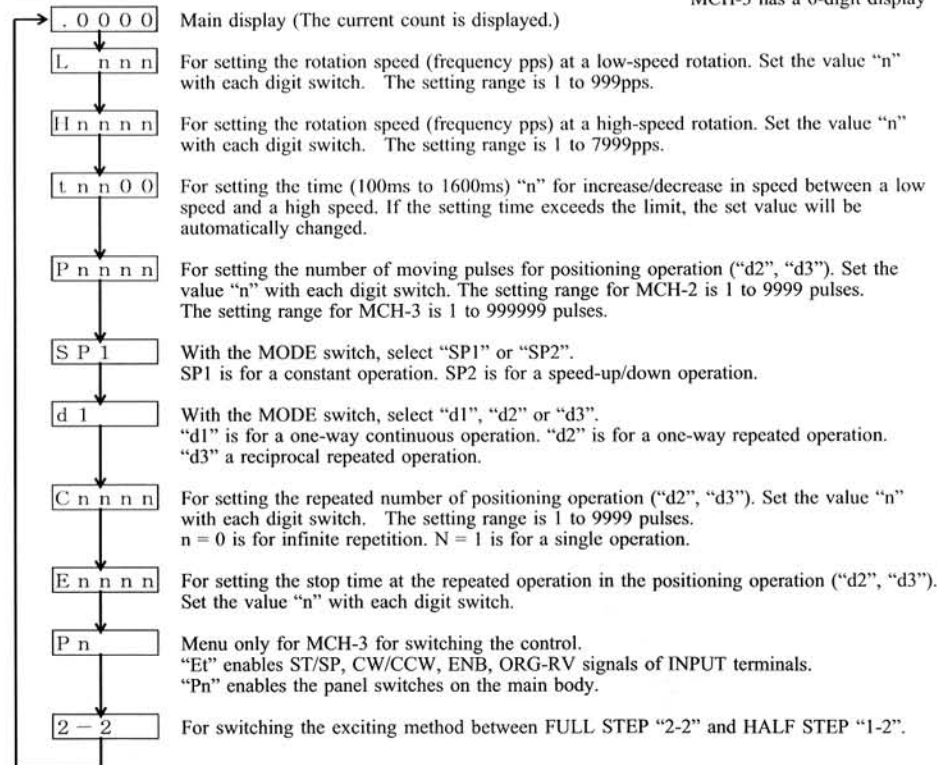
- Specifications of MCH main body
 - Compatible motor : 2-phase stepping motor
 - MCH-1U, -2U, -3U for Unipolar spec. (U spec.)
 - MCH-1B, -2B, -3B for Bipolar spec. (B spec.)
 - Input voltage : DC12V (2A) to DC24V (1A) 24W or less
 - Power is supplied by AC adapter. Input voltage is used for driving motor.
 - Use the power supply voltage corresponding to the motor rating.
 - Output current : The machine is driven with a constant voltage, and therefore the output current is determined by the power supply voltage and the coil resistance value of motor.

*** Operating MCH-2 and MCH-3 ***

- 1) Insert the power cord to the outlet. “. 0000” for MCH-2 and “.000000” for MCH-3 will be displayed.
- 2) Push the “ENABLE” switch, and the indicator “—” will light up and an electric current will pass to the motor. Then, push the “START” switch, and the count will be displayed and the motor will rotate.
- 3) Push the “STOP” switch, and the motor will stop and the counter will stop, too. While it is not used, turn off “ENABLE” to prevent overheating of motor.
- 4) By pushing the “RESET” switch during stop, the counter will be reset.
- 5) Use the “MENU” switch for various settings such as increase/decrease in speed, repeat setting and switching of exciting system. For numerical setting, input the value “n” with the panel switch corresponding to each digit. For selection setting, push the “MODE” switch.

Every time the MENU switch is pushed, the counter display will be switched.

