DR300
DRIVE CHASSIS

OPERATION & TECHNICAL MANUAL

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CHAPTER 1: INTRODUCTION

In This Section:

1.1. Product Overview

Aerotech's DR300 Drive Chassis is an integral part in a UNIDEX 500 or UNIDEX 600 based control system. The DR300 is a 19-inch rack mount chassis with provision for holding up to four individual amplifiers (DC servo, AC brushless, or microstepping) that are inserted into the front of the DR300 panel. The DR300 also provides bus power for the amplifier modules and acts as a breakout for all control and I/O signals. The back of the DR300 contains all the cable connectors as well as descriptions for each. The DR300 Drive Chassis is shown in Figure 1-1.

Figure 1-1. DR300 Drive Chassis

1.1.1. DR300 Functions

The DR300 provides the user flexibility in a motion control system, offering several different functions. These functions:

- Supply low and high level (bus) voltage to amplifiers
- Condition and set bus voltage levels
- Power incremental encoder feedback transducers
- Supply up to 2 high power (bus) voltages at either 40, 80, and 160 VDC levels
- Distribute all motion related signals to and from the UNIDEX 500/U600
- Distribute all motor power connections for Aerotech motor cables
- Assure a fail-safe connection to the UNIDEX 500/U600 controller.

1.1.2. DR300 Configurations

The DR300 is easily configured to the users needs and can be set up for a wide range of applications. It can be configured to:

- House up to 4 DC servo, AC brushless, or microstepping amplifiers
- House from 1 to 4 amplifier modules
- House up to 2 transformers
- House optional brake control logic, brake power, and passive regeneration dissipation options
- Provide all motor power connections to the amplifier modules
- Mount in a rack assembly, panel configuration
- Power up to 4 axes of motors
- Interface with a joystick or electronic hand-wheel.

Figure 1-2 illustrates a typical U500/U600 System (with the DR300 and several options and accessories).

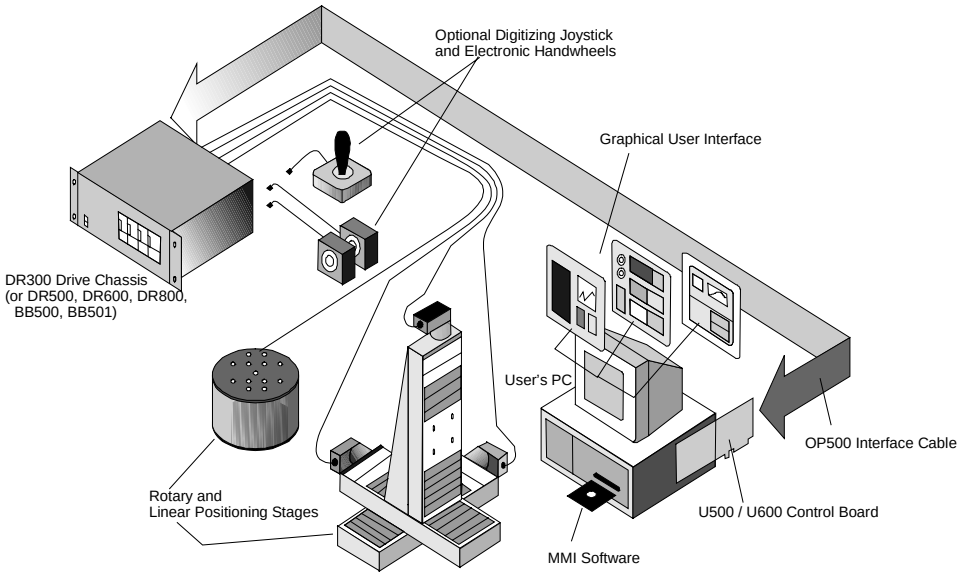


Figure 1-2. UNIDEX 500/U600 System Diagram

1.2. DR300 Options

A variety of options may be purchased with the DR300 drive chassis to enhance its standard operation. The following sections discuss the available options.

1.2.1. The SHUNT500 Regulator Board

The SHUNT500 regulator board provides shunt regulated bus voltage. Figure 1-3 shows the interconnections of the SHUNT500 regulator board.

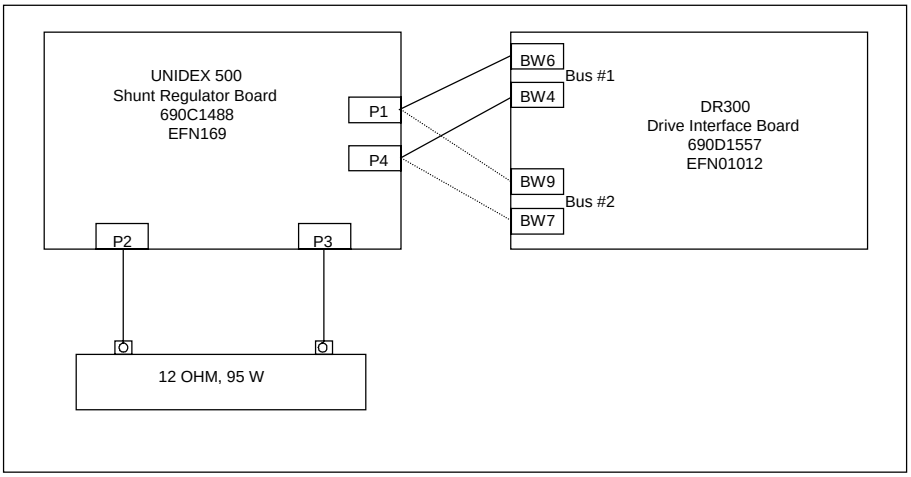


Figure 1-3. SHUNT500 Wiring

The SHUNT500 board, shown in Figure 1-5, is an integral option to the DR300 used to regulate either one of the bus power supplies (Both if Supplies are connected together). Typically, the SHUNT500 board is required for motors operating from a 160 VDC bus with large inertial loads, which on deceleration return the energy back into the power supply, possibly damaging the drive module. The SHUNT500 board prevents the power from pumping up the bus supplies by dissipating the excess energy into a 95 watt resistive load.

The SHUNT500 board has an adjustable voltage set point and fusing. The set point for the regulator is factory set and should not require user adjustment. However, it may be necessary to change the fuse for the regulator circuit. This is accessible by removing the top cover to access the fuse. The mounting location for the SHUNT500 board is shown in Figure 1-4.

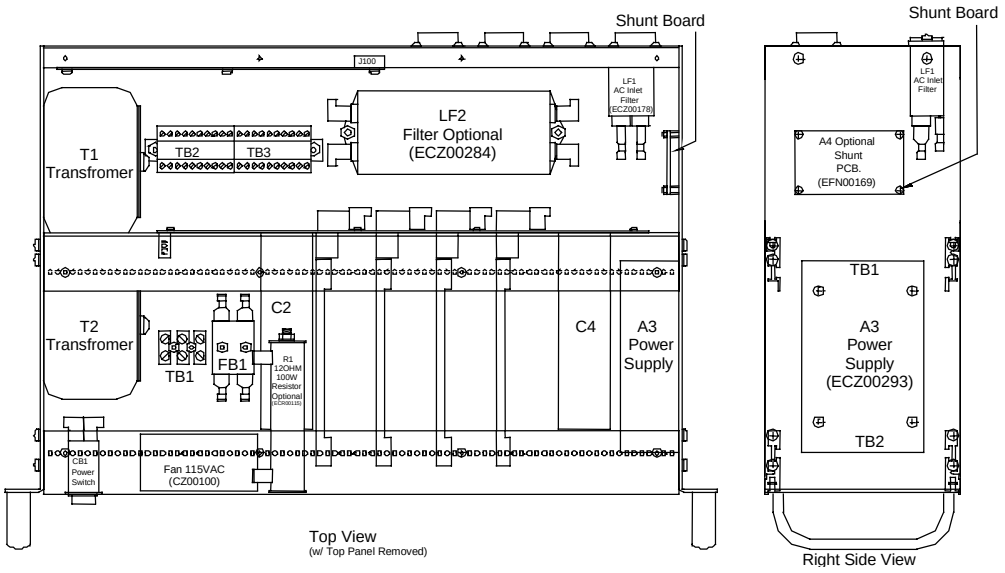


Figure 1-4. Mounting of the Shunt Board

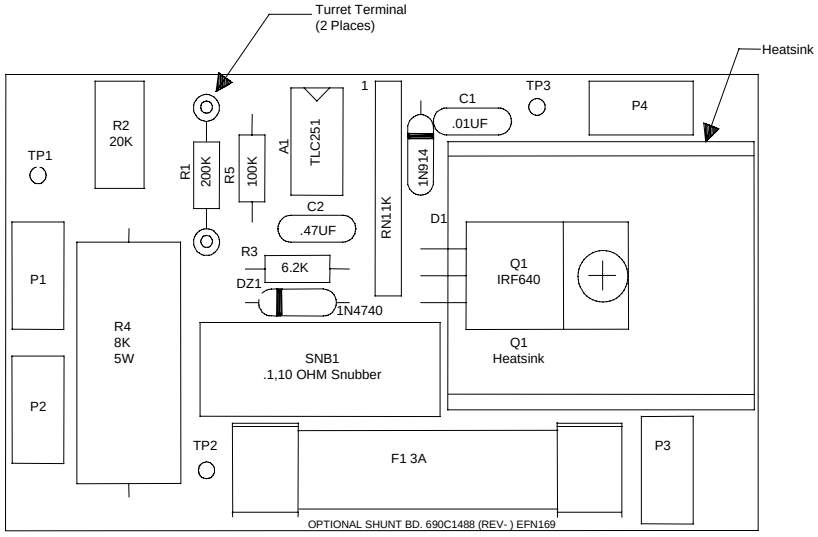
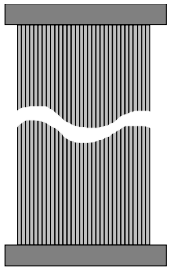


Figure 1-5. SHUNT500 Board

WARNING

Shunt regulator circuit operates at a high DC bus voltage.

1.2.2. DRC I/O Cable



The DRC I/O cable serves two purposes when used with the DR300 Drive Chassis. The primary use is for applications that use brushless motors with Hall effect sensors. In such cases, the necessary Hall effect signals are not available through the standard OP500 cable, therefore, the DRC cable is connected between the UNIDEX 600/U500 and the DR300. Different versions of the DRC I/O cable are available for (1) directly connecting the UNIDEX 600/U500 and a PB8, PB16, or PB24 interface board to allow additional inputs/outputs; or (2), connecting the U600/U500 to the DR300 (to provide Hall effect inputs and extra I/O) with an additional connection for an optional PB8, PB16, or PB24 I/O board.

The second purpose is to allow more than four user inputs or outputs (as in the case when the PB8, PB16, or PB24 I/O board is used).

Figure 1-6 is an illustration of the DRC I/O cable. Refer to Figure 1-7 for illustrations of two versions of the DRC I/O cable.

See the U600 Hardware manual, EDU154, for complete information on using the DRC cable. Figure 1-6 is for reference only.

The DRC cable is not needed to provide Hall effect signals when the U500 PCI board and the DR300 rear panel interface PCB (Rev. A & later) are used.

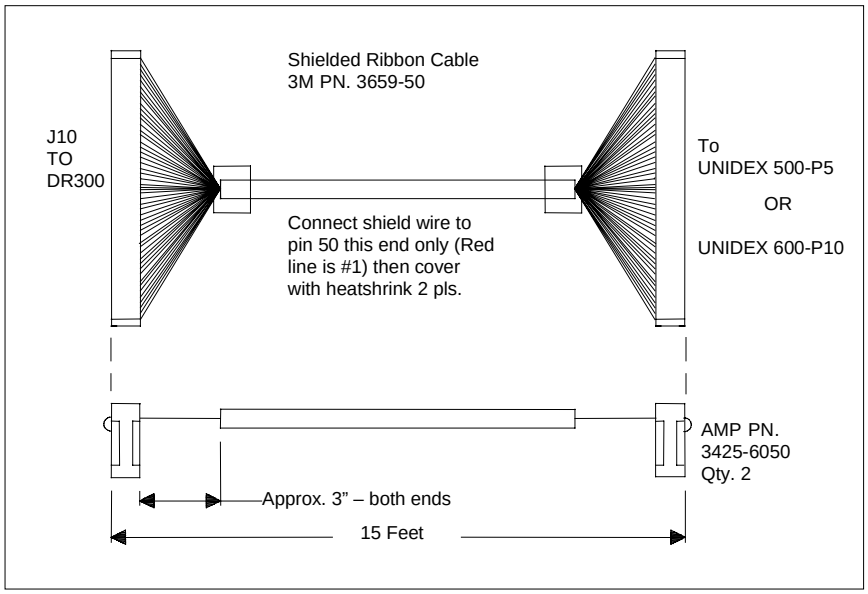


Figure 1-6. DRC Cable

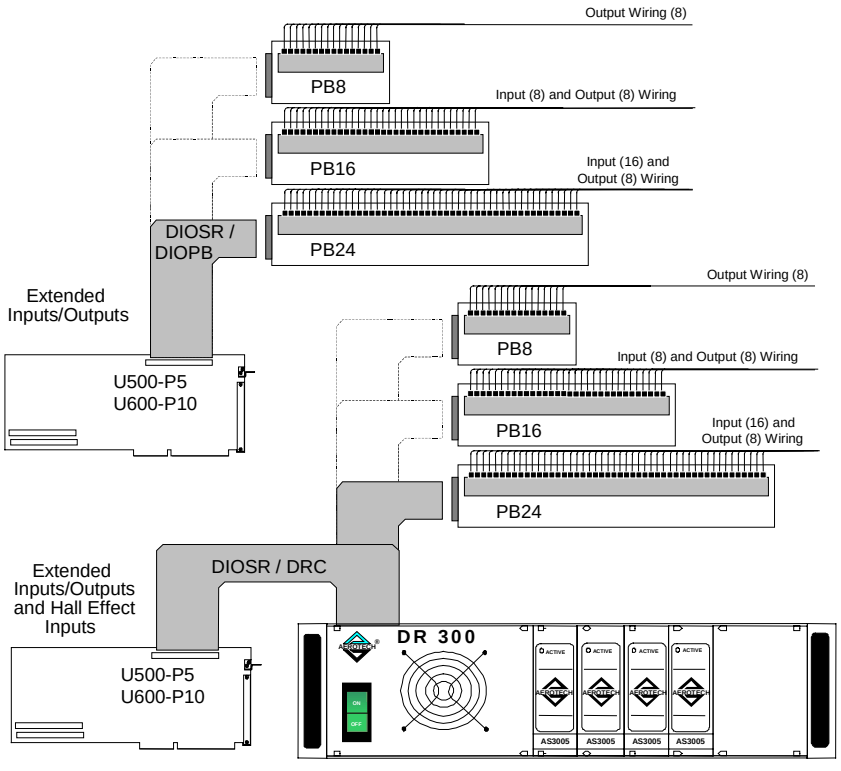
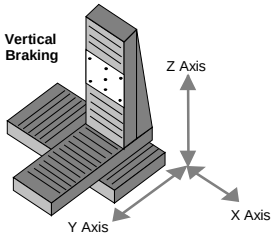


Figure 1-7. Sample Uses of the DRC Cable

1.2.3. DR300 Brake Option

The DR300 brake option, shown in Figure 1-8, is an integral option that provides a fail-safe way to maintain position on a vertical axis when power is removed from that axis. This is accomplished by means of a normally-on electromagnetic brake coupled to the load. To release the brake, 24 VDC (typical) is applied to the brake when that axis is enabled for motion by the UNIDEX 500 or UNIDEX 600. This option requires additional wiring and the installation of several Brake Option components to the Drive Interface Board and the Rear Panel Interface Board that are used to sense the switching on the motor leads of PWM amplifiers. Additional modifications may also be included to meet particular brake applications.



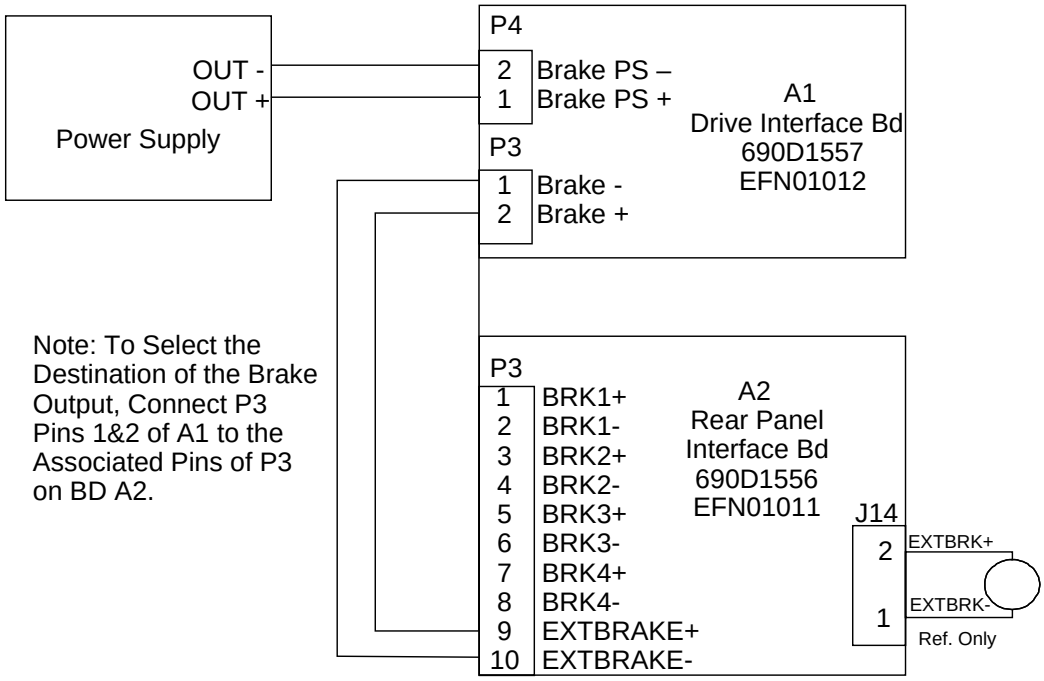


Figure 1-8. BRAKE OPTION Wiring

Brake output (J14) is typically 24 volts.

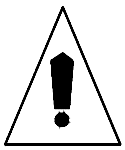
IMPORTANT

1.3. 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.

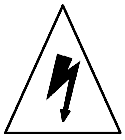
WARNING

If the equipment is used in a manner not specified by the manufacturer, the protection by the equipment may be impaired. The user should practice caution when following the given procedures. Deviation from this may result in damage to the equipment or the machinery.



WARNING

To minimize the possibility of electrical shock and bodily injury when servicing the equipment, ensure that all electrical power switches are in the off position and disconnect main power.



