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CHECKS AND ADJUSTMENT PRIOR TO OPERATION

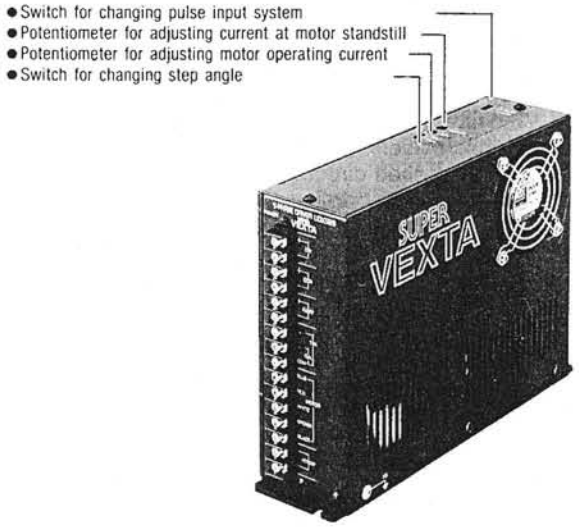
The **UPD** series of 5-phase stepping motor units do not required adjustments of operating current; the following two adjustments and checks, however, must be performed before the power is turned ON.

1. Driver for UPD Series • • • UDX5105,UDX5107,UDX5114,UDX5128,UDX5150

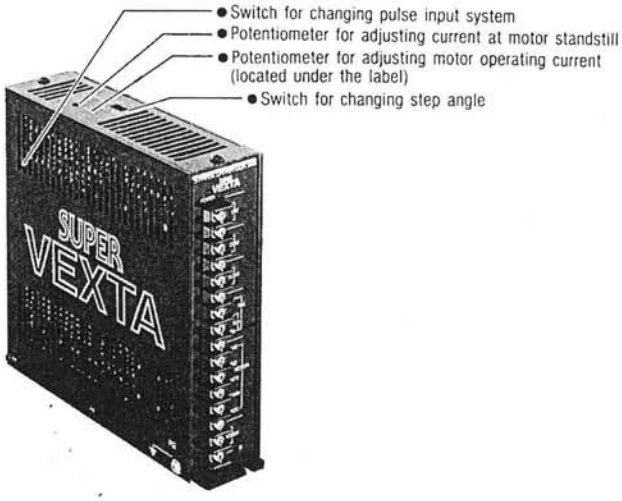
Driver switches and potentiometers are located on top of the driver or on the front panel of the driver, as shown in the following photographs.

