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USER MANUAL

AMP 1

40W 4-Channel Linear Brush Motor

3Ax-603489-xUxx

August 22, 2006



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REVISION HISTORY				
REV.	**DESCRIPTION**	**DATE**	**CHG**	**APPVD**
1	E-POINT JUMPER & AMP SPEC REVISIONS	08/22/06	CP	R. UNADKAT

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INTRODUCTION

The Amp 1 Linear Amplifier is a 3U-size amplifier designed to drive small DC brushed type motors or proportional hydraulic valve actuators. This amplifier provides four 40W continuous (60W intermittent) linear amplifiers. The Amp 1 Linear Amplifier may be interfaced conveniently to the PMAC controller via Acc-24E2A. The maximum bus voltage for this amplifier is 24VDC and the continuous rating for each drive is 0.5A.

The amplifiers on this product will output a current or voltage that is proportional to the voltage input.

The amplifier can receive its logic power supply (_15V) from the 3U-power supply and the bus voltage is supplied from a separate supply.

Power Supply Considerations

The Amp 1 Linear Amplifier requires a single power supply of +12V to +24V max. The current requirement can vary depending on the load, but should not exceed 4A (1A per channel) continuous and 8A peak (2A per channel) for a one-second period. A slow blow 5A fuse is installed to protect the shunt and a fast acting 8A fuse to protect the main bus.

If the amplifier is driven beyond its rated power, driver overheating may occur. In this event, the driver will output a fault signal on the corresponding pin of Terminal Block 2 (TB2) and turn on the corresponding red LED next to Terminal Block 1, TB1, shown in the Amplifier Layout Diagram.

Selecting Current vs. Voltage Mode

The Amp 1 Linear Amplifier can be configured in either current or voltage mode. This is configured by setting the following E-point jumpers.

Maximum Current Output E-Point Jumpers

Each of the amplifiers has an E-point jumper that allows changing the transconductance factor of the amplifier.

Jumper	Description	Default
	Channel 1 Setup	
E1A	Jumper 1-2 Current Mode with gain of 0.2 A/V	**X**
E1B	Jumper 1-2 Current Mode with gain of 0.04 A/V	
E1A & E2	Jumper 1-2 Voltage Mode with gain of 1V in = 2.6V out	
No jumper	Jumper 1-2 Current Mode with gain of 0.02 A/V	
	Channel 2 Setup	
E3A	Jumper 1-2 Current Mode with gain of 0.2 A/V	**X**
E3B	Jumper 1-2 Current Mode with gain of 0.04 A/V	
E3A & E4	Jumper 1-2 Voltage Mode with gain of 1V in = 2.6V out	
No jumper	Jumper 1-2 Current Mode with gain of 0.02 A/V	
	Channel 3 Setup	
E5A	Jumper 1-2 Current Mode with gain of 0.2 A/V	**X**
E5B	Jumper 1-2 Current Mode with gain of 0.04 A/V	
E5A & E6	Jumper 1-2 Voltage Mode with gain of 1V in = 2.6V out	
No jumper	Jumper 1-2 Current Mode with gain of 0.02 A/V	
	Channel 4 Setup	
E7A	Jumper 1-2 Current Mode with gain of 0.2 A/V	**X**
E7B	Jumper 1-2 Current Mode with gain of 0.04 A/V	
E7A & E8	Jumper 1-2 Voltage Mode with gain of 1V = 2.6V out	
No jumper	Jumper 1-2 Current Mode with gain of 0.02 A/V	

Jumpers are provided to lower the current output rating either 200 or 400mA, for motors with smaller current needs. Effectively, this cuts the amplifier transconductance factor in half, allowing use of the full +10V from PMAC's DAC outputs rather than scaling the system to output +2V via Ix69.

Note:

If the amplifier is driving a DC motor at high speeds, the current supply to the motor may be reduced if the back EMF voltage of the motor is sufficiently large (refer to the motor manufacture's data sheet).

