DR600 / DR600H
DRIVE CHASSIS

OPERATION & TECHNICAL MANUAL

P/N: EDA142 (V1.4)

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CHAPTER 1: INTRODUCTION

In This Section:

1.1. Product Overview

Aerotech's DR600 and DR600H Drive Chassis are an integral part in a UNIDEX 600 and UNIDEX 500 based control systems. The DR600 can house up to four Aerotech BA Series amplifiers (DC servo or AC brushless) while the DR600H can house two BAL and/or BA series amplifiers. Both act as a breakout for all control and I/O signals. Both are available in a 19-inch rack mount chassis that easily connect to a U600/U500 controller with an OP500 and DRC cable. The back of the DR600 has all the cable connectors as well as descriptions for each.

Figure 1-1. DR600 and DR600H Drive Chassis

1.1.1. DR600 Functions

The DR600 gives the user flexibility in a motion control system, offering several different functions:

- conditioning and setting bus voltage levels,
- powering incremental encoder feedback transducers,
- distributing all motion related signals to and from the UNIDEX 600/500,
- distributing all motor power connections for Aerotech motor cables,
- assuring a fail-safe connection to the UNIDEX 600/500 controller.

1.1.2. DR600 Configurations

The DR600 is easily configured to the users needs and can be set up for a wide range of applications. It can be configured to:

- (DR600) house up to 4 BA10/20/30 (brush/brushless) amplifiers
- (DR600H) house 2 BAL (brush/brushless) amplifiers, or 2 BA50/100 and 2 BA10/20/30 amplifiers
- house up to 2 transformers
- house optional brake power and control logic
- provide all motor power connections to the drives
- 19” rack mount
- filter AC line
- power up to 4 axis of motors
- interface with a joystick or handwheel
- provide Emergency Stop circuitry and/or motor contactors.

Figure 1-2 illustrates a typical U600/U500 System (with the DR600 and several options and accessories).

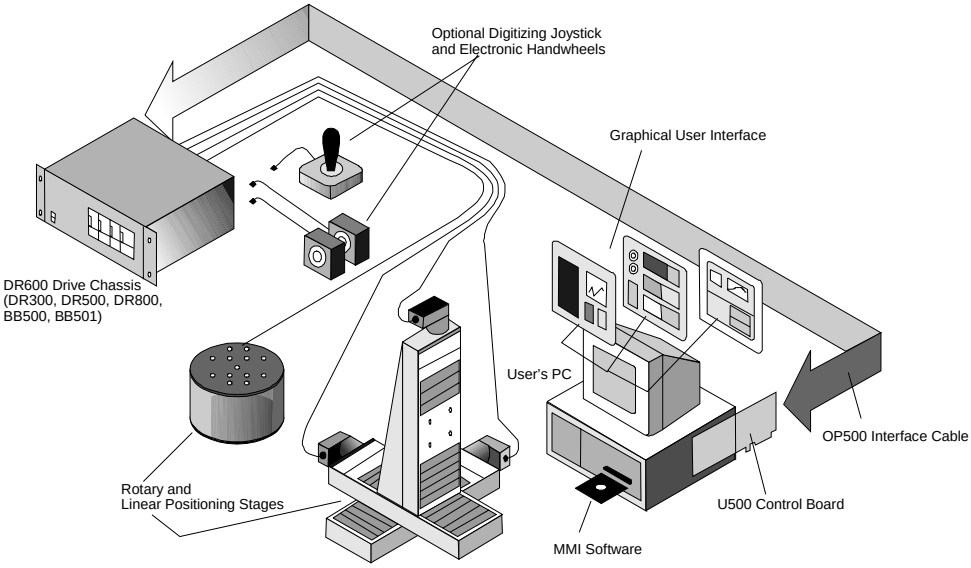
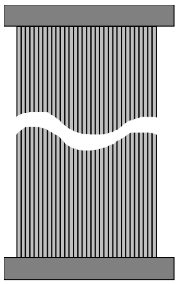


Figure 1-2. UNIDEX 600/UNIDEX 500 System Diagram

1.2. DR600 Options

A variety of options may be purchased with the DR600 drive chassis to enhance its standard operation. The following sections discuss the available options.

1.2.1. DRC I/O Cable



The DRC I/O cable serves two purposes when used with the DR600 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 DR600. 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 DR600 (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 1-3 is an illustration of the DRC I/O cable. Refer to Figure 1-4 for illustrations of two uses of the DRC cable.

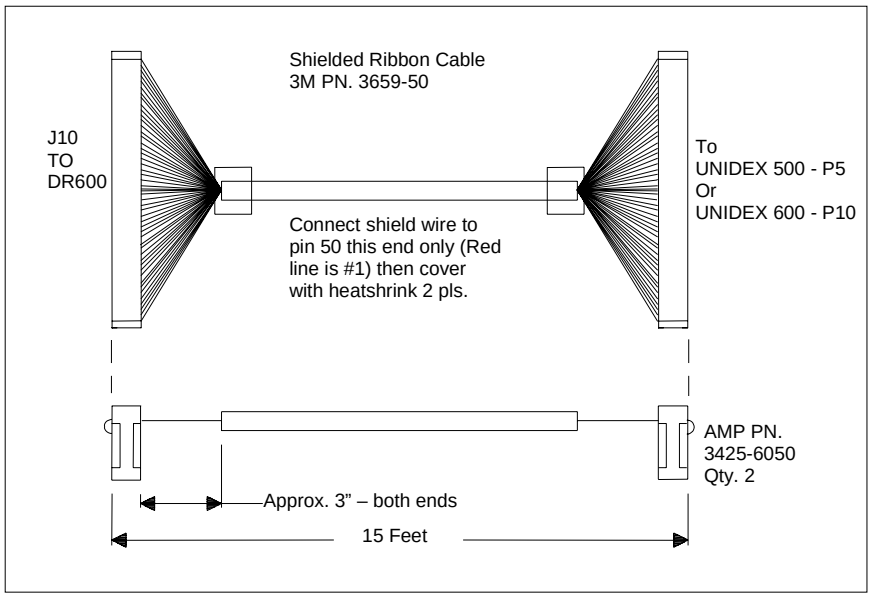


Figure 1-3. DRC I/O Cable

See the UNIDEX 600 Hardware manual, EDU154, for more information on using the DRC cable. Figure 1-4 is for reference only.

The DRC cable is not needed to provide Hall effect signals when the U500 PCI Board and the DR600 rear panel interface PCB (Rev. A & later) are used.

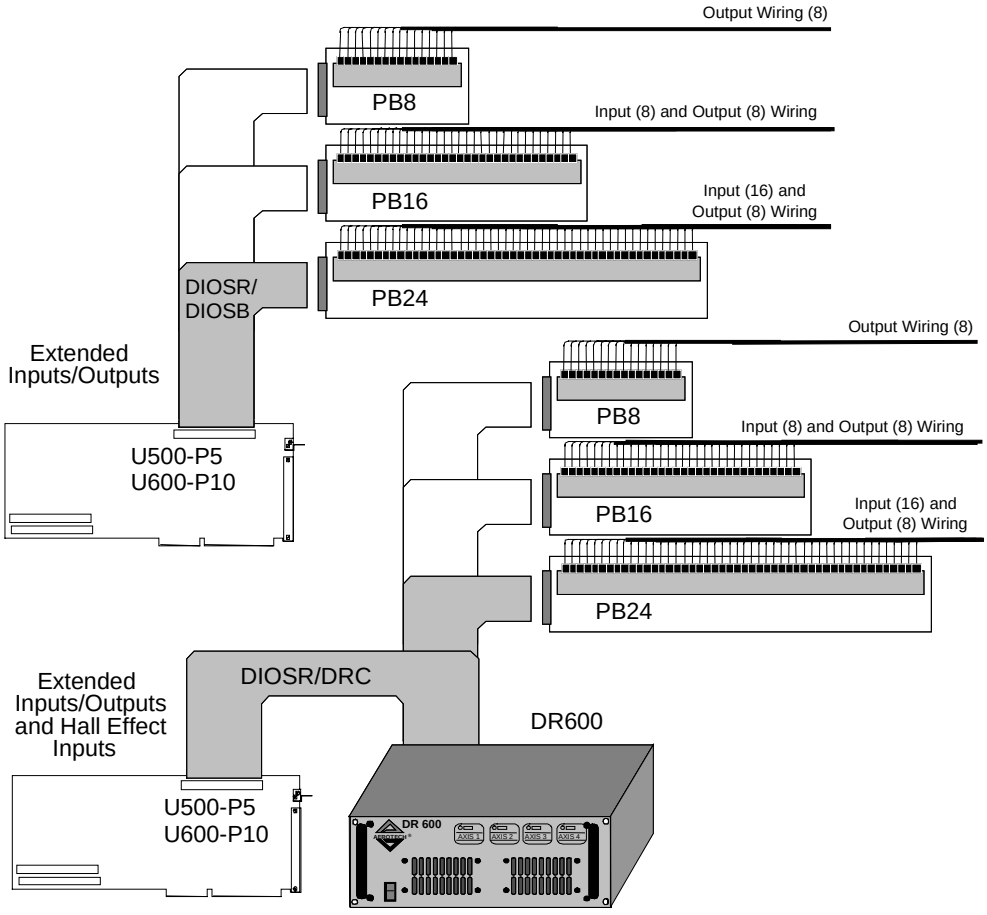
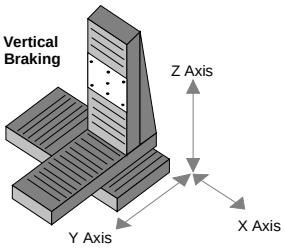


Figure 1-4. Sample Uses of the DRC Cable



1.2.2. Fail-Safe Brake Option

The fail-safe brake option 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 U600/U500. This option includes a power supply to drive the electromagnetic brake into its inactive mode and may also be configured to sense the PWM signals on the motor leads, should a fuse blow.