DANGER

To minimize the possibility of electrical shock and bodily injury, extreme care must be exercised when any electrical circuits are in use, that no person be in contact with the circuitry.

DANGER

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

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CHAPTER 2: SET UP

In This Section:

2.1. Unpacking the DR300 Drive Package

Before unpacking any components, visually inspect the container of the DR300 for any evidence of shipping damage. If any such damage exists, notify the shipping carrier immediately.

All electronic equipment and instrumentation are wrapped in antistatic material and packaged with desiccant. Ensure that the antistatic material is not damaged during unpacking.

WARNING

Remove the packing list from the DR300 container. Make sure that the items specified on the packing list are contained within the package. Certain items required for use with your DR300 are not included within the DR300 shipping container. These items may be found in the UNIDEX 500/600 shipping container.

- The DR300 Drive Chassis
  One to four axis amplifier chassis with power supply

- The OP500 Interface Cable
  12 ft, (3.6m) cable used to connect the UNIDEX 500/600 to the DR300

- AC line cord
  This cable connects the DR300 Drive Chassis to an AC outlet

The DR300 should not have any of its cables connected or disconnected with power applied, nor should any drive modules be removed or inserted into it with power applied. Doing so may cause damage to the system or its components.

WARNING

2.2. DR300 Jumper Selections and Configurations

The DR300 is already configured by the factory according to the specifications given by the user. There should be no need to reconfigure the DR300 Chassis. However, if the user needs to add or change the type of Amplifier for an axis, it will be necessary to configure the slot jumpers. These jumpers are shown in Figure 2-1 and Figure 2-2 and are described in the following sections. The "BW" type slot jumpers on the Drive Interface board are high current jumpers and are permanently soldered to the board. The "JP" type jumpers are two pin headers that insert and pull out of a socket.

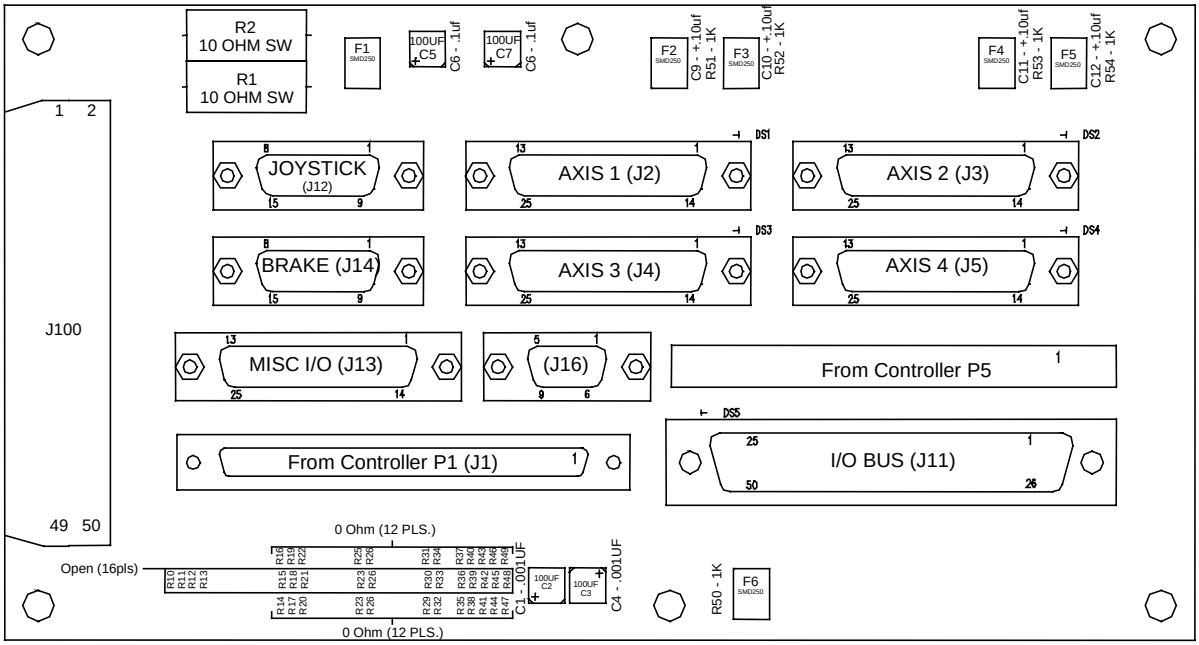
2.2.1. AC Input Voltage Configuration

See Chapter 4: Soft-Start / Voltage Selector Board (section 4.3.).

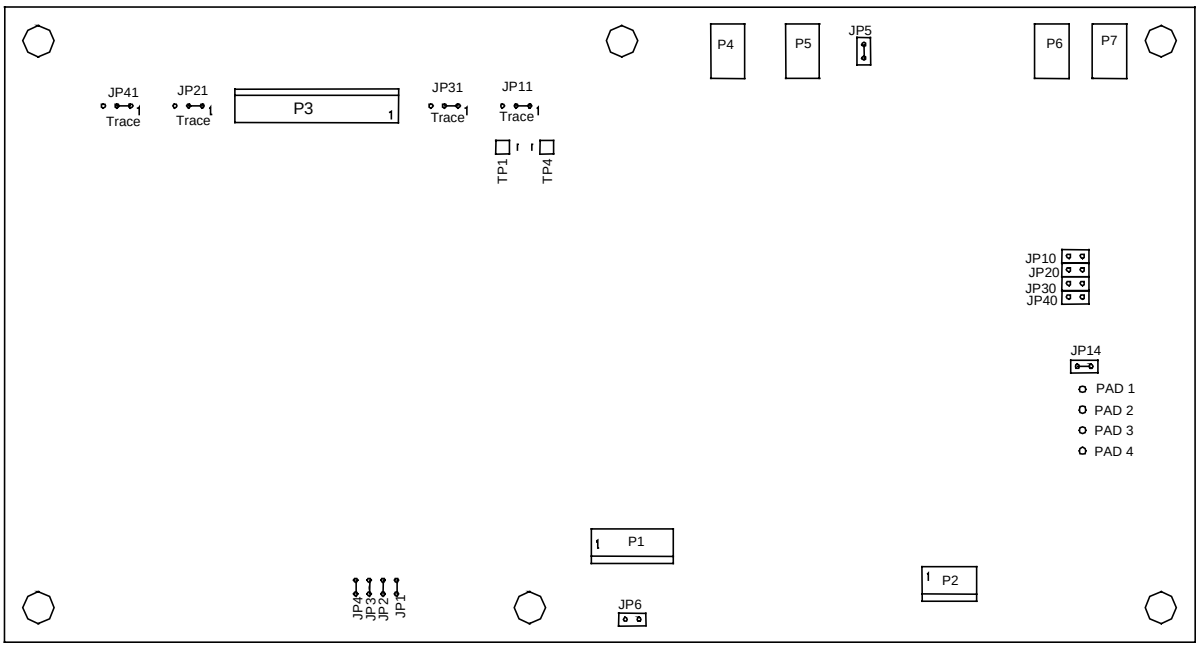
2.2.2. Rear Panel Interface Board Internal Jumpers

This section covers the configurations of the slot jumpers on the DR300 Rear Panel Interface board. Table 2-1 lists the configurations and jumper selections for the Rear Panel Interface Board.

There are two circuit boards with the DR300, be sure to reference the correct jumper table for jumper settings for each board.



TOP SIDE



Drawing 690B1556 Rev. A

BOTTOM SIDE

Figure 2-1. DR300 Rear Panel Interface Board Jumper Locations

Table 2-1. Rear Panel Interface Board Jumper Selections

Configuration	Jumpers	
	Standard	**Optional**
I/O configuration for U600	U500 configuration. JP1-4 are installed	To isolate I/O for U600 configurations. JP1-4 are removed (cut).
	Note: These are trace jumpers.	
+5 Volt minimum Load	Apply additional minimum load to +5 Volts (1 Amp), install JP9	Remove additional minimum load to +5 Volts (1 Amp), remove JP9
DAC Common 1 and DAC Common 2	Disabled, always remove JP10 for U500/U600 ISA Bus.	Connect DAC #1 and #2 commons together when using U500 PCI external DAC supply. Install JP10. See **Warning!** below table.
ESTOP disables drive(s)	24 Volt ESTOP input disables drives. Remove JP14. See Table 2-2, JPx6.	5 volt ESTOP input does not disable drives, insert JP14, JP16, JP26, JP36, and JP46.
Encoder Fault Input		
Axis 1 (J2 Pin 23)	Enabled, set JP5 1-2	Encoder fault input drives mode 1, set JP5 2-3
Axis 2 (J3 Pin 23)	Enabled, set JP6 1-2	Encoder fault input drives mode 2, set JP6 2-3
Axis 3 (J4 Pin 23)	Enabled, set JP7 1-2	Encoder fault input drives mode 3, set JP7 2-3
Axis 4 (J5 Pin 23)	Enabled, set JP8 1-2	Encoder fault input drives mode 4, set JP8 2-3
Limit Power Supply Select		
Axis 1	JP11 is set 1-2 (+5 Volt supply)	JP11 set 2-3 (1-2 open / cut) for external supply – P4
Axis 2	JP21 is set 1-2 (+5 Volt supply)	JP21 set 2-3 (1-2 open / cut) for external supply – P4
Axis 3	JP31 is set 1-2 (+5 Volt supply)	JP31 set 2-3 (1-2 open / cut) for external supply – P4
Axis 4	JP41 is set 1-2 (+5 Volt supply)	JP41 set 2-3 (1-2 open / cut) for external supply – P4
	Note: These are trace jumpers	

JP10 IN – ONLY when using external DAC supply (U500PCI Only).

2.2.3. Drive Interface Board Internal Jumpers

This section covers the configurations of the slot jumpers on the DR300 Drive Interface board. Table 2-2 lists the configurations and jumper selections.

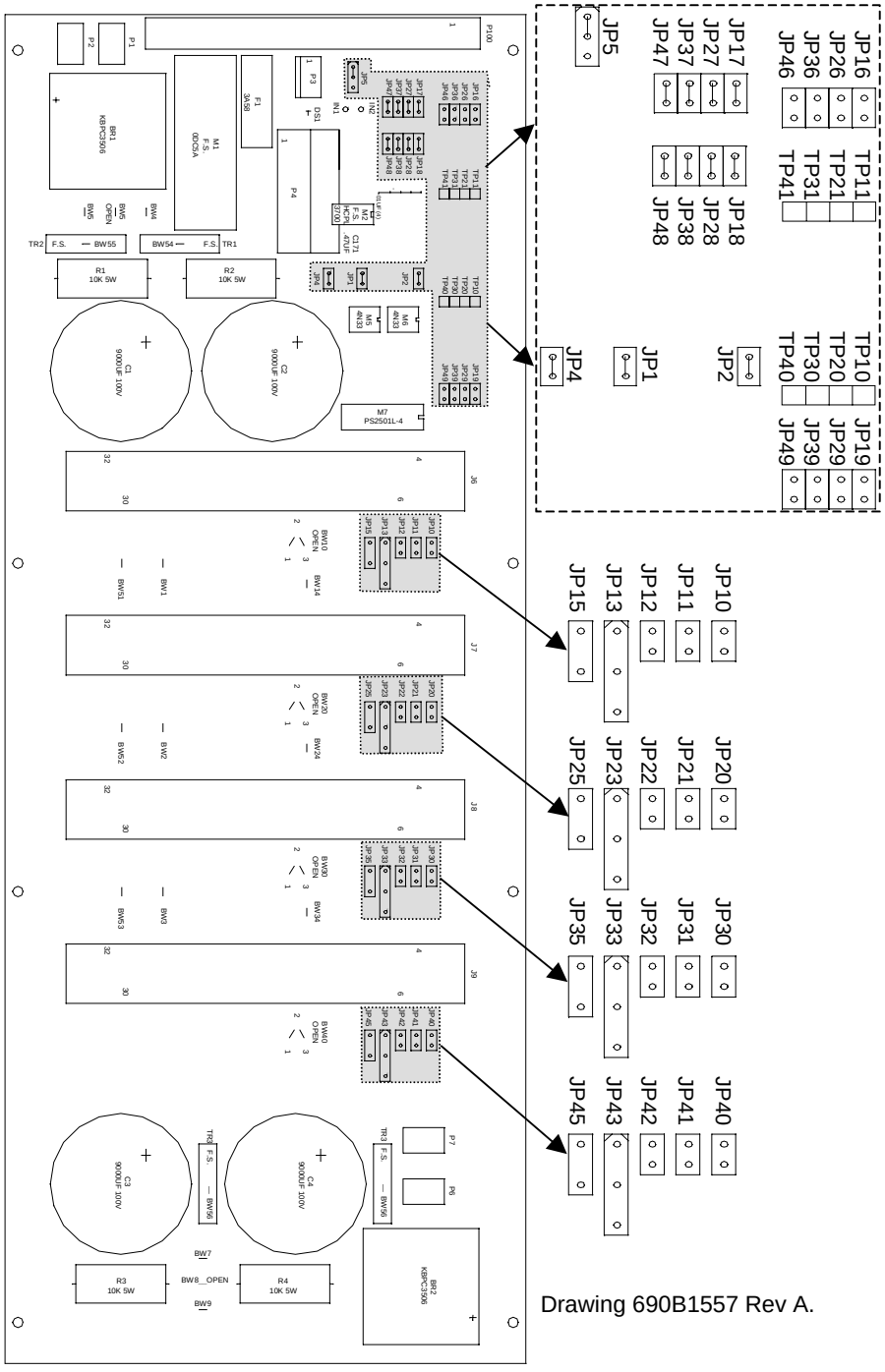


Figure 2-2. DR300 Drive Interface Board Jumper Locations

Table 2-2. Drive Interface Board Jumper Selections

Configuration	Jumpers		
	Standard	**Optional**	
ESTOP disables drives	**No:**	**Yes:**	
Axis 1	Remove JP16	Install JP16	
Axis 2	Remove JP26	Install JP26	
Axis 3	Remove JP36	Install JP36	
Axis 4	Remove JP46	Install JP46	
	See JP14 (Rear Panel Interface Board, Table 2-1)		
Encoder Fault disables drives	**Disabled:**	**Active High:**	**Active Low:**
Axis 1	Remove JP17 1-2 and JP17 2-3	Install JP17 1-2	Install JP17 2-3
Axis 2	Remove JP27 1-2 and JP27 2-3	Install JP27 1-2	Install JP27 2-3
Axis 3	Remove JP37 1-2 and JP37 2-3	Install JP37 1-2	Install JP37 2-3
Axis 4	Remove JP47 1-2 and JP47 2-3	Install JP47 1-2	Install JP47 2-3
Amp switching monitor for optional brake	Disabled, install JP4	Enabled, remove JP4	
Optional Brake control	Use Brake output, set JP5 1-2	Use Output 0, set JP5 2-3	
Thermistor Input	**Disabled**	**Active High**	**Active Low**
Axis 1	Remove JP18 1-2 and 2-3	Install JP18 1-2	Install JP18 2-3
Axis 2	Remove JP28 1-2 and 2-3	Install JP28 1-2	Install JP28 2-3
Axis 3	Remove JP38 1-2 and 2-3	Install JP38 1-2	Install JP38 2-3
Axis 4	Remove JP48 1-2 and 2-3	Install JP48 1-2	Install JP48 2-3
Amplifier Enable	**Active High**	**Active Low**	
Axis 1	Install JP19 1-2	Install JP19 2-3, Remove JP19 1-2	
Axis 2	Install JP29 1-2	Install JP29 2-3, Remove JP29 1-2	
Axis 3	Install JP39 1-2	Install JP39 2-3, Remove JP39 1-2	
Axis 4	Install JP49 1-2	Install JP49 2-3, Remove JP49 1-2	
Bus Power Supply #1	**Unipolar** (0-X, 40-X, 80-X, 160-X) Install: BW4, BW6, BW54, BW55 Remove: BW5 **Unipolar** (160LT-X) Install: BW4 & BW6 Remove: BW5, BW54, BW55 Add: TR1, TR2 (CL-11, ECR130)	**Bipolar** (30-X) Install: BW5 (EIK00226 – QUICK CONN. TAB), BW54, BW55 Remove: BW4, BW6	
Bus Power Supply #2	**Unipolar** (X-0, X-40, X-80, X-160) Install: BW7, BW9 BW56, BW57 Remove: BW8 **Unipolar** (X-160LT) Install: BW7, BW9 Remove: BW8, BW56, BW57 Add: TR3, TR4, (CL-11, ECR130)	**Bipolar** (X-30) Install: BW8 (EIK00226 – QUICK CONN. TAB), BW56, BW57 Remove: BW7, BW9	

Table 2-2. Drive Interface Board Jumper Selections (Continued)

Configuration	Jumpers	
	Standard	**Optional**
Bus Voltages Different:	30-40, 30-80, 30-160, 30-160LT, 40-30, 40-80, 40-160, 40-160LT, 80-30, 80-40, 80-160, 80-160LT, 160-30, 160-40, 160-80, 160-160LT, 160LT-30, 160LT-40, 160LT-80, 160LT-160	
	Split 2-2: IN: BW1, BW3, BW14, BW34, BW51, BW53 OUT: BW2, BW24, BW52	**Split 1-3:** IN: BW2, BW3, BW24, BW34, BW52, BW53 OUT: BW1, BW14, BW51 **Split 3-1:** IN: BW1, BW2, BW14, BW24, BW51, BW52 OUT: BW3, BW34 , BW53
Bus Separation		Bus 1 and Bus 2 the same: 40-40, 80-80, 160-160, 160LT-160LT: or Bus 1 or Bus 2 is 0V: 30-0, 40-0, 80-0, 160-0, 160LT-0, 0-30, 0-40, 0-80, 0-160, 0-160LT: IN: BW1, BW2, BW3, BW14, BW24, BW34, BW51, BW52, BW53

Table 2-3. Drive Interface Bd. Jumper Selections for AM16007 Stepper Drive.