Amplifier-Enable/Fault Polarity Selection

The controller (PMAC or UMAC) should be configured for low-true amplifier-enable signals. A green LED next to Terminal Block 1 (TB1) for each amplifier on the 3U linear amplifier is lit when the board is receiving power and that amplifier is enabled.

Also, if the amplifier fault signal is fed back to PMAC, bit 23 (the most significant bit) of Ix25 (PMAC) or bit 23 of Ix24 for Turbo PMAC should be set to zero for Low True fault input. The red LED for each channel is lit when the amplifier faults (overheats).

Torque/Velocity Control

For direct torque or velocity control, the following I-variables may be adjusted as part of the motor software setup (Example for PMAC2-Turbo):

Ixx00	Set to 1 to activate motor.
Ixx02	Motor xx Command Output Address. For example: I102=$078003 to use DAC1 with motor 1.
Ixx03	Motor xx Position Loop Feedback Address. For example: I103=$3501 to use Encoder 1.
Ixx04	Motor xx Velocity Loop Feedback Address. For example: I104=$3501 to use Encoder 1.
Ixx24	Set motor xx Flag Mode Control. For example: I124=$100001 to specify high true fault input.
Ixx25	Set motor xx Flag Address. For example: I125=$078000 to specify channel 1 flags.
Ixx69	Set motor xx Output Command Limit.

Refer to the Turbo PMAC/PMAC2 Software Reference Manual for full descriptions of these I-variables.

HARDWARE DESCRIPTION

There are six connectors on the QUAD H-Bridge Amplifier board:

- TB1: 8-Pin PMAC Interface Terminal Block
- TB2: 13-Pin Motor Amplifier Output Terminal Block
- TB3: External Power Ground
- TB4: External Bus Power
- TB5: External logic power
- P1: 96-Pin Power Input Connector

TB1: 8-Pin PMAC Interface Terminal Block

This terminal block provides the actual connection to the motors.

Pin	Symbol	Function	Description
1	AMPOUT1	Output	First Motor + Lead
2	AMPOUT1/	Output	First Motor - Lead
3	AMPOUT2	Output	Second Motor + Lead
4	AMPOUT2/	Output	Second Motor - Lead
5	AMPOUT3	Output	Third Motor + Lead
6	AMPOUT3/	Output	Third Motor - Lead
7	AMPOUT4	Output	Fourth Motor + Lead
8	AMPOUT4/	Output	Fourth Motor - Lead

TB2: 13-Pin Motor Amplifier Output Terminal Block

This connector brings in up to four analog command signals and amplifier-enable lines. It also sends the amplifier fault signal back to the controller.

Pin	Symbol	Function	Description	Notes
1	DAC1+	Input	Command Signal 1	Reference to AGND
2	AENA1-	Input	Amplifier Enable 1	Reference to AGND
3	FAULT1-	Output	Amplifier Fault 1	Reference to AGND
4	DAC2	Input	Command Signal 2	Reference to AGND
5	AENA2-	Input	Amplifier Enable 2	Reference to AGND
6	FAULT2-	Output	Amplifier Fault 2	Reference to AGND
7	AGND		Analog Ground	
8	DAC3	Input	Command Signal 3	Reference to AGND
9	AENA3-	Input	Amplifier Enable 3	Reference to AGND
10	FAULT3-	Output	Amplifier Fault 3	Reference to AGND
11	DAC4	Input	Command Signal 4	Reference to AGND
12	AENA4-	Input	Amplifier Enable 4	Reference to AGND
13	FAULT4-	Output	Amplifier Fault 4	Reference to AGND

TB3: External Power Ground

Pin	Symbol	Function	Description
1	PGND	Input	Bus power reference

TB4: External Power

Pin	Symbol	Function	Description
1	A+24V	Input	Bus power reference

TB5: External Logic Power

Pin	Symbol	Function	Description
1	AGND	Input/Output	Reference for logic supply
2	A+15V	Input	For logic power (usually from backplane)
3	AGND	Input/Output	Reference for logic supply
4	A-15V	Input	For logic power (usually from backplane)