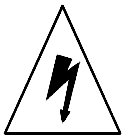
1.3. Safety Procedures and Warnings

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.

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.

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.

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.



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 DR600 Drive Chassis

Before unpacking any components, visually inspect the container of the DR600 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.

Remove the packing list from the DR600 container. Certain items required for use with your DR600 are not included within the DR600 shipping container. These items may be found in the UNIDEX 500/600 shipping container. Make sure that the items specified on the packing list are contained within the DR600 package.

- The DR600/DR600H Drive Chassis
  One to four axis amplifier chassis with power supply
- The OP500 Interface Cable
  12 ft (3.6m) or 5 ft. cable used to connect the U600/U500 to the DR600

- DRC Cable - Optional
  Feedback cable for hall-effect sensors from DR600 to U600/U500
- AC line cord
  This cable connects the DR600 Drive Chassis to an AC outlet

- Engineering Specification Sheet, describing system specifications and required parameter values

The DR600 should at no time have any of its cables connected or disconnected from it with power applied, nor should any BA Series drives be removed or inserted into it with power applied. Doing so may cause damage to the system or its components.

2.2. DR600 Jumper Selections and Configurations

The DR600 is pre-configured by the factory according to the specifications provided by the user. The user should not need to reconfigure the DR600 chassis. However, if there is a need to add an additional BA Series drive, it will be necessary to configure the jumpers on the mother board and interface board, both shown in Figure 2-1, according to the following sections.

See the BA and BAL Series amplifier manuals for the information required to configure the BA/BAL Series drive.

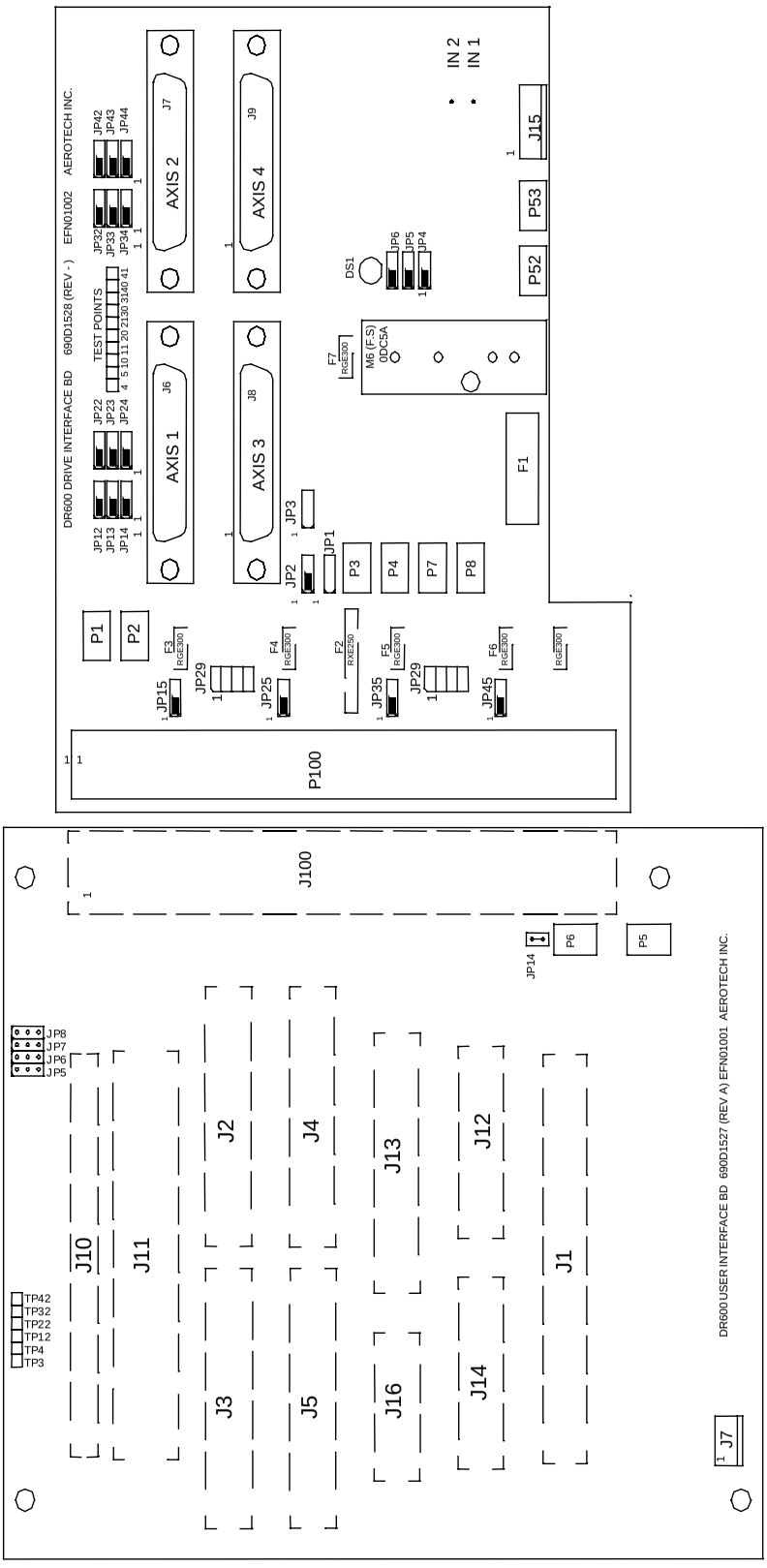


Figure 2-1. DR600 Interface (Left) / Mother Board (Right / Top) Jumper Locations

2.2.1. DR600 Jumpers and Test Points

This section describes the test points and the configuration of the jumpers within the DR600. Table 2-1 lists the jumper configurations for the interface board.

Table 2-2 lists the configurations for the mother board.

Table 2-1. Interface Board Test Points and Jumper Selections

Test Point	Description
TP3	+5 volt Power
TP4	Common
TPx2	Axis x Renishaw Encoder Setup Signal (If Present)

Where, **x** designates axis 1 through 4.

Jumper	Description	Position
JP5	Drive Disable (and, if JP14 Out, ESTOP) on Axis 1 Encoder Fault	1-2
	Encoder Fault Input 1 Drives Auxiliary (Mode) 1	2-3
JP6	Drive Disable (and, if JP14 Out, ESTOP) on Axis 2 Encoder Fault	1-2
	Encoder Fault Input 2 Drives Auxiliary (Mode) 2	2-3
JP7	Drive Disable (and, if JP14 Out, ESTOP) on Axis 3 Encoder Fault	1-2
	Encoder Fault Input 3 Drives Auxiliary (Mode) 3	2-3
JP8	Drive Disable (and, if JP14 Out, ESTOP) on Axis 4 Encoder Fault	1-2
	Encoder Fault Input 4 Drives Auxiliary (Mode) 4	2-3
JP14	No ESTOP on Encoder Fault & No Drive Disable on ESTOP, See JP6 (Mother Board), +5V ESTOP Input Table 2-2.	In *
	Encoder Fault Triggers ESTOP & ESTOP Disables all Drives, See JP6 (Mother Board), +24V ESTOP Input Table 2-2.	Out

***** designates the default position of the jumper

Table 2-2. Mother Board Test Points and Jumper Selections

Test Point	Description
TP4	Common
TP5	Emergency Stop (Active High)
TPx0	Axis x Amplifier Enable from Controller
TPx1	Axis x Encoder Fault

Where, **x** designates axis 1 through 4.