AXIS	1	2	3	4
FUNCTION	**AM16007 STEPPING DRIVE CONFIGURATION**			
PHASE D/B-	BW10 1-2	BW20 1-2	BW30 1-2	BW40 1-2
DRIVE +5V	JP12 IN	JP22 IN	JP32 IN	JP42 IN
MODE	JP10 IN	JP20 IN	JP30 IN	JP40 IN
ICMDA	JP11 IN	JP21 IN	JP31 IN	JP41 IN
AMP FAULT	JP13 OUT	JP23 OUT	JP33 OUT	JP43 OUT
DRIVE KEY	POS C	POS C	POS C	POS C
TACH	JP15 OUT	JP25 OUT	JP35 OUT	JP45 OUT
PHASE A	BW13 IN	BW23 IN	BW33 IN	BW43 IN

Table 2-4. Drive Interface Bd. Jumper Selections for DS16020/16030 Servo Drive

AXIS	1	2	3	4
FUNCTION	**DS16020 / DS16030 BRUSH SERVO DRIVE CONFIGURATION**			
PHASE D/B-	BW10 OUT	BW20 OUT	BW30 OUT	BW40 OUT
DRIVE +5V	JP12 OUT	JP22 OUT	JP32 OUT	JP42 OUT
MODE	JP10 OUT	JP20 OUT	JP30 OUT	JP40 OUT
ICMDA	JP11 OUT	JP21 OUT	JP31 OUT	JP41 OUT
AMP FAULT	JP13 2-3	JP23 2-3	JP33 2-3	JP43 2-3
DRIVE KEY	POS B	POS B	POS B	POS B
TACH	JP15 IN	JP25 IN	JP35 IN	JP45 IN
PHASE A	BW13 IN	BW23 IN	BW33 IN	BW43 IN

Table 2-5. Drive Interface Bd. Jumper Selections for AS32020/32030 Brushless Drive

AXIS	1	2	3	4
FUNCTION	**AS32020 / AS32030 BRUSHLESS SERVO DRIVE CONFIGURATION**			
PHASE D/B-	BW10 OUT	BW20 OUT	BW30 OUT	BW40 OUT
DRIVE +5V	JP12 IN	JP22 IN	JP32 IN	JP42 IN
MODE	JP10 OUT	JP20 OUT	JP30 OUT	JP40 OUT
ICMDA	JP11 IN	JP21 IN	JP31 IN	JP41 IN
AMP FAULT	JP13 1-2	JP23 1-2	JP33 1-2	JP43 1-2
DRIVE KEY	POS G	POS G	POS G	POS G
TACH	JP15 OUT	JP25 OUT	JP35 OUT	JP45 OUT
PHASE A	BW13 IN	BW23 IN	BW33 IN	BW43 IN

Table 2-6. Drive Interface Board Jumper Selections for AS3005 Brushless Drive

AXIS	1	2	3	4
FUNCTION	**AS3005 BRUSHLESS SERVO DRIVE CONFIGURATION**			
PHASE D/B-	BW10 2-3	BW20 2-3	BW30 2-3	BW40 2-3
DRIVE +5V	JP12 OUT	JP22 OUT	JP32 OUT	JP42 OUT
MODE	JP10 OUT	JP20 OUT	JP30 OUT	JP40 OUT
ICMDA	JP11 IN	JP21 IN	JP31 IN	JP41 IN
AMP FAULT	JP13 1-2	JP23 1-2	JP33 1-2	JP43 1-2
DRIVE KEY	POS A+E	POS A+E	POS A+E	POS A+E
TACH	JP15 OUT	JP25 OUT	JP35 OUT	JP45 OUT
PHASE A	BW13 IN	BW23 IN	BW33 IN	BW43 IN

2.2.4. Bus Configuration

The DR300 provides two different bus supplies with each capable of being setup as a unipolar or bipolar power supply. Each bus power supply may be setup as a 40, 80, or 160 VDC unipolar supply (single supply) or as a 30 VDC bipolar supply (dual + and – supply). The 30 VDC bipolar power supply is for use with the linear three phase AC brushless drive (AS3005). Bus power voltages are derived from isolation transformers, autotransformers or off line depending on the Line voltage, bus voltage, and other factors. The bus supply information can be obtained from the DR300 System drawing provided with the DR300.

2.2.4.1. Bus Type (Unipolar/Bipolar Configuration)

The DR300 Bus supplies are normally configured at that factory when the system is built. These supplies should not need to be reconfigured unless a change in bus voltage is needed and, in these cases, it is advisable to contact the factory.

2.2.4.2. Bus #1, Unipolar

When the bus #1 supply is a unipolar supply, the BW5 jumper must be removed to solder in the BW4 and BW6 jumpers.

2.2.4.3. Bus #1, Bipolar

When the bus #1 supply is a bipolar supply, jumpers BW4 and BW6 must be removed and the BW5 jumper must be soldered in.

2.2.4.4. Bus #2, Unipolar

When the bus #2 supply is a unipolar supply, the BW8 jumper must be removed to solder in the BW7 and BW9 jumpers.

2.2.4.5. Bus #2, Bipolar

When the bus #2 supply is a bipolar supply, jumpers BW7 and BW9 must be removed and the BW5 jumper must be soldered in.

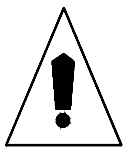
2.2.4.6. Bus Voltage Configuration

The bus voltage is dependent on the AC voltage applied to the AC input of the bus supplies (#1 bus supply AC inputs are P1 and P2, #2 bus supply AC inputs are P6 and P7). The source of AC voltage is typically from isolation transformers with output voltages of 28, 56, or 115 VAC for unipolar supplies that correspond to DC bus voltages of 40, 80 and 160 VDC. The bipolar isolation transformer AC voltage is 21 VAC (Line – CT) and this corresponds to 30 VDC. For bipolar supplies, a transformer centertap connection is also required. The Bipolar supply #1 transformer centertap connection is BW5 and the Bus supply #2 transformer centertap connection is BW8. These transformers are mounted internally on the left side of the DR300 with T1 used for bus supply #1 and T2 used for bus supply #2. When Autotransformers and offline methods are used to provide power to the bus supplies the bus supply cannot be grounded. The bus supplies are grounded by connections to BW4 (Bus supply #1) and BW7 (Bus supply #2). Bus supply #1 contains capacitors C1 and C2, and bus supply #2 contains capacitors C3 and C4. These capacitors are 100-volt capacitors for bus voltages of 80 volts or less and 200-volt capacitors for bus voltages greater than 80 volts.

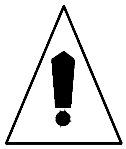
Bus supply #1 is the supply for axis #1 and any axis connected to this bus. Bus supply #2 is the supply for axis #4 and any axis connected to this bus. Axis 2 and 3 can be connected to bus supplies in several different arrangements. A restriction concerning bus separation requires that amplifiers with like voltages must be in consecutive slots. See the Bus separation selection (Table 2-2) for additional information concerning the bus separation jumpers (Bus separation jumpers: BW1, BW2, BW3, BW14, BW24, BW34, BW51, BW52 and BW53).

It may be necessary to add an optional shunt regulator to either bus to dissipate regenerative energy from the load.

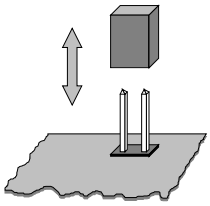
Always disconnect the main power connection before opening the DR300.



2.2.5. Installing A Drive Module in the DR300

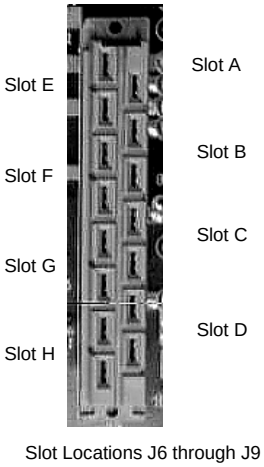


To minimize the risk of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.



Before installing a drive module into a slot in the DR300, it is necessary to configure the jumpers on the Drive Interface board for that type of drive module. There are currently three types of modules: brush motor drive modules - the DS series, stepper motor drive modules - the AM series, and AC brushless motor drive modules - the AS series.

There are two types of jumpers discussed in the following sections: two pin headers and High Current jumpers. The two pin header jumpers are designated as JPx#, where the "x" corresponds to a specific axis (e.g., JP23 is an axis 2 jumper, JP43 is an axis 4 jumper, JP13 is an axis 1 jumper, etc.). All the non-axis specific jumpers are outside the range of 10 through 49. The "#" designates a particular jumper having the same function for each axis. The other type of jumpers are special solder type jumpers and are designated as BWx#, where the "x" and "#" have the same meaning as previously described.



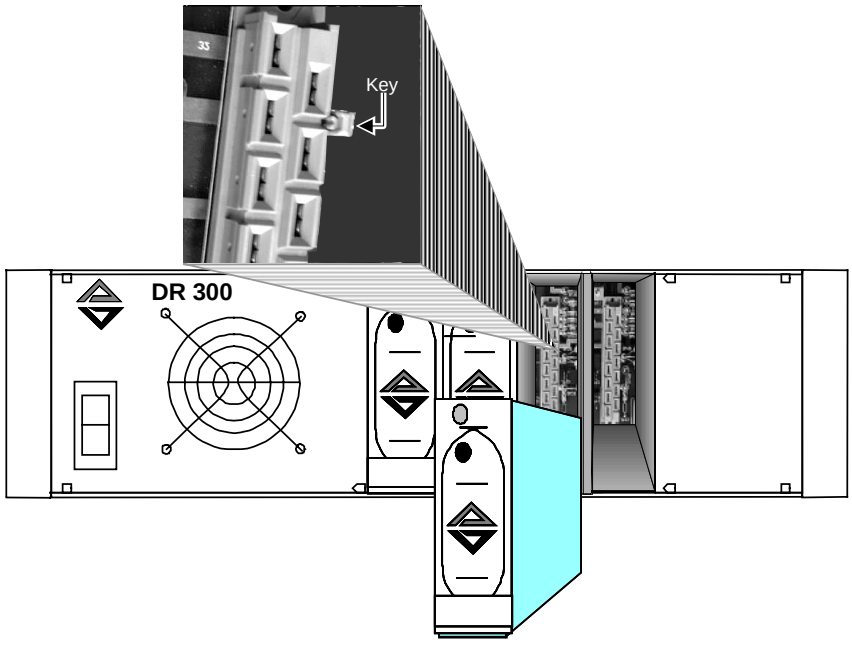


Figure 2-3. DR300 Drive Module Installation

2.2.6. DS16020 / DS16030 Brush Drive Configuration

To configure a slot in the DR300 for a brush drive module (Figure 2-4), proceed with the following steps:

- Set jumpers and Drive key according to DS16020 /DS16030 Brush Drive Configuration Table 2-4.

To minimize the risk of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

To prevent another drive type from being inadvertently inserted into slot B, the mating drive connector on the motherboard should have a key (Aerotech part number EAM857 otherwise Schroff #21101-252) inserted into slot B. Refer to Figure 2-3.

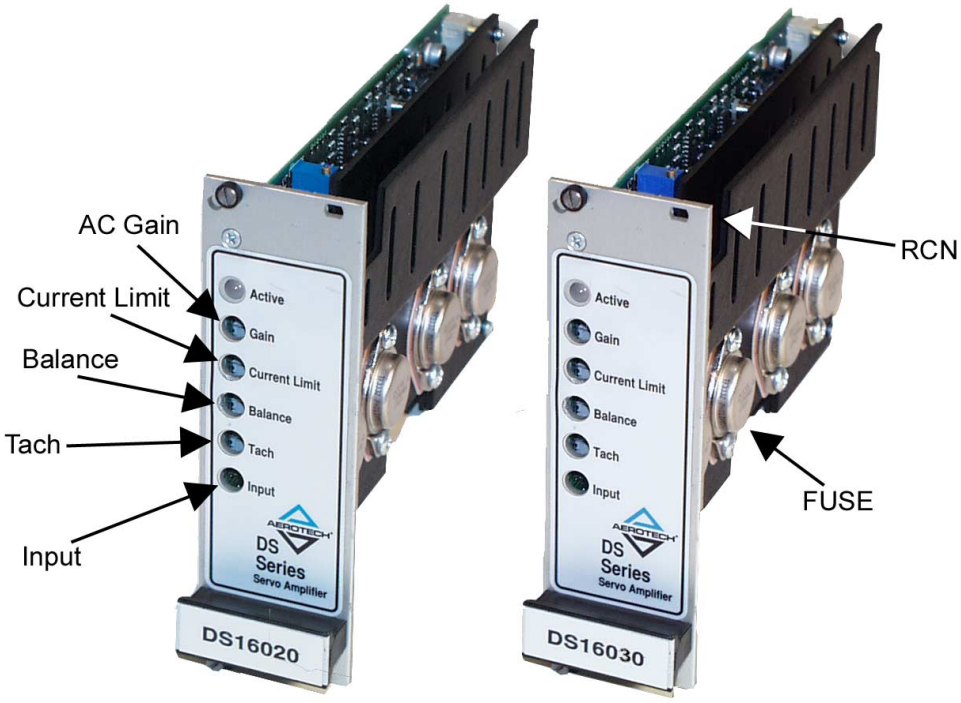


Figure 2-4. DS16020 / DS16030 Brush Drive Modules

2.2.6.1. Electrical Specifications

Electrical specifications are listed in Table 2-7.

Table 2-7. DS160 Series Electrical Specifications

	Units	DS16020	DS16030
Peak Current Output (2 sec)	Amps	±20	±30
Continuous Output Current	Amps	±10 (± 5 without fan)	±15 (± 5 without fan)
Output Fuse, F1 (3 AG, slow blow)	Amps	10 (5 w/o fan)	15 (5 w/o fan)
Peak Output Voltage	Volts	160	160
Minimum Voltage Output	Volts	10	10
Peak Power Output	Watts	2920	4200
Continuous Power Output	Watts	1530 (765 w/o fan)	2300 (765 w/o fan)
Efficiency	%	93	
Pre-Amplifier			
Voltage Gain (max open loop)	dB	100	
Drift (referred to input)	µV/°C	10	
Offset	Volts	Adjustable to Zero	
Power Amplifier			
Gain (continuous output)	Amps/Volt	1	2
Bandwidth	kHz	1	
PWM Switching Frequency	kHz	20	
Output Current Limit	Amps (max)	Adjustable: Zero to Peak	
Shutdown Input		Tristates Motor Output	
Minimum Load Inductance	mH	2	
Operating Temperature	°C	0 to 50	
Storage Temperature	°C	-30 to 85	
Weight	kg (lb)	0.5 (1)	

Two control sections (pre-amplifier and post-amplifier, in dotted lines) are shown in Figure 2-5. These control sections are detailed in Figure 2-6 and Figure 2-9.

2.2.6.2. Fault Output

The Servo Amplifier Module may be selectively configured for a Fault Output of active high. This is accomplished by removing the Fault Output Select jumper (see Figure 2-5) from JP1-1 to 2 and connecting the jumper to JP1-2 to 3 (both are P.C.B. trace jumpers).

2.2.6.3. Personality Module

The Personality Module pre-amplifier circuit, RCN4, (shown in Figure 2-6) is used to interface input and tach feedback signals (if any exist). Figure 2-3 shows the location of this module.

The user may reconfigure this module. An outline of the module is shown in Figure 2-8.

Table 2-8. DS160 Series Potentiometer Descriptions

Potentiometer	Description
Input	Provides the means of adjusting the DC gain of the input command present at J1-Pin 16. Turning this pot CW increases gain.
Tach	Provides the means of adjusting the DC gain of the tach feedback signal present at J1-Pin 18. Turning this pot CW increases gain.
Balance	Provides the means of canceling small DC offsets that may be present in the pre-amplifier circuit.
Current Limit	Provides a means of adjusting the clamp levels of the current command signal produced by the output of the pre-amplifier. Turning this pot CCW increases the clamp levels (increases the peak current).
Gain	Provides the means of adjusting the AC Gain of the pre-amplifier. Turning this pot CCW increases gain.

Pots are only used in Velocity Mode.

