CN0121A
H-BRIDGE AMPLIFIER

CENTENT COMPANY

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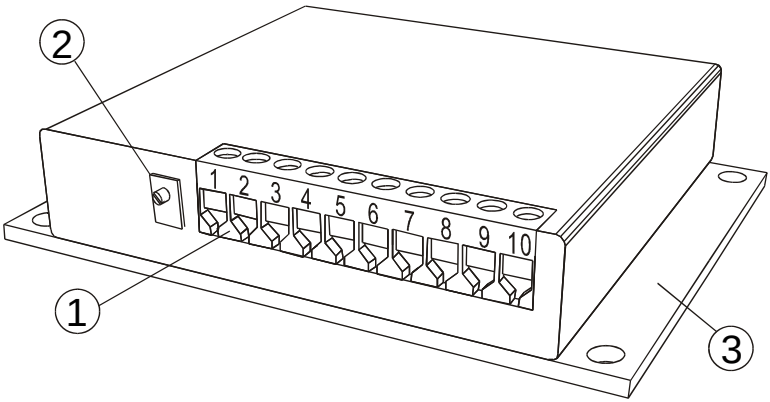
This manual contains information for installing and operating the following Centent Company product:

CN0121A H-Bridge Amplifier

GENERAL DESCRIPTION

The CN0121A is an H-Bridge Servo Amplifier designed for bi-directional operation of permanent magnet (PM) DC motors. The control features a conservative design employing rugged 15 amp, 80 volt output transistors. It is a linear, Class B, current limited amplifier. When adequately heat sunk it can dissipate up to 150 watts of power. There are no safe operating area (SOA) load restrictions, so full output current is available at any voltage. The CN0121A also features a precision two-quadrant current sense amplifier for feedback applications. If the CN0121A is configured as a motor speed control, the Speed Regulation Trimpot is used to adjust for motor speed regulation. Convenient external phase compensation is provided, making this amplifier ideal for use in position or velocity servo applications.



(1) TERMINAL STRIP CONNECTOR

No terminals or connectors are required on the wiring to the CN0121A. The recommended wire size is 16-22 gauge. The terminal assignments and functions are described in the following sections.

MOTOR OUTPUTS *TERMINALS 1 & 9*

The positive motor lead is connected to Terminal 1 and the negative motor lead is connected to Terminal 9. With the motor connected in this way, when the voltage on the non-inverting input, Terminal 7, is greater than the voltage on the inverting input, Terminal 8, the motor will turn clockwise. When the voltage on Terminal 7 is less than the voltage on Terminal 8 the motor will turn counter-clockwise.

The output voltage across the motor is ± 25 volts with a 28 volt power supply. The maximum motor current is 5 amps. The motor output terminals are diode clamped to ground and to the positive supply voltage. The CN0121A's output stages are conservatively designed, utilizing 15 amp @ 80 volt power transistors.

CURRENT LIMIT OUTPUTS *TERMINAL 3 & 4*

A resistor is connected between these Terminals to set the motor output current limit. If no resistor is used the motor current limit is 5 amps. The resistor value is calculated from the following equation:

$$R_I = \frac{(600)I_{LIM}}{5 - I_{LIM}}$$ *Where:* I_{LIM} = output current *and* R_I = limit resistor

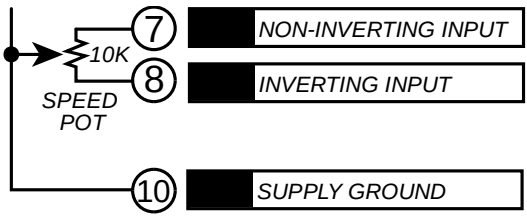
Resistance values for output currents ranging from 1 to 5 amps in ½ amp increments are printed on the CN0121A for user convenience. The following table also lists the closest values for the given motor current using standard ¼ Watt, 5% Carbon Film Resistors.

CURRENT LIMIT TABLE (Terminals 3-4)		
AMPS	*RESISTANCE*	*5% RESISTOR*
5.0	OPEN	none
4.5	5400 ohm	5.6K
4.0	2400 ohm	2.4K
3.5	1400 ohm	1.5K
3.0	900 ohm	910
2.5	600 ohm	620
2.0	400 ohm	430
1.5	257 ohm	270
1.0	150 ohm	150

DIFFERENTIAL INPUTS *TERMINALS 7 & 8*

Terminal 8 is the inverting input and Terminal 7 is the non-inverting input. If the voltage on Terminal 7 is positive with respect to Terminal 8 the motor will turn clockwise. If Terminal 7 voltage is less than Terminal 8 voltage, the motor will turn counter-clockwise.

The input impedance is 10K ohms. The Common-Mode Voltage range is from the positive supply voltage to -1 volts. The maximum Input Offset Voltage is 20 millivolts. The Differential Voltage Gain is internally set to 27. With a 28 volt power supply, a voltage of ±1 volt between the inputs is sufficient to drive the output to saturation in either direction.



The motor may be driven by connecting a 10K ohm potentiometer across the inverting and non-inverting inputs with the wiper connected to ground. This is shown on the cover of the CN0121A.

CURRENT SENSE OUTPUT *TERMINAL 5*

This output provides a voltage proportional to the motor current. It is offset from ground potential by one half of the power supply voltage. The output impedance is 10K ohms.

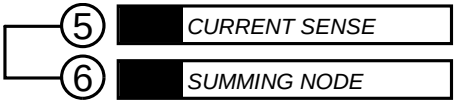
A clockwise turning motor's current causes the Current Sense Output voltage to become more positive. A counter-clockwise turning motor's current causes the output voltage to become more negative.

The transconductance of this stage is variable. It ranges from 0 to 15 volts per amp of motor current and is adjusted by the Speed Gain Trimpot.