Jumper	Description	Position
JP1	End of Travel Limit Switch Power from Logic Supply, See JPx5, 3	1-2, (Disconnect P3)
	End of Travel Limit Switch Power from Limit Supply-P3, See JPx5, 3	2-3 *
JP2	Encoder Power from Logic Supply, See JP3	1-2, (Disconnect P1) *
	Encoder Power from Encoder Supply-P1	2-3
JP3	Logic Supply Power from Controller (PC +5 volts)	1-2, (Disconnect P7)
	Logic Supply Power from Amplifier #1	2-3, (Disconnect P7)
	Logic Supply Power from neither controller nor amplifier	JP3 = Out
JP4	Optional Fail Safe Brake Output Driven by Controller not Motor Sense, See JP5, 28, 29	1-2 *
	Optional Fail Safe Brake Also Driven from Motor Sense, See JP5, 28, 29	2-3
JP5	Brake Driven from Controllers Brake Output, See JP4, 28, 29	1-2 *
	Brake Driven from Controllers Binary Output 0, See JP4, 28, 29	2-3
JP6	All Amplifier not Disable on Emergency Stop, See JP14 (Interface Board)	1-2 *
	All Amplifiers Disabled on Emergency Stop, See JP14 (Interface Board)	2-3
JPx2	Encoder Fault Active High for Axis x	1-2
	Encoder Fault Active Low for Axis x	2-3 *
JPx3	Axis x Amplifier Fault Disable	1-2 *
	Axis x Amplifier Fault Enable	2-3
JPx4	Thermistor Over-Temperature Disable for Axis x	1-2 *
	Thermistor Over-Temperature Enable for Axis x	2-3
JPx5	Axis x End of Travel Limit Switch Power from Encoder Power, See JP2	1-2 *
	Axis x End of Travel Limit Switch Power from Limit Power, See JP1	2-3
JP28A	Fail Safe Brake is on Axis 1, See JP4, 5, 29	1-2, Remove 3-4, 5-6, 7-8
B	Fail Safe Brake is on Axis 2, See JP4, 5, 29	3-4, Remove 1-2, 5-6, 7-8
C	Fail Safe Brake is on Axis 3, See JP4, 5, 29	5-6, Remove 1-2, 3-4, 7-8
D	Fail Safe Brake is on Axis 4, See JP4, 5, 29	7-8, Remove 1-2, 3-4, 5-6
JP29A	Fail Safe Brake is on Axis 1, See JP4, 5, 28	1-2, Remove 3-4, 5-6, 7-8
B	Fail Safe Brake is on Axis 2, See JP4, 5, 28	3-4, Remove 1-2, 5-6, 7-8
C	Fail Safe Brake is on Axis 3, See JP4, 5, 28	5-6, Remove 1-2, 3-4, 7-8
D	Fail Safe Brake is on Axis 4, See JP4, 5, 28	7-8, Remove 1-2, 3-4, 5-6

Where, **x** designates axis 1 through 4.

***** designates the default position of the jumper

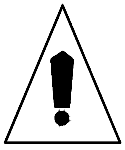
2.2.2. Bus Voltage Configuration

The DR600 allows for two different bus voltages. Each bus power supply may be 40, 60, 80, 160, or 360 VDC. All bus power voltages come from an internal auto-transformer.

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

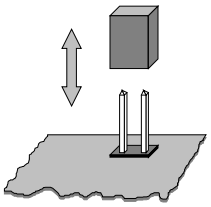
Always disconnect the main power connection before opening the DR600.

2.2.3. Installing A Drive Module In The DR600



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 the DR600, configure the jumpers on the Mother/Interface board for that type of drive module.



The jumpers discussed in the following sections are designated as Jpx#, where the "x" corresponds to a specific axis (e.g., JP24 is an axis 2 jumper, JP44 is an axis 4 jumper, JP10 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 BA and/or BAL Series amplifiers will need to be configured. See their respective manuals for jumper configuration and other information.

2.2.4. Internal System Wiring

The DR600 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 DR600 systems.

2.3. Power Supply

The DR600 contains two power supplies: the Bus Power Supply, and the Logic Power Supply.

Both are fused via the combination power switch/circuit breaker. It is a 5A, 10A or 15A device. The 10A is an Aerotech P.N. EAW260 or ETA P.N. 3120-F321-P7T1-W19LB4. The 5A circuit breaker is an Aerotech P.N. EAW01016 or ETA P.N. 3120-F321-P7T1-W19LB4. The 15A is an Aerotech P.N. EAW00255 or ETA P.N. 3120-F321-P7T1-R04L.

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.

The logic supply provides +5V, +12V, and -12V. This supply is not user serviceable. A re-settable fuse is located on the interface board for external +5V usage. Turning off power for approximately 30 seconds resets this fuse (remove shorts and/or overloads from +5V before turning power on). The logic power supply is typically an Aerotech P.N. ECZ01073, Integrated Power Design P.N. SRW-115-4002.

2.4. Motor Fusing

Short circuit protection is provided by circuitry integral to the BA Series amplifier design. RMS and Peak current are limited by either the BA Series amplifier or the motion controller. Typically, the motion controller provides RMS and Peak current limiting.

The DR600 may also contain 20 amp fuses, industry standard FNM20 type.

2.5. External Device Power

The 5 volt power source for the joystick, pin 19 of the Misc. 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/or overloads from +5V before turning power on).

2.6. Mechanical Installation

The DR600 Rack Mount package requires bolting the unit into a standard 19" rack.