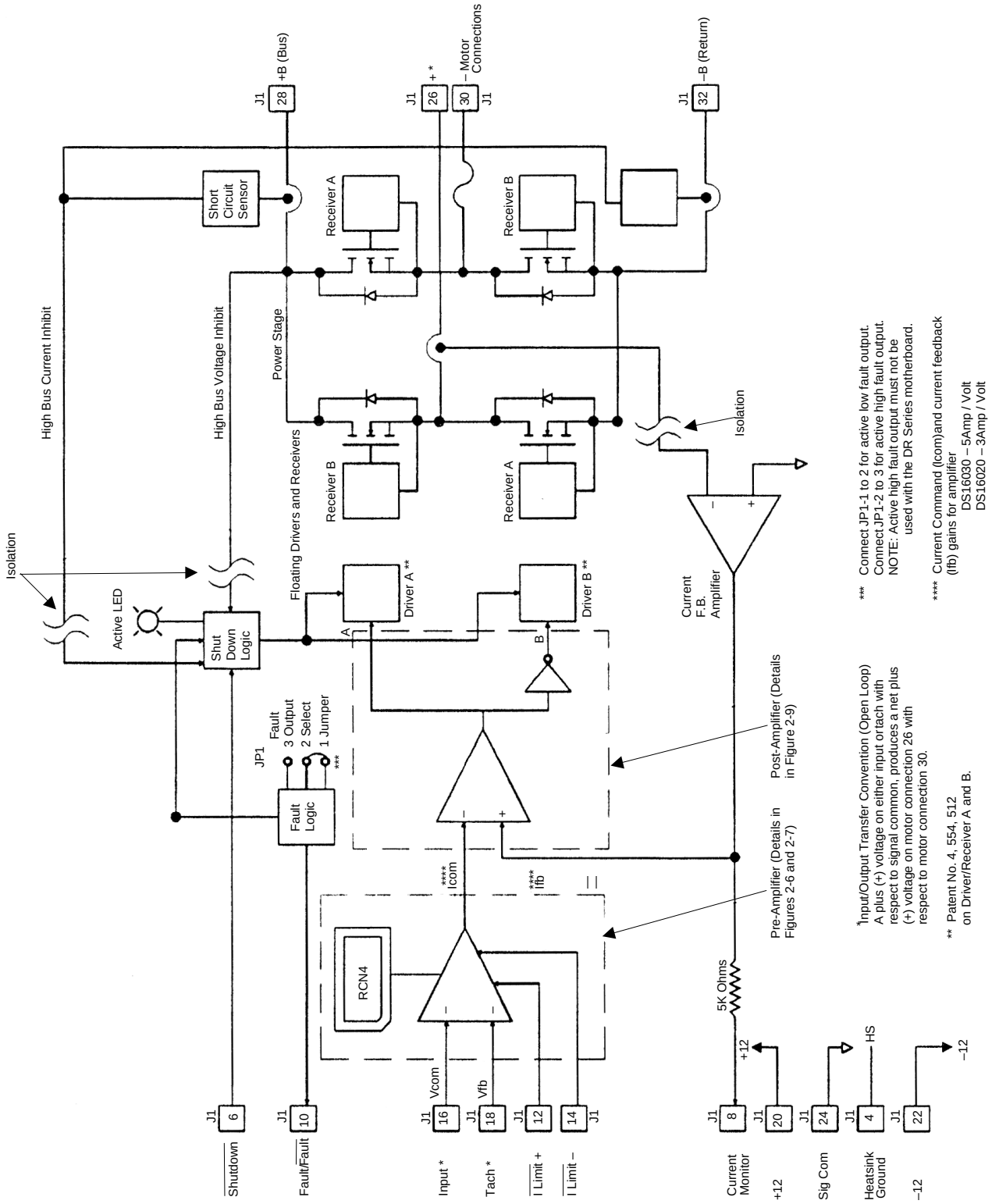


Figure 2-5. Simplified Block Diagram of the DS160 Series Servo Amplifier Module

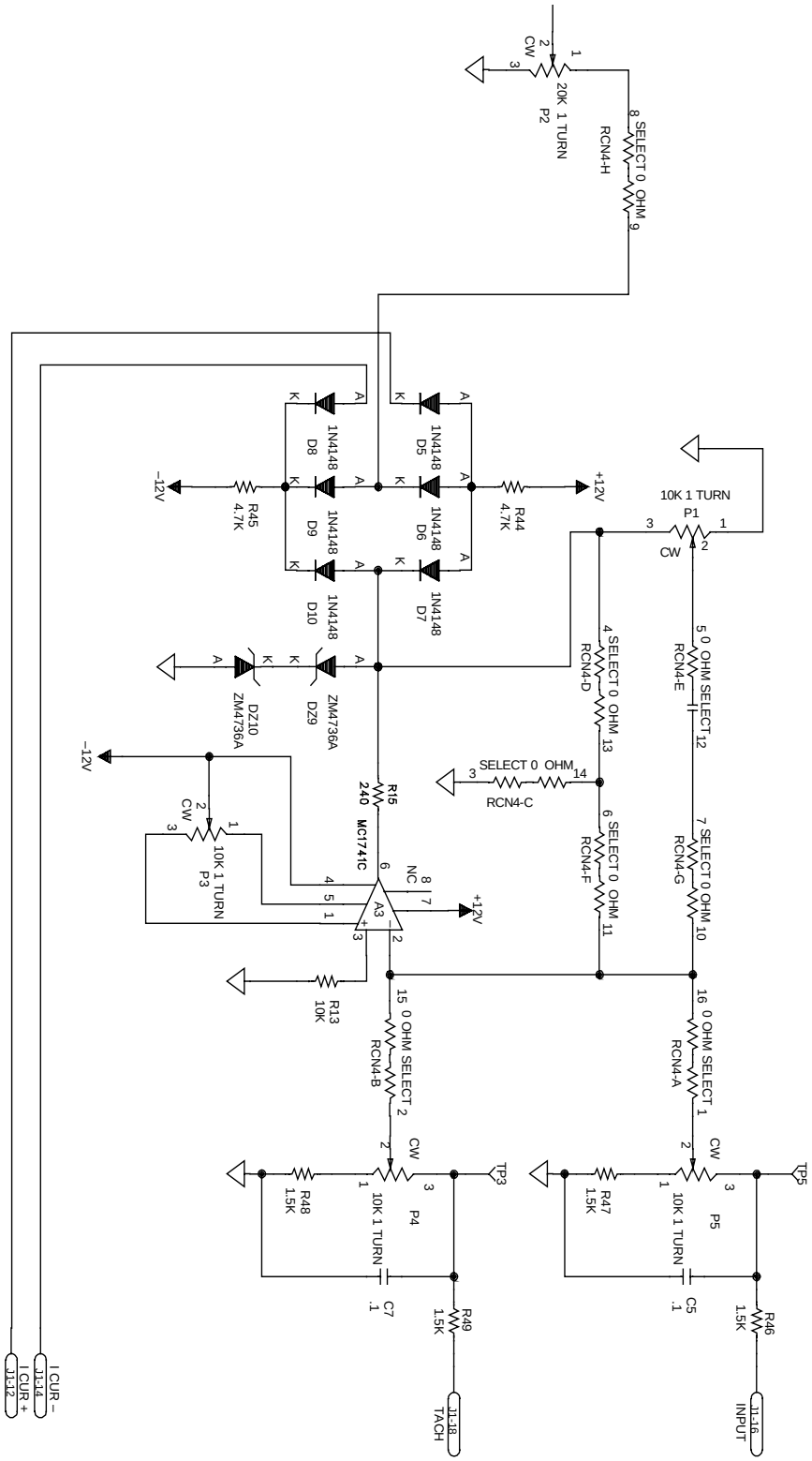


Figure 2-6. DS16020 / DS16030 Brush Drive Modules Pre-Amp Schematic

2.2.6.4. Setting the Current Limit

The RCN4 resistor component 8-9 is used to set the maximum current that can be obtained by the current limit potentiometer (full CW for zero current, full CCW for maximum current). This potentiometer should be full CCW in torque mode (default), so the controller may limit the peak current by its parameters.

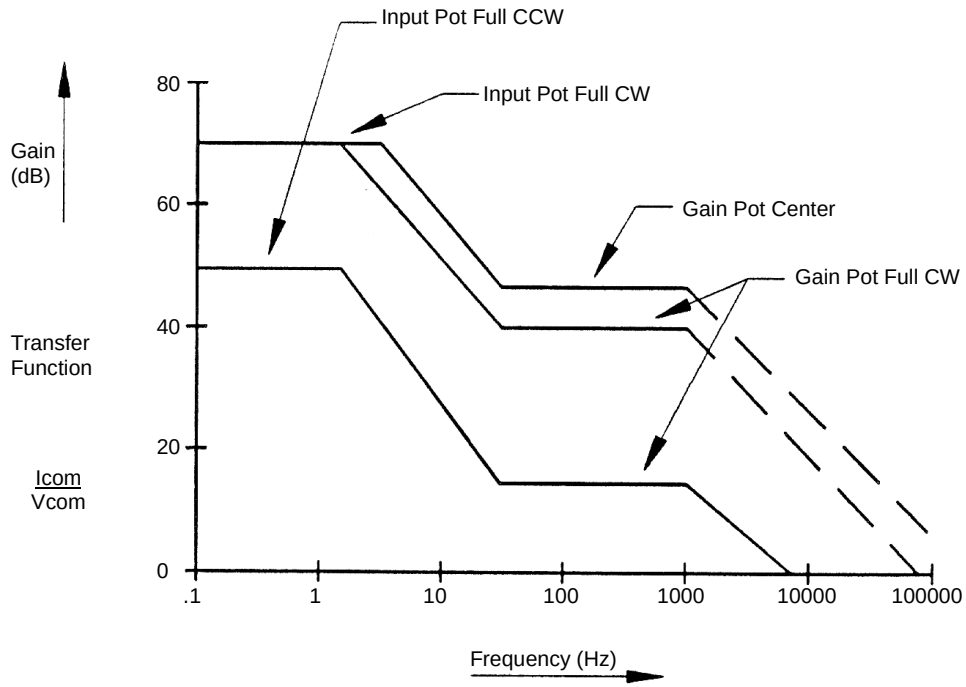
2.2.6.5. Pre-Amplifier Gain Characteristics

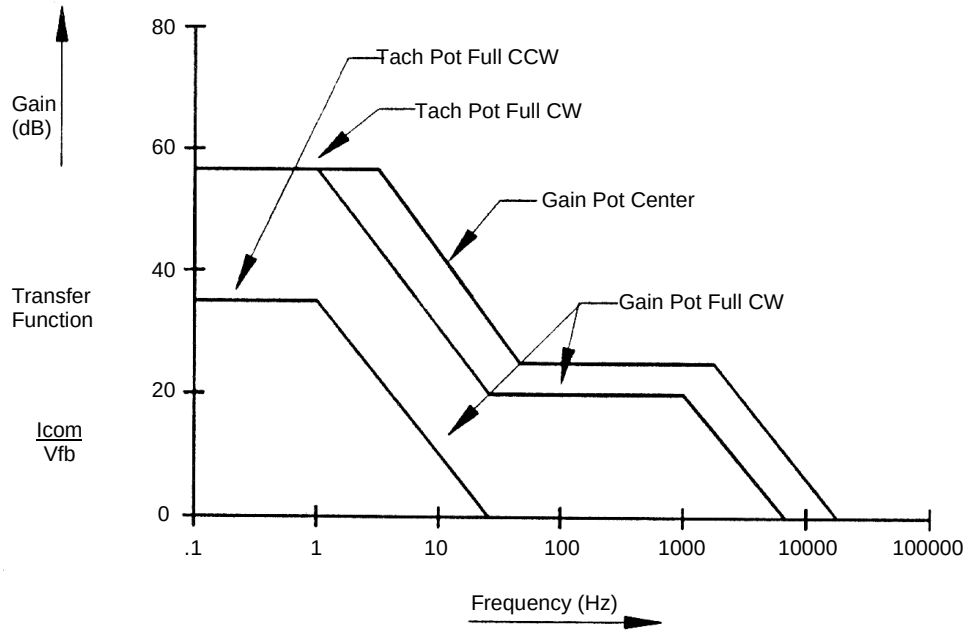
The open loop transfer function for the input connection Vcom (pin 16, J1) and tach feedback connection Vfb (pin 18, J1) to internal current command signal, Icom, is shown in Figure 2-7. The gain curves shown in Figure 2-7 are in relation to the values of RCN4 shown in Figure 2-6.

2.2.6.6. The Post-Amplifier

A detailed circuit description of the post-amplifier (shown by dotted lines in Figure 2-5) is outlined in Figure 2-9. The circuitry shown in Figure 2-9 is for reference only and is not intended to be altered by the user.

Figure 2-9 shows the control relationships of the internal current command, Icom, with the internal current feedback signal, Ifb, (see also Figure 2-5 and Figure 2-6. A brief outline of the PWM circuit, used to control the MOFSET switches of the output power stage, is also shown in this figure.





Note: Transfer functions shown above are with respect to values of RCN4 shown in Figure 2-6.

Figure 2-7. Transfer Function of Pre-Amplifier Circuit

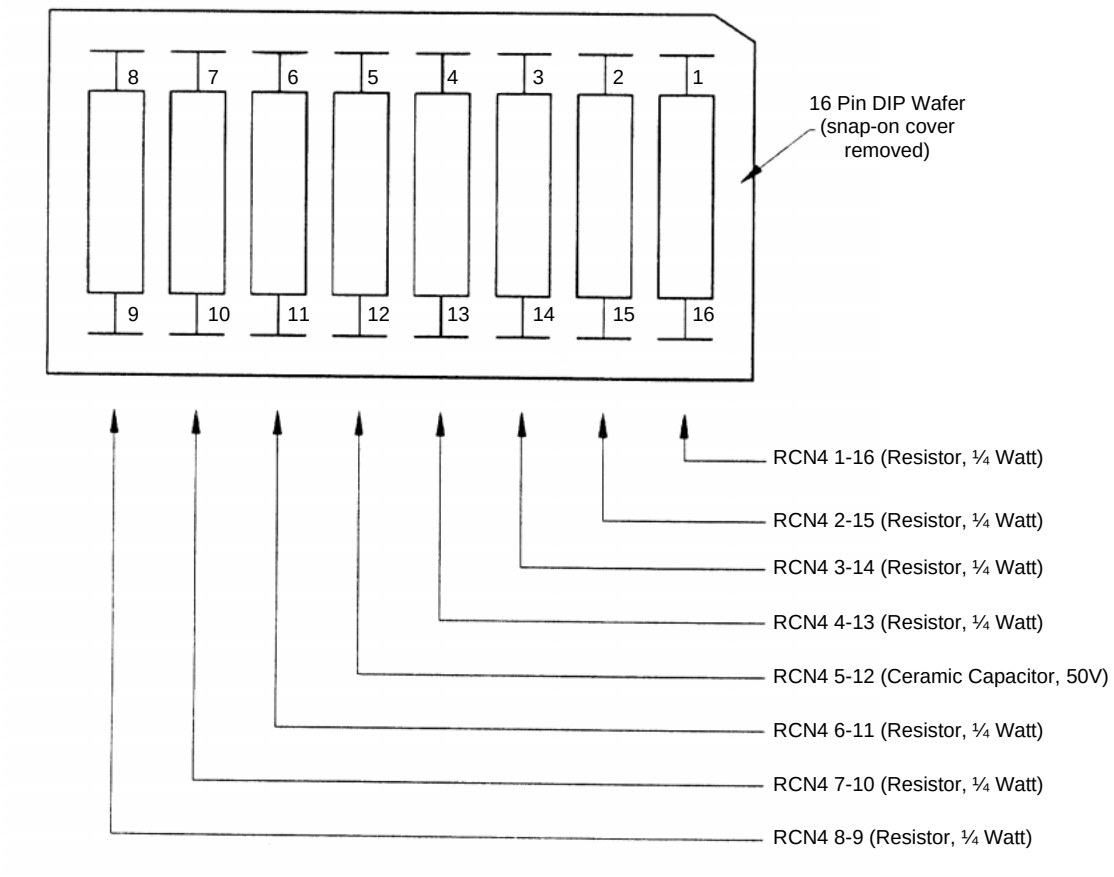


Figure 2-8. Outline of Personality Module RCN4

Table 2-9. DS160 Series Personality Module RCN4 Modes

	DS16020		DS16030	
	Torque Mode	**Velocity Mode**	**Torque Mode**	**Velocity Mode**
1-16	10KΩ	10KΩ	10KΩ	10KΩ
2-15	Open	39KΩ	Open	39KΩ
3-14	Open	390Ω	Open	390Ω
4-13	0Ω	100KΩ	0Ω	100KΩ
5-12	Open	.1uF	Open	.1uF
6-11	10KΩ	100KΩ	10KΩ	100KΩ
7-10	Open	150KΩ	Open	150KΩ
8-9	1.2KΩ	1.2KΩ	2.2KΩ	2.2KΩ

The surface mount version of this module has a 0 ohm resistor in series with each component listed.

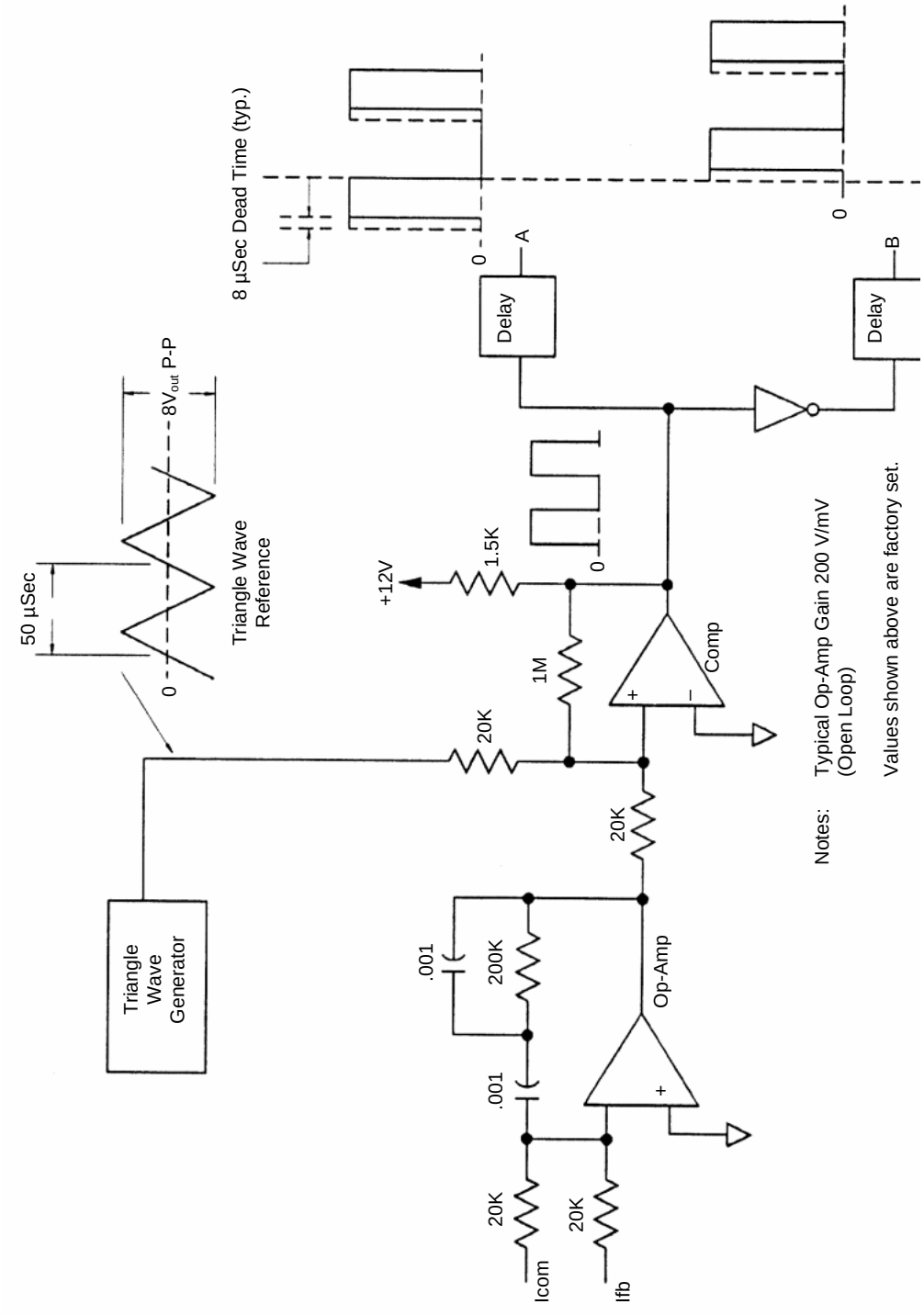


Figure 2-9. Detailed Electrical Diagram of DS160 Post-Amplifier Circuit

2.2.6.7. Troubleshooting the DS160 Series

A troubleshooting guide for the DS160 Series Servo Amplifier module is provided in Table 2-12. A list of recommended spare parts for the DS160 Series Servo Amplifier Module is shown in Table 2-13. Environmental and Power Stage Specifications are listed below.

Table 2-10. DS160 Series Environmental Specifications

	Unit	Value	Comment
Operating Temp	°C	50 (max) – 0 (min)	Ambient temp of the servo module heatsink, not the enclosure
Storage Temp	°C	+85 (max) – -30 (min)	Shelf storage only, not stand-by use
Humidity	%	10 – 90	Non-condensing

Table 2-11. Power Stage Specifications

	Unit	Value	Pin	Comment
Short Circuit Trip	Amps (min)	40	J1-26, 30	Requires power-down reset. Max may be as high as 60 amps.
Typical input/output impedance	Ohms (max)	.3	J1-26, 28, 30, 32	From bus connection (28 or 32) to motor connection (26 or 30)
DC bus high voltage trip	VDC (min)	205	J1-28, 32	Requires power-down reset.
Typical switching efficiency	% (min)	93	--	Efficiency based on switching and resistance losses.