P1: 96 Pin Power Input Connector

Pin#	Row A	Row B	Row C
1	PGND	PGND	PGND
2	PGND	PGND	PGND
3	PGND	PGND	PGND
4	PGND	PGND	PGND
5	PGND	PGND	PGND
6	PGND	PGND	PGND
7	PGND	PGND	PGND
8	PGND	PGND	PGND
9	NC	NC	NC
10	+24V (bus)	+24V (bus)	+24V (bus)
11	+24V (bus)	+24V (bus)	+24V (bus)
12	+24V (bus)	+24V (bus)	+24V (bus)
13	+24V (bus)	+24V (bus)	+24V (bus)
14	+24V (bus)	+24V (bus)	+24V (bus)
15	+24V (bus)	+24V (bus)	+24V (bus)
16	+24V (bus)	+24V (bus)	+24V (bus)
17	+24V (bus)	+24V (bus)	+24V (bus)
18	NC	NC	NC
19	DB R+	DB R+	DB R+
20	DB R+	DB R+	DB R+
21	DB R+	DB R+	DB R+
22	DB R+	DB R+	DB R+
23	NC	NC	NC
24	DB R-	DB R-	DB R-
25	DB R-	DB R-	DB R-
26	DB R-	DB R-	DB R-
27	DB R-	DB R-	DB R-
28	NC	NC	NC
29	AGND	AGND	AGND
30	A+15V	A+15V	A+15V
31	AGND	AGND	AGND
32	A-15V	A-15V	A-15V

Amplifier Specifications

Power Stage Specifications

Description	Specification
V+ input voltage	12V minimum, 24V maximum
Logic power	15V @ 100mA, -15V @ 50mA
Transconductance factor	0.2 A/V, 0.04 A/V, or 0.02 A/V
Max continuous current	4A (1A per channel)
Peak current	8A (2A per channel)
Command input voltage	+/- 10V

Mechanical Specifications

Size & Dimension	See Diagram
TB1 Connector	8-pin Screw Terminal
TB2 Connector	13-pin Phoenix
TB3 Connector	1-pin Screw Terminal
TB5 Connector	1-pin Screw Terminal
TB4 Connector	4-pin Screw Terminal
P1 Connector	96-pin 3U back plane

Environmental

Operating Temperature	0 C to 55 C (32 F to 135 F)
Storage temperature	-12 C to 82 C (10 F to 180 F)
Humidity	0% to 95%, non-condensing