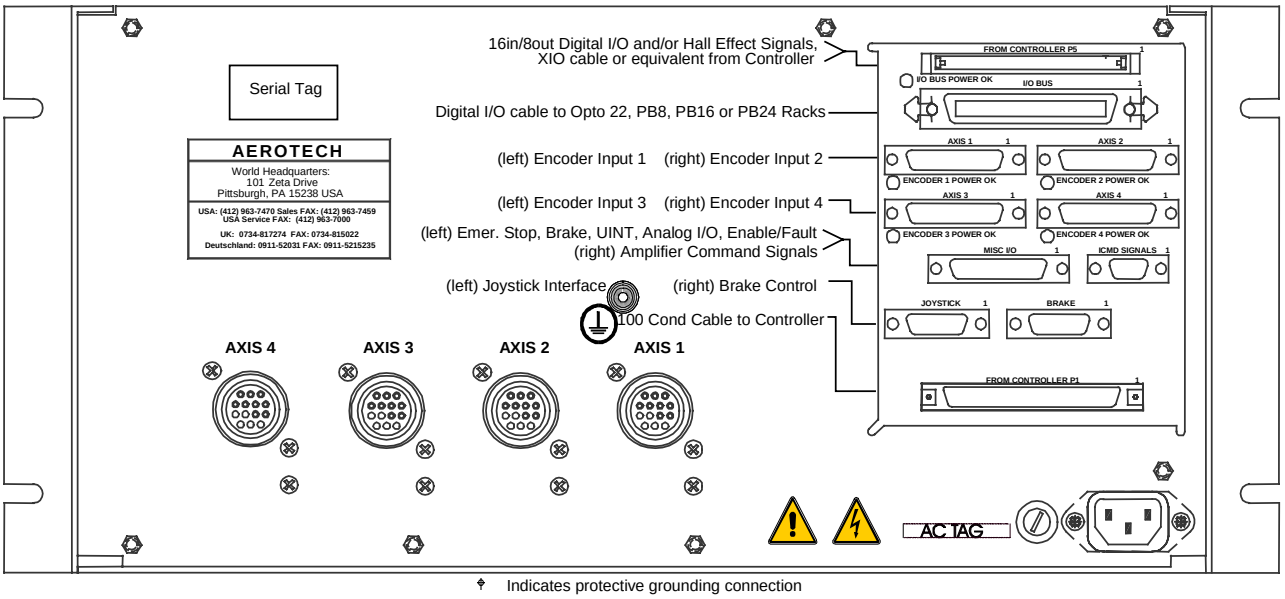


Figure 2-2. DR600 Rear Panel Connector Layout

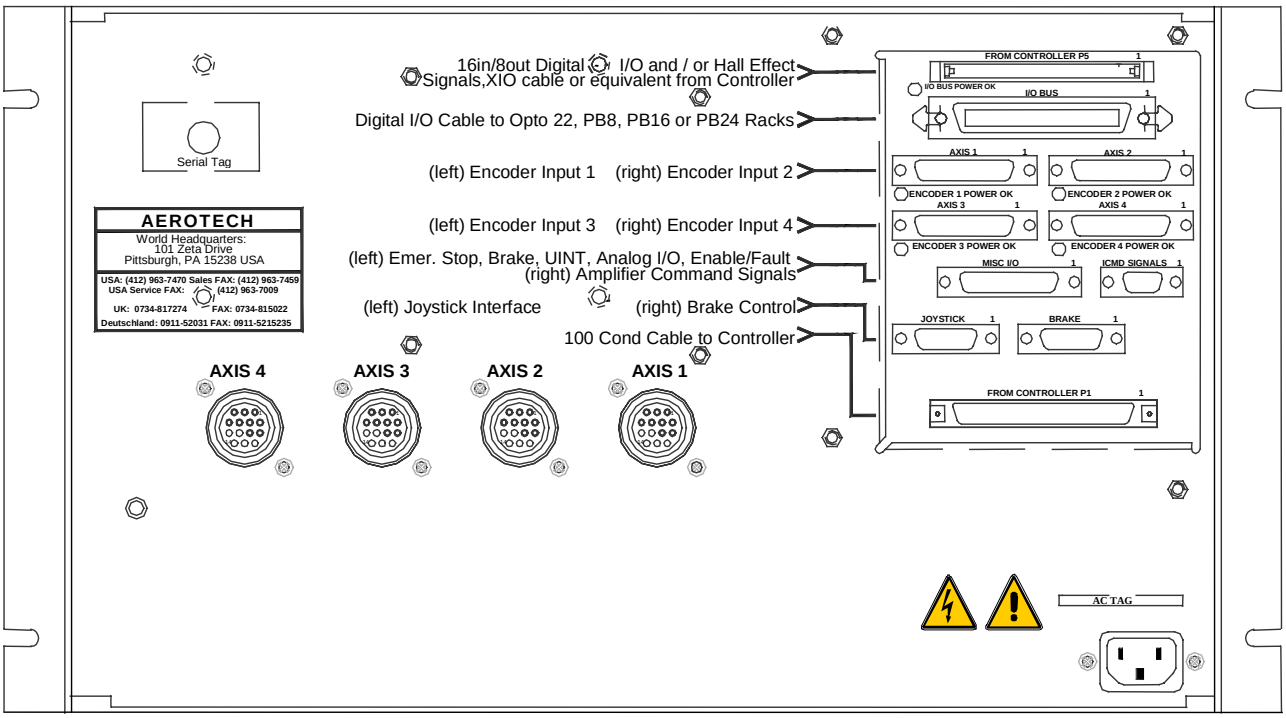


Figure 2-3. DR600H Rear Panel Connector Layout

2.7. Electrical Installation

Motor, power, control, and position feedback cable connections made on the rear of the DR600 (refer to Figure 2-2). The external power connection is done by connecting the AC line cord (supplied with the DR600) into the lower right hand corner female plug and inserting the other end into an AC outlet. The limit/encoder feedback connections connect to the appropriate axis and the motor drive connections connect to the matching motor connector. Control connections are made through connector J1, labeled "From Controller P1".

When using an AC brushless motor, use the optional DRC cable that connects to P10 of the U600 or P5 of the U500 controller and to the rear of the DR600 to connector J10 (labeled "From Controller P5"). This cable accommodates any encoder/Hall effect feedback device. 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 or brake functions, the joystick connection is made at connector J12 and labeled "JOYSTICK" and the Brake connection is made at connector J14 and labeled "BRAKE". Refer to Figure 2-4 for an example of the electrical connections made on the rear of the DR600.

Protective grounding is through the main power connection.

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

Protective grounding connection is indicated by the symbol "⏚".

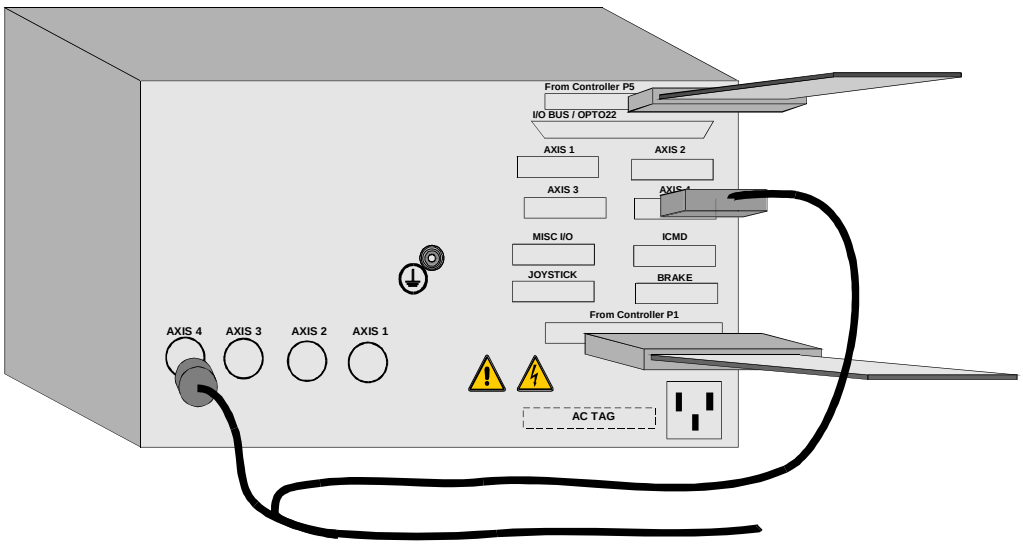


Figure 2-4. DR600 Electrical Connections

2.7.1. Emergency Stop Operation (Optional)

The emergency stop circuit is designed such that opening of the series 24VDC emergency stop circuit (J70 pins 4 to 5, or 6 to 7) will activate an emergency stop condition. The system may then remove the A.C. power from the servo amplifiers (ESTOP2 option) or disconnect the motors from the servo amplifiers (ESTOP3 option). The system may also perform an intelligent system shutdown based on the configuration of the U500/U600 system faultmask.

Clearing of the emergency stop is done by closing the series 24VDC emergency stop circuit (J70 pins 4 to 5, and 6 to 7) and (if implemented) momentarily closing the emergency stop reset switch. The controller may also need to be cleared of the emergency stop buy issuing a fault acknowledge.

If the emergency stop reset switch is implemented, the system will power-up in an emergency stop condition. It must be cleared by momentarily closing the emergency stop reset switch.

The emergency stop circuit may be defeated by adding jumpers to J70 pins 2 to 3, 4 to 5, & 6 to 7. See Figure 2-5.

2.7.1.1. Emergency Stop 2 Option (ESTOP2)

The ESTOP2 option disconnects the A.C. power from the servo amplifiers during an emergency stop condition and triggers the emergency stop input to the U500/U600 controller. The ESTOP2 option may be latched depending upon external wiring to the DR600 emergency stop interface J70. See Figure 2-5.

2.7.1.2. Emergency Stop 3 Option (ESTOP3)

The ESTOP3 option disconnects the motors connections from the servo amplifiers during an emergency stop condition and triggers the emergency stop input to U500/U600 controller. The ESTOP3 option also has a dynamic braking feature that reduces axis coasting when an emergency stop is activated. The ESTOP3 option may be latched depending upon external wiring to the DR600 emergency stop interface J70. See Figure 2-5.

2.7.1.3. Emergency Stop Interface

Both the ESTOP2 and ESTOP3 options incorporate a set of normally open and normally closed dry contacts for triggering an external device. These contacts are isolated from the DR600 and have the following ratings:

Relay Type:	Midtex P/N 156-14C-200 (or equivalent)
Coil rating: (Input)	24VDC @ 37ma. (650 Ohms)
Contact rating: (Output)	5 amps @ 24VDC - resistive load.
	5 amps @ 240VAC - resistive load.

