



P/N DCS4020
Bipolar
Chopper Drive Manual

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Bipolar Chopper Drive Manual

Model DCS4020

Introduction

The bipolar chopper drive has been designed for easy set-up and use. It is ideal for development projects, just connect a single power supply and a motor and the drive is ready to run. Motor current is set using an on-board potentiometer. No external current setting resistors are required. This feature-packed drive provides all basic motor controls, including full or half stepping of bipolar steppers and direction control. An oscillator circuit is standard on the drive with an on-board speed control potentiometer. In addition, external input/output signals allow complete remote control of all drive functions.

Specifications

Nominal Dimensions	113.3 mm L X 78.0 mm W X 33.1 mm H (including mating connectors)
Input Voltage	+24 to +40 Vdc
Motor Direction	Selected via on-board switch or external control via input/output (I/O) connector.
Motor Enable	Enabled/disabled via on-board switch or external control via I/O connector.
Step Rate	<i>Single step operation:</i> via on-board push-button switch or external pushbutton switch via I/O connector. <i>Continuous operation:</i> via on board potentiometer controlled oscillator (10 Hz to 2 KHz). <i>External Control:</i> via I/O connector.
Motor Current	Adjustable from ~66 mA/Ø to ~3 A/Ø. 2 A/Ø continuous duty rating. (Up to 3A/Ø peak non-repetitive rating.)
Stepping Modes	Full step - 2 phases ON Half stepping
Bipolar Drive	Dual full bridge motor driver based on ST Microelectronics part numbers L297 and L298N.
Power Supply	24 Vdc minimum 40 Vdc maximum (reduce power supply voltage if drive heatsink temperature exceeds 55°C). Current up to 4 Amps depending on stepper motor used.

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Power Supply Connections

1. Connect the “positive” (+) lead to + Vdc.
2. Connect the “negative” (-) lead to GND.

This supply powers the stepper motor and electronics (via an on board 5 v regulator).

This drive is intended to operate a low power bipolar stepping motor.

The 4 lead wires from the motor are connected to the removable 4 pin connector, (see “Connector Pin Allocation” for the proper wiring sequence).

WARNING: To prevent damage to motor driver turn off power supply or disable motor outputs **BEFORE** connecting or disconnecting motor leads.

Setting Motor Current

Ensure that the motor leads are connected to the drive and that power is applied at + Vdc and GND. Flip the Enable switch to the ON position. Connect a high impedance (DVM) type voltmeter to the VREF + and VREF - terminals. Adjust the Current Adj. potentiometer, while monitoring the voltmeter, to set the motor current per the following formula:

$$\text{RMS Motor current (Amps)} = 2 \times \text{V Ref (Volts)}.$$

Example: To set a motor current of 0.75 A/Ø, adjust P2 until V Ref reads 0.375 Volts.

Remove the voltmeter.

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Switch Settings - Local Control

Step Rate

	SW1-1	SW1-2
Single Step	ON	ON
Continuous Step	ON	OFF

Motor Enable

	Enable
Enable	OFF
Disable	ON

Motor Direction

	Direction
Clockwise	ON
Counter Clockwise	OFF

Step Mode

	Half/Full
Full Step (2 phases on)	ON
Half Step	OFF

Step Clock Select

	Clock Select
Internal Oscillator	ON
External	OFF

Step Rate Adjustment: The step rate can be varied between 10 steps/sec and 2000 steps/sec by adjusting the Speed Adj. potentiometer.

External I/O Control

External Clock: An external clock or pulse source can be substituted for the on-board oscillator. This can allow indexing and ramping of the motor.

1. Flip the Clock Select switch to the OFF position.
2. Connect an external oscillator to X Clock (T2A-3) and GND.
3. Signal amplitude must remain within the limits of 0 to +5V (TTL Logic).

External Direction Control:

1. Flip the Direction switch to the OFF position.
2. Connect external direction control to X Direction (T2B-4) and GND. Logic low for CW, Logic high for CCW.
3. Signal amplitude must remain within the limits of 0 to +5V (TTL Logic).

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External I/O Control con't

External Enable Control:

1. Flip the Enable switch to the OFF position.
2. Connect external enable control to X Enable (T2B-5) and GND. Logic low for disabled, Logic high for enabled.
3. Signal amplitude must remain within the limits of 0 to +5V (TTL Logic).

External Step Rate Control: Provisions have been made to control the on-board oscillator with an external fixed or variable resistor.

1. Clip open jumper J3 to disable the on-board potentiometer P1.
2. Connect a fixed or variable resistor between terminals X Pot. + and X Pot. -. If using a variable resistor then connect 270 ohm or larger resistor in series with the variable resistor.
3. The step rate can be changed by varying the value of the external resistance.

External Half/Full Step Control:

1. Flip the Half/Full step switch to the OFF position.
2. Connect external control to X Half/Full (control can even be a switch to GND. Logic low for full step, logic high for half step.
3. Signal amplitude must remain within the limits of 0 to +5V (TTL logic).

External Single Step Switch Control:

1. Flip the on-board Switches (SW1-1) to OFF, and (SW1-2) to the ON position.
2. Connect a normally-open momentary switch between terminals X Sgl. Step and GND.
Note: The on-board single step pushbutton switch will remain active in this mode.
3. The external switch can remain connected even when switching back to the continuous step mode.

External Reset Control:

1. Connect external reset control to X Reset and GND. Logic low for reset (translator at "home" state, i.e. L297 I.C. outputs A, Not A, B, Not B = 0101), Logic high (or floating) for normal operation.
2. Signal amplitude must remain within the limits of 0 to +5V (TTL logic).

"Home" State Output:

1. This is an open collector output that indicates when the L297 I.C. is in the "home" state (outputs A, Not A, B, Not B = 0101).
2. Connect a "pull-up" resistor (value of 1K ohm through 5K ohm) between this output (Home) and +5V (X Pot. +). Logic low output is inactive state, logic high output is active "home" position state.

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Connector Pin Allocation

PIN #T1	PIN #T2	Description - Can Stack Motors	Hybrid Motors
1		Bipolar drive output, RED (Phase A)	RED
2		Bipolar drive output, BLACK (Phase A)	RED/WHITE
3		Bipolar drive output, BLUE (Phase B)	GREEN/WHITE
4		Bipolar drive output , GREEN (Phase B)	GREEN
	1	Common negative (-) connection (GND)	
	2	External power input, positive (+) 24 to 40 Vdc.	
	3	External clock input	
	4	Internal chopper sync output	
	5	"Home" state output	
	6	+5V output - also optional external potentiometer connection (+)	
	7	Optional external potentiometer connection (-)	
	8	External half step/full step control	
	9	External reset control	
	10	External direction control	
	11	External enable control	
	12	Optional external single step switch connection	

