BB500 (-TB) INTERFACE BOARD

USER'S MANUAL

P/N: EDO109 (V1.6)

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The BB500, UNIDEX 500, UNIDEX 600 PC-based motion controllers are products of Aerotech, Inc.

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CHAPTER 1: INTRODUCTION AND CONFIGURATION

In This Section:

1.1. Introduction

The BB500 Interface Boards (see Figure 1-1) provide the ability to interface an Aerotech UNIDEX 500 (ISA or PCI bus) or UNIDEX 600 controller to non-Aerotech drives and motors. This board provides four axes of amplifier and feedback terminal blocks, I/O signal connections, a power connector, and three U500/U600 connectors. Also contained on this board are jumpers that permit the BB500 to be configured for either internal or external power configurations. Refer to Figure 1-2 for terminal block and jumper locations.

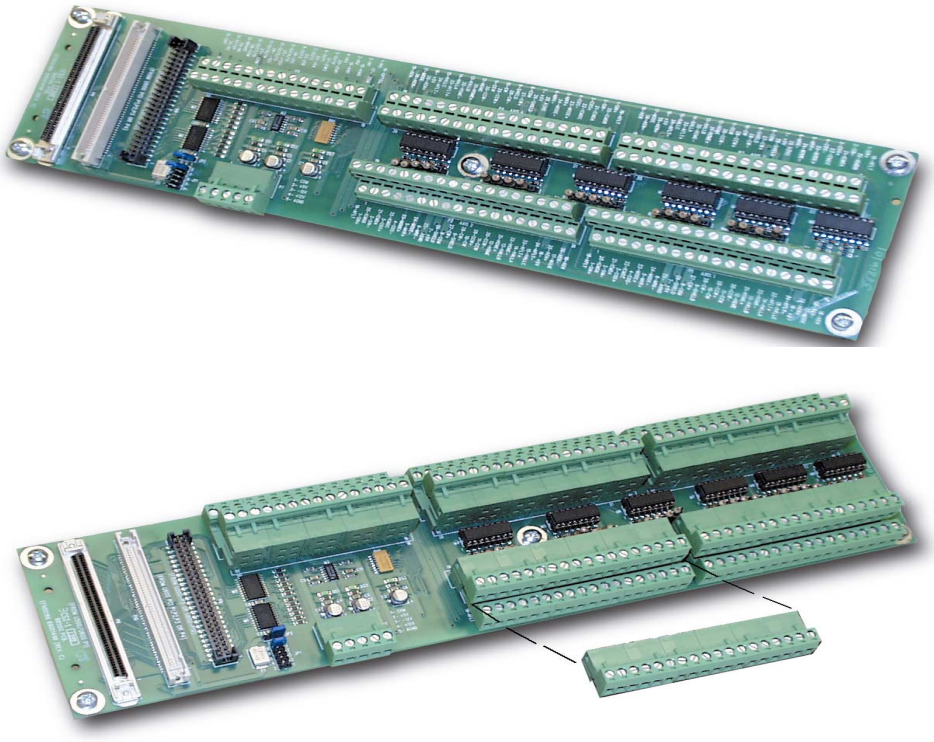
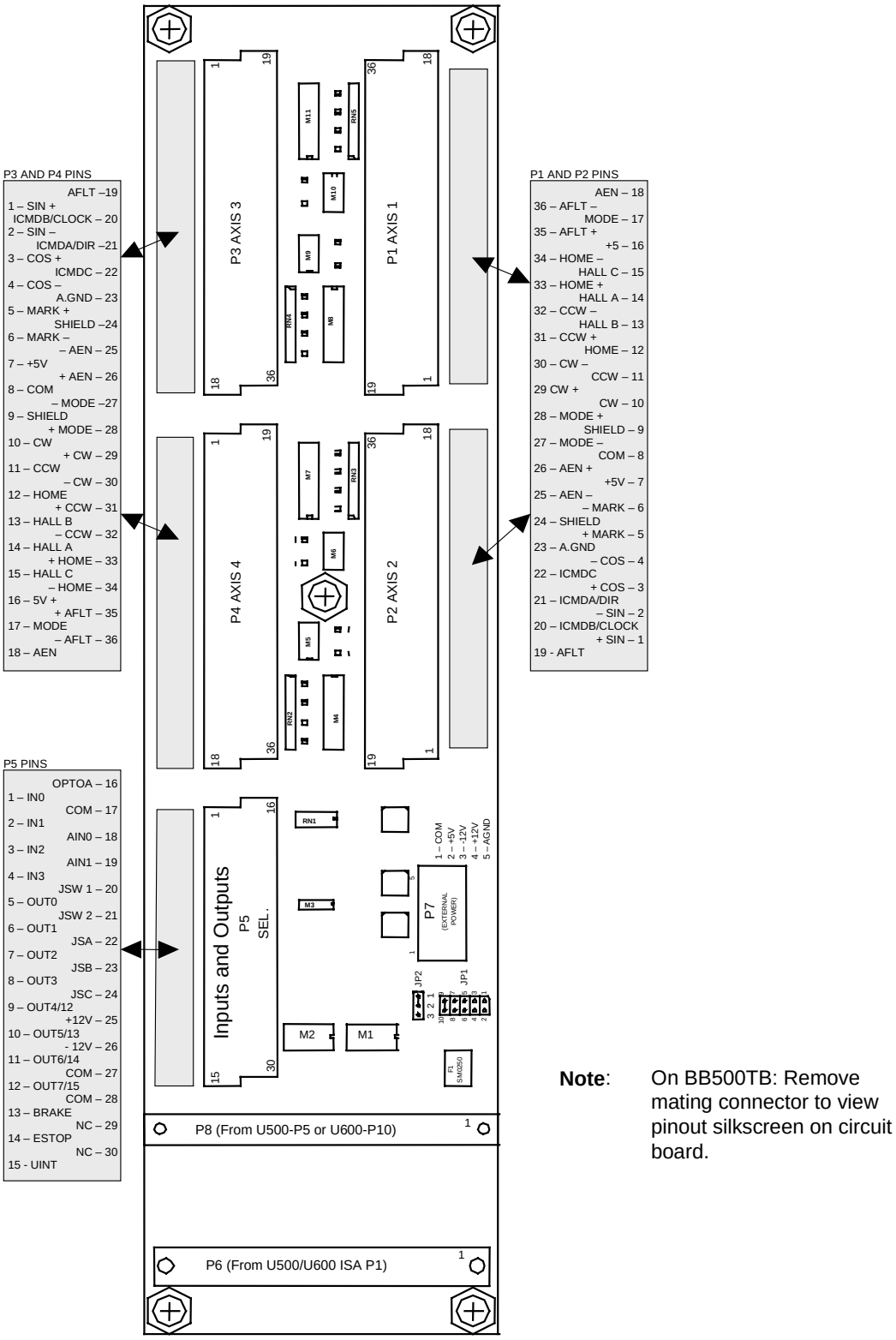


Figure 1-1. BB500 and BB500-TB Interface Boards



Note: On BB500TB: Remove mating connector to view pinout silkscreen on circuit board.

Figure 1-2. BB500 Interface Board (Terminal Block, Connector and Jumper Locations)

1.2. Safety Procedures and Warnings

The following statements apply wherever the Warning or Danger symbol appears within this manual. Failure to observe these precautions could result in serious injury to those performing the procedures and/or damage to the equipment.

To minimize the risk of electrical shock and bodily injury, make certain that all of the electrical power switches are in the off position prior to making any electrical connections.


DANGER

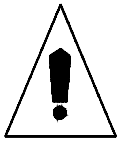
To minimize the risk of electrical shock and bodily injury when any electrical circuit is in use, ensure that no person is exposed to the circuitry.


DANGER

When this controller is installed within a system, mechanical motion will occur. Care must be exercised that all personnel remain clear of any moving parts.


DANGER

To minimize the possibility of bodily injury, make certain that all electrical power switches are in the off position prior to making any mechanical adjustments.


WARNING

1.3. Unpacking the BB500 board

Before unpacking any components, visually inspect the container of the BB500 board for any evidence of shipping damage. If any such damage exists, notify the shipping carrier immediately.

All electronic equipment is wrapped in antistatic material and packaged with desiccant (a drying agent used to reduce moisture). Make certain that the antistatic material is not damaged during unpacking.