A. On the top panel

UDX5128

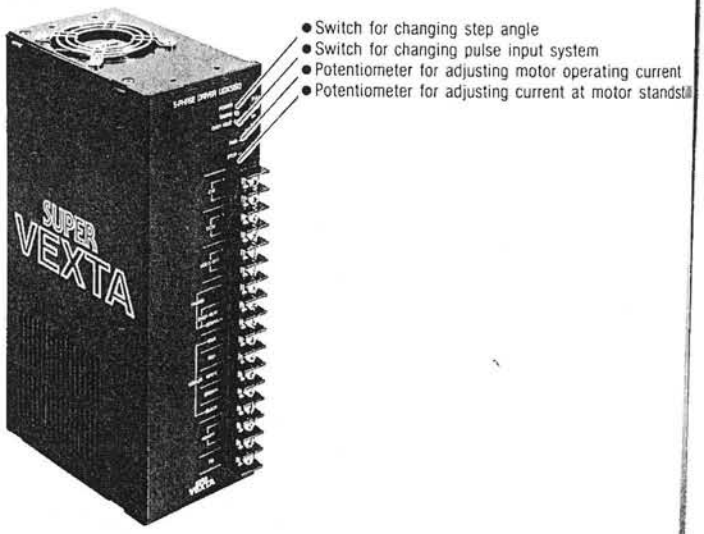


UDX5107
UDX5114

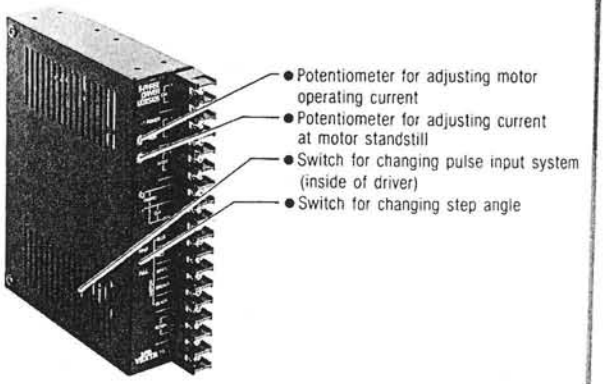


B. On the front panel

UDX5150



UDX5105



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NAME AND FUNCTIONS OF DRIVER PARTS

There are five types and six models of driver to choose from in the UPD series, depending on motor drive system and capacity of motor drive current. All connections and signal input/output conform to standard specifications.
The following is a description of the terminals on a typical driver, the UDX5114.

❶ CW pulse signal input terminal

Inputs CW rotation command pulse. (Inputs operation command pulse in a 1-pulse input system.)

❷ CCW pulse signal input terminal

Inputs CCW rotation command pulse. (In a 1-pulse input system, inputs command for direction of rotation. At L level motor turns clockwise, and at H level counterclockwise.)

❸ Output current OFF signal input terminal

Inputs signal to stop current supply to motor. While this signal is ON, motor cannot move even if operating pulses are input.

❹ Excitation timing signal output terminal

Signal shows that the excitation state of motor (current flowing through coils) conforms with the initial settings set by the driver.
Full Step: For 0.72° steps, a signal is output every 10 pulses input.
Half Step: For 0.36° steps, a signal is output every 20 pulses input.

❺ Overheat signal output terminal

Signal output when temperature of radiation plate within the driver exceeds 70°C, stopping the motor automatically.
(In models UDX5105 and UDX5107N, outputs signal when temperature exceeds 80°C.)

❻ Motor terminal

Terminals for motor signals. Connect to motor by matching with lead wire colors.

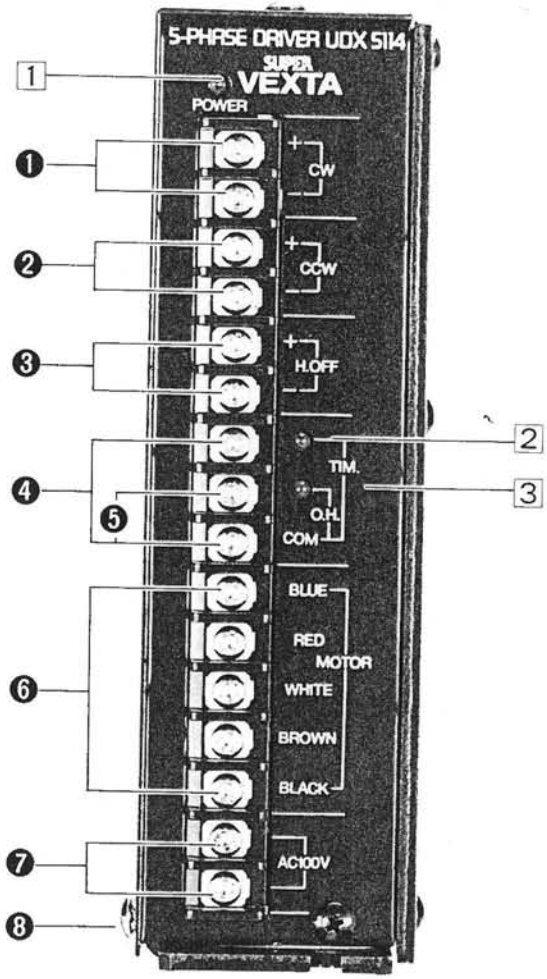
❼ Power supply terminal

Connect to single-phase 100V±10% 50/60Hz power supply.