MCH-2 has a 4-digit display
MCH-3 has a 6-digit display



- 6) By pressing the MODE switch during a repeated operation, the number of completed operations will be displayed.
- 7) By pressing the ORG switch, zero return operation will be conducted. In zero return operation, it will move to the CCW direction at a high speed until the EL signal is input. If -SD is input during the motion, the speed will be decreased. After stop by -EL input, the rotation direction will be switched to CW. Then, after moving at a low speed until the origin signal “ORG” is input, it will stop

<Precautions on operation>

- Unless the set value of operation pattern becomes FL<FH, the next menu cannot be operated.
- The counter display at continuous operation returns to 0 when the count overflows. If the count overflows three times on MCH-2 and eight times on MCH-3, the display will become inaccurate.
- If the moving amount < pulse required for speed up/down is set, the speed will decrease before reaching the high speed setting.

- Unipolar spec. (U spec.) : Rating 250mA/phase (MAX.400mA/phase)
- Bipolar spec. (B spec.) : Rating 400mA/phase (MAX.700mA/phase)
- Fuse : 2A fuse is mounted on the line of the motor power on the main body board.
- Specifications of the supplied AC adapter
 - Input : AC100 to 240V (50/60Hz)
 - Output : DC12V, 2A
- Specifications of the supplied motor
 - Plug: Inside diameter of $\phi 2.1$ mm, Outside diameter of $\phi 5.5$ mm, Center (+) pole
 - U spec. : PFCU25 - 24C1G (1/20) 120 Ω /phase
 - B spec. : PFCU20 - 40S4GA2 (1/10) - 03 160 Ω /phase
 - The rated voltage is DC12V.
 - If a motor other than the supplied motor is used, use the motor within the rating range of the motor and the motion checker

5. Mounting/Wiring procedure

- 1) Connect a motor connecting cable to the stepping motor.
 - 2) Connect the lead wires of motor to the MCH main body as indicated in Table 1. Retain the lead wires with a flat head screwdriver so that adjoining lead wires don't come into contact with each other.
 - 3) MCH-2 and MCH-3 have an external output function. Connect wires according to Table 2 as needed.
 - 4) MCH-3 has an external input function. Connect wires according to Table 3 as needed.
 - 5) Connect the power cord to the AC adapter and the plug to the jack P11 on the MCH main body.
 - 6) The main body can be mounted on the chassis by using the mounting hole at the back of the body as needed.
- The mounting/wiring procedure is completed

<Precautions on mounting/wiring>

- Before connecting or removing the lead wires of motor, turn off the "ENABLE" on MCH-2 and MCH-3 and pull out the power cord on MCH-1.
- While the power is ON, power voltage is being supplied from the OUTPUT terminal. Before wiring, pull out the power cord from the outlet.
- The depth of M4 tapping hole for mounting should be within 10mm

<Table 1> MOTOR terminal (Standard colors of lead wires for NPM Motor)

| CN1 | 1 | 2 | 3 | 4 | 5 | 6 |
|-----------------|-------|-----|-------|--------|--------|--------|
| Unipolar U spec | (Red) | Red | Black | Brown | Orange | Yellow |
| Bipolar B spec | — | — | Brown | Orange | Red | Yellow |

<Table 2> OUTPUT terminal (Open collector output, 26V or less, 30mA or less)

| CN2 | 1 | 2 | 3 | 4 | 5 | 6 |
|-------|-----|-----|-----|-----|-----|-----|
| MCH-2 | GND | +PO | -PO | +5V | — | — |
| MCH-3 | GND | +PO | -PO | +5V | BSY | ORG |

<Table 3> INPUT terminal (Contact input with GND line)

| CN3 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|-------|-----|-------|--------|-----|--------|-----|-----|-----|-----|-----|
| MCH-3 | GND | ST/SP | CW/CCW | ENB | ORG-RV | +EL | -EL | +SD | -SD | ORG |

<Explanation of signs in Tables 2 and 3>

- ±PO : Pulse output terminal. Pulse is output and it can be connected to an external driver.
 - BSY : External output terminal for signal during operation H = Under operation / L = Under stop
 - ORG : Origin signal. If external input ORG is received, an external output ORG (L) will be sent.
 - ST/SP : External input terminal for start/stop. H = Stop / Leg = Start
 - CW/CCW : External input terminal for switching the rotating direction. H = CW / L = CCW
 - ENB : External input terminal for ENABLE. H = Exciting OFF / L = Exciting ON
 - ORG-RV : External input terminal for start/stop of zero return operation. H = Stop / Leg = Return start
 - ±EL : Input terminal for end limit signal. H = Normal / L = EL detection
 - ±SD : Input terminal for slow down signal. H = Normal / L = Low speed
- (Leg indicates the down edge of signal.)