1.4. Mechanical Installation

The BB500 interface board must be mounted in an area free of electrical noise. The board is mounted using five .187" mounting holes (refer to Figure 1-3).

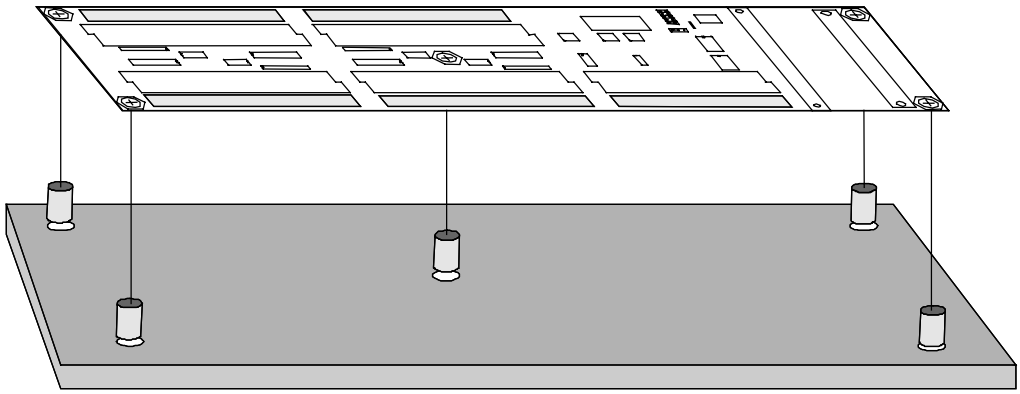


Figure 1-3. Mounting the BB500 Interface Board

Using a metal enclosure will help minimize any electrical noise pickup.

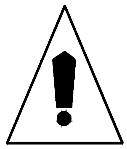
The BB500 can be mounted horizontally or vertically on a panel or chassis.

1.5. The BB500 Breakout Module Description

The BB500 Breakout Module provides an easy method of accessing the signals of the 100-pin connectors of the UNIDEX 600 or UNIDEX 500 controller boards. The signals from this 100-pin connector need to be accessed individually or "broken out" and routed to the appropriate amplifiers, motors, etc.

The BB500 is connected to the 100-pin connector of the UNIDEX 600 or UNIDEX 500 (accessible from the rear of the PC) using the OP500 cable. Connections from a user-supplied drive module may then be made to the terminal blocks on the BB500. The BB500 is illustrated in Figure 1-4.

Care should be exercised when connecting a drive module to the BB500 breakout module. Be sure that signal lines are properly connected.



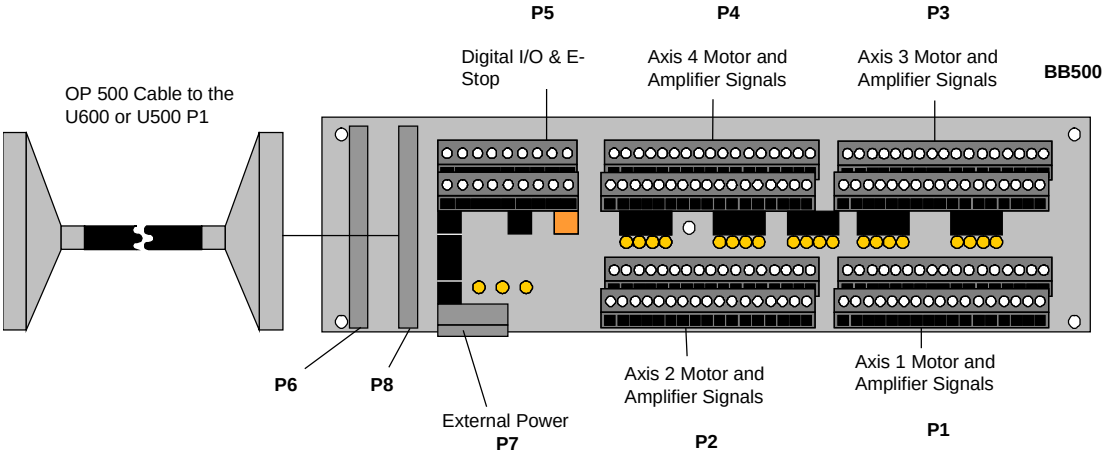


Figure 1-4. Components of the BB500 Breakout Module

The BB500 can be powered internally (by way of the interconnecting cable that connects the UNIDEX controller to the BB500) or from an external power source via the P7 connector. The power source (either internal or external) is selected via a set of jumpers on the BB500 board. Inputs, outputs, encoder signals, limit signals, and amplifier signals are available on the BB500.

The BB500 also generates a third current command signal for brushless drives requiring such. This third current command complements the primary and secondary commands produced by the controller for commutating brushless motors. The primary and secondary commands are sinusoidal and displaced by 120°. The current command generated by the BB500 is also sinusoidal and displaced by 240°. This produces three signals, each 120° displaced from the other.

1.6. Hardware Configurations

This section describes the configuration, power, and system interconnects requirements for the BB500 interface board. This section contains a description of the jumper configurations and connector pinouts for system interfacing.

1.6.1. BB500 Interface Board Jumper Configurations

The BB500 contains jumpers used to configure the board for internal or external power to the BB500. Table 1-1 is a list of the jumpers on the BB500 interface board. Refer to Figure 1-2 for jumper locations.

If utilizing the opto-isolated inputs or outputs, an external +5 volt power supply **must** be used to power the BB500 via the P7 connector.

Table 1-1. BB500 Power Jumper Description

Jumper	Setting	Description
JP2	1-2	External +5V power supply via P7 (Default)
	2-3	Internal + 5V power supply (U500/ U600 P1)

The UNIDEX 500 PCI Ultra controller has the ability to electrically isolate the analog outputs (Current Commands) from the other digital circuitry. The user must then supply +/- 12 volts at 250 milliamps to the P7 connector in this mode. (The U500PCI-Ultra must also be configured for isolation).

