# SD DRIVE SERIES
INSTALLATION MANUAL

Description:
The SD Drives are an integral part of the Centroid CNC control solution. Packaged as a complete motor drive for AC brushless as well as DC brush motor control, the SD3 and SD1 can be configured through software for a wide variety of applications. The SD3 will drive three motors, any combination of brushed or brushless, and accept an encoder input for the control of an external spindle inverter. All motors can run off a single power input or can have separate input voltages as required. Logic power supply voltage is developed from a DC input of 100 volts to 320 volts, which can be the same source as the motor power. Motor feedback is wired directly to the drive where the incremental encoder is read by an individual processor for each axis. Fiber optic communications with the drive are bi-directional so that status reporting can be viewed at the PC. An open collector transistor is available for a brake on each of the axes. This can be wired to an external relay to drive any type of motor brake.

An internal fan provides cooling to the main switching IGBT's as well as the entire circuit. Thermal sensing will warn and then shut down the drive in case of an overload. All motors are protected against over-currents through a fuse on each axis. Fuses are mounted internally. All safety precautions must be followed when replacing fuses.

Specifications:
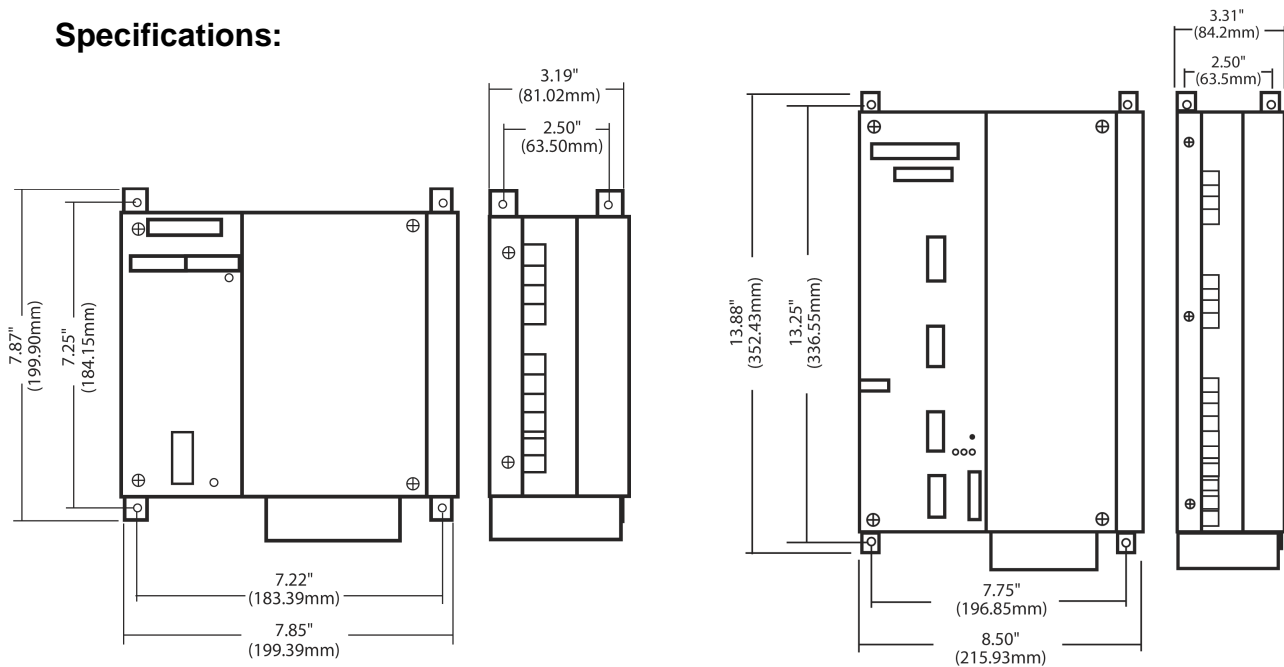
Outside Dimensions:

	SD3	SD1
	13.88 X 8.50 X 3.31 (in)	7.87 X 7.85 X 3.19 (in)
	352 X 215 X 84 (mm)	200 X 199 X 81 (mm)

Weight:

SD3   5 lbs / 2.3 Kg
SD1   2.5 lbs / 1.13 Kg

Power Input:

Logic Power	100 - 340 VDC	
Motor Power	100 - 340 VDC	2000 Watts Continuous
	220Vac Max	5700 Watts Peak per axis

Encoder Input: Quadrature differential pair incremental encoder
                        plus commutation. 5V Max voltage.
                        Brushless motors are limited to 1024, 2048 , 4096 line
                        encoders. Spindle encoder input is for control of an
                        external spindle drive through PLCIO module or
                        equivalent.

Control Interface: Synchronous Serial Communication Full Duplex to
                        CPU9SD, CPU10, or CPU10B – 4 optical fibers.
                        Max length of 30 feet for SD1 systems
                        Max length of 40 feet for SD3 systems

Motor Output Voltage: 100 - 220 VAC   AC Brushless
                        100 - 320 VDC   DC Brush (100 -160 VDC typical)
                        Motor output peak voltage will be the input level.