6. Explanation of operation

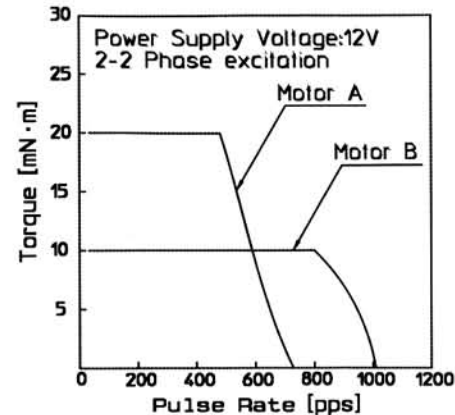
*** Operating MCH-1 ***

- 1) By inserting the power cord into the outlet, the controller body and the connected motor will be turned on, and "CW" and "600PPS" will light up.
- 2) Select the rotation speed (frequency pps) with the "SPEED" switch.
- 3) Push the rotation direction switch "CW" or "CCW".
By pushing and releasing the switch for a moment, it will rotate by one step. (= inching operation)
By pushing the switch for one second, it will rotate continuously.
- 4) To stop the rotation, push the "CW" or "CCW" switch again.
- 5) When it is not used, pull out the power cord to prevent heating of motor.

- At repeated operation of d2, the counter displays up to the set value for moving amount, and then the display will return to "0" and the counter will start counting again.
- Even if the time of speed-up/down "t" is within the setting range, "1023" will be automatically set when the rate set value exceeds 1023 (3FF hex).

$$\text{Speed-up/down time [sec]} = \frac{(\text{H set value} - \text{L set value}) \times \text{Rate set value}}{4915200 [\text{Hz}]}$$

7. Torque property of the supplied motor (Pullout/Reference value)



Motor A
Model: PFCU25-24C1G (1/20)
Drive system: Unipolar constant voltage drive
Drive circuit: MCH-1U, MCH-2U, MCH-3U
(Drive IC: NP2671)
Gear strength (Ordinary): 20mN·m

Motor B
Model: PFCU20-40S4GA (1/10)
Drive system: Bipolar constant voltage drive
Drive circuit: MCH-1B, MCH-2B, MCH-3B
(Drive IC: NP3775)
Gear strength (Ordinary): 10mN·m

8. If there is something wrong, --> Check the following again before contacting us.

- Power doesn't turn on.....
- Has the power cord connected to the AC adapter fully and have the plugs connected fully?
- Motor doesn't run.....
- When using MCH-2 or 3, check that the ENABLE "—" lights up.
- Has the sheath of cable been caught in the connecting portion of the motor lead wire and the terminal block? Check that the core of the cable has been inserted properly.
- Motor has a high-speed compliance (continuous response frequency).
Has the set value exceeded the limit of the motor specification?
On MCH-1, change the set value from 600 to 400 pps. On MCH-2 and MCH-3, decrease the set value of FH.
- Has a motor for bipolar spec been connected to the MCH-1U, -2U or -3U for unipolar spec.?
- Abnormal movement.....
- Has the motor been connected according to Table 1?
- Is a different manufacturer's motor used? The terminals of different manufacturer's motor may be different from those of Table 1. Check the motor spec.
- Has the sheath of cable been caught in the connecting portion of the motor lead wire and the terminal block? Check that the core of the cable has been inserted properly.

9. Guarantee

The guarantee term is one year from the purchase date.
If a failure due to defect caused in manufacturing occurs during the guarantee term, we will repair or exchange this product at no charge.

10. Contact

For technical inquiries or questions on this product, contact the following address:

<Asia/Europe>

Nippon Pulse Motor Co., Ltd. HP Group
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TEL. 540-633-1677

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Specifications of various models can be downloaded at our website.