Amplifier User Components Description

Fuses

Label	Type	Description
F1	8A	Fast Blow for BUS

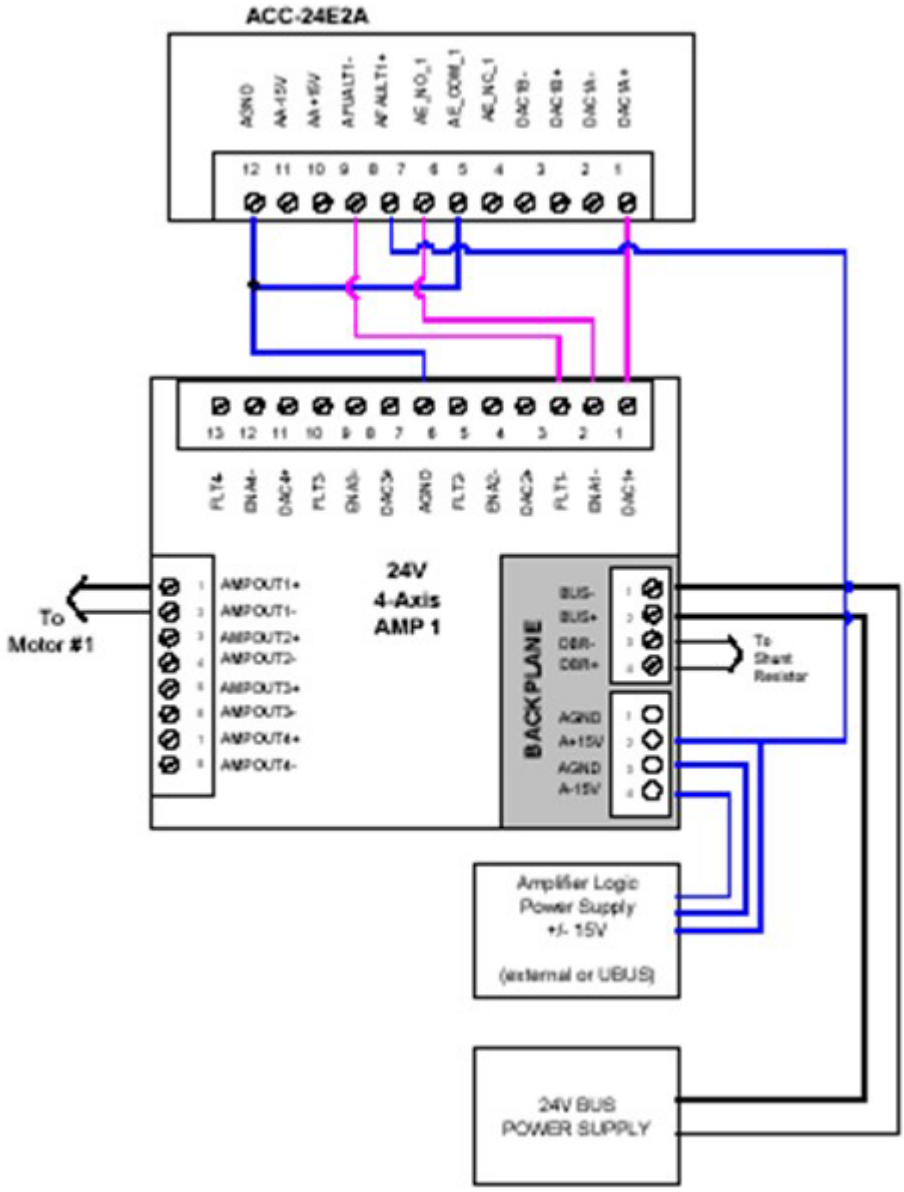
LEDs

Label	Function
LD1	Channel 1 Enable
LD2	Channel 1 Fault
LD3	Channel 2 Enable
LD4	Channel 2 Fault
LD5	Channel 3 Enable
LD6	Channel 3 Fault
LD7	Channel 4 Enable
LD8	Channel 4 Fault
LD10	Over Temperature Fault

Offset Pots

Name	Label	Function
A	R6	Channel 1 Current Offset
B	R46	Channel 2 Current Offset
C	R86	Channel 3 Current Offset
D	R126	Channel 4 Current Offset