Table 2-12. DS160 Series Troubleshooting Guide

Condition	Possible Cause	References
Active LED is de-energized, even with ±12VDC applied to pins 20 and 22 of J1.	Shutdown input (pin 6, J1) is pulled low.	See Figure 2-5
	High DC bus voltage (pins 28, 32 or J1).	See Figure 2-5
	+12VDC input (pin 20, J1) is below +11VDC.	See Figure 2-5
	Short circuit exists at motor connections (pin 26, 30 or J1)	See Figure 2-5
Active LED is energized, but no torque is present at motor shaft.	Motor load fuse F1 is open	See Figure 2-5
	I limit + (pin 12, J1) and/or I limit – (pin 14, J1) contact closed to signal common.	See Figure 2-5
	No DC bus voltage on +B, +B return (pins 28, 32 of J1)	See Figure 2-5.
	Current limit pot turned full CW.	See Figure 2-5.
Motor accelerated to full speed when ±12VDC power and DC bus power was applied.	Tach feedback wires reversed (pin 18, 24 of J1)	See Figure 2-5
	Personality module removed	See Figure 2-6.
Motor has high pitch (oscillation) sound when ±12VDC and DC bus power is applied.	Tach and or Gain pot turned too high.	See Figure 2-6.
Motor gets excessively hot when running at minimum load condition (reference current monitor, pin 8 of J1).	Ripple current (peak to peak) in excess of 20% of continuous return of motor, due to too high pre-amplifier gains.	See Figure 2-6.
	Ripple current (peak to peak) in excess of 20% of continuous return of motor, due to too low motor inductance.	See Figure 2-6.

Table 2-13. DS160 Series Replacement Parts

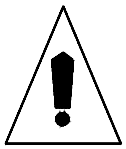
Item	Aerotech Part #	Comment
DS16020 Servo Amplifier Module	EFA465	--
DS16030 Servo Amplifier	EFA469	--
Motor load fuse, F1		Use any “slow blow” fuse (no greater than 10 amp for DS16020 and 15 amp for DS16030 current with no less than 250 Volt rating). Fuse size: 3 AG
Personality Module (blank)	EIK135 and EIK162	Used for pre-selection of gain parameters for other motor combinations.

2.2.7. AM16007 Stepper Drive Configuration

To configure a slot in the DR300 for a stepper drive module (Figure 2-10), proceed with the following steps:

- Set jumpers and Drive key according to AM16007 Stepper Drive Configuration (Table 2-3).

Test Point information and Electrical Specifications are provided below (Table 2-14 and Table 2-15).



To minimize the risk of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

To prevent another drive type from being inadvertently inserted into slot C, the mating drive connector on the motherboard should have a key (Aerotech part number EAM857 otherwise Schroff #21101-252) inserted into slot C. Refer to Figure 2-3.

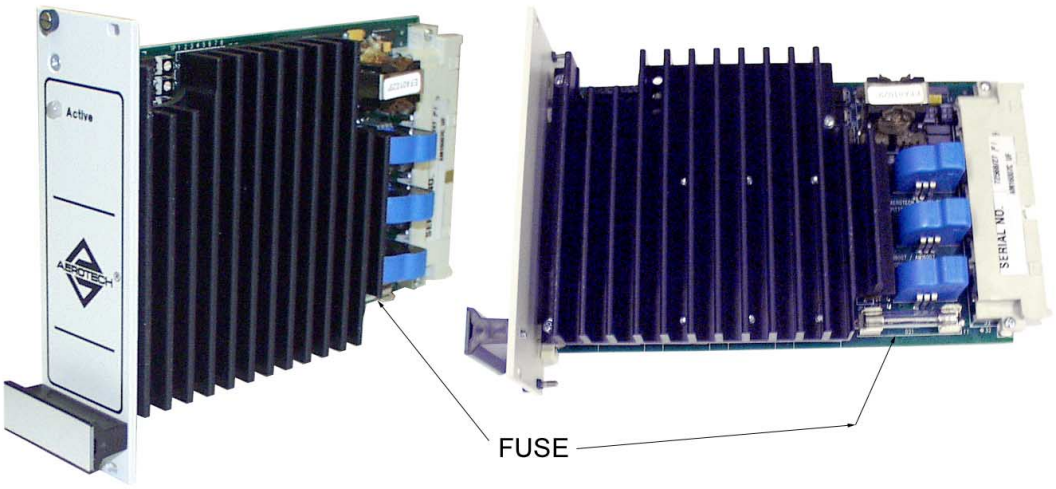


Figure 2-10. AM16007 Stepper Drive Module

Table 2-14. AM16007 Electrical Specifications

Electrical Specifications	AM16007
Peak Current Output (2 sec)	±7.5 amps
Continuous Output Current	±5 amps
Output Fuse, F1 (3 AG, slow blow)	7
Peak Output Voltage	160
Power Amplifier	
Gain (Continuous Output)	.75
PWM Switching Frequency	20
Shutdown Input	Tristates Motor Output
Minimum Load Inductance	2 mH
Operating Temperature	0 to 50°C
Storage Temperature	-30 to 85°C
Weight	.5 kg (1 lb)

Table 2-15. AM16007 Test Points

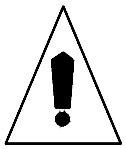
Test Point	Signal
TP3	Triangle Wave (20 kHz)
TP4	Common
TP5	SIN I Command
TP6	SIN I Feedback
TP2	COS I Command
TP1	COS I Feedback

2.2.8. AS32020 / AS32030 AC Brushless Drive Configuration

To configure a slot in the DR300 for an AC brushless drive module (Figure 2-11), proceed with the following steps:

- Set jumpers and Drive key according to AS32020 / AS32030 Brush Drive Configuration (Table 2-5).

Test Point information and Electrical Specifications are provided below (Table 2-16 and Table 2-17).



To minimize the risk of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

To prevent another drive type from being inadvertently inserted into slot A, the mating drive connector on the motherboard should have a key (Aerotech part number EAM857 otherwise Schroff #21101-252) inserted into slot A. Refer to Figure 2-3.

If the drive is an AS3005 AC brushless, refer to the following section.

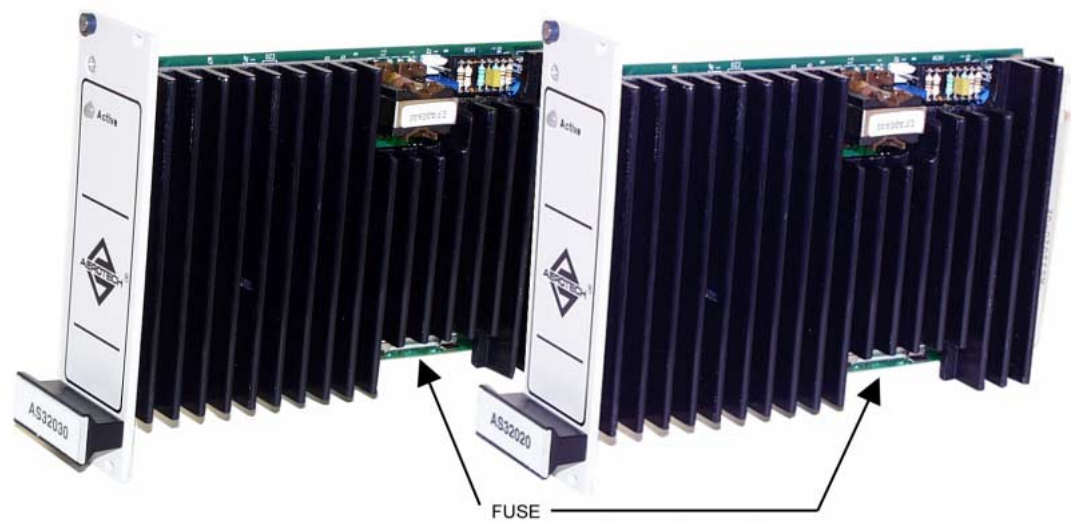


Figure 2-11. AS32020 / AS32030 AC Brushless Drive Modules

Table 2-16. AS32020 / AS32030 Electrical Specifications

	Units	AS32020	AS32030
Peak Current Output (2 sec)	Amps	±20	±30
Continuous Output Current	Amps	±7	±10.7
Output Fuse, F1 (3 AG, slow blow)	Amps	8	12
Peak Output Voltage	Volts	160*	
Efficiency	%	93	
Power Amplifier			
Gain (continuous output)	Amps/Volt	1	2
PWM Switching Frequency	kHz	20	
Output Current Limit	Amps (max)	Adjustable: Zero to Peak	
Shutdown Input		Tristates Motor Output	
Minimum Load Inductance	mH	2	
Operating Temperature	°C	0 to 50	
Storage Temperature	°C	-30 to 85	
Weight	kg (lb)	0.5 (1)	

* 320 VDC, but limited by internal bus power supply to 160 VDC

Table 2-17. AS32020 / AS32030 Test Points

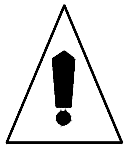
Test Point	Signal
TP4	Common
TP5	+5V
TP6	Phase A Current Command
TP7	Phase B Current Command
TP8	Phase B Feedback
TP9	Phase A Feedback
DS1	LED Drive Enable

2.2.9. AS3005 AC Brushless Linear Drive Configuration

To configure a slot in the DR300 for an AC brushless linear drive module (Figure 2-12), proceed with the following steps:

- Set jumpers and Drive key according to AS3005 Brushless Drive Configuration (Table 2-6).

Test Point information and Electrical Specifications are provided below (Table 2-18 and Table 2-19).



To minimize the risk of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

To prevent another drive type from being inadvertently inserted into slots A and E, the mating drive connector on the motherboard should have a key (Aerotech part number EAM857 otherwise Schroff #21101-252) inserted into both the A and E slot. Refer to Figure 2-3.

If the drive is not an AS3005 AC brushless drive, refer to the previous section. Configure the appropriate bus power supply for bipolar operation following the guidelines in Section 2.2.3.

Figure 2-12. AS3005 AC Brushless Linear Drive Configuration

Table 2-18. AS3005 Electrical Specifications

	Units	AS3005
Peak Current Output (2 sec)	Amps	±5
Continuous Output Current	Amps	*
Output Fuse, F1 (3 AG, slow blow)	Amps	*
Peak Output Voltage	Volts	30
Power Amplifier		
Gain (continuous output)	Amps/Volt	.5
Shutdown Input		Removes Input Command
Minimum Load	ohms	4
Operating Temperature	°C	0 to 50
Storage Temperature	°C	-30 to 85
Weight	kg (lb)	0.5 (1)

* Load dependent, consult factory.

Table 2-19. AS3005 Test Points

Test Point	Signal
TP5	Phase C Current Feedback
TP8	Phase B Current Feedback
TP10	Phase A Current Feedback
TP12	Torque Command (Phase A)
TP6	Phase C Current Command
TP9	Phase B Current Command
TP11	Phase A Current Command
TP7	Torque Command (Phase B)
DS1	Drive Enable (LED)
TP4	Common
TP3	-12 V
TP2	+12V

2.2.10. Internal System Wiring

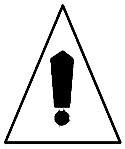
The DR300 wiring varies depending upon the desired AC input voltage, the number of axes, and the desired DC bus voltage required for the drive modules. A system wiring drawing is provided with the documentation package for all DR300 systems.

2.2.11. AC Line Voltage Configuration

See Chapter 4: Soft-Start / Voltage Selector Board, section 4.3.

2.3. Power Supply Fusing

The entire chassis is protected by CB1, a combination power switch and circuit breaker. There will be either a 5A breaker or an 10A breaker (see section 3.4.). The Bus Power Supplies are individually fused on the AC side of the circuit by F1 – F4 (see section 4.5.). The fuses are located inside the DR300 on a fuse block mounted to the left side on the bottom of the DR300 near the transformers. The right fuse is for Bus supply #1 and the left fuse is for Bus supply #2. The value of these fuses can be found on the DR300 system wiring drawing (see Chapter 4, Table 4-3).



WARNING

To minimize the possibility of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

Besides the two Bus power supplies the DR300 contains a power supply that provides +5, +12, -12 and +24 VDC. This supply is located on the right side of the DR300 and is not user serviceable. Several re-settable fuses are located on the Rear Panel Interface board for external +5V usage. These fuses do not require replacement, but are reset by turning off power for approximately 30 seconds (remove shorts or overloads from +5V before turning power on).

2.4. Motor Fusing

Most drive modules have their own power fuse. To replace a drive module fuse, follow these steps:

To minimize the possibility of electrical shock and bodily injury, ensure that all electrical power switches are in the off position and disconnect main power.

- Turn off the DR300 power switch.
- Loosen the two screws on the cover plate of the drive module securing it to the front of the chassis, refer to Figure 2-13.
- Remove the drive module from the DR300, refer to Figure 2-14.
- Check for proper fuse size and type, and replace the fuse on the drive module. (Refer to Sections 2.2.6 – 2.2.9 for drive modules)

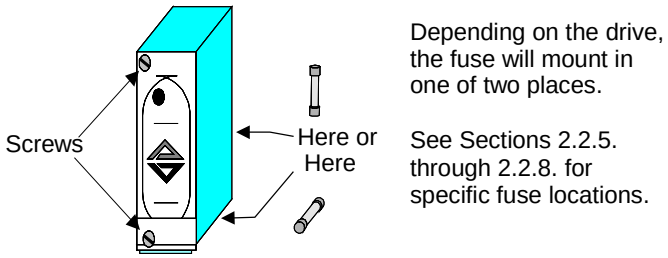


Figure 2-13. Drive Module Fuse Mounting (Generic)

2.5. External Device Power

The 5-volt source for the joystick, pin 19 of the Miscellaneous I/O connector, the encoder and limit switch power sources on the axis encoder connectors (if configured for 5 volt operation), and pin 25 of the I/O bus connector are fused by a re-settable fuse located on the interface board. Turning off power for approximately 30 seconds resets this fuse (remove shorts and overloads from +5V before turning power on).

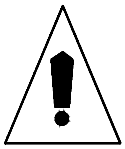
2.6. Mechanical Installation

The DR300 Rack Mount package is designed to be mounted into a standard 19" rack. The DR300 chassis (Figure 2-14) should be mounted so free airflow is available in front and back of the chassis for proper cooling. Allowance must also be made for the rear panel connections and cables (refer to Figure 2-15).

Figure 2-14. DR300 Front Panel

2.7. Electrical Installation

Motor, power, control, and position feedback cable connections are made to the rear of the DR300 (refer to Figure 2-15). To make the external AC power connection, the AC line cord (supplied with the DR300) is plugged into the DR300 lower left hand corner female plug and the other end is inserted into the AC outlet.



WARNING

Verify that the DR300 is configured for the correct AC Line Voltage. See Section 4.3.

The limit/encoder feedback connections connect to the appropriate axis and the motor drive connections connect to the matching axis motor connector. For example, the location for the axis 1 motor connector is behind the axis 1 drive module (i.e., the axis motor connectors on the rear of the chassis are numbered Axis 4 through 1 from left to right). Control connections are made through connector J1, labeled "From UNIDEX 500/600 P1".

When using an AC brushless motor, use the optional DIOSR/DRC cable that connects to U500-P5/U600-P10 and to the rear of the DR300 to connector J10 (labeled "From UNIDEX 500-P5/600-P10"). This cable accommodates Hall effect feedback devices. For applications that require resolver or inductosyn feedback, connect these cables directly to the resolver option board within the personal computer. When using the optional joystick, the joystick connector is J12 and is labeled "JOYSTICK". The Brake connector is J14 and labeled "BRAKE". Refer to Figure 2-1 and Figure 2-15 for the rear panel layout of the DR300.

Protective grounding is through the main power connection.

The supply connection is the main power cord (the main power disconnect).

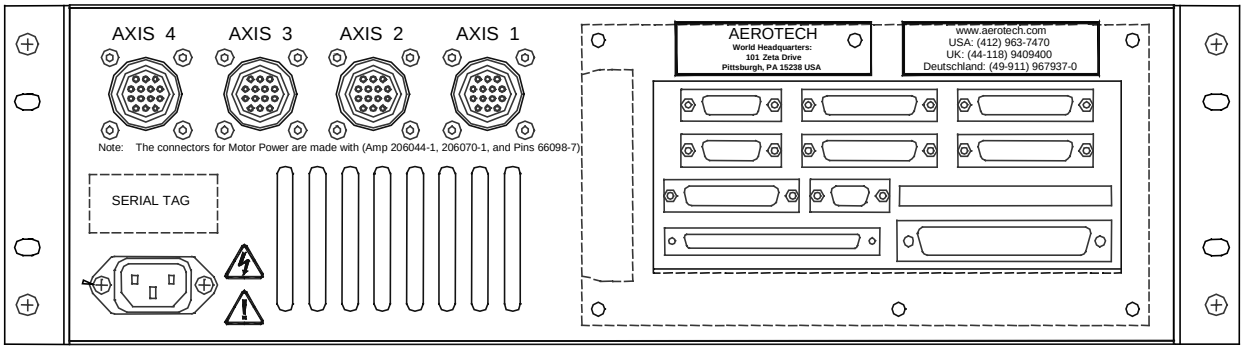


Figure 2-15. DR300 Electrical Connections

2.7.1. DR300 Power Up

To safely power up the DR300, properly connect all drive modules and cables to the DR300 before turning on the power. Likewise, always turn the system off before removing any cables from the DR300 chassis. Locate the system serial label on the left side of the DR300 rear panel. This label contains important information such as:

- the customer order number (please provide this number when calling customer service)
- the drawing number
- the system part number.

This part number includes the required AC input voltage. The AC input voltage is determined by the following letters:

- A = 115 VAC
- B = 230 VAC
- C = 100 VAC
- D = 208 VAC.

For example, the DR300R-A-80-40 specifies a 115 VAC input.

Before connecting the DR300 to its power source, compare the desired input power to the required input power indicated by the system part number.

A combination power switch/circuit breaker is located on the front of the DR300. This breaker is connected to the incoming AC power and provides protection to the DR300 system in case of severe overloads. This breaker is selected to meet the current requirements of the DR300 system and is normally either a 5 amp and 10 amp breaker.

The external + 5 Volt connections are fused by a re-settable fuses located on the interface board. These fuses protect the system should a fault or overload condition occur with the optical encoders, joystick, I/O bus, or Misc. I/O connectors. This fuse will reset itself when the overload condition is removed (power may also need to be turned off to reset the fuse). In addition to this fuse, each drive module has a safety fuse. To access the safety fuse, unscrew the module from the front panel.

The DR300 also provides external +12 Volt supply connections for some requirements. The Miscellaneous I/O connector pin 21 (User Supply) is normally connected to +12 Volts. Some DR300 systems may use +12 Volts for the limit switch supply (Special request / requirements). The DR300 can also provide an external +24 Volt output for Brake applications. The +24 Volt Brake output is only provided when the Brake option is used.

