USER MANUAL

AMP-2

4-Axis PWM Brush Motor 40V DC Bus

3Ax-603443-360

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DELTA TAU
Data Systems, Inc.
NEW IDEAS IN MOTION ...

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INTRODUCTION

The Delta Tau AMP-2 or QUAD H-Bridge Low Power Drive is a 3U-size amplifier designed to drive DC brushed type motors in the UMAC system. This amplifier provides four 80W continuous PWM amplifiers. The QUAD H-Bridge Low Power Drive may be interfaced conveniently to the PMAC controller via ACC-24E2A. The maximum bus voltage for this amplifier is 40VDC and the continuous rating for each drive is 2A.

The amplifiers on this product will output a current that is proportional to the voltage input. The amplifier was designed to be used with torque or current command inputs from the controller but if the controller has microstepping capabilities, the user can also use the product to drive stepper motors.

Power Supply Considerations

The QUAD H-Bridge Low Power Drive requires a single power supply of +15V to +40V max. The current requirement can vary depending on the load, but should not exceed 12A (2A per channel) continuous and 20A peak (4A per channel) for a one-second period. A slow blow 5A fuse is installed to protect the shunt and a fast acting 15A fuse to protect the main bus.

The bus power supply can be provided to the amplifier unit through Amplifier Backplane board or through the TB3 and TB4 terminal connectors located on the amplifier unit.

The amplifier receives its logic power supply (±15V) from an external power supply or the 3U power supply used for a UMAC system via the Amplifier Backplane board (part number 603490 or 603470, see last section of this manual).

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.

Current Mode Considerations

The QUAD H-Bridge High Power Drive is a current amplifier with a fixed current gain 0.5A/V. This means that the ± 10V signal input from each DAC on the J1 connector corresponds to ± 5A of current across the load, provided that the bus supply voltage is not exceeded.

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).

Maximum Current Output E-Point Jumpers

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

Jumper	Description	Default
E1	No Jumper 0.5A/V Transconductance factor for amplifier 1 Jumper 1-2 0.25A/V Transconductance factor for amplifier 1	No Jumper
E2	No Jumper 0.5A/V Transconductance factor for amplifier 2 Jumper 1-2 0.25A/V Transconductance factor for amplifier 2	No Jumper
E3	No Jumper 0.5A/V Transconductance factor for amplifier 3 Jumper 1-2 0.25A/V Transconductance factor for amplifier 3	No Jumper
E4	No Jumper 0.5A/V Transconductance factor for amplifier 4 Jumper 1-2 0.25A/V Transconductance factor for amplifier 4	No Jumper

Jumpers are provided to lower the current output rating to 2.5A, for motors with 2.5A instantaneous current (rather than the amplifiers rated at 5A). 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 ±5V via Ix69.

Amplifier-Enable/Fault Polarity Selection

The controller (PMAC) should be configured for low-true amplifier-enable signals. A green LED next to Terminal Block 1 (TB1) for each amplifier on the QUAD H-Bridge 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 (PMAC1) 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 PMAC1-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 a full description of these I-variables.

HARDWARE DESCRIPTION

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

1. TB1: 8-Pin PMAC Interface Terminal Block
2. TB2: 13-Pin Motor Amplifier Output Terminal Block
3. TB3: External Power Ground
4. TB4: External Power
5. TB5: JFAN
6. TB6: 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	1st Motor + Lead
2	AMPOUT1/	Output	1st Motor - Lead
3	AMPOUT2	Output	2nd Motor + Lead
4	AMPOUT2/	Output	2nd Motor - Lead
5	AMPOUT3	Output	3rd Motor + Lead
6	AMPOUT3/	Output	3rd Motor - Lead
7	AMPOUT4	Output	4th Motor + Lead
8	AMPOUT4/	Output	4th 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+40V	Input	Bus power supply

TB5: JFAN

Pin	Symbol	Function	Description
1	FAN-	Output	For cooling fan
2	FAN+	Output	For cooling fan
3	AGND	Input/Output	Reference for logic supply
4	A+15V	Input	For logic power (usually from backplane)
5	AGND	Input/Output	Reference for logic supply
6	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	+40V (bus)	+40V (bus)	+40V (bus)
11	+40V (bus)	+40V (bus)	+40V (bus)
12	+40V (bus)	+40V (bus)	+40V (bus)
13	+40V (bus)	+40V (bus)	+40V (bus)
14	+40V (bus)	+40V (bus)	+40V (bus)
15	+40V (bus)	+40V (bus)	+40V (bus)
16	+40V (bus)	+40V (bus)	+40V (bus)
17	+40V (bus)	+40V (bus)	+40V (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	15V minimum, 40V maximum
Logic Power	15V @ 100 mA, -15V @ 50 mA
Transconductance Factor	0.5V/A
Max Continuous Current	12A (2A per channel)
Peak Current	20A (4A per channel)
Internal Switching Frequency	20 KHz
Reference Input Voltage	± 10V