Table 1-2. BB500 Opto-Isolated Analog Output Jumper Description

Jumper	U500 ISA, U600 ISA	UNIDEX 500 PCI
JP1A	IN	IN
JP1B	OUT	IN
JP1C	IN	IN
JP1D	OUT	IN
JP1E	IN	OUT

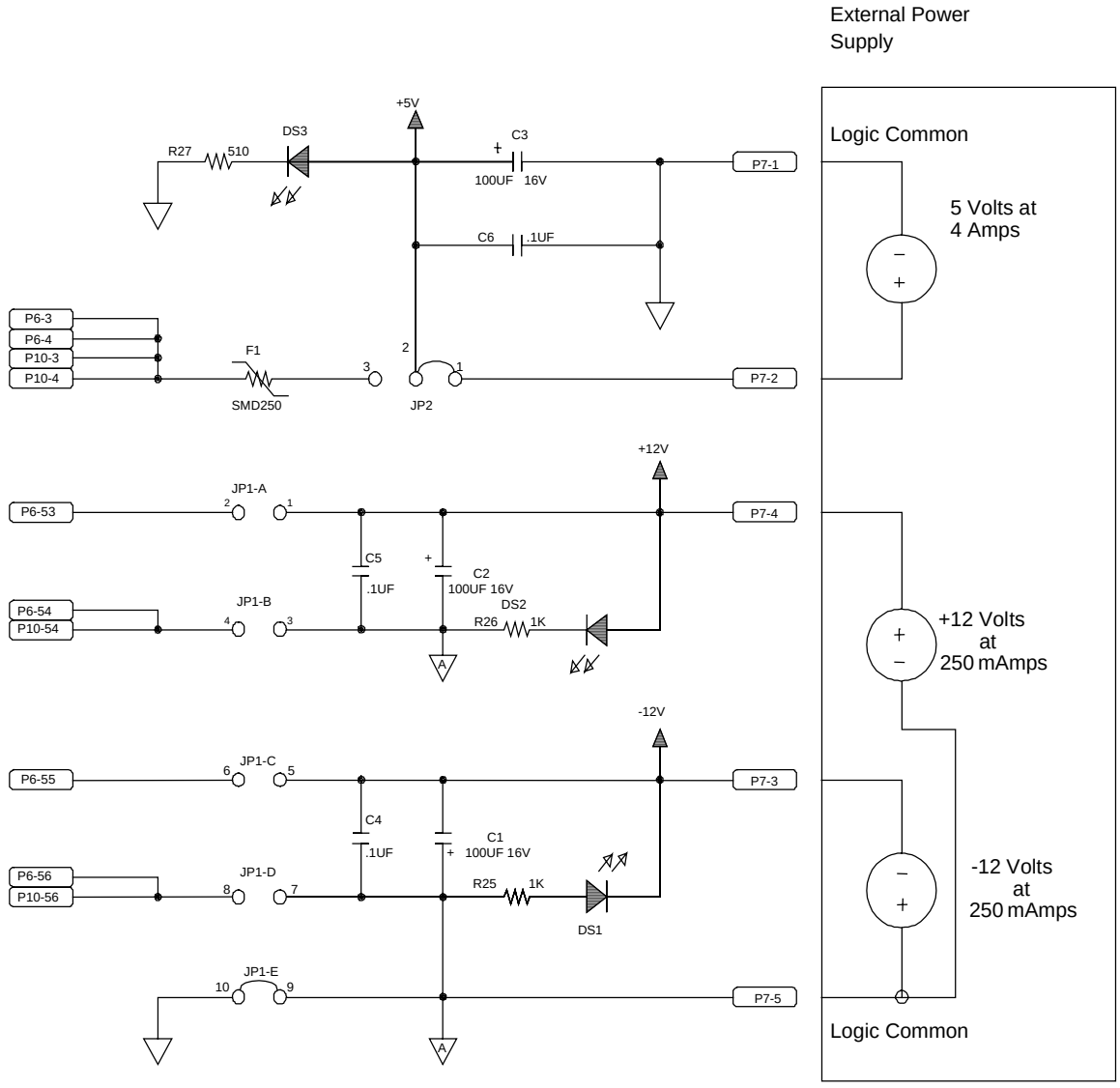


Figure 1-5. BB500 Input Power

1.6.2. BB500 Interface Board Connectors

The BB500 board contains nine connectors consisting of three U500/U600 Interface connectors, four axis feedback connectors, and one miscellaneous I/O connector, and a power connector.

1.6.2.1. Axis Feedback Connectors (P1-P4)

The BB500 interface board contains four encoder feedback terminal blocks (P1-P4, one for each axis). All four have the same pinouts. The pinouts for the axis feedback connectors are listed in Table 1-3. Pins 25-36 are opto-isolated versions of other signals present on the connectors.

Table 1-3. BB500 Axis Feedback Connectors (P1-P4) Pinouts

TB #	Pin #	Description
P1, P2, P3, and P4	1	Encoder SIN +
	2	Encoder SIN -
	3	Encoder COS +
	4	Encoder COS -
	5	Encoder MRK +
	6	Encoder MRK -
	7	Encoder +5 Volts
	8	Encoder Common
	9	Encoder Shield (Frame Gnd.)
	10	CW Limit Input
	11	CCW Limit Input
	12	Home Limit Input
	13	Hall Effect B Input
	14	Hall Effect A Input
	15	Hall Effect C Input
	16	+5V
	17	Mode (Auxiliary) Output
	18	Axis Amplifier Enable – Aen
	19	Axis Fault Input– Aflt
	20	Primary Current Command or U500PCI Clock (see note below)
	21	Secondary Current Command or U500PCI Direction (see note below)
	22	Phase C – (Opt. 3rd I. Cmd.)
	23	Analog Common
	24	Frame Ground
	25	Amp. Enable Outputs Opto. –
	26	Amp. Enable Outputs Opto. +
	27	Mode Output Opto. –
	28	Mode Output Opto. +
	29	CW Limit Input Opto. +
	30	CW Limit Input Opto. -
	31	CCW Limit Input Opto. +
	32	CCW Limit Input Opto. -
	33	Home Limit Input Opto. +
	34	Home Limit Input Opto. -
	35	Amp. Fault Input Opto. +
	36	Amp. Fault Input Opto. -

U500PCI Stepper Drive clock and direction signal. See the U500 manual (EDU150), for the required jumper settings.

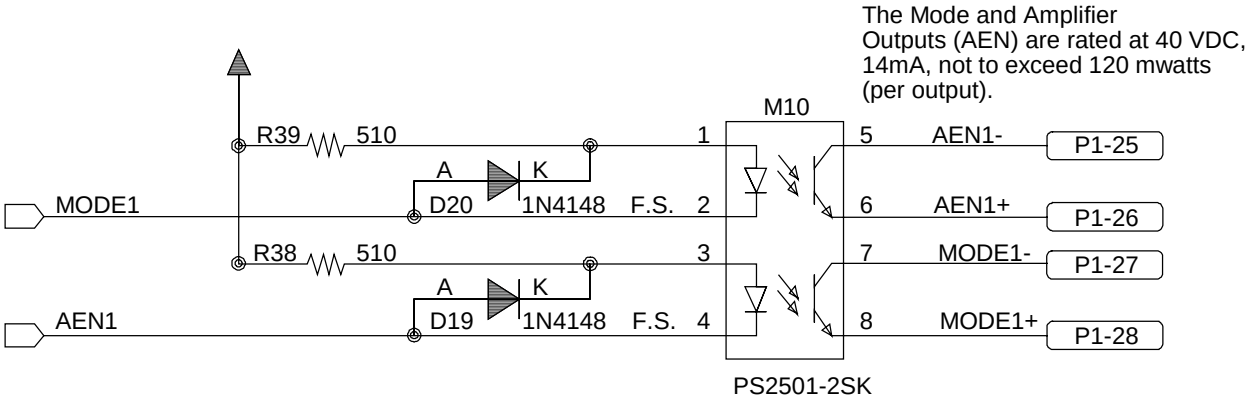


Figure 1-6. Typical Opto-Isolated Outputs

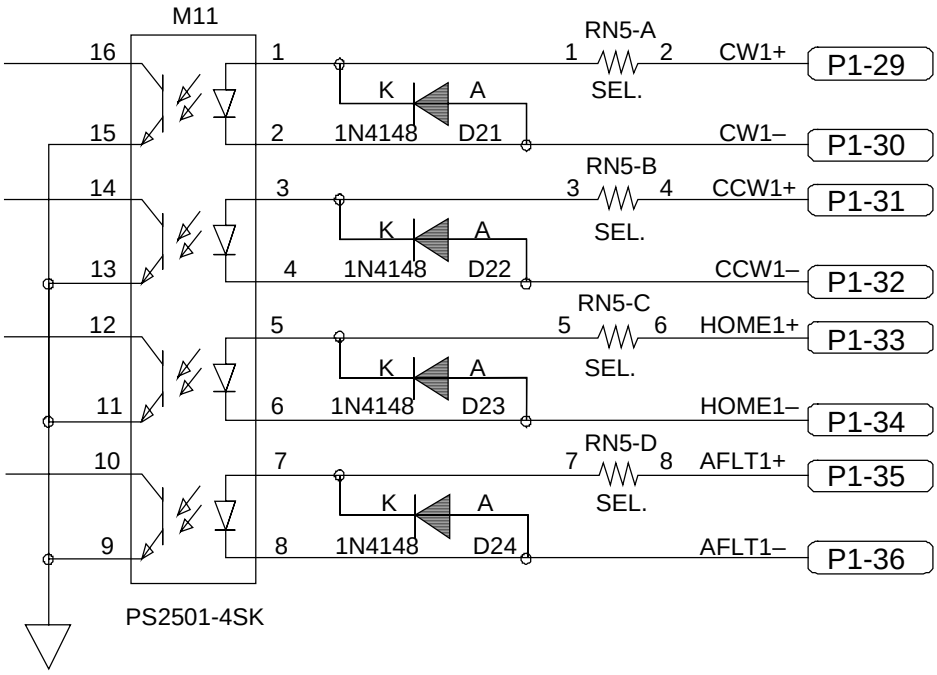


Figure 1-7. Typical Opto-Isolated Inputs

Table 1-4. Axes Resistor Network Associations

Axis Number	Resistor Network (RN) Number
1	RN5
2	RN4
3	RN3
4	RN2

Table 1-5. External Resistance Required for Various Input Voltages

Select Resistor Value Based Upon Operating Voltage		
Voltage	**Required Resistor Value**	**Aerotech Part Number**
+5 Volt	680 Ohm	EIR00842
+12 Volt	2200 Ohm	EIR00861
+24 Volt	4700 Ohm	EIR00835

1.6.2.2. Miscellaneous I/O (P5)

The BB500 interface board contains miscellaneous I/O terminal block (P5). The pinouts for the connector are listed in Table 1-6.