2.8. DR300 Interface

The UNIDEX 500/600 is connected to the DR300 drive rack using a maximum of two cables between the units. The OP500 cable, a 100 conductor shielded cable, carries all control signals. This cable connects from P1 on the UNIDEX 500/600 motion processor board installed in the personal computer to the connector at the back of the DR300 Drive Chassis labeled "From UNIDEX 500/600 P1". Normally, this is the only connection required for brush and stepper motor systems.

Systems that use brushless motors require a second cable. The purpose of this cable is to connect the brushless motor Hall Effect signals via the I/O bus to the UNIDEX 500/600 Controller Board. This requires an additional 50 conductor ribbon cable (DIOSR/DRC, see Figure 2-16), connected from U500-P5/U600-P10 to the connector on the rear of the DR300 chassis labeled From UNIDEX U500-P5/600-P10 ".

A system drawing is provided in the customer documentation package for the DR300 system. This drawing will contain information concerning the AC Line configuration, bus wiring, amplifier configuration and options.

It may be necessary to use an additional slot in the user's personal computer (PC) to provide an exit for the DIOSR/DRC cable connector.

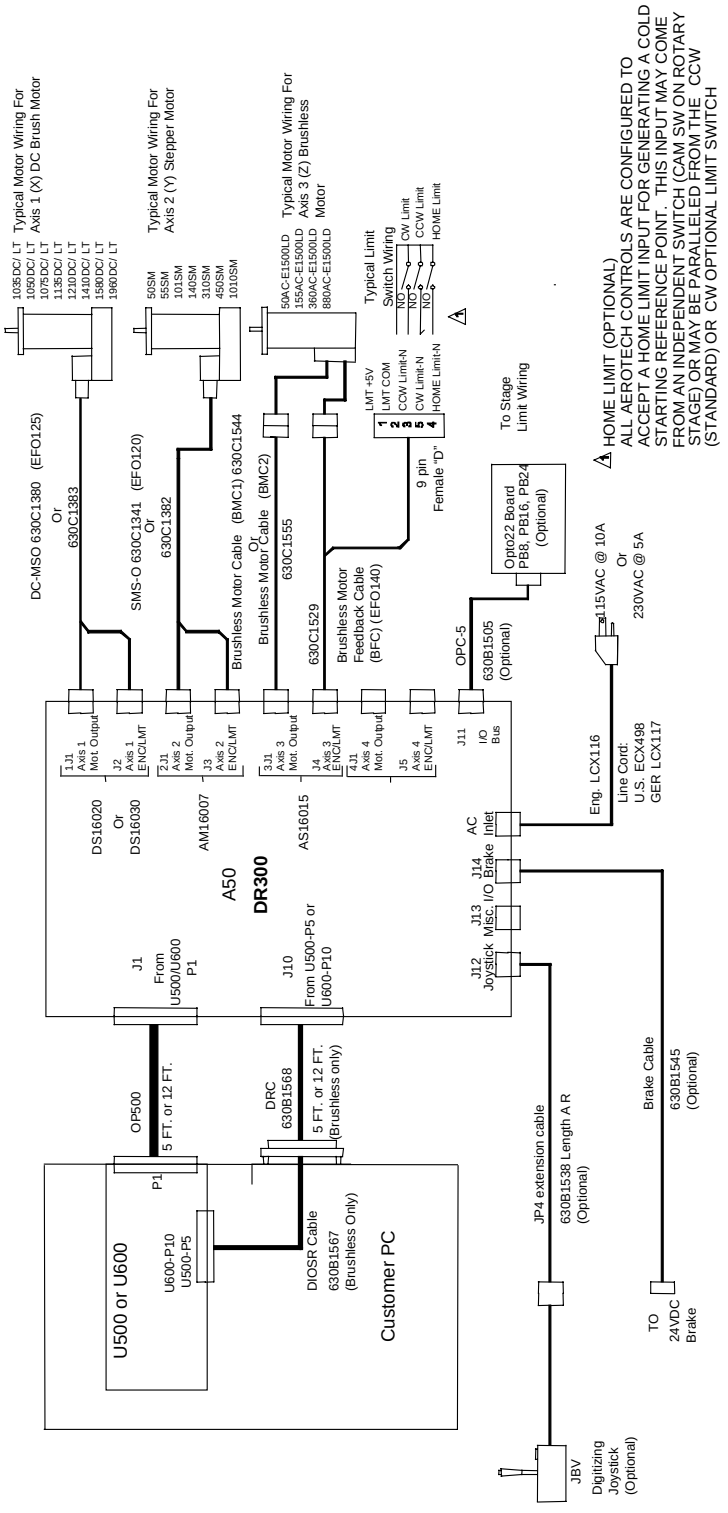


Figure 2-16. U500/U600 Generic System Interconnect

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CHAPTER 3: TECHNICAL DETAILS

In This Section:

3.1. OP500 Interconnect Cable Specifications and Connector Pinouts

Table 3-1 defines the pinouts for the 100-pin connector that mates with J1 on the rear of the DR300. This is an AMPLIMITE .050" series connector that is part of the 100 conductor shielded OP500 cable that connects the DR300 to connector P1 of the U500/U600 CPU board. The OP500 cable carries differential encoder signals as well as analog signals, which limits the maximum cable length to 15 feet.

All input and output designations are relative to the U500/U600 CPU board, connector P1. All connectors are N.C. (no connection) where blank.

Refer to Figure 3-1 for the location of the connectors on the rear of the DR300 Chassis assembly.

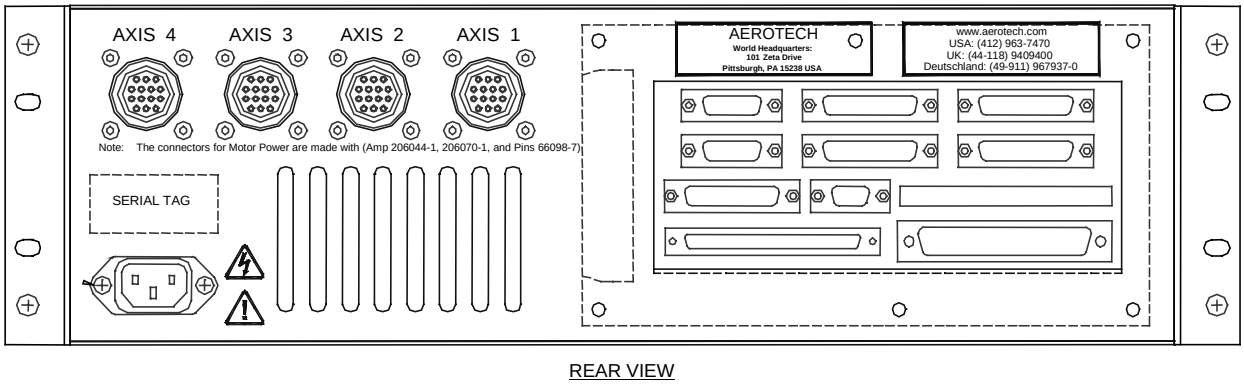


Figure 3-1. DR300 Rear Panel Connector Layout

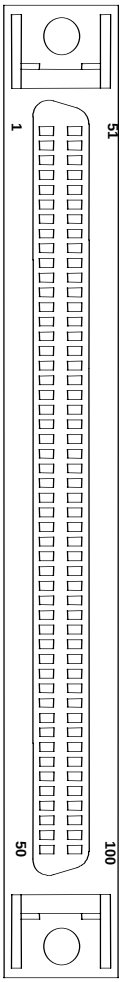


Table 3-1. Pinouts for Connector J1 from U500/U600 Connector P1

Pin #	Description	Pin #	Description
1	Interlock Send	**51**	Common
2	Sync (unused) / Common	**52**	Hall Effect HC1
3	U500/U600 +5 Volts (unused)	**53**	+12 VDC OUT / DAC +12 VDC IN *
4	U500/U600 +5 Volts (unused)	**54**	+12 VDC OUT / DAC Common *
5	Hall Effect HB1	**55**	-12 VDC OUT / DAC -12 VDC IN *
6	Hall Effect HA1	**56**	-12 VDC OUT / DAC Common *
7	Sine Encoder + Axis 1	**57**	Mode Axis 1
8	Sine Encoder - Axis 1	**58**	Mode Axis 2
9	Cosine Encoder + Axis 1	**59**	User Input 0
10	Cosine Encoder - Axis 1	**60**	User Input 1
11	Marker Encoder + Axis 1	**61**	User Input 2
12	Marker Encoder - Axis 1	**62**	User Input 3
13	Hall Effect HB2	**63**	User Output 0
14	Hall Effect HA2	**64**	User Output 1
15	Sine Encoder + Axis 2	**65**	User Output 2
16	Sine Encoder - Axis 2	**66**	User Output 3
17	Cosine Encoder + Axis 2	**67**	Mode Axis 3
18	Cosine Encoder - Axis 2	**68**	Mode Axis 4
19	Marker Encoder + Axis 2	**69**	Axis Enable 1
20	Marker Encoder - Axis 2	**70**	Axis Enable 2
21	Hall Effect HC2	**71**	Axis Enable 3
22	Hall Effect HB3	**72**	Axis Enable 4
23	Sine Encoder + Axis 3	**73**	Axis Fault 1
24	Sine Encoder - Axis 3	**74**	Axis Fault 2
25	Cosine Encoder + Axis 3	**75**	Axis Fault 3
26	Cosine Encoder - Axis 3	**76**	Axis Fault 4
27	Marker Encoder + Axis 3	**77**	Common
28	Marker Encoder - Axis 3	**78**	Common
29	Hall Effect HA3	**79**	Current Command Axis 1
30	Hall Effect HC3	**80**	Current Command Axis 1 Phase 2
31	Sine Encoder + Axis 4	**81**	Current Command Axis 2
32	Sine Encoder - Axis 4	**82**	Current Command Axis 2 Phase 2
33	Cosine Encoder + Axis 4	**83**	Current Command Axis 3
34	Cosine Encoder - Axis 4	**84**	Current Command Axis 3 Phase 2
35	Marker Encoder + Axis 4	**85**	Current Command Axis 4
36	Marker Encoder - Axis 4	**86**	Current Command Axis 4 Phase 2
37	Hall Effect HB4	**87**	Common
38	Hall Effect HA4	**88**	Hall Effect HC4
39	Clockwise Limit Axis 1	**89**	Joystick Potentiometer 1
40	Counter Clockwise Limit Axis 1	**90**	Joystick Potentiometer 2
41	Clockwise Limit Axis 2	**91**	Joystick Button A
42	Counter Clockwise Limit Axis 2	**92**	Joystick Button B
43	Clockwise Limit Axis 3	**93**	Joystick Interlock (Button C)
44	Counter Clockwise Limit Axis 3	**94**	Brake
45	Clockwise Limit Axis 4	**95**	Analog A/D 0
46	Counter Clockwise Limit Axis 4	**96**	Analog A/D 1
47	Home Limit Input Axis 1	**97**	Emergency Stop Input (cathode - see pin 99)
48	Home Limit Input Axis 2	**98**	User Interrupt
49	Home Limit Input Axis 3	**99**	Opto-isolator Anodes Junction (for E-stop)
50	Home Limit Input Axis 4	**100**	Interlock Receive

*** WARNING – Power Pins – See Individual pin descriptions**

3.1.1. Pin Descriptions

The following is a brief description for each pin of the OP500 connector that connects J1 of the DR300 to the U500/U600 CPU board.

For hardware specific information on a signal, refer to your controller's hardware manual.

Pin 1 - Interlock Send	The DR300 input is a logic signal driven by the UNIDEX 500/600 to sense the presence of the DR300 Drive Chassis. UNIDEX 500/U600 drives this line and senses the signal returned through the drive chassis (on pin 100 interlock receive) to assure the system is properly connected.
Pin 2 - Amplifier Sync / Common	The Sync. signal is a logic level square wave output at 20 kilo hertz that drives the PWM current regulators, on the drive modules, to synchronize the switching of the power output circuits. This is currently not used by any drive modules. This pin may also be configured as common.
Pins 3 & 4 - Encoder Power	These +5 volt Encoder Power inputs are not normally used by the DR300. These connections are used to provide optional +5 volt power from the U500/U600 board.
Pins 51, 77, 78, 87	These pins are common to the power supply.

The following pins repeat for all 4 axes. For each set of encoder signals refer to Figure 3-2 (Motor Phasing) and Figure 3-3 (Linear Motor (Forcer) CW Direction). On the U500/U600 board, each of the outputs are applied to a differential receiver (26LS32 typical) with a 180 ohm termination resistor across each pair of inputs. In addition, each of the sine and cosine signal pairs are also connected to an exclusive OR circuit for detecting the loss of encoder signals (this excludes the marker signal pairs).

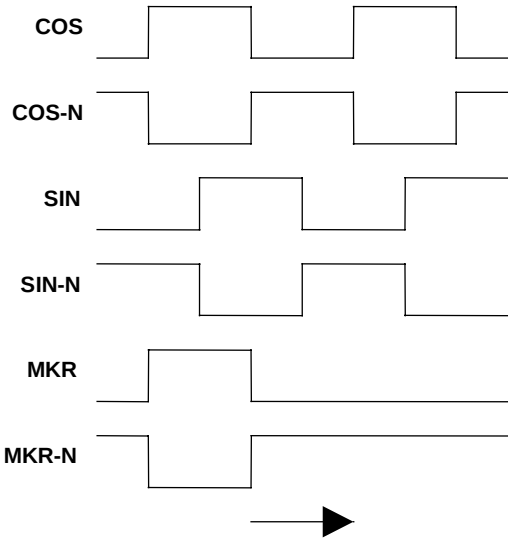


Figure 3-2. CW Motor Rotation Viewed from Mounting Flange End

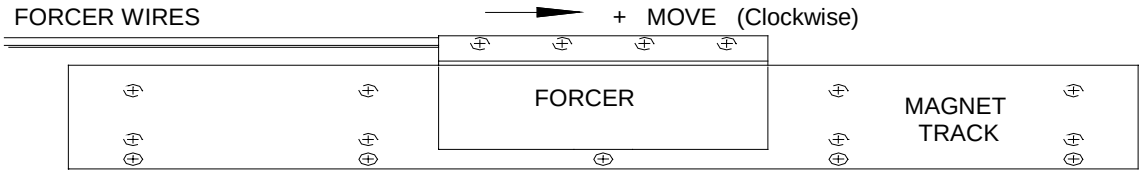


Figure 3-3. Linear Motor (Forcer) CW Direction

AXIS 1 PINOUTS INCLUDE:

Pin 5 – HB1	This is axis #1 hall Effect Sensor B output
Pin 6 – HA1	This is axis #1 Hall Effect Sensor A output
Pin 7 - Sine	This is the active high sine output from a differential quadrature type square wave encoder used for position and/or velocity feedback.
Pin 8 - Sine N	This is the active low sine output from a differential quadrature type square wave encoder used for position and/or velocity feedback.
Pin 9 - Cosine	This is the active high cosine output from a differential quadrature type square wave encoder used for position and/or velocity feedback.
Pin 10 - Cosine-N	This is the active low cosine output from a differential quadrature type square wave encoder used for position and/or velocity feedback.
Pin 11 - Marker	This is the active high marker output from a differential quadrature type square wave encoder. This produces a once per revolution indication from the motor that is used for homing the axis to an absolute reference position.
Pin 12 - Marker-N	This is the active low marker output from a differential quadrature type square wave encoder.
Pin 52 – HC1	This is axis #1 Hall Effect Sensor C output

AXIS 2 PINOUTS INCLUDE:

Pin 13 – HB2	This is axis 2 Hall Effect Sensor B output
Pin 14 – HA2	This is axis 2 Hall Effect Sensor A output
Pins 15 to 20	These follow the same sequence as those described for Axis 1 pins 7 - 12.
Pin 21 – HC2	This is axis 2 Hall Effect Sensor C output

AXIS 3 PINOUTS INCLUDE:

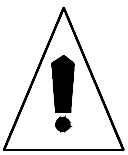
Pin 22 – HB3	This is axis 3 Hall Effect Sensor B output
Pins 23 to 28	These follow the same sequence as those described for Axis 1 pins 7 - 12.
Pin 29 – HA3	This is axis 3 Hall Effect Sensor A output
Pin 30 – HC3	This is axis 3 Hall Effect Sensor C output

AXIS 4 PINOUTS INCLUDE:

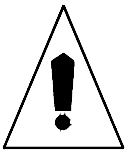
Pins 31 to 36	These follow the same sequence as those described in Axis 1 pins 7 - 12.
Pin 37 – HB4	This is axis 4 Hall Effect Sensor B output
Pin 38 – HA4	This is axis 4 Hall Effect Sensor A output
Pin 88 – HC4	This is axis 4 Hall Effect Sensor C output

Each of the following end of travel limit switch inputs (39-50) are contact closure signals. See the UNIDEX 500/U600 manuals for additional information concerning the end of travel limits.

Pin 39 - CW Limit Axis 1	When activated, this signal immediately stops all clockwise motion of the motor.
Pin 40 - CCW Limit Axis 1	When activated, this signal immediately stops all counter clockwise motion of the motor.
Pin 41 - CW Limit Axis 2	When activated, this signal immediately stops all clockwise motion of the motor.
Pin 42 - CCW Limit Axis 2	When activated, this signal immediately stops all counter clockwise motion of the motor.
Pin 43 - CW Limit Axis 3	When activated, this signal immediately stops all clockwise motion of the motor.
Pin 44 - CCW Limit Axis 3	When activated, this signal immediately stops all counter clockwise motion of the motor.
Pin 45 - CW Limit Axis 4	When activated, this signal immediately stops all clockwise motion of the motor.
Pin 46 - CCW Limit Axis 4	When activated, this signal immediately stops all counter clockwise motion of the motor.
Pin 47 - Home Limit Axis 1	This is the home limit switch output for axis 1. It is the same as the CW/CCW limit outputs except that it is used only during the home cycle to find a reference point to begin looking for the once per revolution marker pulse.
Pin 48 - Home Limit Axis 2	Refer to the description given for pin 47.
Pin 49 - Home Limit Axis 3	Refer to the description given for pin 47.
Pin 50 - Home Limit Axis 4	Refer to the description given for pin 47.



Pins 53 - +12V	This pin may be an input or output. On U500 and U600 ISA controllers, this pin is driven from the +12V from the ISA bus. On U500 PCI, this pin may be an input (+12V) to power the DAC's. See the U500 manual for more information.



Pins 54 - +12V/Common	On U500/U600 ISA controllers, this pin is driven from the +12V from the ISA bus. On the U500 PCI, this pin may be the common for the DAC's when using an isolated power supply. See the U500 manual for more information.

Pins 55 - –12V	This pin may be an input or output. On U500 and U600 ISA controllers, this pin is driven from the –12V from the ISA bus. On U500 PCI, this pin may be an input (–12V) to power the DAC's. See the U500 manual for more information.
Pins 56 - –12V/Common	On U500/U600 ISA controllers, this pin is driven from the –12V from the ISA bus. On the U500 PCI, this pin may be the common for the DAC's when using an isolated power supply. See the U500 manual for more information.