Mechanical Specifications

Size & Dimension	See Diagram
TB1 Connector	8 pin Screw Terminal
TB2 Connector	13 pin Phoenix
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	15A	Fast Blow for BUS
F2	5A	Slow Blow

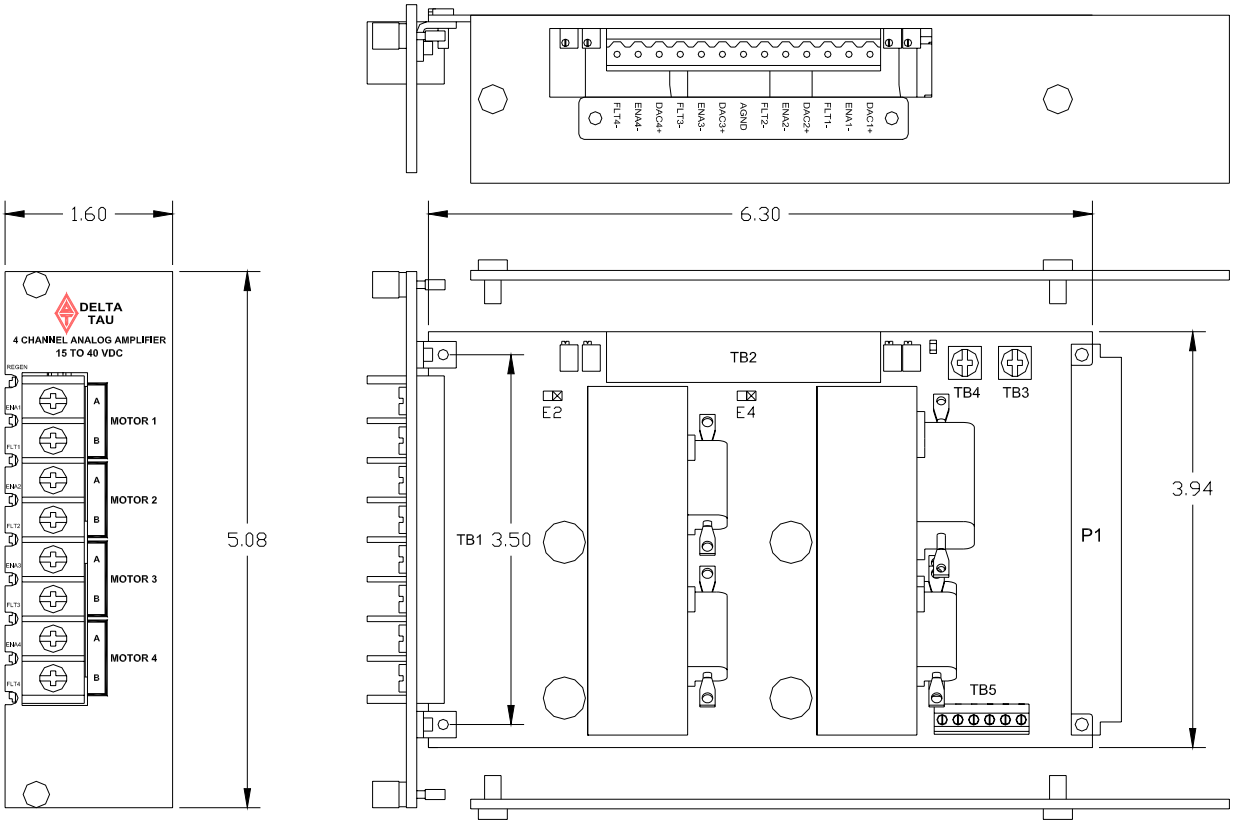
LEDs

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
LD9	REGEN
LD10	Over Temperature Fault