❽ Frame grounding terminal

Mounted on driver case. Connect to the FG terminal of your controller.

UDX5107,UDX5114

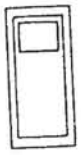


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① Switching and Setting Functions

• Setting the Step Angle

FULL



HALF

When switch for changing step angle is flipped to FULL, the driver is set for 0.72°/step (500 pulses per revolution); when switch is flipped to HALF, the driver is set for 0.36°/step (1000 pulses per revolution).

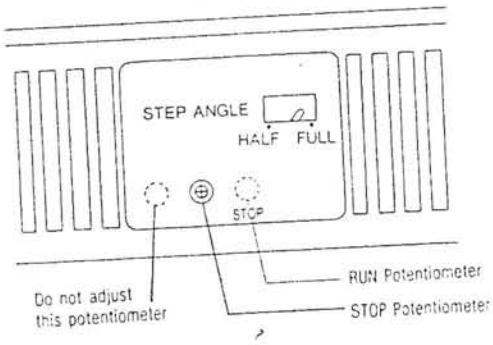
② Adjusting Motor Output Current

• Motor Operating Current.

1). Adjust the motor current with RUN potentiometer.
2). The motor operating current is set for rated current when shipping, but it can be readjusted using the RUN potentiometer to lower the operating current in order to suppress temperature rise in the motor/driver, or lower operating current in order to allow a margin for motor torque or to suppress vibration.

The graph on the right shows operating current values against the RUN potentiometer scale.

Note: On the model UDX5107 and UDX5114, the RUN potentiometer is hidden under the label on top of the driver. To make current adjustment, peel off the label.



• Current at Motor Standstill

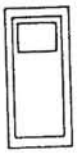
1). Use STOP potentiometer to adjust the current during the motor is stopped. It can be adjusted between 20 ~ 100% of set operating current.
2). When shipping, the current cutback is set for 50%. The STOP potentiometer can be used to readjust the current at motor standstill as the relation to motor holding brake force requires.

The right graph shows the rate of current cutback during motor stops against the STOP potentiometer scale.

$$\text{Holding Brake Torque} = \text{Holding Torque} \times \frac{\text{Standstill current to be set}}{\text{Operating current to be set}}$$

• Pulse Input System

2PULSE



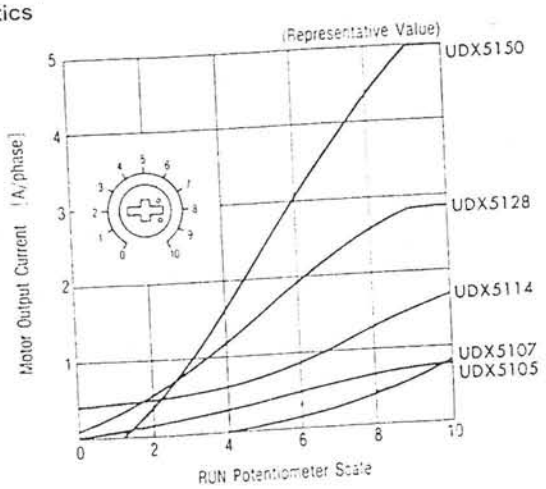
1PULSE

The driver is generally designed to function under either of the following two pulse output system.

