
**PAS 9415/AMP
ENGINEERING SPECIFICATION**

**8 CHANNEL +/- 60 mA AMPLIFIER
Revision A (12/01/2011)**

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8 Channel +/- 60 mA Amplifier

TABLE OF CONTENTS

Section	Title	Page
I	INTRODUCTION	5
	General Description	5
II	SPECIFICATIONS	6
	Electrical Specifications	6
	Environmental Specifications	6
	Physical Specifications	6
	LED Indicators	7
	Connector Definitions	7
III	CIRCUIT DESCRIPTION	10
IV	CALIBRATION PROCEDURE	11
	Offset Adjustment	11
	Gain Adjustment	11

8 Channel +/- 60 MA Amplifier

LIST OF TABLES

<u>Table</u>	<u>Title</u>	<u>Page</u>
1	6 Position Molex Header (P5)	7
2	DB37 Input Connector (P3)	8
3	DB37 Output Connector (P4)	9
4	Gain and Offset Potentiometer Table	11

I. INTRODUCTION

GENERAL DESCRIPTION

The PAS 9415/AMP provides eight voltage to current amplifiers on a 6 U format card. Input, output, and power connectors are provided on the card's front panel. The top connector is a DB37F and it is used to terminate the input signals. The bottom connector is another DB37F and it is used to terminate the current output and sense signals. Power is terminated on a 6 pin Molex shrouded header located between the I/O connectors.

The amplifiers convert +/- 10 Volt input signals to +/- 60 mA output signals. Ten Ohm current sense resistors are also provided on each channel so that the board's output current can be monitored with an analog input card.

II. SPECIFICATIONS

Electrical Specifications

Number of Channels	8
Input Voltage Range	+/- 10 Volts
Output Current Range	+/- 60 mAmps
Output Load Range	100 Ohms to 200 Ohms
Output Accuracy	0.2% of FSR = 0.24mA
Current Sense Resistance	10 Ohms, 0.1%
External Power Supply Voltage	+/- 18 Volts
Settling time for 60mA Step	1 mSec (max.)
Slew Rate	100mA/ mSec

Environmental Specifications

Operating Temperature Range	0 to 55 degrees C.
Storage Temperature Range	-20 to 85 degrees C.
Relative Humidity Range	20% to 80%, non-condensing

Physical Specifications

Dimensions	Form factor: Double (160 mm x 233 mm)
Weight	12 oz. (typ.)
Connectors	2 ea. DB37 female, (Analog Input and Output connectors)
	1 ea. 6 pin shrouded header (External power connector)

LED Indicators

Two red LEDs are provided on the board's front panel and are connected to pins 1 and 2 of the D-sub, I/O connectors. These LEDs can be driven by the user to display status.

Connector Definitions

Two 96 position DIN connectors are installed on the backplane end of the board and connect to the VME bus to bring in +5 Volts to power the LED.

Two DB37 female connectors are installed through the board's front panel to provide access to the eight voltage to current channels and the two LEDs. The pin outs of these connectors are defined on the following page.

A six-position Molex header is provided at the front panel, and located between the two DB37 connectors. This connector is used to bring in external power to the amplifiers.

The mating connector to this header is Molex P/N 50-57-9406, and the crimp on pin is P/N 16-02-1114 or 16-02-1125. The pin out of this connector is defined below.

TABLE 1

6 Position Molex Header (P5)

1	Positive Power Supply
2	Power Supply Ground
3	Negative Power Supply
4	N/C
5	N/C
6	N/C

TABLE 2
DB37 Input Connector (P3)

AGND	37	19	AGND
AGND	36	18	VIN0
AGND	35	17	AGND
AGND	34	16	VIN1
AGND	33	15	AGND
AGND	32	14	VIN2
AGND	31	13	AGND
AGND	30	12	VIN3
AGND	29	11	AGND
AGND	28	10	VIN4
AGND	27	9	AGND
AGND	26	8	VIN5
AGND	25	7	AGND
AGND	24	6	VIN6
AGND	23	5	AGND
AGND	22	4	VIN7
AGND	21	3	AGND
AGND	20	2	LED1
		1	LED2

TABLE 3

DB37 Output Connector (P4)

AGND	37	19	AGND
AGND	36	18	IOUT0
AGND	35	17	SENSE0
AGND	34	16	IOUT1
AGND	33	15	SENSE1
AGND	32	14	IOUT2
AGND	31	13	SENSE2
AGND	30	12	IOUT3
AGND	29	11	SENSE3
AGND	28	10	IOUT4
AGND	27	9	SENSE4
AGND	26	8	IOUT5
AGND	25	7	SENSE5
AGND	24	6	IOUT6
AGND	23	5	SENSE6
AGND	22	4	IOUT7
AGND	21	3	SENSE7
AGND	20	2	LED1
		1	LED2

III. CIRCUIT DESCRIPTION

The PAS 9415/AMP provides eight voltage to current conversion amplifier circuits. Each amplifier converts a +/-10 Volt input signal into a +/-60 mA signal. All channels provide offset and gain adjustments so that the output can be adjusted to 0.2% of full-scale range.

The amplifiers are designed to operate into a load resistance of 100 to 200 Ohms. Output current is sensed with a 33.33 Ohm, 0.1%, resistor in series with the output. Two volts will be developed across this resistor with 60mA of output current. A 10.0 Ohm, 0.1%, resistor is connected in series with ground for each channel and can be used to convert the output current into a voltage that can be measured with an analog input card. The current return path from the load can either be connected directly to ground, or to ground through the resistor. If the resistor is used, then 600mV will be developed across it with 60mA of output current.

A power supply of at least +/-18 Volts is required to power the amplifier. When a load of 200 Ohms is used, 12 Volts will be developed across the load at 60 mA of output current. Additionally, 2.6 Volts are developed across the output and current sensing resistors. The output amp requires 3 Volts of operating headroom voltage. Summing all of these voltages indicates the need for 18 Volt power supply rails.

Each amplifier is built with an OPA551F output amplifier and an OPA551U current sense amplifier. The F suffix part is the DDPAK7, high power package. This part is mounted with a heat sink to improve its power dissipation. The power supply voltage should be set as low as possible in order to minimize the power in the amplifier. The U suffix amplifier is an SO-8 package since it does not dissipate much power. Both of the OPA551 amplifiers have short circuit and thermal protection.

VI. CALIBRATION PROCEDURE

Install the card in a VME chassis and connect the +/- 18 Volt power supply to P5. Connect a 200 Ohm power resistor from the output to the sense return of the channel under test. Connect an amp meter in series with the 200 Ohm resistor. Connect a volt meter from the sense return to analog ground. Connect a voltage standard from the input of the channel under test to analog ground.

Offset Adjustment

Input zero volts with the voltage standard and adjust the offset potentiometer, (See table 4), for the channel under test to 0.000 mA. Observe 0.00 mV across the sense resistor.

Gain Adjustment

Input 10.000 Volts with the voltage standard and adjust the gain potentiometer, (See table 4), for the channel under test to 60.00 mA. Observe 600mV across the sense resistor. Input -10.000 Volts and observe - 60.00 mA of output current and - 600 mV across the sense resistor. Repeat for all eight channels.

Maximum tolerance is +/- 0.2% FSR. This equals +/- 0.24 mA for current readings and +/- 2.4 mV for sense voltage readings.

TABLE 4

Gain and Offset Potentiometer Table

CH #	Offset Pot	Gain Pot
0	4	2
1	15	13
2	26	24
3	37	35
4	48	46
5	59	57
6	70	68
7	81	79