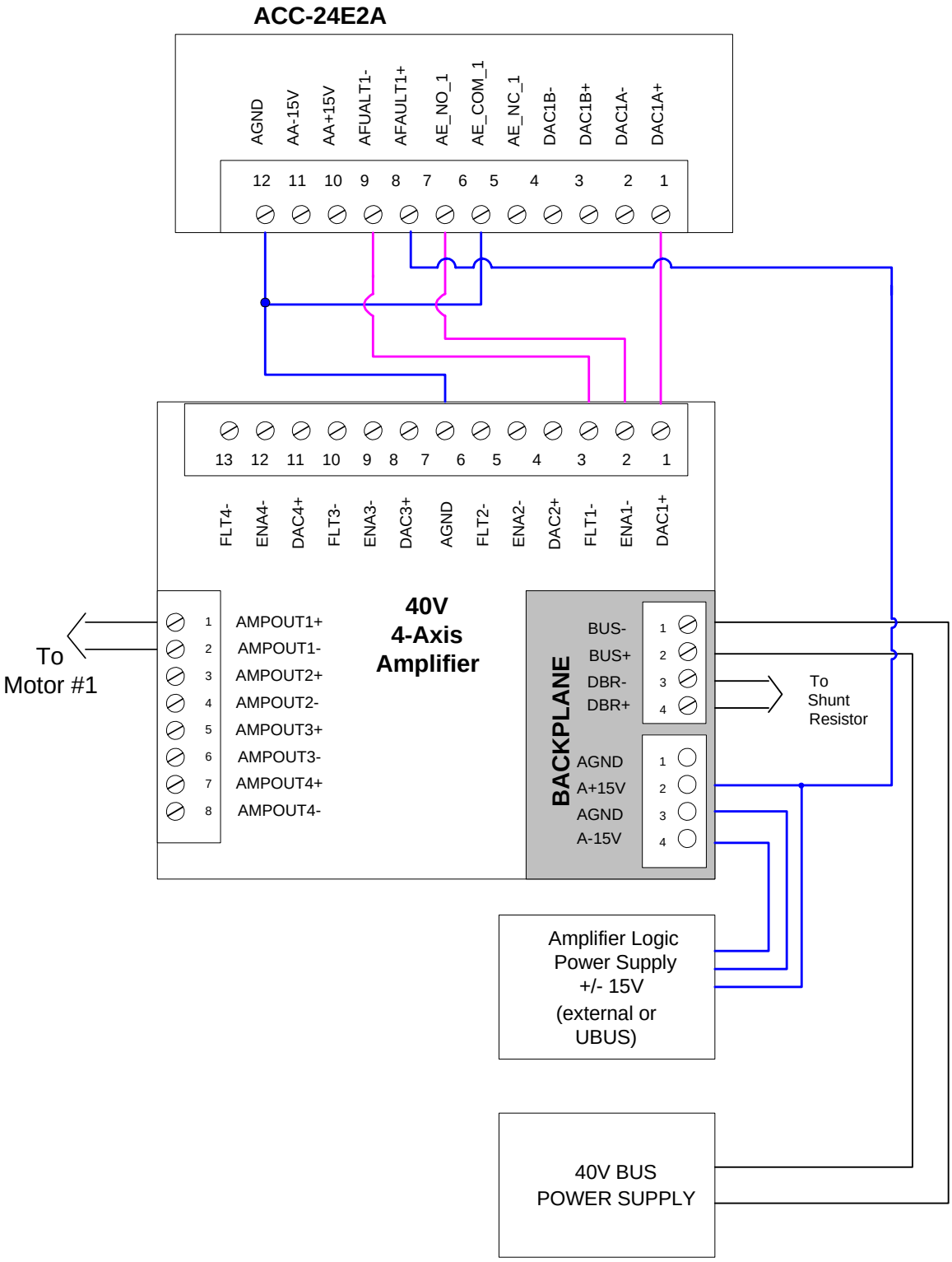
Offset Pots

Name	Label	Function
A	R15	Channel 1 Current Offset
B	R35	Channel 2 Current Offset
C	R55	Channel 3 Current Offset
D	R75	Channel 4 Current Offset