Table 1-6. BB500 Miscellaneous Connector (P5) Pinouts

Pin #	Description	Pin #	Description
1	Input 0	16	Emergency Stop Anode
2	Input 1	17	Common
3	Input 2	18	Analog Input 0
4	Input 3	19	Analog Input 1
5	Output 0	20	Joystick X Axis Potentiometer
6	Output 1	21	Joystick Y Axis Potentiometer
7	Output 2	22	Joystick Button A
8	Output 3	23	Joystick Button B
9	OUT12 (U600), OUT4 (U500)	24	Joystick Interlock
10	OUT13 (U600), OUT5 (U500)	25	+12 Volts
11	OUT14 (U600), OUT6 (U500)	26	-12 Volts
12	OUT15 (U600), OUT7 (U500)	27	Common
13	Brake Output	28	Common
14	Emergency Stop Cathode	29	Unused
15	User Interrupt	30	Unused

1.6.2.3. U500/U600 Interface Connector (P6)

The U500/U600 Interface connector is a 100-pin "AMPLIMITE" connector that provides the majority of the signals to and from the UNIDEX 500 or UNIDEX 600 controller board. Refer to Table 1-7 for a description of the pinouts for connector P6.

Table 1-7. BB500 U500/U600 Interface Connector (P6) Pinouts

Pin	Function	Descr.	Pin	Function	Descr.
1	Common	ILOCKS	2	*Reserved*	*Reserved*
3	+5 Volts	+5	4	+5 Volts	+5
5	Encoder Common or HB1	Common	6	Encoder Common or HA!	Common
7	Encoder Sine Positive, Axis 1	SIN1+	8	Encoder Sine Ground, Axis 1	SIN1-
9	Encoder Cosine Positive, Axis 1	COS1+	10	Encoder Cosine Ground, Axis 1	COS1-
11	Marker Pulse, Axis 1	MRK1+	12	Marker Pulse, Axis 1	MRK1-
13	Encoder Common or HB2	Common	14	Encoder Common or HA2	Common
15	Encoder Sine Positive, Axis 2	SIN2+	16	Encoder Sine Ground, Axis 2	SIN2-
17	Encoder Cosine Positive, Axis 2	COS2+	18	Encoder Cosine Ground, Axis 2	COS2-
19	Marker Pulse, Axis 2	MRK2+	20	Marker Pulse, Axis 2	MRK2-
21	Encoder Common or HC2	Common	22	Encoder Common or HB3	Common
23	Encoder Sine Positive, Axis 3	SIN3+	24	Encoder Sine Ground, Axis 3	SIN3-
25	Encoder Cosine Positive, Axis 3	COS3+	26	Encoder Cosine Ground, Axis 3	COS3-
27	Marker Pulse, Axis 3	MRK3+	28	Marker Pulse, Axis 3	MRK3-
29	Encoder Common or HA3	Common	30	Encoder Common or HC3	Common
31	Encoder Sine Positive, Axis 4	SIN4+	32	Encoder Sine Ground, Axis 4	SIN4-
33	Encoder Cosine Positive, Axis 4	COS4+	34	Encoder Cosine Ground, Axis 4	COS4-
35	Marker Pulse, Axis 4	MRK4+	36	Marker Pulse, Axis 4	MRK4-
37	Encoder Common or HB4	Common	38	Encoder Common or HA4	Common
39	Clockwise Limit, Axis 1	CW1	40	Counter clockwise Limit, Axis 1	CCW1
41	Clockwise Limit, Axis 2	CW2	42	Counter clockwise Limit, Axis 2	CCW2
43	Clockwise Limit, Axis 3	CW3	44	Counter clockwise Limit, Axis 3	CCW3
45	Clockwise Limit, Axis 4	CW4	46	Counter clockwise Limit, Axis 4	CCW4
47	Home Limit, Axis 1	HOME1	48	Home Limit, Axis 2	HOME2
49	Home Limit, Axis 3	HOME3	50	Home Limit, Axis 4	HOME4
51	Reserved	Reserved	52	Limits Common or HC1	Common
53	Reserved	Reserved	54	Reserved	Reserved
55	Reserved	Reserved	56	Reserved	Reserved
57	Mode (Aux) Axis 1	MODE1	58	Mode (Aux) Axis 2	MODE2
59	Input 0	IN0	60	Input 1	IN1
61	Input 2	IN2	62	Input 3	IN3
63	Output 0	OUT0	64	Output 1	OUT1
65	Output 2	OUT2	66	Output 3	OUT3
67	Mode (Aux) Axis 3	MODE3	68	Mode (Aux) Axis 4	MODE4
69	Amplifier Enable 1	AEN1	70	Amplifier Enable 2	AEN2
71	Amplifier Enable 3	AEN3	72	Amplifier Enable 4	AEN4
73	Amplifier Fault 1	AFLT1	74	Amplifier Fault 2	AFLT2
75	Amplifier Fault 3	AFLT3	76	Amplifier Fault 4	AFLT4
77	Limits Common	Common	78	Limits Common	Common
79	Axis 1 Primary ICMD/U500PCI CLK.	ICMD1B	80	Axis 1 Secondary ICMD/U500PCI DIR.	ICMD1A
81	Axis 2 Primary ICMD/U500PCI CLK.	ICMD2B	82	Axis 2 Secondary ICMD/U500PCI DIR.	ICMD2A
83	Axis 3 Primary ICMD/U500PCI CLK.	ICMD3B	84	Axis 3 Secondary ICMD/U500PCI DIR.	ICMD3A
85	Axis 4 Primary ICMD/U500PCI CLK.	ICMD4B	86	Axis 4 Secondary ICMD/U500PCI DIR.	ICMD4A
87	Common	Common	88	Common or HC4	Common
89	Joystick Potentiometer 1 Input	JSW1	90	Joystick Potentiometer 2 Input	JSW2
91	Joystick Button A Input	JSA	92	Joystick Button B Input	JSB
93	Joystick Interlock	JSC	94	Brake Output	BRAKE
95	Analog Input 0	AIN0	96	Analog Input 1	AIN1
97	E - Stop Cathode (See P1-99)	ESTOP	98	User Interrupt/Cmd Trigger	UINT
99	E-Stop Anode (See P1-97)	OPTOA	100	Interlock Receive	ILOCKR

1.6.2.4. External Power Supply Connector (P7)

The external power supply connector (P7) is a 5-pin terminal board connector. This connector provides connections for an external power supply to power the encoder and limit circuits (possibly at a voltage other than 5 volts). The pinouts for the external power supply connector are listed in Table 1-8.

Table 1-8. BB500 External Power Supply Connector (P7) Pinouts

Pin	Function	Description	Required Current
1	Logic Common	External Power	N.A.
2	+5 Volts	External Power	4 Amps
3	-12 Volts	External Power	250 mAmps.
4	+12 Volts	External Power	250 mAmps.
5	Analog Common	External Power	N.A.

1.6.2.5. U500/U600 I/O Hall Effect Connector (P8)

This connector is a multifunction connector used with the UNIDEX 500 or UNIDEX 600 board. P8 is a 50-pin ribbon type and is used for Hall effect and additional I/O signals. The pinouts for this connector are in the *UNIDEX 500 Operation and Technical Manual, P/N EDU150* and the *UNIDEX 600 Hardware Manual, P/N EDU154*.

The UNIDEX 500 and UNIDEX 600 have different pinouts for the P8 connector.

1.7. Power Requirements

The PC's 5 volt power supply may be used to power the BB500 if the users connected load is less then 750 milliamps. An external power supply should be used if the load exceeds this value or the voltage measured on the BB500 is less than 4.9 VDC.

The following current capacity requirement is for a typical system. Some systems may require higher amperage supplies.

+5 Volt Power Supply requirements

Nominal Voltage (Min. - Max.):	4.9 - 5.25 Volts
Ripple (P-P Volts):	< 100mv P-P
Current Capacity:	1 Amp / Axis minimum (typical). 4 Amps for 4 Axis (typical).

Power for the BB500 may be derived from the U500/U600 card (through the OP500 cable) or from the P7 connector.

1.8. System Interconnections

The BB500 provides system interfacing between the UNIDEX 600 and the UNIDEX 500 controllers and non-Aerotech drives and motors. Figure 1-8 is a block diagram of the system interconnects.

