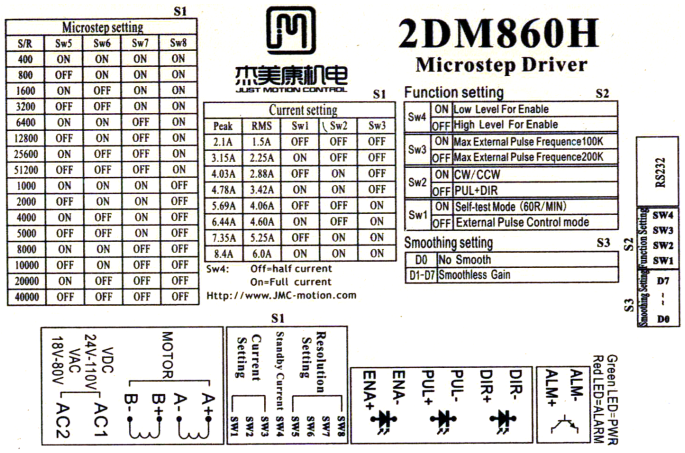
2DM860H $6A\ 80V_{AC}$ Digital Stepper Drive

The $2DM860H$ is a two phase digital stepper driver based on DSP (tms). Its Micro step resolutions and output current are programmable and it has advanced control algorithm, which can bring a unique level of system *smoothness*, provides optimum torque and mid range stability. The control algorithm of $multi-stepping$ can ensure smooth stepper motor system performance. The control algorithm of torque compensation can improve the torque of motor in the high speed. The control algorithm of motor self test and parameter auto setup technology offers optimum responses with different motors and easy to use. The control algorithm of smoothness can enhance the acceleration and deceleration of motor $(S-Curve)$. Its unique features make the $2DM860H$ to be an ideal solution for applications.



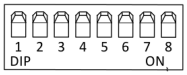
Key Features

- Parameter auto-setup and motor self-test
- $Multi-Stepping$ inside, small noise, low heating, smooth movement
- Torque compensation in high speed
- Variable current control technology, high current efficiency
- $S-Curve$ dynamic acceleration and deceleration filtering provides a smooth $Start/Stop$ motion, reducing mechanical wear and tear
- Support PUL/DIR and CW/CCW modes
- Storage the position of motor
- Optically isolated input and compatible with $5V$ *to* $24V$
- User-defined micro steps
- Micro-step resolutions and Output current programmable
- Over current and over voltage protection
- Automatic detection, flexible selection of pulse edge count mode
- Green light means running while red light means protection or off line

SPECIFICATION

Parameter	*Min*	*Typical*	*Max*	*Unit*
Input Voltage(AC)	18	48	80	VAC
Output Current	1	-	6	A
Pulse Signal Frequency	0	-	250	kHz
Pulse width	2.5			μs

S1



CURRENT SETTING

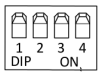
peek	RMS	***S1-1***	***S1-2***	***S1-3***
2.10A	1.50A	off	off	off
3.15A	2.25A	on	off	off
4.03A	2.88A	off	on	off
4.78A	3.42A	on	on	off
5.69A	4.06A	off	off	on
6.44A	4.60A	on	off	on
7.35A	5.25A	off	on	on
8.40A	6.00A	on	on	on

S1-4 is used for setting the standstill current , "**off**" means the standstill current is set to be half of the selected dynamic current or other current, which can be set by the HISU (via rs232)
S1-4 = off Half Current = on Full Current

MICROSTEP SETTING

step/rev	***S1-5***	***S1-6***	***S1-7***	***S1-8***
400	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

S2



The **S2** switch is mainly a number of auxiliary functions, the auxiliary functions of the first three switch are respectively motor self detection, pulse counting mode and single pulse selection; fourth and fifth are set for the smoothing coefficient, and the last one is reserved.

	OFF	**ON**
S2-1	External Pulse	Self-test (60r/min)
S2-2	Pul&Dir (normal)	Cw/Ccw
S2-3	Max Puls 200kHz	Max Puls 100kHz
S2-4	High Level For Enable	Low Level For Enable

S3

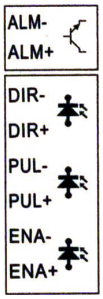
SMOOTH COEFFICIENT

0	No smooth
1-7	Pulse smoothing coefficient, this effect is gradually increasing

The Smothness must be set to the same value for each driver in multi-axis applications

Control Signal Input Connector

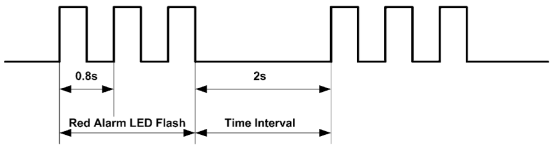
ALM-	Alarm output-
ALM+	Alarm output+
DIR-	Direction signal-
DIR+	Direction signal+
PUL-	Pulse signal+
PUL+	Pulse signal-
ENA-	Enable signal+
ENA+	Enable signal-



Compatible with 5V to 24V

Control Signal

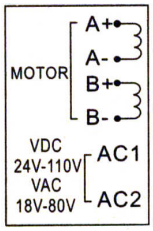
In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