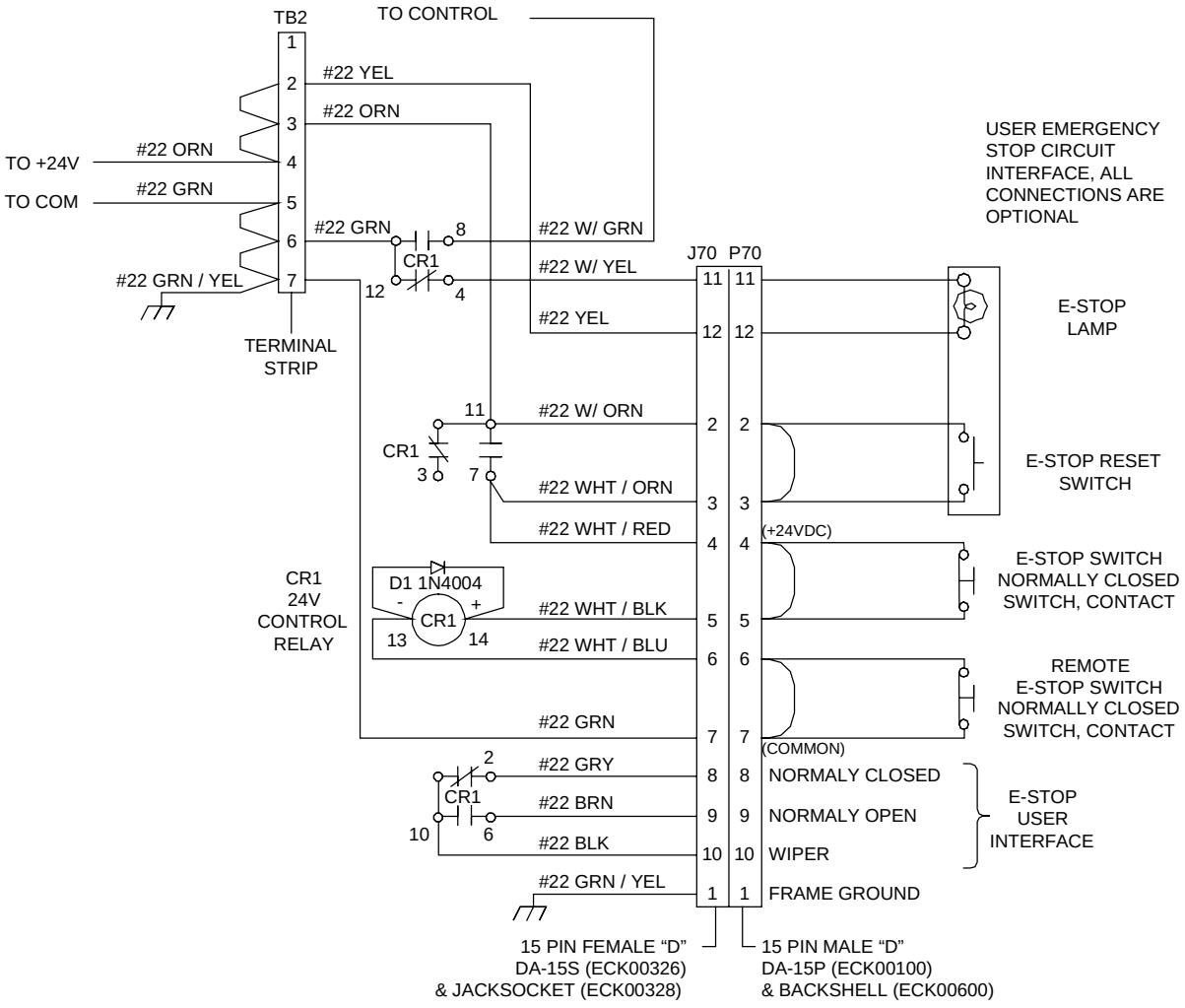


Figure 2-5. ESTOP Connector Schematic

2.7.2. DR600 Power Up

To safely power up the DR600, properly connect all drive modules and cables to the DR600 before turning on the chassis. Likewise, always turn the system off before removing any cables from the DR600 chassis. Locate the system serial label in the upper left corner of the DR600 rear panel. This label contains important information such as:

- the customer order number
- the drawing number
- and 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 DR600R-4-A-80/ specifies a 115 VAC input.

Before connecting the DR600 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, located on the front of the DR600, provides overload protection for the system. All systems contain a switch/circuit breaker. A re-settable fuse, located on the interface board, protects the system should a fault or overload condition occur with the optical encoders, joystick, I/O bus, or Misc. I/O connectors.

2.8. DR600 Interface

To connect the UNIDEX 500/600 to the DR600 drive rack requires one or 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 controller board installed in the personal computer to the connector at the back of the DR600 Drive Chassis labeled "From Controller P1". Normally, this is the only connection required for brush systems.

Systems that use brushless motors require a second cable. The purpose of this cable is for the Hall effect sensors that interface to the UNIDEX 500/600, through the I/O bus, to commutate a brushless motor. This requires an additional 50 conductor ribbon cable (DRC, see Figure 1-3), connected from P5 on the UNIDEX 500 CPU board or the UNIDEX 600 P10 to the connector on the rear of the DR600 chassis labeled ""From UNIDEX 500 P5".

It may be necessary to add an additional slot to the user's personal computer (PC) to allow this cable to exit the PC due to the OP500 cable utilizing the existing slot.

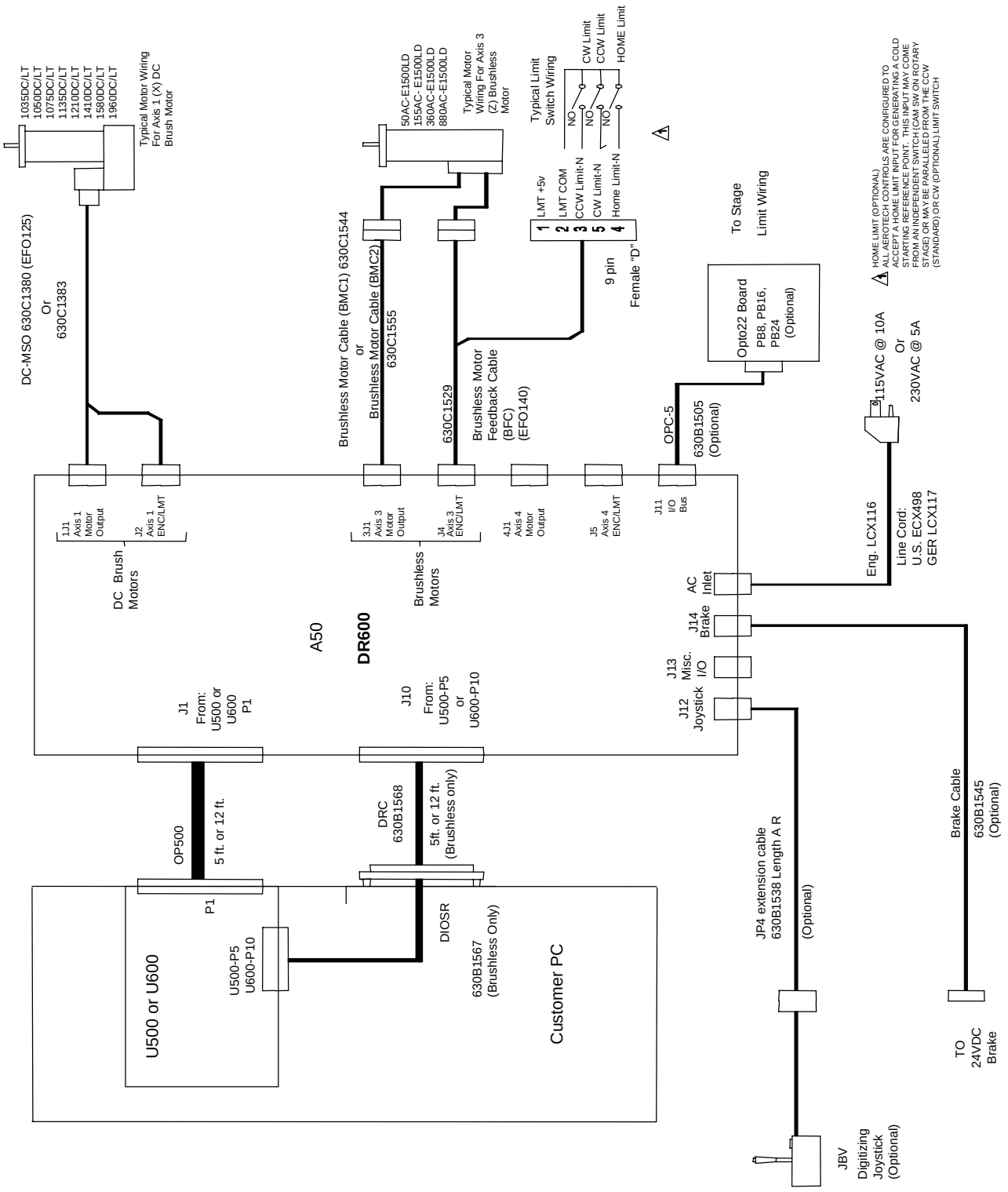


Figure 2-6. UNIDEX 600 / UNIDEX 500 Generic System Interconnection

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CHAPTER 3: TECHNICAL DETAILS

In This Section:

3.1. Connector Pinouts and OP500 Interconnect Cable Specifications

Table 3-1 defines the pinouts for the 100-pin connector that mates with J1 on the rear of the DR600. This is an AMPLIMITE .050" series connector that is part of the 100 conductor shielded OP500 cable that connects the DR600 to connector P1 of the UNIDEX 600/500 controller. 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 U600/U500 controller, connector P1. All connectors are N.C. where blank.