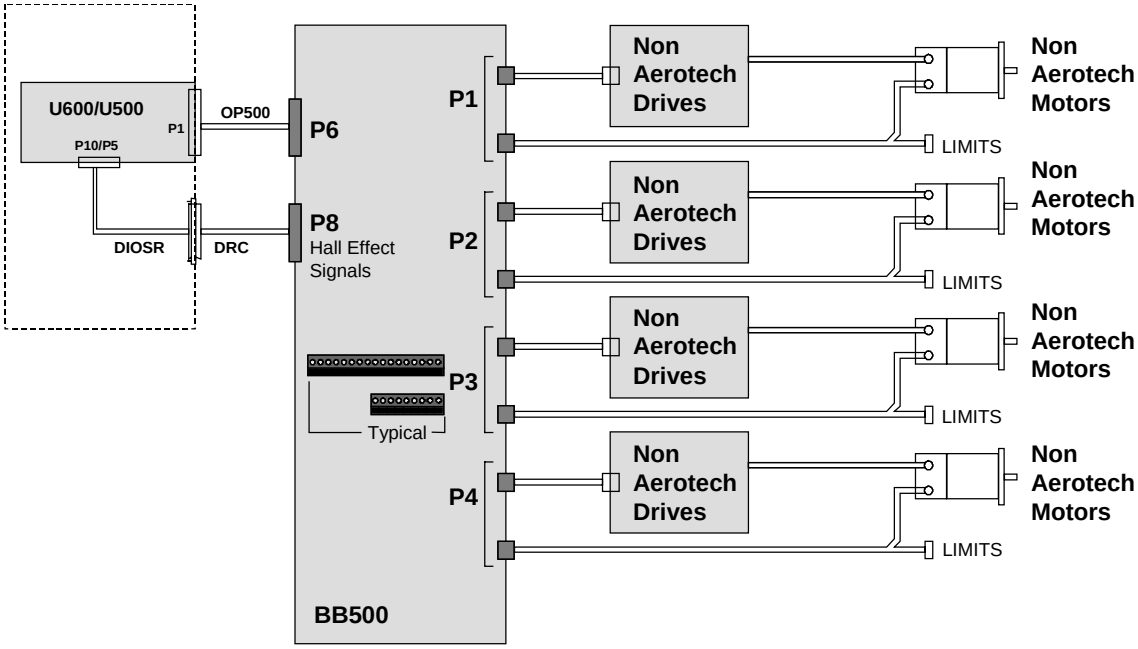


Figure 1-8. System Interconnect with BB500 Breakout Board

The following figures show several different wiring configurations with the BB500 breakout module.

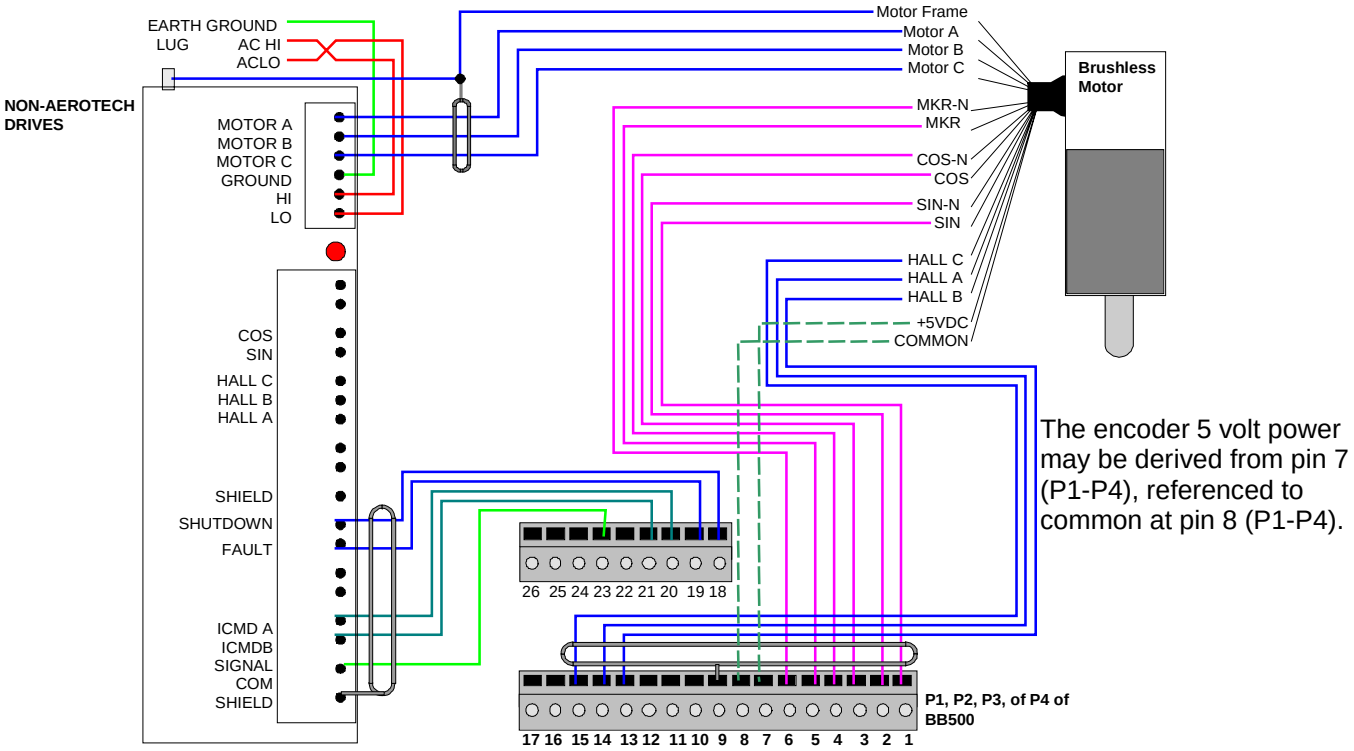


Figure 1-9. Commutated Brushless Motor Wiring Configuration

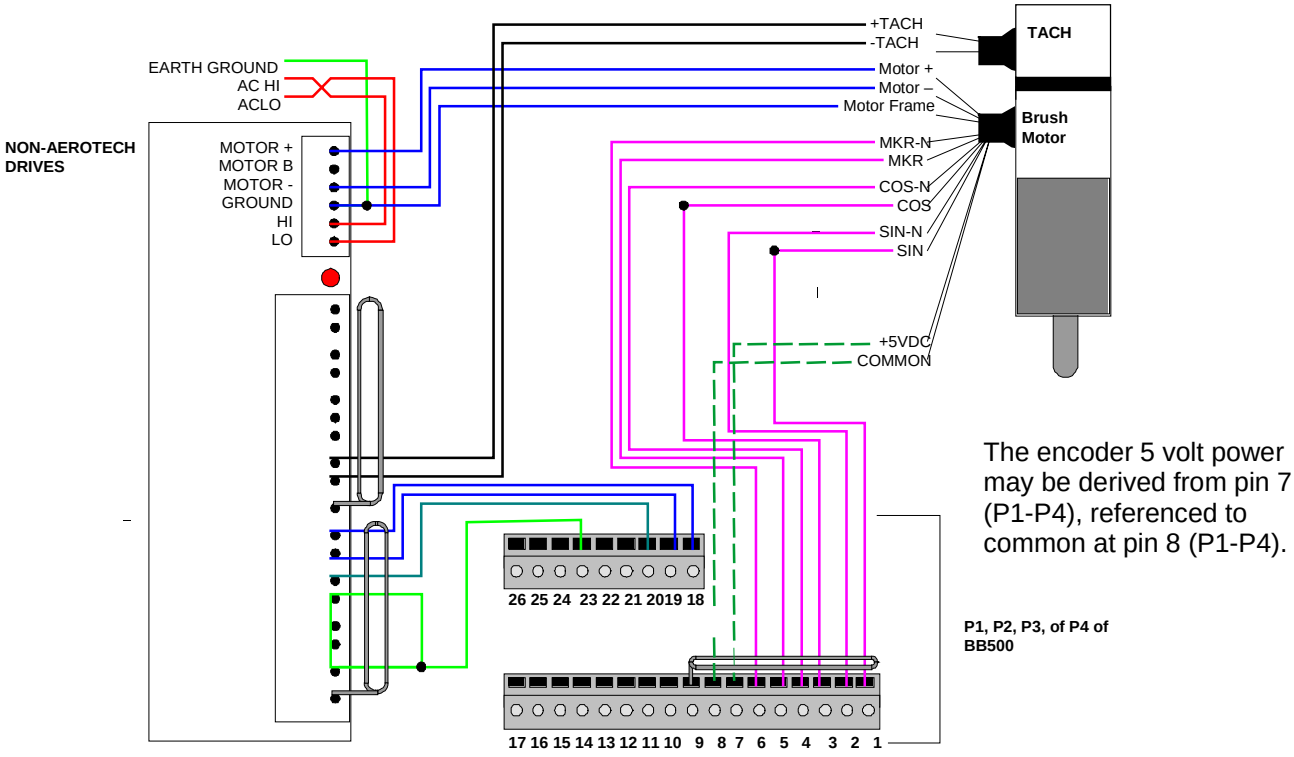


Figure 1-10. Wiring Configuration of Brush Motor with Tachometer (Velocity Command Mode)