LOW POWER QUAD H-BRIDGE AMPLIFIER LAYOUT



SAMPLE WIRING DIAGRAM

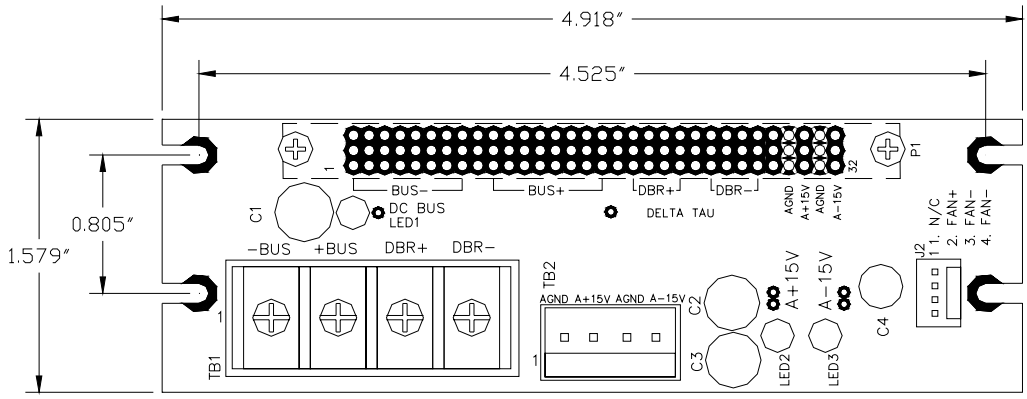


ANALOG AMPLIFIER BACKPLANE BOARD

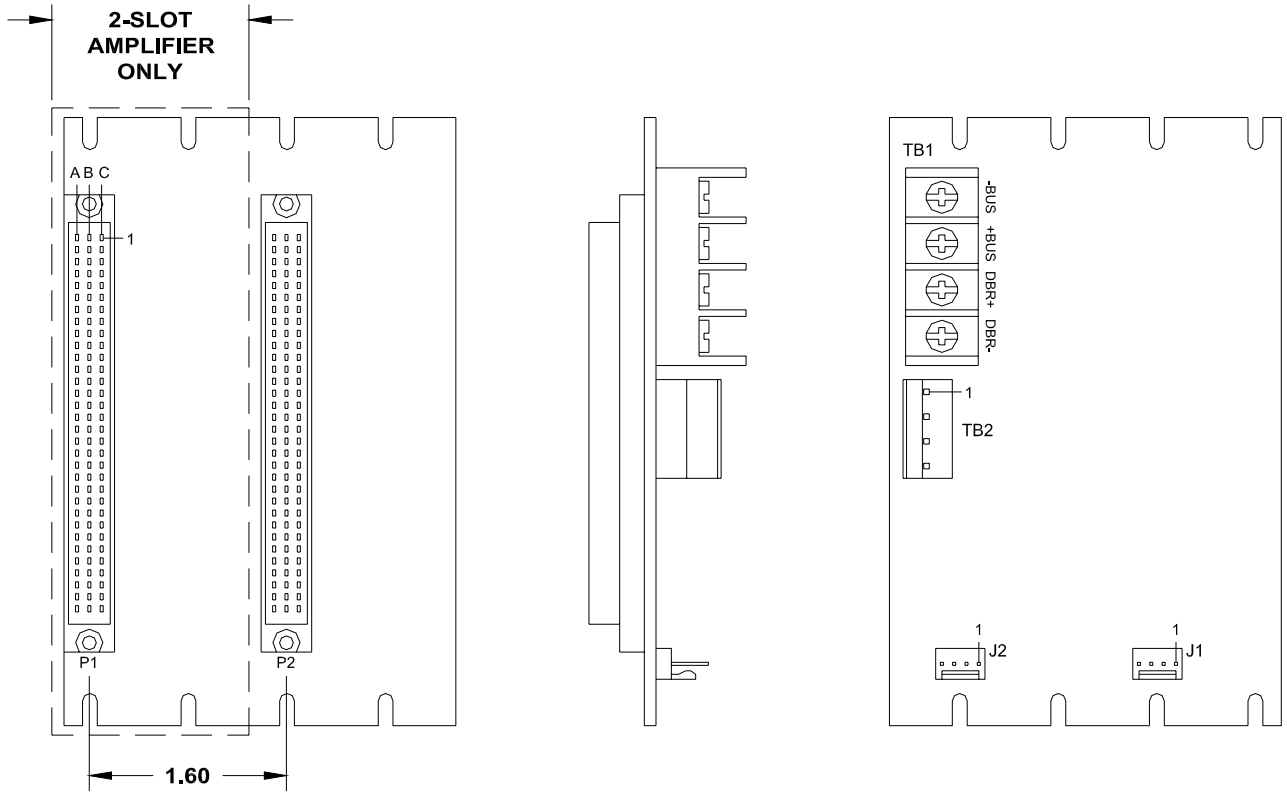
The analog amplifier backplane board allows easy access to power the Quad H-Bridge amplifier units when placed in the 3U racks. The amplifier backplane boards come in two options: single amplifier 2-slot assemblies or dual amplifier 4-slot assemblies. The board itself has terminal screws for the external 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



Analog Amplifier Backplane Connectors

TB1 Bus Power and Shunt Resistor Inputs

Pin	Label	Description
1	-BUS	BUS Voltage reference
2	+BUS	BUS Voltage (15V to 65V)
3	DBR+	Shunt Resistor Input
4	DBR-	Shunt Resistor Input

TB2 Logic Power Supply and Fan Power Supply Input

Pin	Label	Description
1	AGND	Logic and Fan Supply Reference
2	+15V	+15V input
3	AGND+	Logic and Fan Supply Reference
4	-15V	-15V input

J1 Fan Power Supply Output

Pin	Label	Description
1	NC	No Connection
2	+FAN	+12V output
3	-FAN	AGND Reference voltage for fan
4	-FAN	-12V output

J2 Fan Power Supply Output

(For Dual Quad Amp Backplane only 603470-10x)

Pin	Label	Description
1	NC	AGND
2	+FAN	+12V output
3	-FAN	AGND Reference voltage for fan
4	-FAN	-12V output