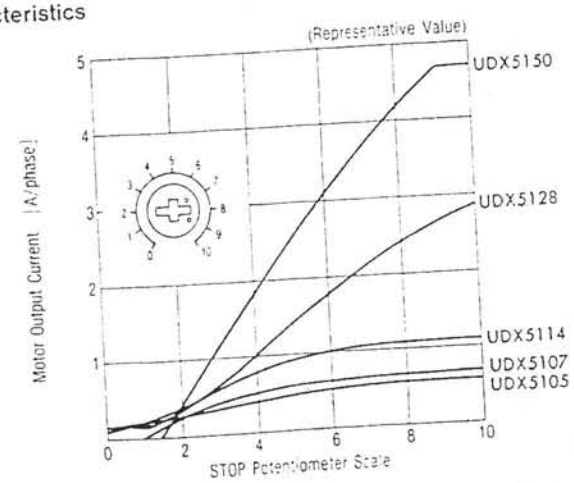
When switch for changing pulse input system is flipped to 2PULSE, the driver is set for the 2-pulse input system, in which two types of pulse signal (one each for CW and CCW) are used to control the motor. When switch is flipped to 1PULSE, the driver is set for the 1-pulse input system, in which a pulse signal and a rotational direction signal are used to control the motor.

* The model UDX5114 does not have a 2-pulse/1-pulse display.
* On model UDX5105, pulse input system is set by internal switch as follows;
  2-pulse input system SW1:ON SW2:OFF
  1-pulse input system SW1:OFF SW2:ON

