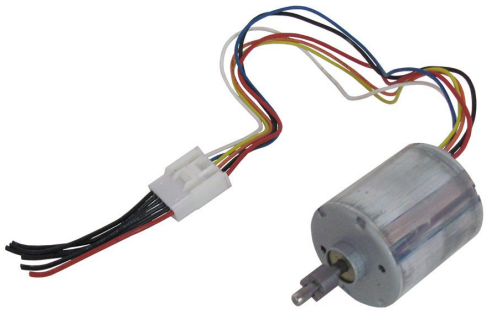
Nidec 22H BLDC motor

Nidec 22H677E010



I purchased this motor from Allelectronics (part# DCM-429, $3.75 each, Nidec #22H677E010 is on the case) to use as a stand-in for MIKE ADC software development. This motor has a integrated controls. Mine has a 4 mm diameter shaft, 18.2 mm long.

For the wiring, I was lucky in that "Jeffl_2" posted a wiring description on the allaboutcircuts forum (transcript at the end of this document). The wire assignments are in the following table:

Nidec 22H677E010 Wires

Wire	Color	Function
1	RED	+12VDC
2	BLACK	Ground
3	ORANGE	CW/CCW
4	YELLOW	Output Tach 2: pulses/rev = (3 x #poles / 2) (18 pulses/rev)
5	BLUE	PWM input (500 Hz to 50 kHz, > 20% duty cycle)
6	WHITE	Enable

Wire up two motors as in this table:

ATMega168 Pin Assignments (PDIP pin #s in parenthesis)

PORTB	PORTC	PORTD
PB0 (14) **TACHA**	PC0 (23) **DIRA**	PD0 (2) Rx **Com to RS-422**
PB1 (15) **TACHB**	PC1 (24) **DIRB**	PD1 (3) Tx **Com to RS-422**
PB2 (16) **LED Indicator**	PC2 (25) **ENABLEA (DEPL)**	PD2 (4) INT0 **HOMEA**
PB3 (17) MOSI **SPI**	PC3 (26) **ENABLEB (RETR)**	PD3 (5) INT1 **HOMEB**
PB4 (18) MISO **SPI**	PC4 (27) SDA **(DEPLOY SENS)**	PD4 (6) **CSA encoder**
PB5 (19) SCK **SPI**	PC5 (28) SCL **(RETRACT SENS)**	PD5 (11) **OC0B PWM MotorB**
PB6 (9) XTAL **14.7456 MHz**	PC6 (1) RESET	PD6 (12) **OC0A PWM MotorA**
PB7 (10) XTAL **14.7456 MHz**	No pin here	PD7 (13) **CSB encoder**

We're using the 8-bit timer0 to generate the motor speed PWM signal on pins PD6 (OC0A) and PD5 (OC0B).

From the motor's point of view, these are the connections:

Nidec 22H (MotorA) Connections to ATMega168

Wire	Color	Function	ATMega168 pin
1	RED	+12VDC	NC
2	BLACK	Ground	GND
3	ORANGE	DIRA	PC0
4	YELLOW	TACHA (Tach 2, twelve poles * 3/2 = 18 pulses/rev)	PB0
5	BLUE	PWM input (500 Hz to 50 kHz, > 20% duty cycle)	PD6 OC0A
6	WHITE	EnableA	PC2

Nidec 22H (MotorB) Connections to ATMega168

Wire	Color	Function	ATMega168 pin
1	RED	+12VDC	NC
2	BLACK	Ground	GND
3	ORANGE	DIRB	PC1
4	YELLOW	TACHB (Tach 2, twelve poles * 3/2 = 18 pulses/rev)	PB1
5	BLUE	PWM input (500 Hz to 50 kHz, > 20% duty cycle)	PD5 OC0B
6	WHITE	EnableB	PC3

Motor type

There are many Nidec 22H variants: four different 12-volt and five different 24-volt versions. I think this motor is a 24-volt Type 4.

The spec sheet says the tachometer 2 output is (# poles 3 / 2) = 18 pulses per revolution. Using the tachometer output, my measured top speed with a 24-volt supply is around 3420 rpm; the datasheet says the maximum no-load speed is 3300 rpm, which is consistent.

I measured the current draw at maximum no-load speed to be 0.74 amps, also consistent with the datasheet value of 0.74 amps (exactly the same).

Notes from the web

Jeffl_2 posted his understanding of the wires for this motor on the the allaboutcircuts forum:

Jeffl_2 09-17-2013, 10:55 PM

I have a Nidec 22H677E010 that I got from All Electronics, that's not the same as yours but I've done a rather thorough analysis and I did get mine to spin. These motors appear to use the Rohm BD6922FV controller chip but that doesn't really help much because even that data sheet doesn't say very much about applications, however I did manage to figure out that you need to apply the correct supply voltage AND a valid PWM signal AND pull up the start line before ANYTHING happens (the inputs are 5 volt TTL compatible, the outputs are all open collector). The part I have happens to be a 24 volt "type 5" motor with sleeve bearings. The PWM signal has to be between 500 hertz and 50 kilohertz with at least a 20% duty cycle. The color code on the wires of the model I have is as follows: red = 24 volt, blk = ground, wht = input start, blu = input PWM, yel = output tach 2 (motor poles x 3 / 2), orange = input reverse. Your wire colors could be similar or they might be quite different. You could use a 5 volt MCU to output the PWM or just a 555 chip powered by 5 volts, the resistor network would be from +5 tie a 2K resistor to a 10K pot to 200 ohms to the junction of pins 2, 6 and a 10 nf cap to ground, tie the wiper to pin 7 and take pin 3 as PWM, tie pins 4 and 8 to +5 and 1 to ground, that'll get you about 16 kHz varying duty cycle 20% to about 98% by adjusting the pot. You can tell if you've got the correct supply voltage by whether the no-load current matches any of those shown on the data sheet. Good luck!

On the Allelectronics product site, there's another comment with the wire descriptions (maybe the same guy):

A customer from Camarillo, CA

NOT a "stepper"

This is a Nidec 22H brushless DC motor that is designed to run on 24 volts, it is called a "type 5" on the data sheet so the stator windings are high inductance which tends to limit the maximum speed, sleeve bearings. From what I can tell it uses a Rohm BD6922FV controller chip but there's not a lot of info available about it either. Probably the reason people are having trouble getting it to work is the shaft won't rotate unless there is actually a PWM signal present, you can't just "tie it high", data sheet says 500 Hz to 50 kHz. All inputs are 5V TTL compatible and outputs are open collector. Many 22Hs were made for Dell 3100CN printers but I have no idea whether they used this model. Pinout is as follows: red = 24V, blk = gnd, wht = input start, blue = input PWM, org = input fwd/rev, yel = output tach 2, motor poles x 3/2. Would work well under control of a 5V MCU or just use a 555 running on 5V to generate the PWM and control the speed which should be about 2150 RPM unloaded.