Refer to Figure 3-1 for the location of the connectors on the rear of the DR600 Chassis assembly.

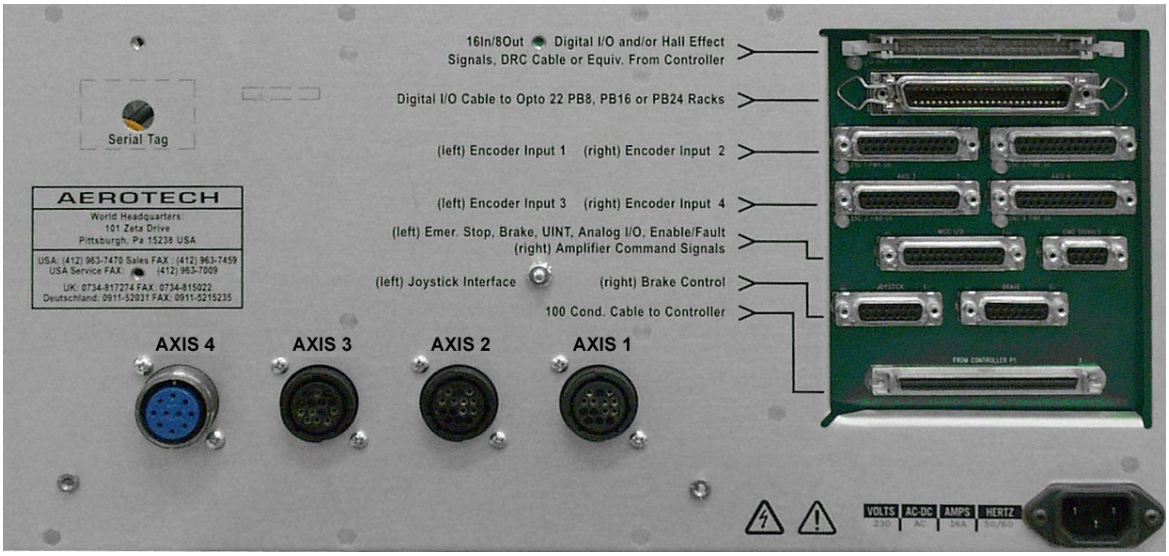


Figure 3-1. DR600 Rear Panel Connector Layout

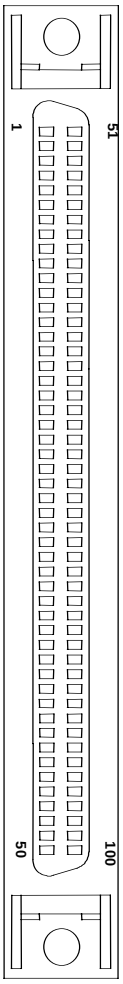


Table 3-1. Pinouts for Connector J1 From U500/U600 Connector P1

Pin #	Description	Pin #	Description
1	Interlock Send	**51**	Common
2	Sync (unused) / Common	**52**	Hall Effect HC1
3	U500/U600 +5 Volts (unused)	**53**	+12VDC OUT / DAC +12VDC IN *****
4	U500/U600 +5 Volts (unused)	**54**	+12VDC OUT / DAC Common *****
5	Hall Effect HB1	**55**	-12VDC OUT / DAC -12VDC IN *****
6	Hall Effect HA1	**56**	-12VDC 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

*** 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 DR600 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 DR600 input is a logic signal driven by the UNIDEX 500/U600 to sense the presence of the DR600 Drive Chassis. U500/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 DR600. 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 the purpose of detecting the loss of encoder signals (this excludes the marker signal pairs).

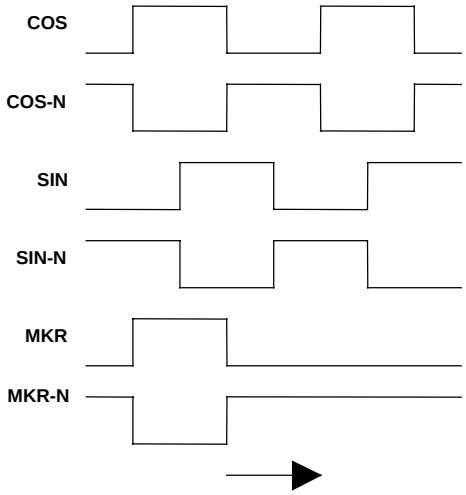


Figure 3-2. CW Motor Rotation Viewed from Mounting Flange End

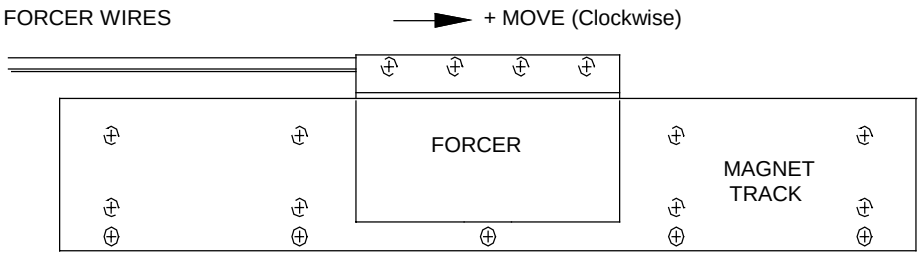


Figure 3-3. Linear Motor (Forcer) CW Direction

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:

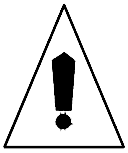
Pin 22 – HB3	This is axis 3 Hall Effect Sensor B output
Pins 23 to 28	These follow the same sequence as those described for Axis 1 pins 7 - 12.
Pin 29 – HA3	This is axis 3 Hall Effect Sensor A output
Pin 30 – HC3	This is axis 3 Hall Effect Sensor C output

AXIS 4 PINOUTS INCLUDE:

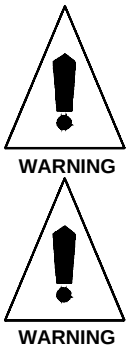
Pins 31 to 36	These follow the same sequence as those described in Axis 1 pins 7 - 12.
Pin 37 – HB4	This is axis 4 Hall Effect Sensor B output
Pin 38 – HA4	This is axis 4 Hall Effect Sensor A output
Pin 88 – HC4	This is axis 4 Hall Effect Sensor C output

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 DR600 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 DR600 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 U500/U600 controller to verify proper connection of the DR600. The U500/U600 manuals provide additional information concerning this signal.

3.2. DR600 Rear Panel Connectors

There are 14 connectors on the rear panel of the DR600 Chassis. The following sections show the pinouts for each connector and a description for each pin in the connector.

3.2.1. Motor Feedback 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.

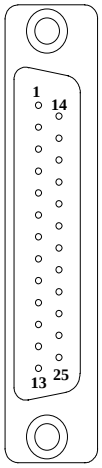


Table 3-2. Pinouts for Axis 1 Through Axis 4 (J2 - J5)

Pin #	Description	Pin #	Description
1	Shield (Chassis Frame)	**14**	Cosine Input
2	Thermistor Input	**15**	Cosine-N Input
3	+5 Volts (Encoder)	**16**	Limit Switch Power
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**	Common (Limit)
8	Tachometer – Input (Common)	**21**	Common (Encoder)
9	Encoder Setup (Optional)	**22**	Home Limit Input
10	Hall Effect Sensor A Input	**23**	Encoder Fault Input
11	Hall Effect Sensor C Input	**24**	Counter-clockwise end of travel limit input
12	Clockwise End Of Travel Limit Input	**25**	Brake + Output (Optional)
13	Brake – Output (Optional)		

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).

