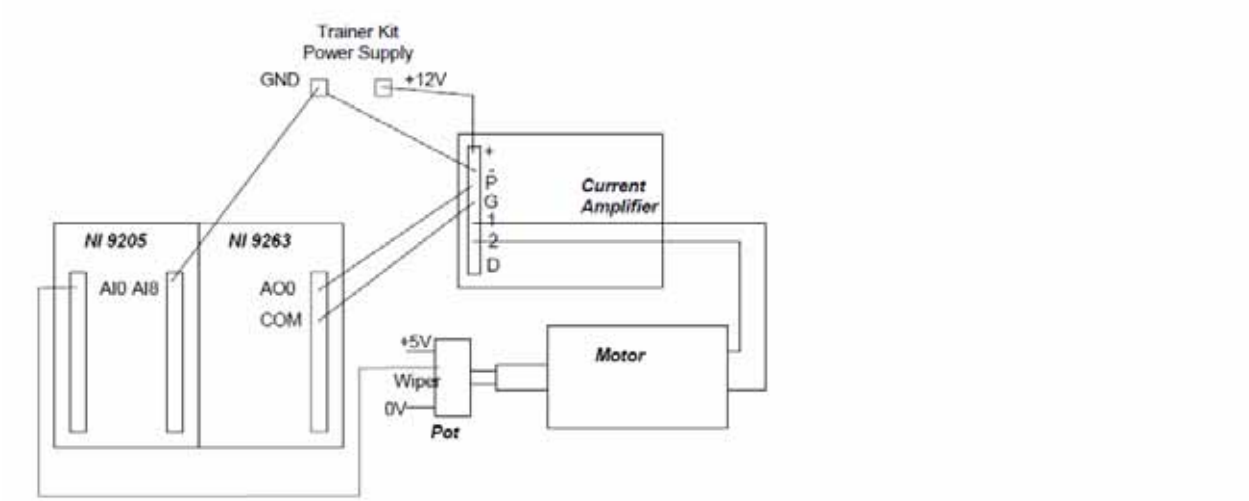
MAE106 Low-Cost Current Amplifier

When you apply a low-power voltage (-5 to 5 volts) to the amplifier at pin P, it provides a high-power current (0-3 amps, 12-55 Volts depending on the supply voltage) for the motor (which you connect to pins 1 and 2). The output current is proportional to the input voltage at P. The following diagram shows how to wire the system to the NI 9205 AD and NI 9263 DA units and a motor with a potentiometer. Note that AI stands for analog input, AO for analog output, and COM for ground. The P input on the current amplifier takes a -5 to +5 voltage.



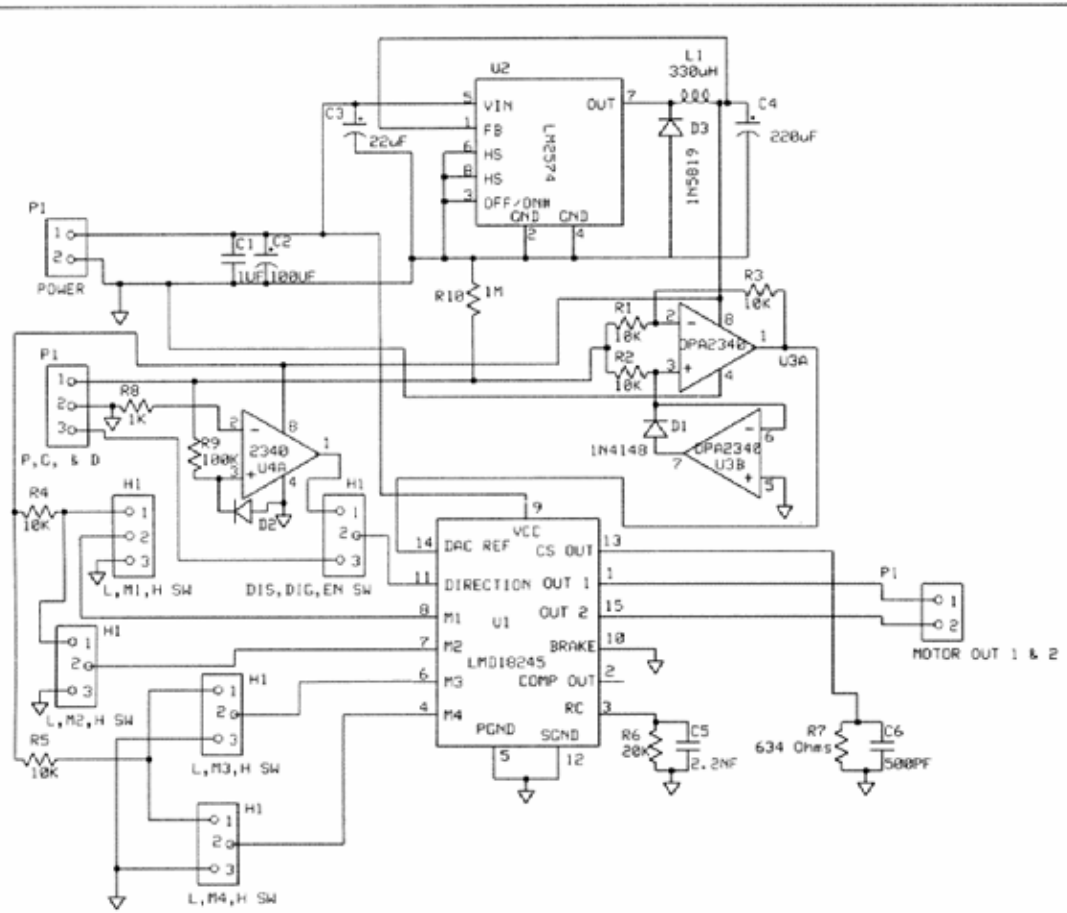
The current amplifier terminals are as follows:

+	Positive power supply	connected to +12 V on trainer kit
-	Negative power supply	connected to Ground on trainer kit
P	Input into current amplifier	connected to NI 9263 AO0
G	Ground	connected to NI 9263 COM (common)
1,2	Leads through which current is generated	connected to motor
D	Direction input	unconnected

The amplifier is a switching type amplifier. This means that it creates the desired current by rapidly switching on and off at an appropriate rate. The switching rate for switching amplifiers is typically more than 10 KHz. The advantage of a switching type amplifier is that it consumes less power because the power transistors inside it don't heat up much when they are fully off (so I = 0 and Power = IV = 0), or when they are fully on (so R = 0 and $P=I^2R=0$). Another common type of amplifier is a linear amplifier, and it biases power transistors between fully "off" and fully "on" (0<R<inifinity), and thus the transistors heat up. The disadvantage of a switching amplifier is that the rapid switching adds electrical noise (and sometimes audible noise – try to listen to see if you can hear the amplifier switching frequency, if you have decent hearing it shouldn't be too hard to hear).

Note: there is a jumper on the board which disables the D (Direction) input. When the D jumper is moved and the D input is enabled, a digital high (5 volts) or low (0 volts) on D will make the motor shaft turn one or the other direction, with a current proportional to a 0-5 volt input on the P input.

The underlying driver chip is a National Semiconductor LMD18245 (3A, 55V DMOS Full-Bridge Motor Driver). A complete schematic of the driver circuit is shown on the next page.



Note:

P = Pot or motor controlled signal

C = Ground, same as - for motor power

D = Digital control of motor direction

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MOTOR DRIVER		
Dave Hartwig	Rev C 9/29/03	Page 1 Of 1