SUMMING NODE *TERMINAL 6*

This node sums the differential amplifier output, the Current Limit Output, and if connected, the Current Sense Output.

Connecting the Current Sense Output, Terminal 5, to the Summing Node will make the CN0121A operate as a speed control.



If a Phase Compensation Network is necessary, it may be connected to the Summing Node, Terminal 6.

POWER SUPPLY INPUTS *TERMINALS 2 & 10*

The power supply is connected to Terminal 2 and Terminal 10. Terminal 2 is the positive supply input and Terminal 10 is the supply ground.

> Reversing the power supply leads to the CN0121A will result in destruction of the drive; so be careful to check the wiring before powering up the drive.

A regulated supply is recommended but is not necessary. The power supply voltage can range from 9 VDC to 32 VDC. Do not exceed the CN0121A's maximum rated voltage. The current rating of the power supply must be at least equal to the maximum motor current plus the quiescent current draw for the CN0121A. Quiescent current draw (motor not connected) is 22 milliamps @ 9 VDC to 75 milliamps @ 32 VDC.

(2) SPEED GAIN TRIMPOT

This multi-turn trimmer potentiometer is located on the front face of the CN0121A adjacent to the Input/Output Connector. Adjusting the Speed Gain Trimpot will offset the motor's series resistance; thus making motor speed independent of the torque load. Turn the trimmer clockwise to increase gain and thus maintain speed under load. Turn the trimmer counter-clockwise to decrease gain.

The following procedure should be used to adjust the Speed Gain Trimpot:

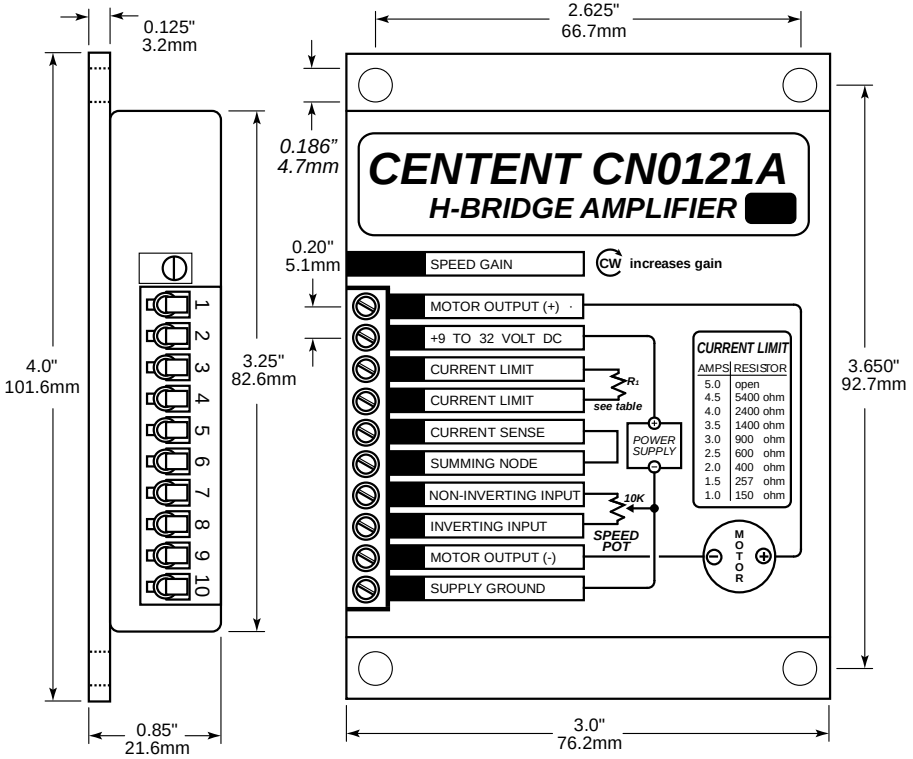
1) Set the motor speed to 5-10% of maximum speed.
2) Apply a load to the motor and observe if the speed increases or decreases.
3) Remove the load.
4) If speed increases under load, turn the trimpot counter-clockwise.
If speed decreases under load, turn the trimpot clockwise.
5) Repeat steps 2 through 4 until there is no observable change in speed when load is applied or removed.

Note: if the motor oscillates when step 1 is attempted, turn the trimpot counter-clockwise until the motor runs smoothly; then proceed with steps 2-5.

(3) MOUNTING PLATE

The CN0121A is a linear amplifier. As a consequence it may dissipate considerable heat while running large motors at low speed under heavy load. This heat may cause damaging temperatures in the CN0121A. For this reason it is extremely important to properly heat sink the drive.

Mount the CN0121A on a finned aluminum heat sink using thermal compound between the CN0121A and the heat sink. If needed, use a fan to force air over the heat sink. Monitor the case temperature of the CN0121A under the worst case motor load conditions. Do not let the case temperature exceed 70°C (158°F).



SPECIFICATIONS

ELECTRICAL	MIN.	MAX.	UNIT
Power Supply Voltage	9	32	VDC
Power Supply Current *	--	70	mA
Motor Voltage *	-25	+25	VDC
Maximum Load Current	-5	+5	A
Voltage Gain	25.6	28.3	%
Frequency Response	DC	20	KHz
Common Mode Range	-1	V_{supply}	V
Input Impedance	--	10K	ohms
Input Offset	--	20	mV
Input Bias Current (inputs grounded)	--	150	µA
Current Range Limit	-5	+5	A
Current Sense Output	0	15	V/A

* using 28 VDC power supply

ENVIRONMENTAL	MIN.	MAX.	UNIT
Operating Temperature	-40	+70	ºC
Weight	300	400	gram
Terminal Screw Torque		4.5	lb/in