Motor Operation Current-RUN Potentiometer Scale Characteristics



Current at Motor Standstill-STOP Potentiometer Scale Characteristics

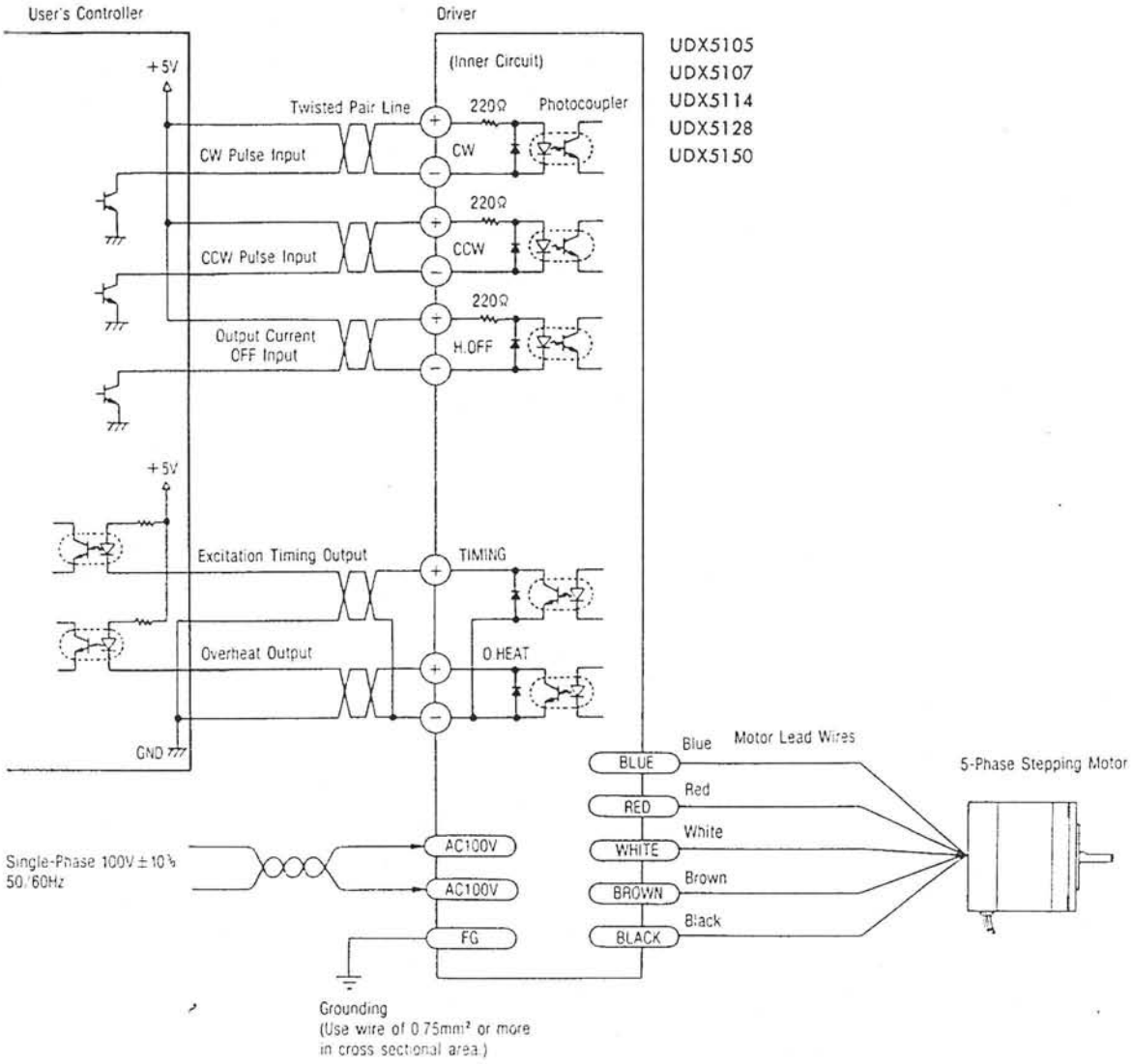


* Values when driver RUN potentiometer is set at rated values.

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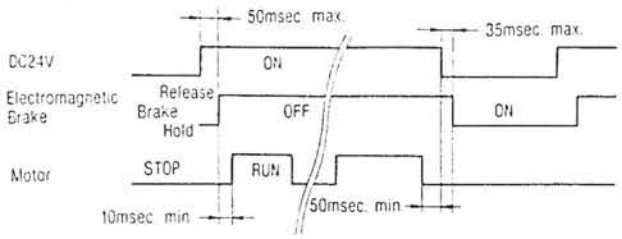
CONNECTING DIAGRAMS

1. For UPD Drivers



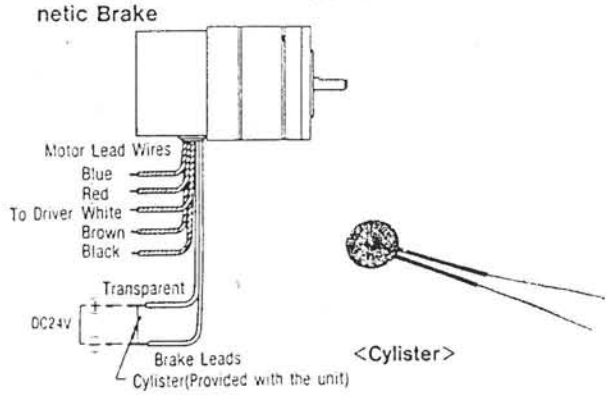
Electromagnetic Brake Type

- Signal Input Timing Chart



- Motor operation should be started after electromagnetic brake is released.
- Holding brake by electromagnetic brake is required to have a time delay of approximately 50msec. after motor

- Connection of 5-Phase Stepping Motor with Electromagnetic Brake



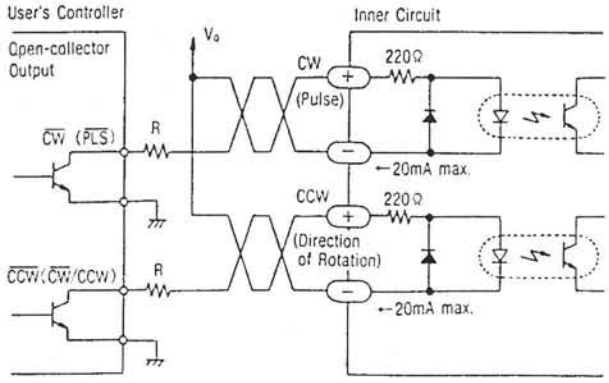
- A cylister provided with the unit should always be connected between electromagnetic brake leads as a surge arrester.