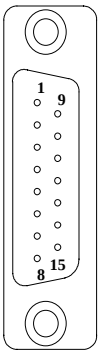


Table 3-3. Pinouts for the Joystick Interface Connector (J12)

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

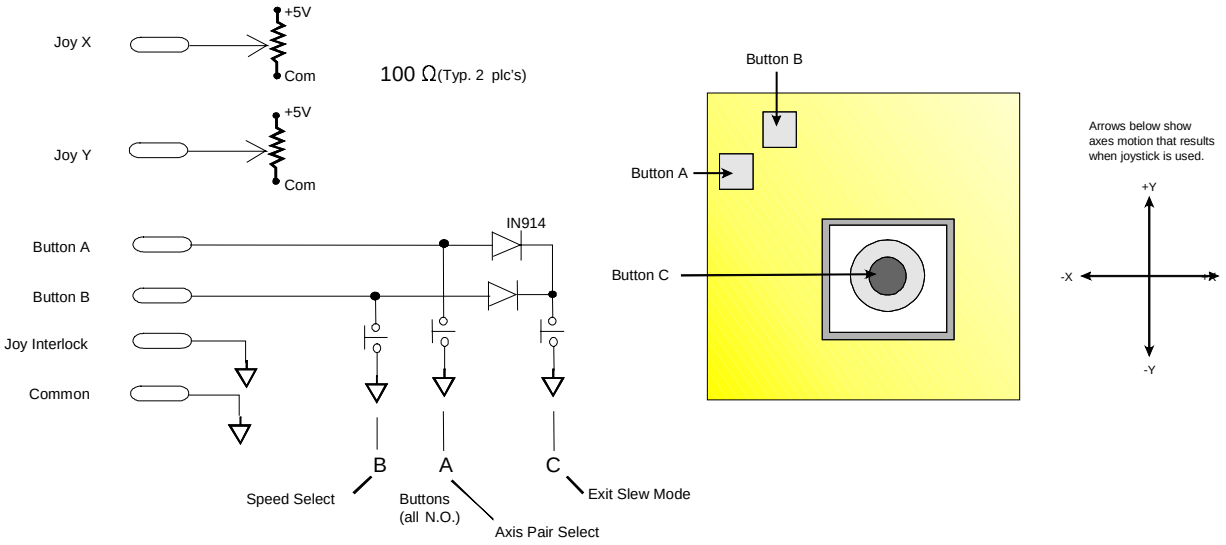


Figure 3-4. Joystick Interface

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).

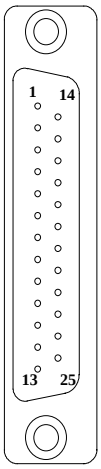


Table 3-4. Pinouts for the Miscellaneous I/O Connector (J13)

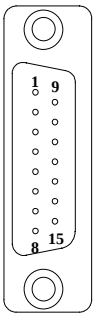
Pin #	Description	Pin #	Description
1	Shield (Chassis Frame)	14	Unused
2	User Interrupt Input	15	Unused
3	Emerg. Stop Opto-Isolator Input	16	Unused
4	Opto-Isolator Anode(s)	17	Unused
5	Fault Axis 1	18	Common
6	Fault Axis 2	19	+5 Volts
7	Fault Axis 3	20	Common
8	Fault Axis 4	21	+12 Volts (100mA max.)
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 Output -	9	Unused
2	Brake Output +	10	Unused
3	Unused	11	Unused
4	Unused	12	Unused
5	Unused	13	Unused
6	Shield (chassis frame)	14	Unused
7	Unused	15	Unused
8	Common (for interlock input)		



3.2.5. Digital I/O Connector

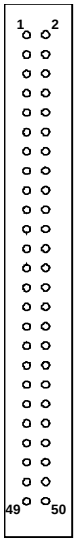
Table 3-6 shows the pinouts for the digital I/O or "From UNIDEX 600-P10/U500-P5" connector. The mate to this connector is a 3M #3425-6050 (Aerotech # ECK332).

This connector is normally used to connect to U500-P5 or U600-P10. This is required for U600 systems and may be required for U500 systems if Hall effect sensors (brushless only) are used as shown in section 1.2.2.

When looking at this connector, 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	Input1 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 / Output 15
11	Input 10/ Axis 3 Hall switch	35	Output 6 / Output 14
13	Input 9/ Axis 2 Hall switch	37	Output 5 / Output 13
15	Input 8/ Axis 2 Hall switch	39	Output 4 / Output 12
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 Current Command Connector

The table below shows the pinouts for the current command outputs to the BA Series drives. The mating connector is a Cinch # DE9P (Aerotech PN, ECK137), with a backshell #DE24657 (Aerotech PN, ECK612).

Table 3-7. Pinout for Current Command Output (J16)

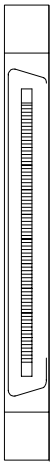
Pin #	Description	Pin #	Description
1	Common	**6**	Axis 1 Primary I. Cmd. Output
2	Axis 1 Secondary I. Cmd. Output	**7**	Axis 2 Primary I. Cmd. Output
3	Axis 2 Secondary I. Cmd. Output	**8**	Axis 3 Primary I. Cmd. Output
4	Axis 3 Secondary I. Cmd. Output	**9**	Axis 4 Primary I. Cmd. Output
5	Axis 4 Secondary I. Cmd. Output		

3.2.7. The Opto-22 Connector

Table 3-8 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 3-8. 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 17 through 20 are Outputs 12 through 15 when using the U600/U620 Systems. See the UNIDEX 600 Hardware manual for more information on this connector.

3.2.8. Motor Power Connector Pinouts

The motor power connectors are either a 14 pin AMP circular plastic motor connector or optional MS connectors.

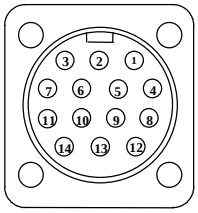
The plastic mating connector is an AMP #206044-1 (Aerotech #ECK131). The backshell is an AMP #206070-1 (Aerotech #ECK134). The pins for the connector are AMP #66098-7 (Aerotech #EIK194).

The AC Brushless MS mating connector is comprised of an Amphenol #MS3106A-18 plug (Aerotech #MCM475), an Amphenol #9718-10S insert (Aerotech #MCM495), an Amphenol 97-3057-1010 clamp (Aerotech #MCM477), and an Amphenol AN3055-18-10 bushing (Aerotech #MCM481).

The DC Brush MS mating connector is comprised of an Amphenol #MS3106A-18 plug (Aerotech #MCM475), and an Amphenol #MS18-10P (Aerotech MCM00499).

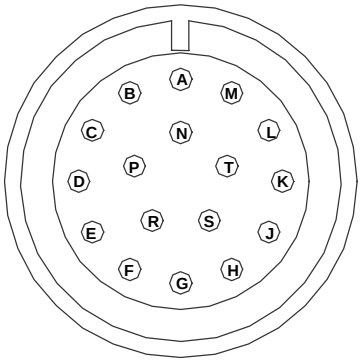
For a DC Brush motor connector, the following pins apply:

Plastic Mating Connector



Viewed From Wire Side of Connector

DC Brush Motor Mating Connector



Viewed From Wire Side of Connector

Table 3-9. Pinout for Motor Connectors with a DC Brush Motor

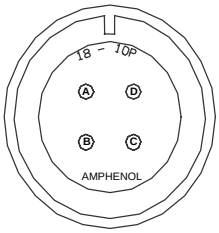
Plastic Con Pin #	Description	MS. Connector Pin
1	motor frame	E, F
8	motor shield	E, F
5, 7	motor +	G, C
4, 6	motor -	H, K

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

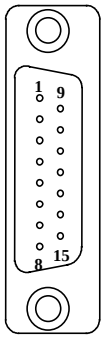
Table 3-10. Pinout for Motor Connectors with an AC Brushless Motor

Plastic Con Pin #	Description	MS. Connector Pin
1	motor frame	D
8	motor shield	D
5, 7	phase C	C
4, 6	phase B	B
3, 9	phase A	A

AC Brushless MS Mating Connector



Viewed From Wire Side of Connector



3.2.9. ESTOP Connector (J70)

Table 3-11 shows the pinouts for the emergency stop connector. The mate to this connector is a Cinch # DA=15P (Aerotech # ECK100). Refer to Figure 2-5 for internal ESTOP wiring.

Table 3-11. Pinout for ESTOP Connector (J70)

Pin #	Description	Pin #	Description
1	Chassis Frame Ground	**9**	User Relay N.O. Contact
2	ESTOP Reset Switch (+24V)	**10**	User Relay Wiper Contact
3	ESTOP Reset Switch (Com)	**11**	ESTOP Lamp (Com)
4	ESTOP Switch (+24V)	**12**	ESTOP Lamp (+24V)
5	ESTOP Switch (Com)	**13**	Unused
6	Remote ESTOP Switch (+24V)	**14**	Unused
7	Remote ESTOP Switch (Com)	**15**	Unused
8	User Relay N.C. Contact		

3.3. DR600 Outline Drawings and Mechanical Specifications

Refer to Figure 3-5 for dimensions. The package depth indicated does not allow for the required space at the back of the chassis to allow for motor and user cable connections. Allow 152.4 mm [6.00 in] for connectors and wire bends. The height noted below is the only size difference between the DR600 and the DR600H.