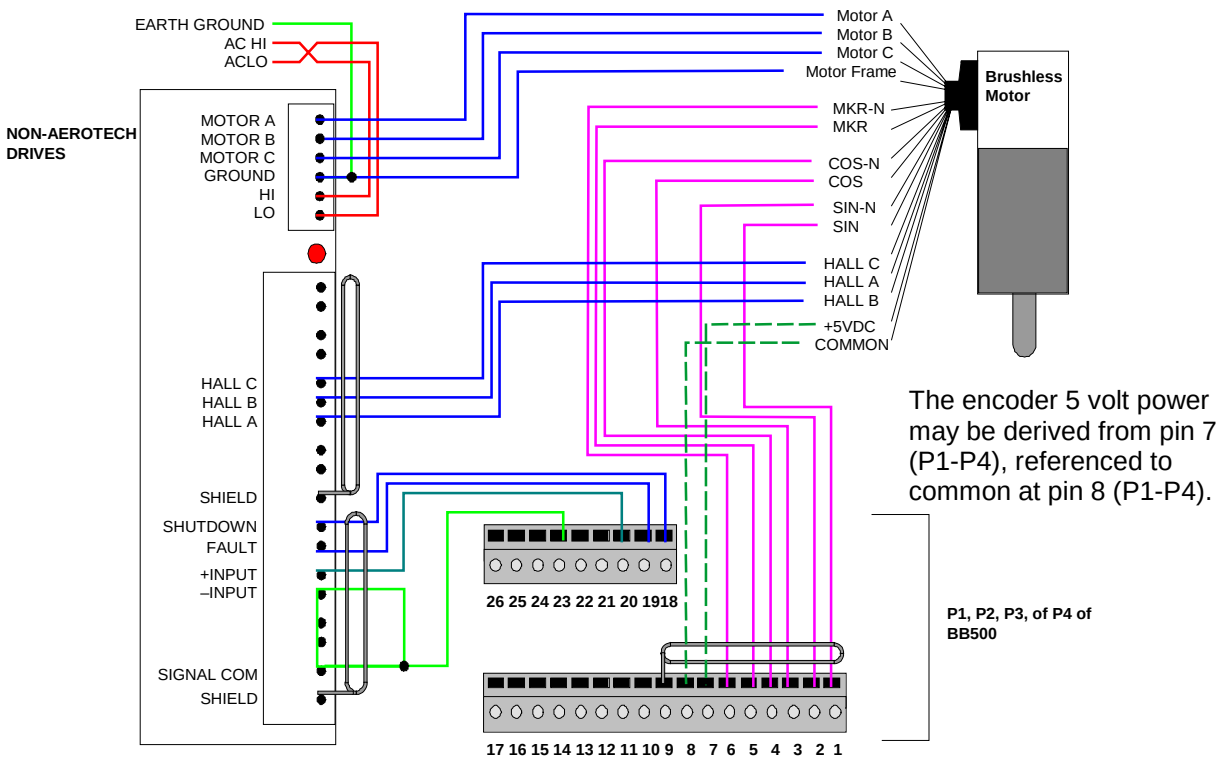


Figure 1-11. Wiring Configuration of a Brushless Motor with a Self-Commutating Amplifier

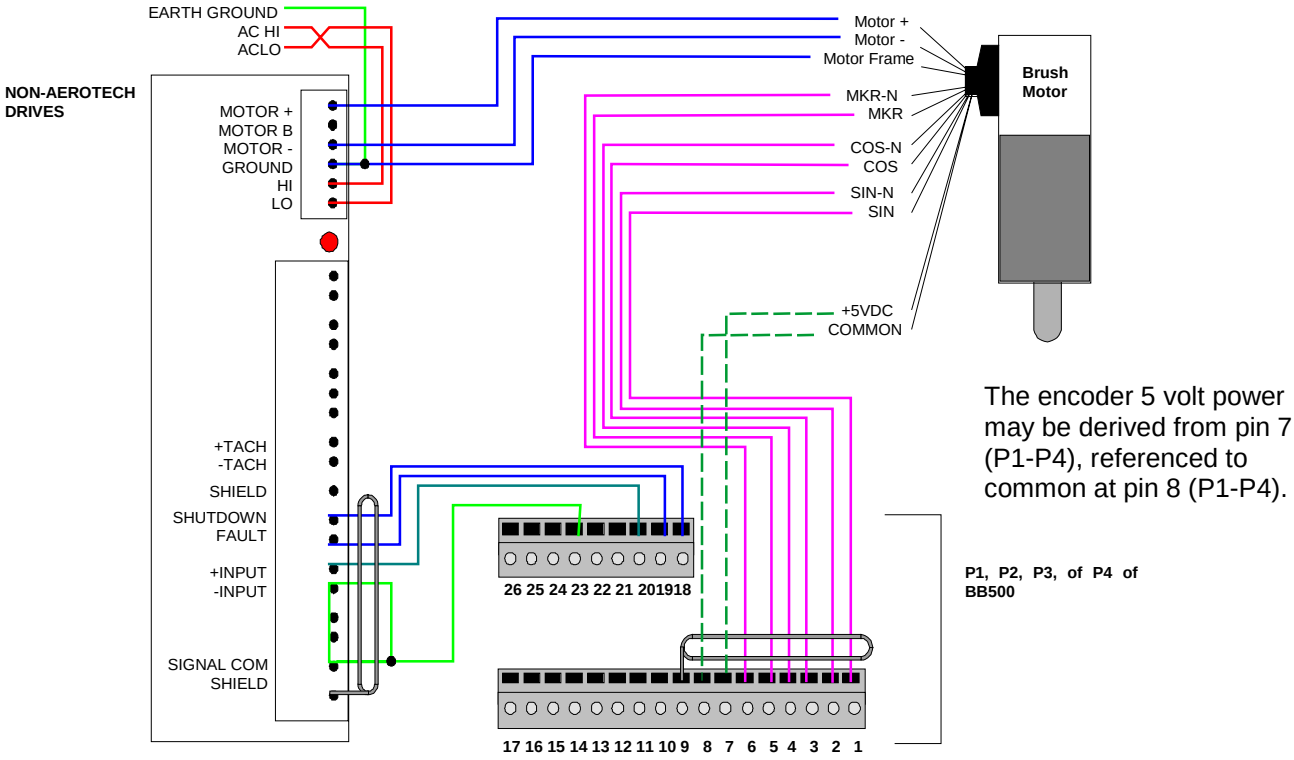


Figure 1-12. Brush Motor without Tachometer (Current Command Mode)