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DESCRIPTION OF INPUT/OUTPUT SIGNALS

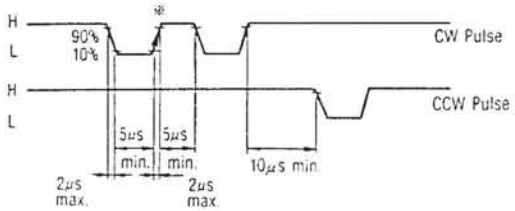
CW/CCW Pulse Input

1. Internal Circuit and Wiring



The characters indicate signals under the 2-pulse input system, while the characters in parenthesis indicate signals under the 1-pulse input system.
External resistance R is not required when $V_o = 5V$. When $V_o > 5V$, connect external resistance R making input current should be less than 20mA.

2. Pulse Wave

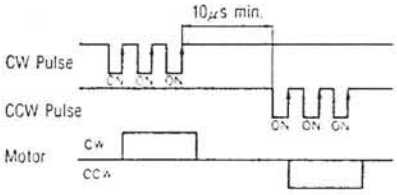


The photocoupler diode lights in gray part. The motor moves at pulse rising edge (see arrow).

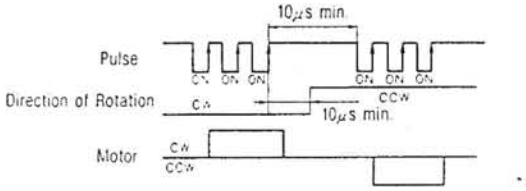
1). Pulse voltages are 4 ~ 5V for H level and 0 ~ 0.5V for L level. (For model UDX5150, H = 4 ~ 5V and L = 0 ~ 1V.)
2). The input pulse should have a pulse width of at least 5μsec, rise and fall times of at most 2μsec and a maximum pulse duty of 50%.
3). 10msec. minimum, an interval for changing the direction of rotation, is a nominal value. Time varies with motors and moment of load inertia.

3. Pulse Input System

● **2-Pulse Input System**
This system involves two kinds of pulses, a CW pulse and a CCW pulse. When a CW pulse is input, the motor rotates clockwise (as seen from the motor output shaft end) and when a CCW pulse is input, the motor rotates counterclockwise.

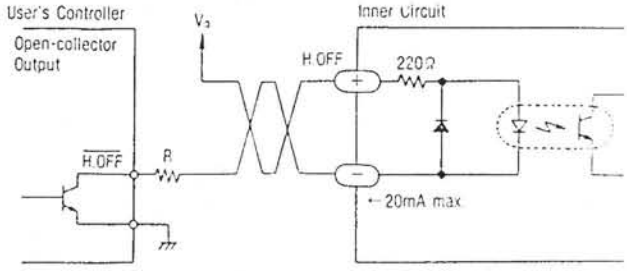


● **1-Pulse Input System**
This system uses a pulse signal and a directional (CW/CCW) signal. When the directional signal is at L level (photocoupler is ON), the motor rotates clockwise; when the signal is at H level, the motor rotates counterclockwise.



Output Current Off (H.OFF) Input

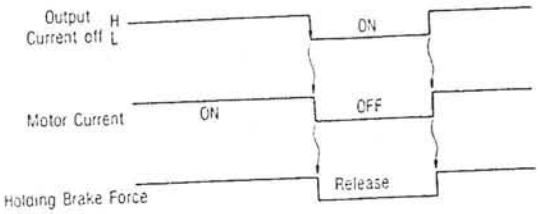
1. Internal Circuit and Wiring



External resistance R is not required when $V_o = 5V$. When $V_o > 5V$, connect external resistance R making input current should be less than 20mA.

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1). When the output current off signal is at L level (photocoupler is ON), no current is sent to the motor (holding brake force is released) and the motor shaft can be moved by external force.
Use this function when the motor shaft needs to be turned or positioning carries out by hand.
While the motor is in operation the signal should always be set to H level. If no needs is anticipated for this function, leave terminal unconnected.