- t1: ENA must be ahead of DIR by at least $5\mu s$. Usually, ENA+ and ENA- are NC (not connected).
- t2: DIR must be ahead of PUL active edge by $6\mu s$ to ensure correct
- t3: Pulse width not less than $2.5\mu s$
- t4: Low level width not less than $2.5\mu s$

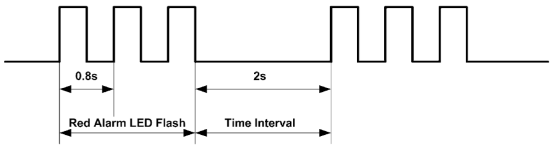
Power and Motor Connector

A+	Motor Phase A+
A-	Motor Phase A-
B+	Motor Phase B+
B-	Motor Phase B-
AC1	Power Input
AC2	Power Input



Output Alarm Signal

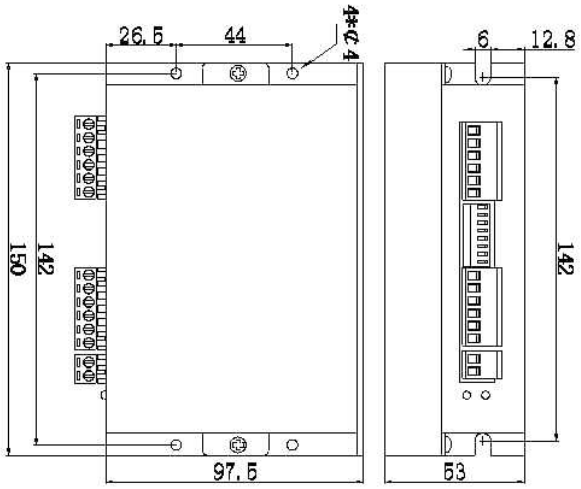
Faults alarm and LED flicker frequency



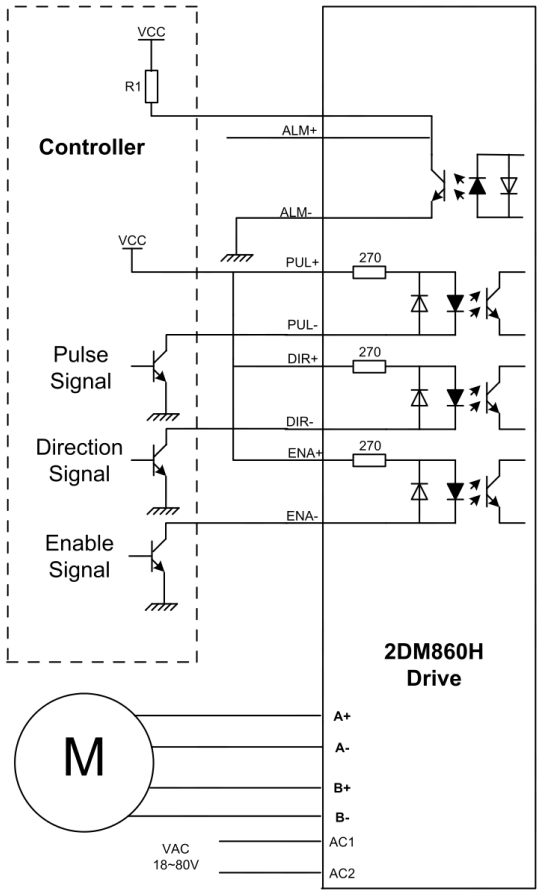
flash(s)	*description to the Faults*
1	Error occurs when the motor coil current exceeds the drive's current limit.
2	Voltage reference error in the drive
3	Parameters upload error in the drive
4	Error occurs when the input voltage exceeds the drive's voltage limit.

The drive will halt when there is fault. The user need to disconnect power source and reconnect the power source to eliminate the fault.

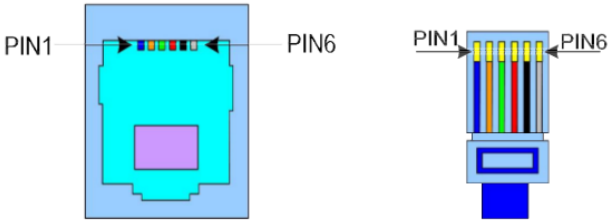
Mechanical Specifications



Wiring



RS232 Serial Interface



PIN1	TXD	Transmit Data
PIN2	RXD	Receive Data
PIN4	+5V	Power Supply to HISU
PIN6	GND	Power Ground

Parameter Setting

The parameter setting method of $2DM860H$ drive is to use a $HISU$ adjuster through the RS232 serial communication ports, only in this way we can set the parameters we want. There are a set of best default parameters to the corresponding motor which are carefully adjusted by our engineers, users only need refer to the following table, specific condition and set the correct parameters.