SAMPLE WIRING DIAGRAM

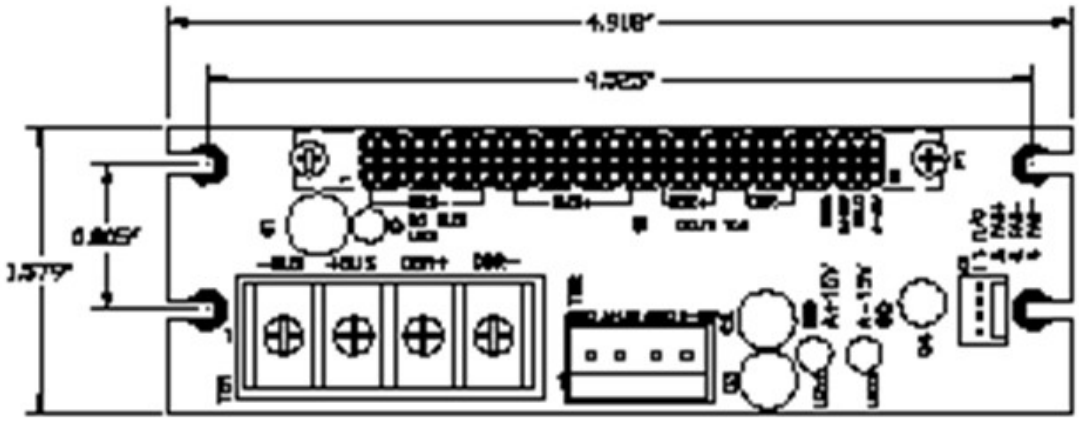


ANALOG AMPLIFIER BACKPLANE BOARD

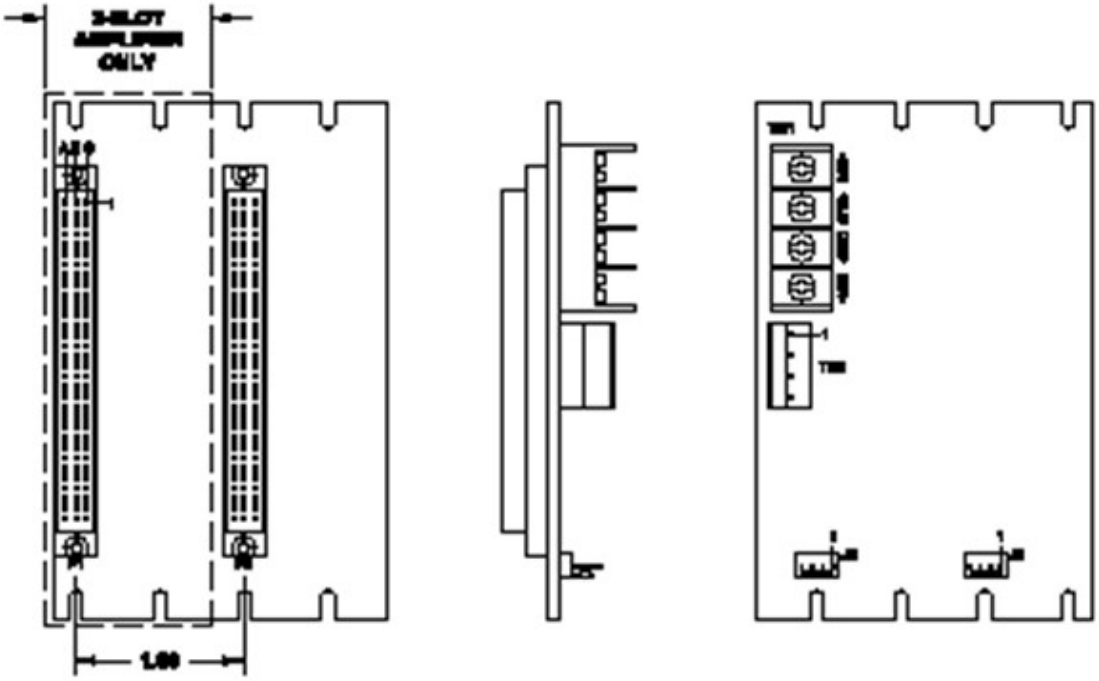
The analog amplifier backplane board allows easy access to power the Quad H-Bridge amplifier units when placed in the 3U racks. The amplifier backplane boards come in two options: single amplifier 2-slot assemblies or dual amplifier 4-slot assemblies. The board itself has terminal screws for the external bus, external shunt resistors, a Molex connector for the logic power, and another Molex connector for the cooling fans.

Backplane Board	Part Number	3U Slots used
Single Amplifier	603490-10x	2
Dual Amplifier	603470-10x	4

Single Quad H-Bridge Amplifier Backplane Layout



Dual Quad H-Bridge Amplifier Backplane Layout



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