Pin 57 - Mode Control Axis 1	This input controls the AS/AM Series of stepper and brushless drive modules. See the UNIDEX 500/U600 manuals for additional information concerning the Mode Control.
Pin 58 - Mode Control Axis 2	Refer to the description for pin 57.

The following four signals are the same user inputs (to the U500/U600 board) that are available on the I/O bus connector (J11) on the rear of the DR300 chassis. See the U500/600 manuals for additional information concerning the user inputs.

Pin 59 - User Input 0	This is the least significant input bit. Refer to the description given above.
Pin 60 - User Input 1	Refer to the description preceding pin 59.
Pin 61 - User Input 2	Refer to the description preceding pin 59.
Pin 62 - User Input 3	Refer to the description preceding pin 59.

The following four signals are the same user outputs that are on the I/O bus connector (J11) on the rear of the DR300 chassis. Each of these signals are logic-level open-collector outputs. All outputs go to a logic high state during reset. See the U500/U600 manuals for additional information concerning the user outputs.

Pin 63 - User Output 0	Refer to the description given above.
Pin 64 - User Output 1	Refer to the description preceding pin 63.
Pin 65 - User Output 2	Refer to the description preceding pin 63.
Pin 66 - User Output 3	Refer to the description preceding pin 63.
Pin 67 - Mode Control Axis 3 Input	Refer to the description for pin 57.
Pin 68 - Mode Control Axis 4 Input	Refer to the description for pin 57.

The following four input signals from the U500/U600 board are +5 volt logic level signals used to enable the drive modules. There is a pull up resistor (10K ohm typical) on each of these inputs. These inputs require the logic level to be low to engable the drive module in a standard configuration. If this input is set to a logic high (+5 volts), or is unconnected, the drive is disabled in the standard configuration. See the UNIDEX 500/U600 manuals for additional information concerning configuration of the Axis Enable signals.

Pin 69 - Axis Enable 1 Input	Refer to the description given above.
Pin 70 - Axis Enable 2 Input	Refer to the description preceding pin 69.
Pin 71 - Axis Enable 3 Input	Refer to the description preceding pin 69.
Pin 72 - Axis Enable 4 Input	Refer to the description preceding pin 69.

The following four Axis Fault signals are 5 volt logic level outputs. These outputs indicate an axis drive fault when the logic level is low. See the UNIDEX 500/U600 manuals for additional information concerning Axis Fault signals.

Pin 73 - Axis Fault 1 Output	Refer to the description given above.
Pin 74 - Axis Fault 2 Output	Refer to the description preceding pin 73.
Pin 75 - Axis Fault 3 Output	Refer to the description preceding pin 73.
Pin 76 - Axis Fault 4 Output	Refer to the description preceding pin 73.

Each of the following four pairs of inputs are the analog current command signals for the drive modules. The current commands are generated on the U500/U600 board by a serial D/A converter with 16 bit resolution scaled to a range that includes -10 to +10 volts (See the U500/U600 manuals for additional information). Each axis has two current commands associated with it. The first commands DC brush motors and the second (or phase two command output) is used in addition to the first to generate a quadrature, or a 120° offset current command, for stepping or AC brushless motors.

Pin 79 - Current Command Axis 1	Refer to the description given above.
Pin 80 - Current Command Axis 1 Phase 2	Refer to the description preceding pin 79.
Pin 81 - Current Command Axis 2	Refer to the description preceding pin 79.
Pin 82 - Current Command Axis 2 Phase 2	Refer to the description preceding pin 79.
Pin 83 - Current Command Axis 3	Refer to the description preceding pin 79.
Pin 84 - Current Command Axis 3 Phase 2	Refer to the description preceding pin 79.
Pin 85 - Current Command Axis 4	Refer to the description preceding pin 79.
Pin 86 - Current Command Axis 4 Phase 2	Refer to the description preceding pin 79.

The following two output signals are the analog outputs for the joystick interface. The joystick interface also includes three logic level outputs that are connected to the joystick buttons. The button C input is significant because it is the interlock for the joystick, indicating when it is connected to the system. The UNIDEX 500/U600 tests this input on power-up or reset so that the joystick may be calibrated for optimum performance. The controller can also sense if the joystick has become disconnected while in use, preventing a run-away condition. The U500/U600 manuals provide additional information concerning these signals.

Pin 89 - Joystick Potentiometer 1 Output	Refer to the description given above.
Pin 90 - Joystick Potentiometer 2 Output	Refer to the description preceding pin 89.

The following three logic inputs are used by the joystick interface for mode selection and detection of the joystick. The U500/U600 manuals provide additional information concerning these signals.

Pin 91 - Joystick Button A Output	Refer to the description given above.
Pin 92 - Joystick Button B Output	Refer to the description preceding pin 91.
Pin 93 - Joystick (Button C) Interlock	Refer to the description preceding pin 91.

Pin 94 - Brake Output	This input signal disengages an optional, normally on electromagnetic brake, driven by an open collector buffer. With the optional brake hardware present, there is a 10k ohm pull up resistor to the 5 volt logic supply.

The following two input signals are spare A/D signals to the U500/U600. One of these may be used as an MFO input. The U500/U600 manuals provide additional information concerning these signals.

Pin 95 - Analog A/D 0	Refer to the description given above.
Pin 96 - Analog A/D 1	Refer to the description preceding pin 95.

The following two signals vary from U500 to U600. See their respective Hardware manuals for complete information.

Pin 97 - Emergency Stop	Refer to the description given above.
Pin 98 - User Interrupt Input	Refer to the description preceding pin 97.
Pin 99 - Opto Isolator Anodes	Refer to the description preceding pin 97.
Pin 100 - Interlock Receive Output	This output is connected to pin 1 and is monitored by the UNIDEX 500/600 controller to verify proper connection of the DR300. The U500/U600 manuals provide additional information concerning this signal.

3.2. DR300 Rear Panel Connectors

Besides the OP500 cable connector J1 (see Section 3.1.), there are 14 additional connectors on the rear panel of the DR300 Chassis. The following sections show the pinouts for each connector and a description for each pin in these connectors.

3.2.1. Axis Encoder Connectors

Table 3-2 shows the pinouts for Axis 1 through Axis 4. The mating connector is a Cinch #DB-25P (Aerotech # ECK101) for the Axis 1 through 4 connectors.

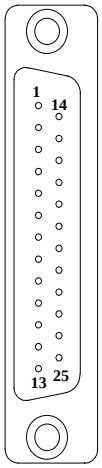


Table 3-2. Pinouts for Axis 1 Through Axis 4 (J2 - J5)

Pin #	Description	Pin #	Description
1	Shield (Chassis Frame)	14	Cosine Input
2	Auxiliary Shutdown Input (Remove JPx4 in DR300 to enable)	15	Cosine-N Input
3	+5 Volts	16	Limit Switch Power (+5V or +12V)
4	Common	17	Sine Input
5	Hall Effect Sensor B Input	18	Sine-N Input
6	Marker-N Input	19	Tachometer + Input
7	Marker Input	20	Limit Common
8	Tachometer – Input	21	Encoder Common
9	Reserved for Setup (Special Option)	22	Home Limit Input
10	Hall Effect Sensor A Input	23	Reserved / Encoder Fault
11	Hall Effect Sensor C Input	24	Counter-clockwise end of travel limit input
12	Clockwise End Of Travel Limit Input	25	Unused / Brake + Output Option
13	Unused / Brake – Output Option		

3.2.2. Joystick Connector

Table 3-3 shows the pinouts for the Joystick connector. The mating connector is a Cinch # DA-15P (Aerotech # ECK100).

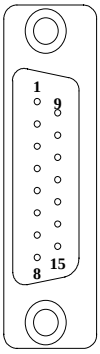


Table 3-3. Pinouts for the Joystick Interface Connector (J12)

Pin #	Description	Pin #	Description
1	+5 Volts	9	
2	Joystick Button A/C Input	10	
3	Joystick Potentiometer 1 Input	11	
4	Common	12	
5		13	Joystick Interlock (common) Input
6	Joystick Potentiometer 2 Input	14	
7	Joystick Button B/C Input	15	
8			

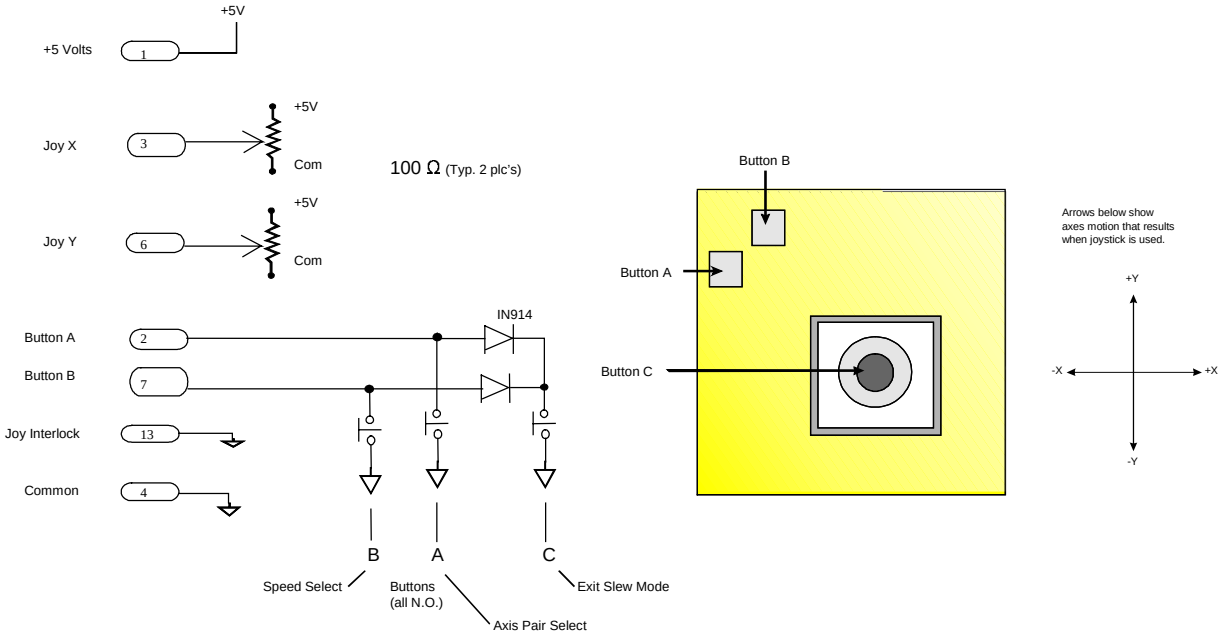


Figure 3-4. Joystick Interface

3.2.3. Miscellaneous Input/Output Connector

Table 3-4 shows the pinouts for the Miscellaneous Input/Output connector. The mate to this connector is a Cinch # DB-25P (Aerotech # ECK101).

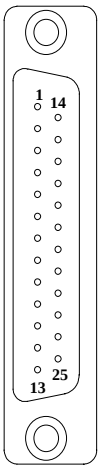


Table 3-4. Pinouts for the Miscellaneous I/O Connector (J13)

Pin #	Description	Pin #	Description
1	Shield (Chassis Frame)	**14**	Current Command Axis 1
2	User Interrupt	**15**	Current Command Axis 2
3	Emerg. Stop Opto-Isolator Input	**16**	Current Command Axis 3
4	Opto-Isolator Anodes	**17**	Current Command Axis 4
5	Fault Axis 1	**18**	Common
6	Fault Axis 2	**19**	+5 Volts
7	Fault Axis 3	**20**	User Common
8	Fault Axis 4	**21**	User +12 Volts (500mA max.)
9	Brake Output	**22**	Common
10	Shutdown Axis 1	**23**	Reserved
11	Shutdown Axis 2	**24**	Analog Input 0
12	Shutdown Axis 3	**25**	Analog Input 1
13	Shutdown Axis 4		

3.2.4. Brake Connector

Table 3-5 shows the pinouts for the brake connector. The mate to this connector is a Cinch # DA-15P (Aerotech # ECK100).

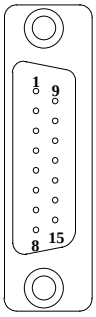


Table 3-5. Pinouts for Optional Brake Connector (J14)

Pin #	Description	Pin #	Description
1	Brake Common	**9**	
2	Brake Output	**10**	
3		**11**	
4		**12**	
5		**13**	
6	Shield (chassis frame)	**14**	
7	Brake Interlock Input	**15**	
8	Common (for interlock input)		

3.2.5. Digital I/O Connector

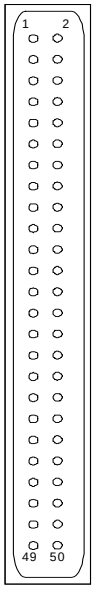
Table 3-6 shows the pinouts for the digital I/O or "From UNIDEX 500/U600 P5" connector. The mate to this connector is a 3M #3425-6050 (Aerotech # ECK332).

This connector is normally used to connect to U500-P5 or U600-P10. This is required if Hall effect sensors (brushless motors only) are used as shown in Section 1.2.2.

When looking at this connector, note that all even numbered pins, 2 through 50 are common.

Table 3-6. Pinouts for the Digital I/O Connector (J10)

Pin #	Description	Pin #	Description
1	Input 15/Axis 4 Hall switch	**25**	Input 3
3	Input 14/Axis 4 Hall switch	**27**	Input 2
5	Input 13/Axis 4 Hall switch	**29**	Input 1
7	Input 12/Axis 3 Hall switch	**31**	Input 0
9	Input 11/Axis 3 Hall switch	**33**	Output 7
11	Input 10/Axis 3 Hall switch	**35**	Output 6
13	Input 9/Axis 2 Hall switch	**37**	Output 5
15	Input 8/Axis 2 Hall switch	**39**	Output 4
17	Input 7/Axis 2 Hall switch	**41**	Output 3
19	Input 6/Axis 1 Hall switch	**43**	Output 2
21	Input 5/Axis 1 Hall switch	**45**	Output 1
23	Input 4/Axis 1 Hall switch	**47**	Output 0
24	Unused	**49**	Unused



The outputs are open collector devices and should only be exposed to +5 volt logic levels. All outputs are tri-stated (high impedance) on reset.

3.2.6. The Opto-22 Connector

Table 3-7 shows the pinouts for the Input/Output (I/O) or Opto-22 Bus connector. The mating connector is a 3M #3564-1001 (Aerotech # ECK353).

This connector is normally used to connect to U500-P5 or U600-P10 if Hall effect sensors are used (see section 1.2.2.).

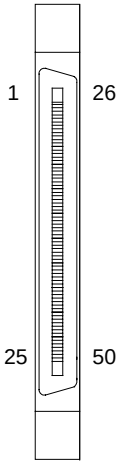


Table 3-7. Pinouts for the I/O Bus or Opto-22 Connector (J11)

Pin #	Description	Pin #	Description
1	Input 15/Axis 4 Hall switch	**14**	Input 2/High-Speed Position-Latch Input *
2	Input 14/Axis 4 Hall switch	**15**	Input 1/Reserved Output 1 *
3	Input 13/Axis 4 Hall switch	**16**	Input 0/Reserved Output 2 *
4	Input 12/Axis 3 Hall switch	**17**	Output 7/Output 15 *
5	Input 11/Axis 3 Hall switch	**18**	Output 6/Output 14 *
6	Input 10/Axis 3 Hall switch	**19**	Output 5/Output 13 *
7	Input 9/Axis 2 Hall switch	**20**	Output 4/Output 12 *
8	Input 8/Axis 2 Hall switch	**21**	Output 3
9	Input 7/Axis 2 Hall switch	**22**	Output 2
10	Input 6/Axis 1 Hall switch	**23**	Output 1
11	Input 5/Axis 1 Hall switch	**24**	Output 0
12	Input 4/Axis 1 Hall switch	**25**	+ 5 Volts
13	Input 3/User-Reset Input *	**26-50**	Common

Pins 13 through 20 vary when used with U600/U620 Systems. See the U600 Hardware manual for more information on these signals.

3.2.7. DAC Outputs Connector

Table 3-8 shows the pinouts for the DAC Outputs connector. The mate to this connector is a Cinch # DE-9P (Aerotech # ECK00137).

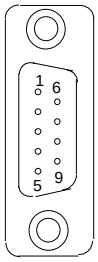


Table 3-8. Pinouts for the DAC Outputs Connector (J16)

Pin #	Description	Pin #	Description
1	Common	**6**	ICMDB1
2	ICMDA1	**7**	ICMDB2
3	ICMDA2	**8**	ICMDB3
4	ICMDA3	**9**	ICMDB4
5	ICMDA4		

3.2.8. Motor Power Connector Pinouts

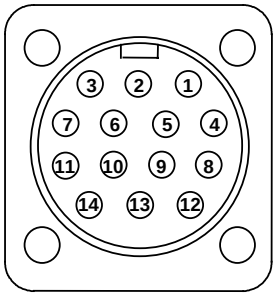
The motor power connector is a 14 pin AMP circular plastic motor connector. The mating connector is an AMP #206044-1 (Aerotech # ECK131). The backshell is an AMP #206070-1 (Aerotech # ECK134). The pins for the connector are AMP #66098-7 (Aerotech # EIK194).

For a Stepper motor connector, the following pins apply:

Table 3-9. Motor Connector (Stepper)

Pin #	Description
1	motor frame
8	motor shield
2	phase A
7	phase A/
4	phase B
3	phase B/

Plastic Mating Connector



Viewed From Wire Side of Connector

For a DC Brush motor connector, the following pins apply:

Table 3-10. Motor Connector (Brush)

Pin #	Description
1	motor frame
8	motor shield
5	motor +
4	motor -

For an AC Brushless motor connector, the following pins apply:

Table 3-11. Motor Connector (Brushless)

Pin #	Description
1	motor frame
8	motor shield
5	phase C
4	phase B
3	phase A

3.2.9. DR300 Drive Interface Board Test Points

Table 3-12 describes the DR300 Drive interface board test points.

Table 3-12. DR300 Test Points

Signal		Axis #	Test Point or Indicator
Common			TP4
5Volt Power			DS5 (LED)
Amplifier Enable		1	TP14 and Pad 1
		2	TP15 and Pad 2
		3	TP16 and Pad 3
		4	TP17 and Pad 4
Aux. Encoder Fault	J2, Pin 23	1	TP7
	J3, Pin 23	2	TP9
	J4, Pin 23	3	TP11
	J5, Pin 23	4	TP13
Controller Enable		1	TP6
		2	TP8
		3	TP10
		4	TP12

3.3. DR300 Outline Drawings and Mechanical Specifications

The DR300 rack mount package contains handles and mounting flanges (see Figure 3-5). The weights for this package are provided in Table 3-13.