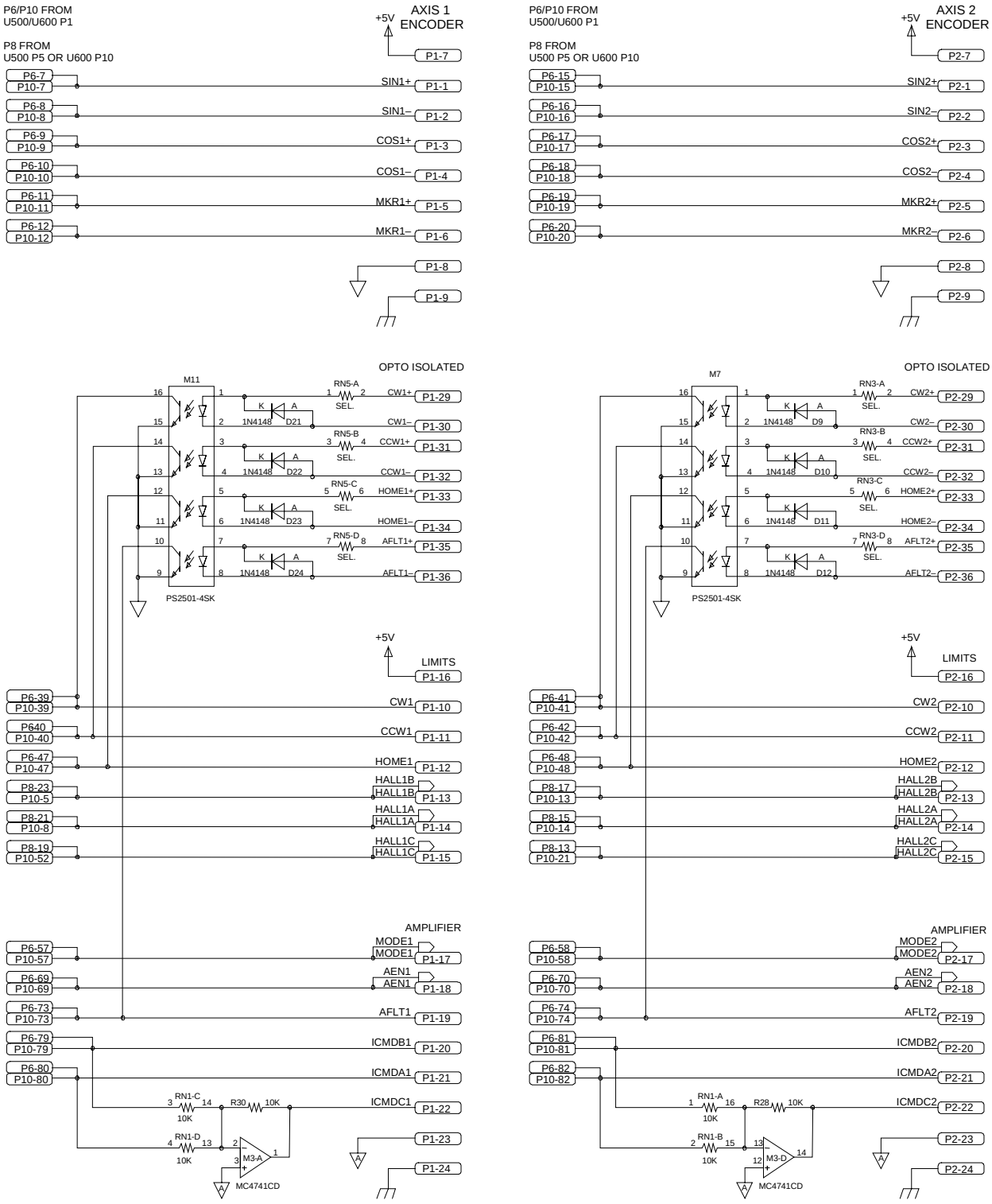


Figure 1-13. 1/3 BB500 Drawing (690D1498 Rev. D)

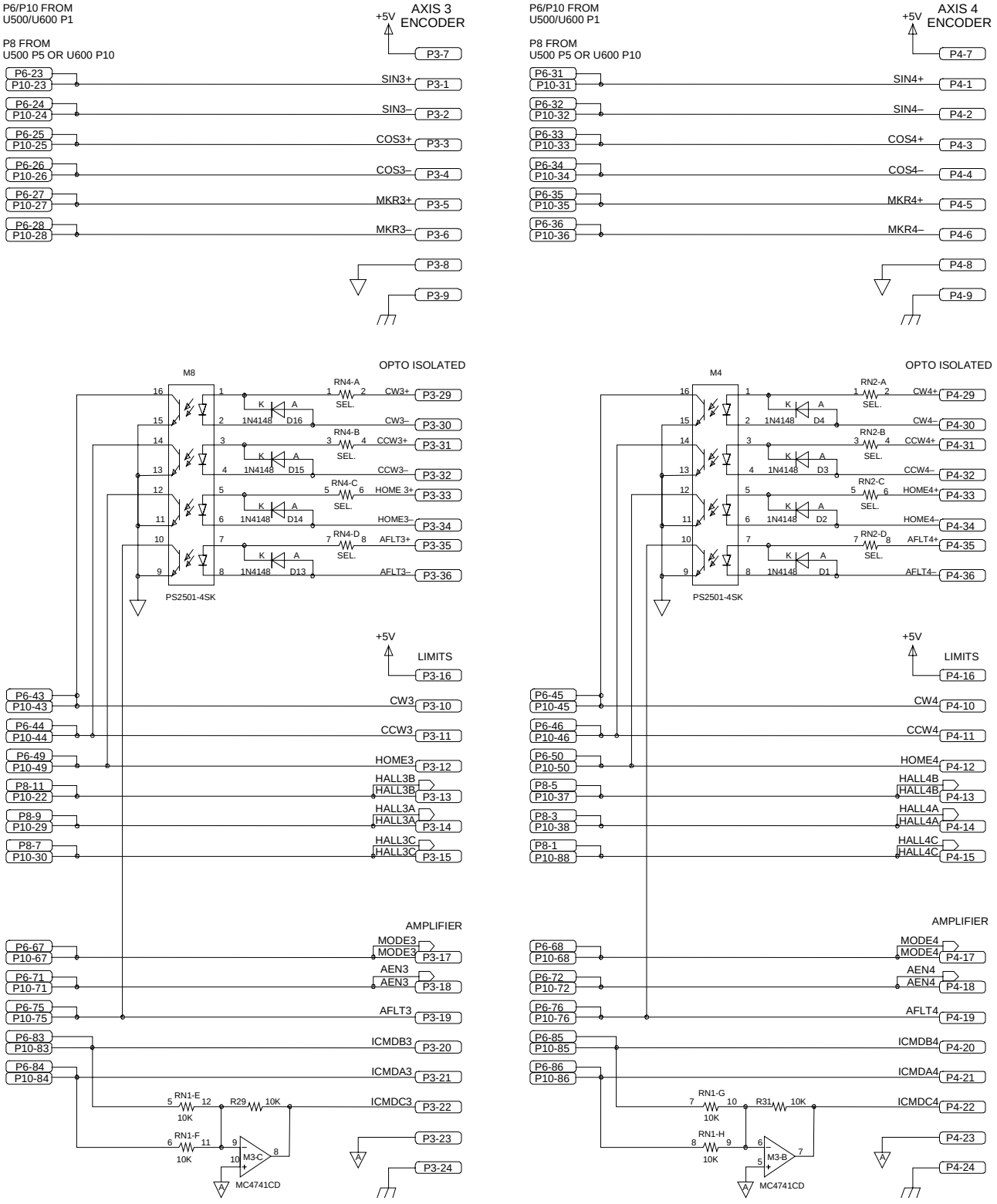


Figure 1-14. 2/3 BB500 Drawing (690D1498 Rev. D)