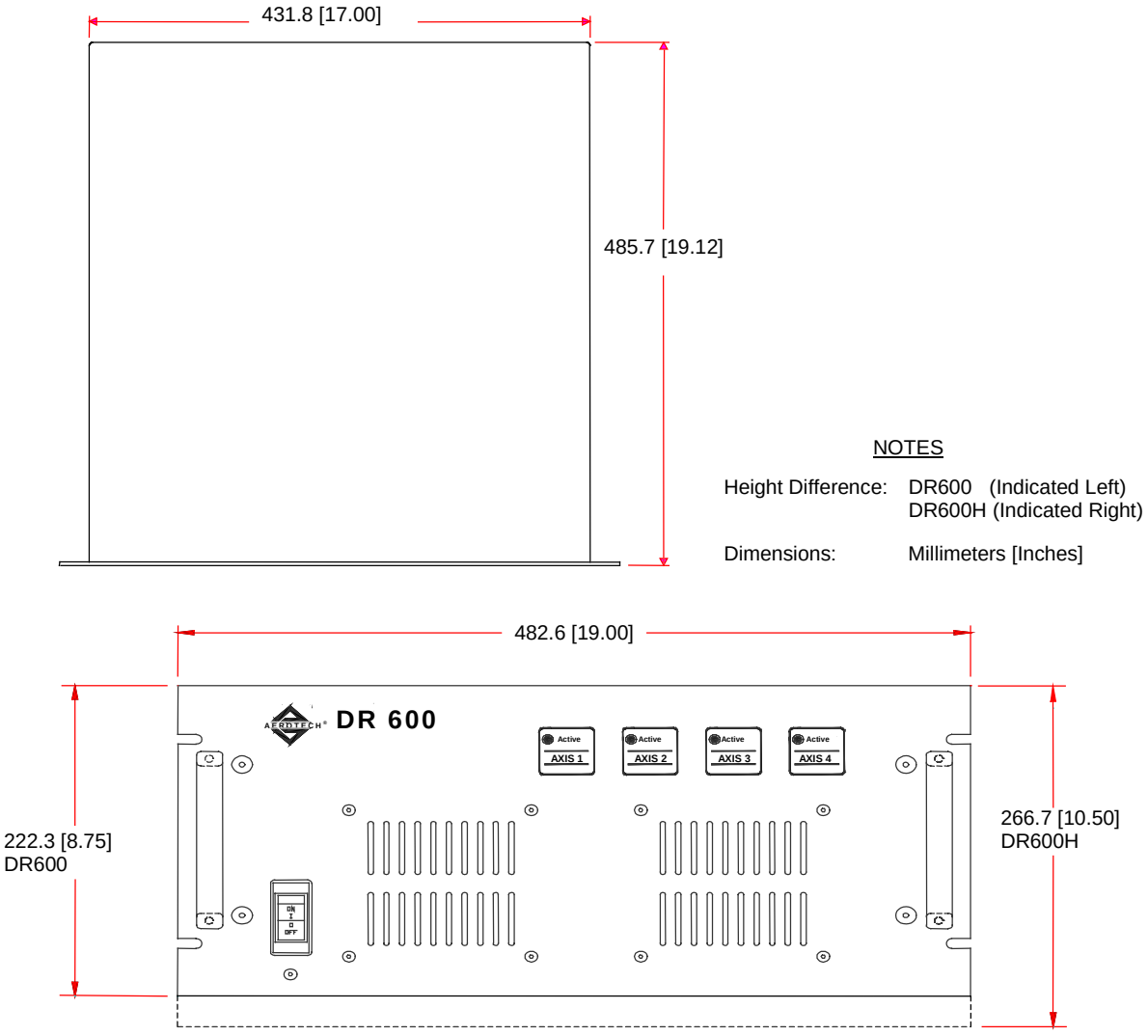


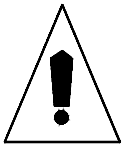
Figure 3-5. DR600 Rack Mount Package

3.4. Electrical Specifications

Aerotech configures each DR600 to fit the user's particular power requirements. The possible input voltages are 115 VAC, 230 VAC, 100 VAC, and 208 VAC. Each DR600 systems power specifications can be found on the power specification tag located on the rear of the DR600 chassis (see following example).

Example:

115V~ 50/60Hz 10A



Hazardous voltage may be present.

The input current is determined by the BA Series amplifiers present in your DR600/H and current draw of the 45 watt logic power supply. Reference your BA Series amplifier manual, or Aerotech's catalog (or website), for BA Series amplifier current draw or output power.

- Line Frequency: 50 Hz to 60 Hz
- Installation category: Over-voltage 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 2,000 m.
- Pollution Pollution degree 2 (normally only non-conductive pollution.
- Use Indoor use only.

3.6. Emergency Stop Sense Input

The UNIDEX 600/U500 has an optically isolated emergency stop sense input. See your controller's hardware manual for more information.

The UNIDEX 600 and UNIDEX 500 require parameter changes before they will recognize the E-Stop circuit. Refer to the UNIDEX 500 Technical and Operation Manual or the UNIDEX 600 User's Guide for more details.

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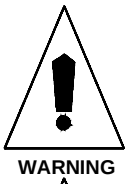
CHAPTER 4: TROUBLESHOOTING

In This Section:

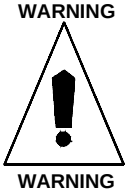
4.1. Warnings and Cautions

The user must be aware of the following cautions and dangers when troubleshooting the DR600.

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.

Danger, risk of electric shock.

4.2. Amplifier Related Problems

Amplifier related problems are usually related to cable connections and parameter settings. Table 4-1 provides a list of some common amplifier related problems.

Table 4-1. Amplifier Problems

Symptom	Possible Causes
Axis will not Enable	Check Motor and Controller cables. Verify DR600 power is on. Verify Parameters. Check Encoder and Hall feedback. Check Amplifier fuses.
Motor oscillates or squeals when in position	Check servo-loop gains.
Motor faults	Check parameters. Check Encoder and Hall feedback phasing. Motor load too high or mechanically locked. Programmed speed to 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 DR600 chassis.

4.3. Power Related Problems

The DR600 contains several power supplies that generate +5V, +12V, -12V, and the bus supplies. Table 4-2 lists some power checks that can be made.

Table 4-2. Power Checks

Symptom	Possible Causes
DR600 appears dead	Verify power switch is on. Verify DR600 has AC power (listen for internal fans).
+5 Volts low or not present	Used several places (J2-5) pins 3 (20 is common). Check for +5 Volt short (disconnect all cables to DR600).
Axis will not enable and/or no motor torque	Check +5 Volt supply. Check Bus supply fuses (see system drawing).

Always disconnect main power connection before opening the DR600 chassis.

WARNING

4.4. Fuse Replacement

Fusing is provided by the combination power switch/circuit breaker on the front panel. The 10A circuit breaker is ETA P.N. 3120-F321-P7T1-W19LB4 (Aerotech P.N. EAW260). The 5A circuit breaker is ETA P.N. 3120-F321-P7T1-W19LB4 (Aerotech P.N. EAW01016). The 15A circuit breaker is ETA P.N. 3120-F321-P7T1-R04L (Aerotech EAW00255).

Table 4-3 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 4-3. 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

Always disconnect the mains power connection before opening the DR600 chassis.

4.5. Preventative Maintenance

The DR600 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 4-4 lists the recommended checks that should be made during these inspections.

Table 4-4. 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 DR600 and should be removed immediately. **Note**: Disconnect power to avoid shock hazard.
Visually inspect all cables and connections.	Tighten or resecure any loose connections. Replace worn or frayed cables. Replace broken connectors.

4.6. Cleaning

The DR600 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 DR600 while cleaning. Do not allow cleaning substance to enter DR600 or onto any of the connectors. Cleaning Labels (Rear Panel) should be avoided to prevent erasing of label information.

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APPENDIX A: WARRANTY AND FIELD SERVICE

In This Section:

Aerotech, Inc. warrants its products to be free from defects caused by faulty materials or poor workmanship for a minimum period of one year from date of shipment from Aerotech. Aerotech's liability is limited to replacing, repairing or issuing credit, at its option, for any products 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

Phone: (412) 963-7470
Fax: (412) 963-7459
TWX: (710) 795-3125

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Symbols

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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
1.4	1.2.2.	Text deleted
	Table 2-1.	Text added to table cells (for JP14)
	Table 2-2.	JP1, JP3, and JPx2 updated
	2.3.	15 A fuse information added.
	2.7.1.	ESTOP Operation Option information added
	2.7.2.	Text deleted (also, originally numbered as 2.7.1.)
	3.2.6. (Table 3-7.)	Text corrected (J15 changed to J16)
	3.2.8.	Text added.
	3.2.9.	ESTOP connector pinout information added
	4.4.	15 A fuse information added

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READER'S COMMENTS

DR600 Drive Chassis
P/N EDA 142, September, 2001

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

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Adequate to the subject?	____	____
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