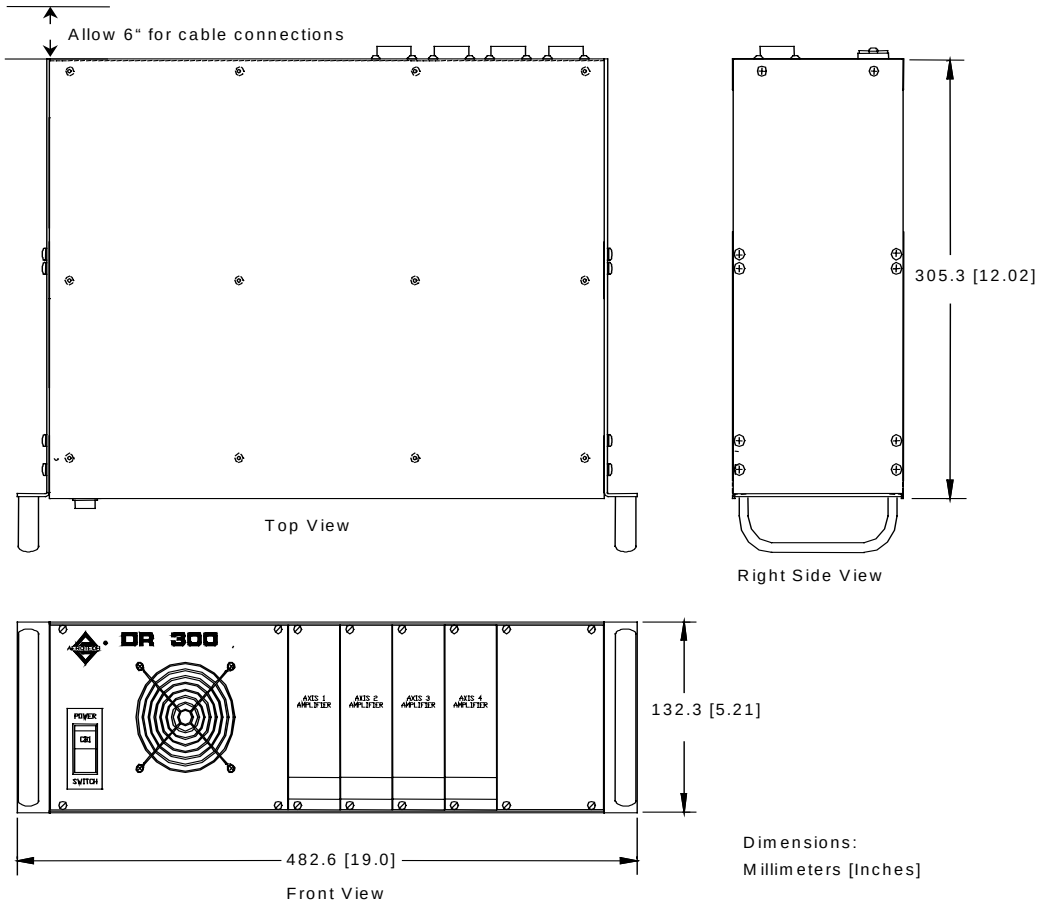


Figure 3-5. DR300 Rack Mount Package

Table 3-13. Weights for DR300 Packages (not including drives)

VAC IN	# of Axis	40, 60, 80, or 160V Bus
115, 100, 208 and 230VAC	1-2	21lbs (9.6kg)
(With Isolation Transformers)	3-4	27lbs (12.3kg)

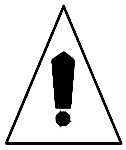
For each Bus configured for a 160V with a 115 VAC Line Voltage and not using a isolation transformer, the weight is reduced by 6 lbs (2.7kg).

3.4. Electrical Specifications

Aerotech configures each DR300 to fit the user's particular power requirements. The possible input voltages are 115 VAC, 230 VAC, 100 VAC, and 208 VAC (refer to Table 3-14). Each DR300 systems power specifications can be found on the power specification tag located on the rear of the DR300 chassis (see following example).

Example:

115V~ 50/60Hz 5A



Hazardous voltage may be present.

Table 3-14. Electrical Specifications

VAC IN RMS	# of Axis	Max. AC Line Input	Bus Voltage	Max. Watts Out
115VAC ±10%	2	5A	(40,60,80,160)	350
	2	10A	160 (no Isolation transformer)	1000
	4	10A	(40,60,80,160)	700
	4	10A	160 (no Isolation transformer)	2000
230VAC ±10%	2	5A	(40,60,80,160)	350
	4	5A	(40,60,80,160)	700
100VAC ±10%	2	5A	(40,60,80,160)	350
	4	10A	(40,60,80,160)	700
208VAC ±10%	2	5A	(40,60,80,160)	350
	4	5A	(40,60,80,160)	700

- Line Frequency: 50 Hz to 60 Hz
- Installation category: Overvoltage Category II
- Equipment class: Class I (equipment with basic insulation/grounded)

3.5. Environmental Specifications

- Temperature: Ambient
  - Operating - 5° - 40°C (41° - 104°F)
  - Storage - -20 - 70°C (-4 - 158°F)
- Humidity: Maximum relative humidity is 80% for temperatures up to 31°C. Decreasing linearly to 50% relative humidity at 40°C. Non-condensing.
- Altitude Up to 2000 m.
- Pollution Pollution degree 2 (normally only non-conductive pollution.
- Use Indoor use only.

3.6. Emergency Stop Sense Input

The UNIDEX 500/U600 has an optically isolated emergency stop sense input. See your controller's hardware manual for more information.

The U500 and U600 require a parameter change before it will recognize the E-stop circuit. Refer to the UNIDEX 500 Technical and Operation Manual, P/N EDU150, or the UNIDEX 600 User's Guide, P/N EDU157 for more details.

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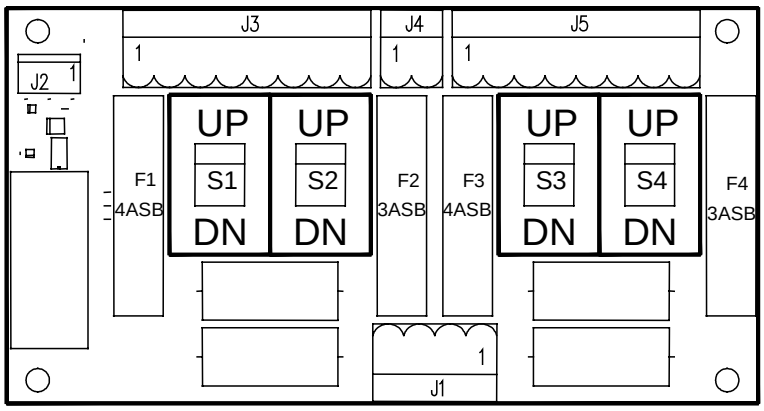
CHAPTER 4: SOFT-START / VOLTAGE SELECTOR BOARD

In This Section:

4.1. Soft-Start / Voltage Selector Overview

The Soft-Start / Voltage Selector Board is used to limit AC inrush current during turn-on and selection of the AC line voltage. The Soft-Start / Voltage Select Board is shown below.



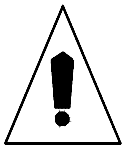
SWITCH SETTINGS				
	S1	S2	S3	S4
100VAC	UP	DN	UP	DN
115VAC	UP	UP	UP	UP
200VAC	DN	DN	DN	DN
230VAC	DN	UP	DN	UP

WARNING: S1, S2, S3 AND S4 MUST BE SET FOR THE APPLIED AC POWER INPUT VOLTAGE. SETTING S1-S4 INCORRECTLY MAY RESULT IN DAMAGE TO UNIT.

Figure 4-1. Soft-Start / Voltage Select Board

4.2. Soft-Start Operation

Soft-start operation is an automatic function that limits inrush current to approximately 10 amps for 100/115 VAC operation and 20 amps for 200/230 VAC operation. Inrush current limiting is only activated during initial power-up or when AC power interruptions last longer than .3 seconds. Short Power interruptions (less than about .3 seconds) will not initiate a soft-start activation. This prevents the possibility of soft-start induced nuisance trips during normal operation.



The Soft-Start circuit requires +24 VDC for proper operation (provided internally). Damage to the Soft-Start circuit may result if +24 VDC is not connected.

4.3. Voltage Selector Function

The Soft-Start / Voltage Select Board contains four user settable switches (S1-S4) to configure the controller for 100 VAC, 115 VAC, 200 VAC or 230 VAC input power. The voltage selector can only be used with transformers designed to interface with this board. The location of these switches is shown in Figure 4-1.

Procedure for setting AC voltage selector switches:

1. Turn-off and disconnect all power from unit.
2. Determine the AC line operating voltage that unit needs be set to (Nominal settings: 100VAC, 115VAC, 200VAC and 230 VAC).
3. Use Table 4-1 to set all four of the voltage selector switches to the position indicated for the desired operating voltage. See Figure 4-1 for additional information.

   Example: For 230VAC Operation, Set: S1 to "DN" position, S2 to "UP" position, S3 to "DN" position, and S4 to "UP" position.

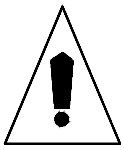
Table 4-1. Voltage Selector Switch Settings

AC Volts	S1	S2	S3	S4
100 VAC	UP	DN	UP	DN
115 VAC	UP	UP	UP	UP
200 VAC	DN	DN	DN	DN
230 VAC	DN	UP	DN	UP

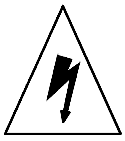
NOTE: "UP" and "DN" refer to positions of S1-S4 shown in Figure 4-1.

The Voltage Selector can only be used with transformers designed to interface with this circuit. This Voltage Selector function will not work with off-line supplies. Damage to unit may result if this function is used improperly.

The Voltage Selector must be setup to match the AC line voltage. Damage to unit may result if the Voltage Selector is set to a voltage that is different from the input AC Line voltage.



Disconnect Mains power before opening chassis. Voltage selector settings must not be changed with Mains power applied to unit.



4.4. Connector Pinouts

The Soft-Start / Voltage Selector Board contains five interface connectors, described in the following sections.

4.4.1. AC Input Power Connector (J1)

The pinouts for the AC Input Power connector are listed in Table 4-2.

Table 4-2. AC Input Power Connector (J1) Pinouts

Pin	Description	Pin	Description
1	AC LO	3	AC HI
2	AC LO	4	AC HI

4.4.2. +24 VDC Power Connector (J2)

The pinouts for the +24 VDC connector are listed in Table 4-3.

Table 4-3. +24 VDC Power Connector (J2) Pinouts

Pin	Description	Pin	Description
1	COMMON	3	+24 VDC
2	COMMON	4	+24 VDC

4.4.3. Transformer Interface Connectors (J3, J5)

The pinouts for the Transformer Interface connectors are listed in Table 4-4.

Table 4-4. Transformer Interface Connectors (J3, J5) Pinouts

Pin	Description	Pin	Description
1	Transformer Thermal Switch (WHT WIRE)	5	Transformer 100VAC Lead (GRN WIRE)
2	Transformer 0VAC Lead (BLU WIRE)	6	Transformer 115VAC Lead (BRN WIRE)
3	Transformer 0VAC Lead (GRY WIRE)	7	Transformer 100VAC Lead (ORN WIRE)
4	Transformer Thermal Switch (WHT WIRE)	8	Transformer 115VAC Lead (BLK WIRE)

NOTE: Transformer colors are referenced to custom Aerotech transformers only (P.N. EAX01010). Do not use with other transformers.

4.4.4. Fan Interface Connector (J4)

The pinouts for the AC Input Power connector are listed in Table 4-5.

Table 4-5. Fan Interface Connector (J4) Pinouts

Pin	Description
1	Fan AC HI (115VAC)
2	FAN AC LO

4.5. Fuse Information

The Soft-Start / Voltage Select Board contains four fuses (F1-4) used in the Voltage Select circuit to protect the transformers. Fuses F1 and F3 (Typical value: 4 Amps) provide the primary protection for 100 and 115 VAC operation. Fuses F2 and F4 (Typical value: 3 Amps) provide the primary protection for 200 and 230 VAC operation. Fuses F1 and F2 are used to protect the transformer connected to J3. Fuses F3 and F4 are used to protect the transformer connected to J5. Fuses are shown in Figure 4-1. Table 4-6 lists the Part #'s for these fuses.

Table 4-6. Fuse Replacement Part Numbers

FUSE	Manufacturer P/N	Aerotech P/N
3 amp, 3AG	PN. BK/MDA-3	EIF103
4 amp, 3AG	PN. BK/MDA-4	EIF104

Disconnect Mains power before opening chassis. Fuses must not be changed with Mains power applied to unit.

Refer to Chapter 5, section 5.4., for Fuse Replacement information regarding the DR300.

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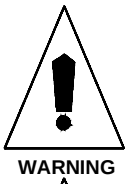
CHAPTER 5: TROUBLESHOOTING

In This Section:

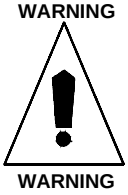
5.1. Warnings and Cautions

The user must be aware of the following cautions and dangers when troubleshooting the DR300.

No user serviceable parts inside.



Motor temperatures may exceed 50°C.



Mains Power Cord is the disconnect device when servicing.

Hazardous voltages may be present at Mains inlet and motor connectors.

Voltages up to 24 Volts may be present at I/O and Brake connectors.

Motors must be mechanically secured before applying power.

Risk of electric shock.

5.2. Amplifier Related Problems

Amplifier related problems are usually related to cable connections and parameter settings. Table 5-1 provides a list of some common amplifier related problems.

Table 5-1. Amplifier Problems

Symptom	Possible Causes
Axis will not Enable	Check Motor and Controller cables. Verify DR300 power is on. Verify Parameters. Check Encoder and Hall feedback. Check Amp and Bus fuses.
Motor oscillates or squeals when in position	Check tuning parameters and gains.
Motor traps out	Check parameters. Check Encoder and Hall feedback phasing. Motor load too high or mechanically locked. Programmed speed too fast.
Motor unstable	Check parameters. Check Encoder and Hall feedback.
Motor runs away	Check parameters. Check Encoder and Hall feedback phasing.

Always disconnect main power connection before opening the DR300 chassis.

5.3. Power Related Problems

The DR300 contains several power supplies that generate +5V, +12V, -12V, and the bus supplies. Table 5-2 lists some power checks that can be made.

Table 5-2. Power Checks

Symptom	Possible Causes
DR300 appears dead	Verify power switch is on. Verify DR300 has AC power (listen for internal fans).
+5 Volts low or not present	The +5 Volts is used in several places. Drive Interface Bd. P4-4 is +5V, P4-3 is common. Rear Panel Interface Bd. P5 is +5V, P6 is common. Check for +5 Volt short (disconnect all cables to DR300). Check that LED's on Rear Panel Interface Bd. are ON (If a LED is OFF, this indicates that the associated connector may have a +5 Volt short. **Note**: DR300 uses resettable fuse for external 5V supply connections. Reset by turning off power for 30 seconds.
Axis will not enable and/or no motor torque	Check +5 Volt supply. Check Bus supply fuses (see system drawing). **Note**: Bus supply fuse failure usually indicates a more serious problem (contact Aerotech).

Always disconnect main power connection before opening the DR300 chassis.

5.4. Fuse Replacement

Table 5-3 lists the manufacturer and Aerotech's part number for typical replacement fuses. Additional fuse information can be found on the system drawing supplied with the unit.

Table 5-3. Fuse Replacement Part Numbers

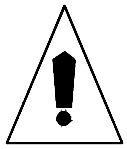
Fuse	Manufacturer P/N	Aerotech P/N
15 amp, 3AG, Bus	PN. BK/MDA-15	PN. EIF116
12 amp, 3AG, Bus	PN. BK/MDA-12	PN. EIF173
10 amp, 3AG, Bus	PN. BK/MDA-10	PN. EIF117
4 amp, 3AG,Bus	PN. BK/MDL-4	PN. EIF104
2 amp, 5x20mm fuse	Littlefuse 235002	PN. EIF195
1 amp, 5x20mm fuse	Littlefuse 218001	PN. EIF189

See Chapter 4 for fuse information regarding the Soft-Start / Voltage Selector board.

Bus fuses are usually located in the left compartment (transformer / power supply area) of the DR300.

The system drawing and amplifier documentation contains information regarding the fuses on the power amps.

10, 12, and 15 amp fuses are not user replaceable. An open fuse usually indicates that the unit should be returned for service.



Always disconnect the main power connection before opening the DR300 chassis.

5.5. Preventative Maintenance

The DR300 and external wiring should be inspected monthly. Inspections may be required at more frequent intervals, depending on the environment and use of the system. Table 5-4 lists the recommended checks that should be made during these inspections.

Table 5-4. Preventative Maintenance

Check	Action to be Taken
Visually Check chassis for loose or damaged parts / hardware. **Note**: Internal inspection is not required.	Parts should be repaired as required. If internal damage is suspected, these parts should be checked and repairs made if necessary.
Inspect cooling vents.	Remove any accumulated material from vents.
Check for fluids or electrically conductive material exposure.	Any fluids or electrically conductive material must not be permitted to enter the DR300 and should be removed immediately. **Note**: Disconnect power to avoid shock hazard.
Visually inspect all cables and connections.	Tighten or re-secure any loose connections. Replace worn or frayed cables. Replace broken connectors.

5.6. Cleaning

The DR300 should be wiped with a clean, dry (or slightly damp with water), soft cloth. Fluids and sprays are not recommended because internal contamination may result in electrical shorts and/or corrosion. The electrical power must be disconnected from the DR300 while cleaning. Do not allow cleaning substance to enter DR300 or onto any of the connectors. Cleaning Labels (Rear Panel) should be avoided to prevent rubbing off label information.

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APPENDIX A: WARRANTY AND FIELD SERVICE POLICY

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 that 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

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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
1.5	2.2.2.	Figure 2-1. – JP14 added
	2.2.3.	In Table 2-2. – part number ECR130 now refers to CL-11 (not CL-10, as previously indicated)
	3.2.6.	J11 drawing pin numbers added
	3.2.8.	Table 3-10 and Table 3-11: Pinouts changed
1.4	Chapter 2	Extensive changes, additions, deletions.
	Table 3-1.	Table Updated.
	3.1.1.	Text Updated.
	Chapter 4	New Chapter 4 (Soft-Start/Voltage Selector Board).
	Chapter 5	Chapter 5 (Troubleshooting) – previously chapter 4.

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READER'S COMMENTS

DR300 Drive Chassis
P/N EDA 141, July 2002

Please answer the questions below and add any suggestions for improving this document. Is the information:

	Yes	No
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How do you use this document in your job? Does it meet your needs?
What improvements, if any, would you like to see? Please be specific or cite examples.

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