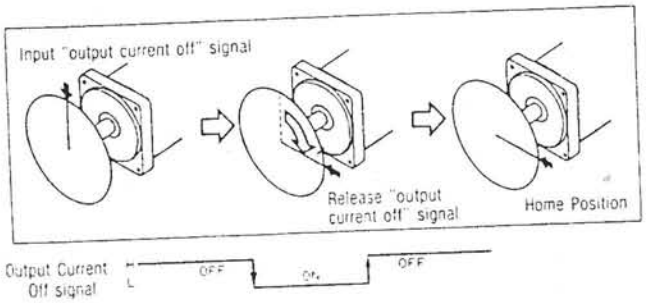


Gray part means that the motor provides holding brake force in proportion to standstill current set by STOP potentiometer.

2). The motor excitation sequence (phase) does not change even when the output current off signal is switched from ON to OFF.
When the shaft has been moved by external force under input from output current off, the shaft may move up to ± 3.6° depending on shaft position.

2. Manual Home Position Detecting

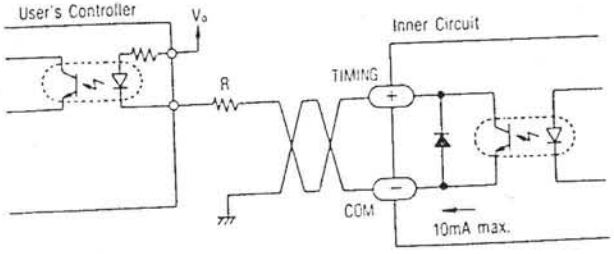
When set the home position after manual positioning, follow the steps shown below;
- Input "Output current off signal"
- Positioning
- Release "Output current off signal"



Note: Pulse Signal Input
Pulse signal output should always be at H level when pulse signals are stopped. If pulse signal output remains at L level the automatic current cutback at standstill function will not operate.
- When using the 2-pulse input system
  * Do not input CW and CCW pulses at the same time.
  * If either the CW or CCW pulse is at L level, input of the opposite pulse will not result in normal motor response.
- When using the 1-pulse input system
  * The direction of rotation should only be changed only when pulses are stopped (at H level).

Excitation Timing (TIM.) Output

1. Inner Circuit and Wiring

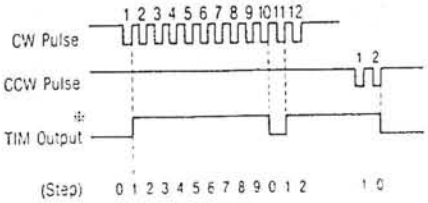


V_o should be greater than 5V and less than 24V. Maintain current at 10mA or less.

1). The excitation timing signal indicates that the excitation state of motor conforms to the initial setting (step 0). This signal can be used to detect home position with greater precision by setting the mechanical home position of equipment to coincide with the excitation home position (step 0) of the motor.
2). A signal is output at every time the excitation sequence returns to step "0" in synchronization with the input pulse. The excitation sequence rotate for each 7.2° the motor shaft moves.
The timing (TIM.) lamp on the front panel light every 10 pulses at full-step (0.72°/step) and every 20 pulses at half step (0.36°/step).

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Timing Chart of Full-Step



Note: On above chart, step "0" corresponds to L level.
1. When the power supply is turned ON, the excitation sequence is reset to "0" and the timing (TIM.) lamp lights.
2. The TIM. lamp blinks at high speed when the motor is running, so it may appear to be on continuously.