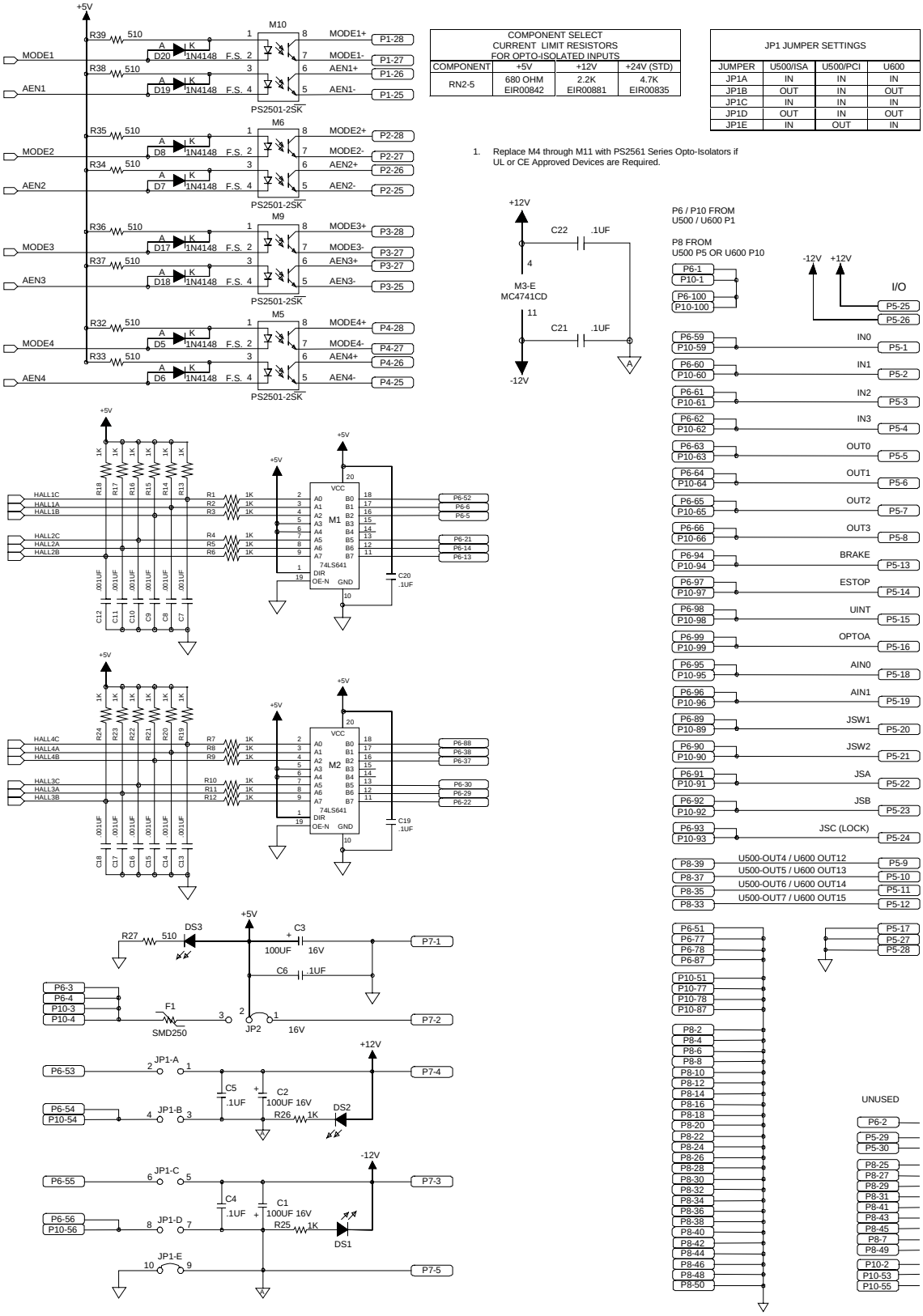


Figure 1-15. 3/3 BB500 Drawing (690D1498 Rev. D)

1.9. Troubleshooting and Technical Support

1.9.1. Common Problems and Causes

Table 1-9 lists some common problems and causes that may be encountered when interfacing with the BB500 interface board.

Table 1-9. Problems, Causes, and Solutions

Problem	Possible Causes/Solutions
No encoder signal	Check encoder +5 volt supply.
No Hall effect signals	Check Hall effect +5 volt supply.
Motor runs away	Check encoder and Hall effect signals and phasing.
Motor runs erratic and/or is not stable	Check encoder and Hall effect shielding. Check motor frame ground connections.

1.9.2. +5 Volt supply

The BB500 board requires and distributes +5 volts for system operation. If the +5 volt source is not capable of providing the required current, axis motion will be unreliable. Using a multimeter, verify that the +5 volt supply is between 4.9 and 5.25 volts. Verify the +12 volt and -12 volt power, is greater than +/- 11.8 volts, respectively.

The on board logic receives power from the U500/U600 control board through J1, pins 3 and 4. Check the +5 volt signal at J14, pin 1 (brake connector). If the +5 volt signal is not there, check for a blown fuse on the U500/U600 control board.

Check jumpers JP1 and JP2 to be sure the board is correctly configured for internal or external power. Check fuse F1 (1 amp).

1.9.3. Connectors

Verify that connectors are fully inserted and plugged into the correct sockets.

1.9.4. Technical Support

If you have technical support questions, please have the following information available before calling:

1. Your customer order number. If you have purchased a complete system from Aerotech, this six-digit number will be on a system serial tag on one or more of the items.
2. We may also need to know the type of PC you are using (brand name, CPU, available memory), the current version of the operating system, and your relevant machine configuration.
3. If you are developing your own application, we will need to know what compiler and version number you are using (e.g., Borland C v3.1, Microsoft Visual C, etc.).
4. If possible, try to be at the equipment when calling.

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APPENDIX A: WARRANTY AND FIELD SERVICE

In This Section:

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products which are returned by the original purchaser during the warranty period. Aerotech makes no warranty that its products are fit for the use or purpose to which they may be put by the buyer, whether or not such use or purpose has been disclosed to Aerotech in specifications or drawings previously or subsequently provided, or whether or not Aerotech's products are specifically designed and/or manufactured for buyer's use or purpose. Aerotech's liability or any claim for loss or damage arising out of the sale, resale or use of any of its products shall in no event exceed the selling price of the unit.

Laser Products

Aerotech, Inc. warrants its laser products to the original purchaser for a minimum period of one year from date of shipment. This warranty covers defects in workmanship and material and is voided for all laser power supplies, plasma tubes and laser systems subject to electrical or physical abuse, tampering (such as opening the housing or removal of the serial tag) or improper operation as determined by Aerotech. This warranty is also voided for failure to comply with Aerotech's return procedures.

Return Procedure

Claims for shipment damage (evident or concealed) must be filed with the carrier by the buyer. Aerotech must be notified within (30) days of shipment of incorrect materials. No product may be returned, whether in warranty or out of warranty, without first obtaining approval from Aerotech. No credit will be given nor repairs made for products returned without such approval. Any returned product(s) must be accompanied by a return authorization number. The return authorization number may be obtained by calling an Aerotech service center. Products must be returned, prepaid, to an Aerotech service center (no C.O.D. or Collect Freight accepted). The status of any product returned later than (30) days after the issuance of a return authorization number will be subject to review.

Returned Product Warranty Determination

After Aerotech's examination, warranty or out-of-warranty status will be determined. If upon Aerotech's examination a warranted defect exists, then the product(s) will be repaired at no charge and shipped, prepaid, back to the buyer. If the buyer desires an air freight return, the product(s) will be shipped collect. Warranty repairs do not extend the original warranty period.

Returned Product Non-warranty Determination

After Aerotech's examination, the buyer shall be notified of the repair cost. At such time the buyer must issue a valid purchase order to cover the cost of the repair and freight, or authorize the product(s) to be shipped back as is, at the buyer's expense. Failure to obtain a purchase order number or approval within (30) days of notification will result in the product(s) being returned as is, at the buyer's expense. Repair work is warranted for (90) days from date of shipment. Replacement components are warranted for one year from date of shipment.

Rush Service

At times, the buyer may desire to expedite a repair. Regardless of warranty or out-of-warranty status, the buyer must issue a valid purchase order to cover the added rush service cost. Rush service is subject to Aerotech's approval.

On-site Warranty Repair

If an Aerotech product cannot be made functional by telephone assistance or by sending and having the customer install replacement parts, and cannot be returned to the Aerotech service center for repair, and if Aerotech determines the problem could be warranty-related, then the following policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs. For warranty field repairs, the customer will not be charged for the cost of labor and material. If service is rendered at times other than normal work periods, then special service rates apply.

If during the on-site repair it is determined the problem is not warranty related, then the terms and conditions stated in the following "On-Site Non-Warranty Repair" section apply.

On-site Non-warranty Repair

If any Aerotech product cannot be made functional by telephone assistance or purchased replacement parts, and cannot be returned to the Aerotech service center for repair, then the following field service policy applies:

Aerotech will provide an on-site field service representative in a reasonable amount of time, provided that the customer issues a valid purchase order to Aerotech covering all transportation and subsistence costs and the prevailing labor cost, including travel time, necessary to complete the repair.

Company Address

Aerotech, Inc.
101 Zeta Drive
Pittsburgh, PA 15238-2897
USA

Phone: (412) 963-7470
Fax: (412) 963-7459

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REVISION HISTORY

In This Section:

Revisions

The following section provides the user with general information regarding the latest changes to this manual. Extensive changes, if made, may not be itemized – instead, the section or chapter will be listed with "extensive changes" in the corresponding General Information cell.

Table R-1. Revisions

Revision	Section(s) Affected	General Information
1.6.	1.6.2.	Figure 1-6: pin labels updated

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READER'S COMMENTS

BB500 (-TB) Interface Board User's Manual
P/N EDO109, May 2002

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	Yes	No
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