Mode	*Definition*	*Range*	*Dimension*	*Drive Restart*	*Default Value*
P1	Current loop K_p	$0-4000$	1	N	1000
P2	Current loop K_i	$0-1000$	1	Y	50
P3	Damping coefficient	$0-500$	1	N	200
P4	Amplitude of $1-$ resonance point	$0-100$	1	N	0
P5	Phase of $1-$ resonance point	$0-100$	1	N	0
P6	Amplitude of $2-$ resonance point	$0-100$	1	N	0
P7	Phase of $2-$ resonance point	$0-100$	1	N	0
P8	Anti-resonance coefficient	$0-1000$	1	N	0
P9	Reserved				
P10	Enable signal level	$0-1$	1	N	0
P11	Initial direction selection	$0-1$	1	N	0
P12	Reserved				
P13	Command Type	$0-1$	1	Y	0
P14	User-defined micro steps	$4-1000$	50	Y	0
P15	Time of standstill current	$0-4000$	$1ms$	N	1000
P16	Percentage of standstill current	$0-100$	1	Y	50
P17	Speed smoothness	$0-10$	1	Y	50
P18	Enable of position memory	$0-1$	1	Y	0
P19	User-defined resistance of motor	$0-100$	mh	Y	0
P20	User-defined inductance of motor	$0-100$	$0.1Ohm$	Y	0
P21	Result of position memory	0-128	1		0
P22	Reserved				

There are total 22 parameter configurations, use the $HISU$ to download the configured parameters to the drive, he detail descriptions to every parameter configuration are as follows:

Current loop K_p (P1) & Current loop K_i (P2)

The **P1** and **P2** is used to set K_p and K_i of Current loop at the moment of power-on. When the motor is turning, the K_p and K_i is got by the Self-tuning algorithm.

Current loop K_p

Increase Kp to make current rise fast. Proportional Gain determines the response of the drive to setting command. Low Proportional Gain provides a stable system (doesn't oscillate), has low stiffness, and the current error, causing poor performances in tracking current setting command in each step. Too large proportional gain values will cause oscillations and unstable system.

Current loop K_i

Adjust K_i to reduce the steady error. Integral Gain helps the drive to overcome static current errors. A low or zero value for Integral Gain may have current errors at rest. Increasing the integral gain can reduce the error. If the Integral Gain is too large, the system may "hunt" (oscillate) around the desired position.

Damping coefficient (P3)

This parameter is used to change the damping coefficient in case of the desired operating state is under resonance frequency.This parameter is useful in high speed.

Amp $1-2$ & Phase $1-2$ (P4,P5,P6,P7)

$2DM860H$ Driver provides robust anti-resonance control to stop the vibrations and maintain equilibrium.

Amp1 and **Phase1** is Phase adjustment for $1st$ and Amplitude adjustment for $1st$ resonance area respectively. Usually between $0.6rps$ and $1.2rps$.

Amp2 and **Phase2** is Phase adjustment for $2nd$ and Amplitude adjustment for $2nd$ resonance area respectively. Usually between $1.2rps$ and $2.4rps$.

Anti-resonance coefficient (P8)

This parameter is used for reducing resonance. Usually between 3rps and 4rps.

Enable signal level (P10)

This parameter is set to control the Enable Input signal level. 0 means high, while 1 means low.

Initial direction selection (P11)

For the initial direction selection, 1 indicates that the initial direction is the counter clockwise, and the 0 indicates the initial direction is clockwise.

User-defined micro steps (P14)

This parameter is set of user-defined micro steps. The actual micro steps = the set value $\times 50$. For example, if the parameter is 4, the micro steps is $4 \times 50 = 800$. But If this parameter is 0, which means micro steps is set by the outer DIP switches.

Time of standstill current (P15)

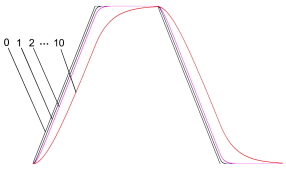
This parameter is set the time when the standstill current is set to be half of the selected dynamic current or other current.

Percentage of standstill current (P16)

This parameter is set the percentage of standstill current.

Speed smoothness (P17)

This parameter is set to control the smoothness of the speed of the motor while acceleration or deceleration, the larger the value, the smoother the speed in acceleration or deceleration.



Enable of position memory (P18)

This parameter is set to enable the function of position memory. 0 means disable, while 1 means enable. If set 1, the $2DM860H$ can remember the position of motor in the next time of power on.

User-defined inductance of motor (P19)

This parameter is set the inductance of motor. 0 means $2DM860H$ gets the inductance by control algorithm of Parameter auto-setup, while 1 means $2DM860H$ gets the inductance through user sets.

User-defined resistance of motor (P20)

This parameter is set the resistance of motor. 0 means $2DM860H$ gets the resistance by control algorithm of Parameter auto-setup, while 1 mean $2DM860H$ gets the resistance through user sets.

Result of position memory (P21)

This parameter is set to control the smoothness of Display the result of position memory

Processing Methods to Common Problems and Faults

Power on power light off

No power input, please check the power supply circuit. The voltage is too low.

Power on red alarm light on

- Please check the motor is connected with the drive.
- The stepper digital drive is over voltage or under voltage. Please lower or increase the input voltage.

After input pulse signal but the motor not running

- Please check the input pulse signal wires are connected in reliable way.
- Please make sure the input pulse mode is corresponding with the real input mode.
- The Driver is disabled.