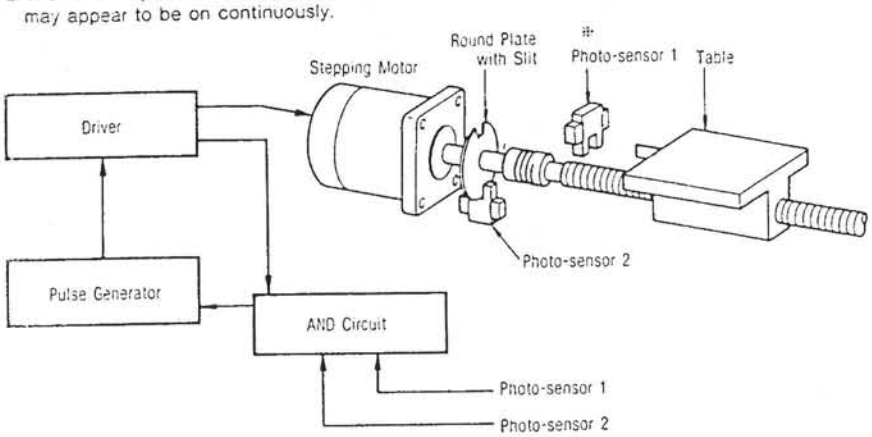
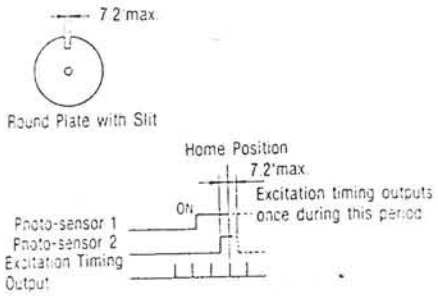


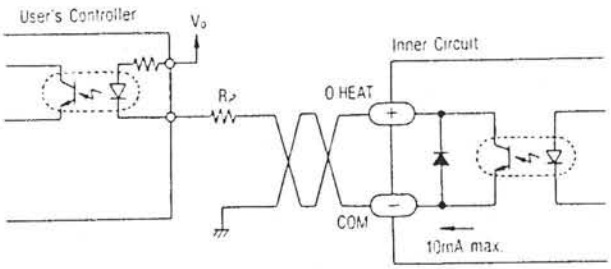
Photo-sensor 1 should be installed where the sensor can detect a slit within one slit disk revolution.

When repeatedly performing home position detection, error in the sensors and limit switches sometimes causes the slippage of home position. In such cases, the home position detection of equipment can be made more accurate by constructing an AND circuit using the mechanical home position and the excitation timing output signal.



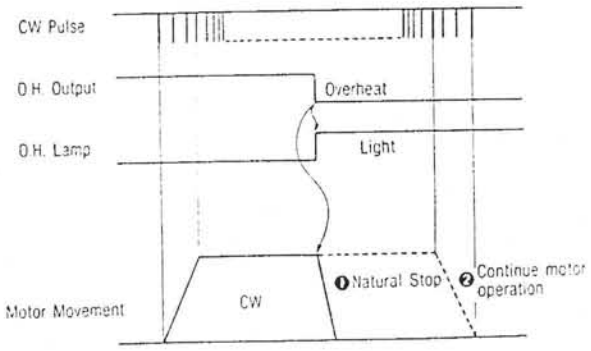
Overheat (O.H.) Output

Internal Circuit and Wiring



V_o should be greater than 5V and less than 24V.
Maintain current at 10mA or less.

1). Overheat (O.H.) signal is output when the temperature of heat radiation plate inside the driver exceeds 70°C (80°C for **UDX5105** and **UDX5107N**). On above wiring, output of the overheat signal corresponds to L level.
The overheat lamp on the front panel light when this signal is output.
2). If the automatic output current off function has been set at this time, output current to the motor drops to "zero" and the motor comes to a natural stop.
Note: Models **UDX5107**, **UDX5114** and **UDX5128** come to a natural stop only.
3). When an overheat signal is output, either reconsider operating condition (ambient temperature, operating patterns, etc.) or take measures such as forced cooling of the driver.
4). Overheat signal will be canceled automatically as soon as the inner temperature of the driver drops.



The switch for automatic output current off function may be used to control motor operation when the overheat signal is output as follows:
❶ Flip switch to AHO side to bring the motor to a natural stop.
❷ Flip switch to OFF side to continue motor operation.

However, once an overheat signal has been output, all pulse output to the driver should be ceased and power turned off as soon as the motor set operation has finished. Reconsideration should be given to operating conditions.

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