Motor Output Power: 2000 Watts continuous   @ 220 VAC
                        5700 Watts Peak   @ 220 VAC, 22A
                                                 3 Phase

                        3 independent outputs.
                        Current mode, position commanded
          SD1 High Power Model (for 3 and 4 kW motors)
                        4000 Watts continuous   @ 220 VAC
                        11400 Watts Peak   @ 220 VAC, 45A
                                                 3 Phase

Axis Brake Driver: 50 Volts DC Max. (5 and 24 Volt typical)
                        0.5 Amps DC Max.

Braking Resistor: 40 ohms 200 watt minimum.

Motor cable length: 50 feet maximum.

Installation

Optimal mounting for the SD drive is vertical onto a metal backing. Note the direction of the airflow through the drive must go up. The drive chassis must be electrically connected to an earth grounded structure. **Make sure ALL SD drives in a system are tied into the same ground.** Indicators on the drive cover should be visible without removing the unit for trouble-shooting purposes. **When mounting SD drives to the cabinet make sure to use star washers in between the screw head and the SD drive. This will assure a good ground contact between the SD drive and the cabinet.**
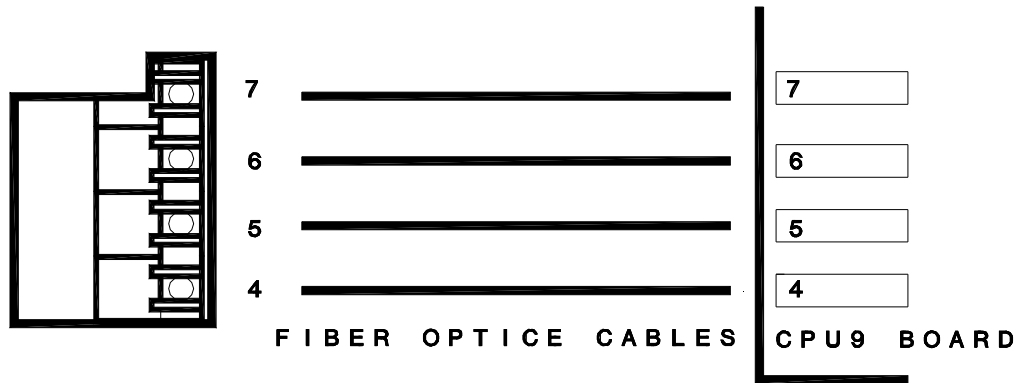
Wiring:
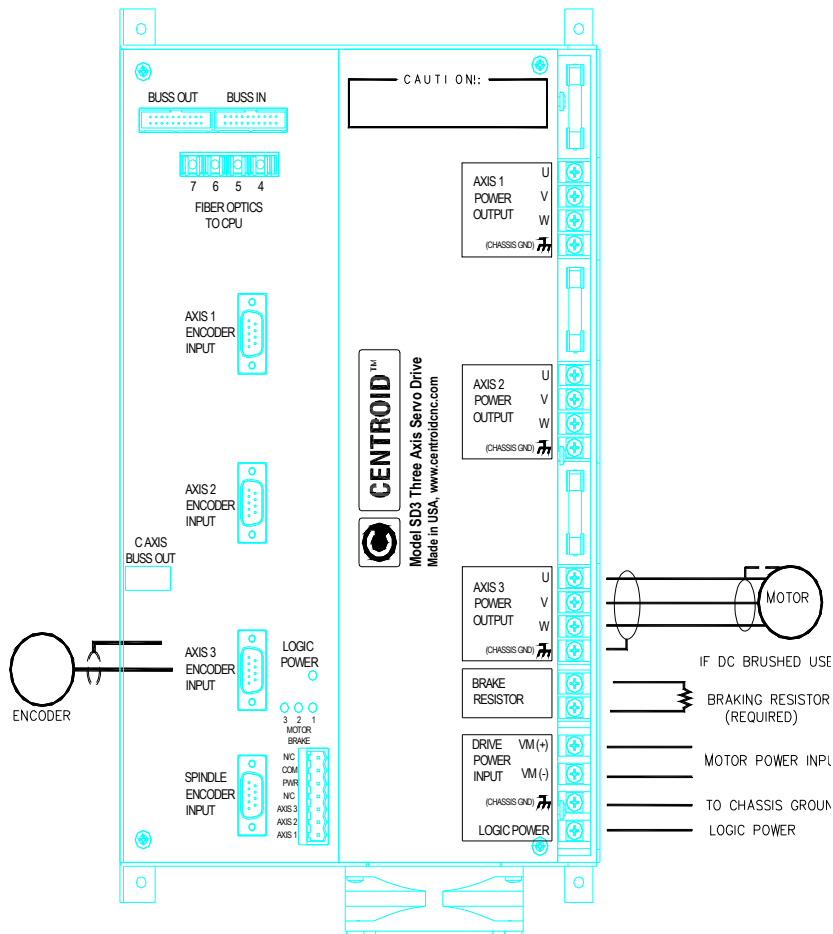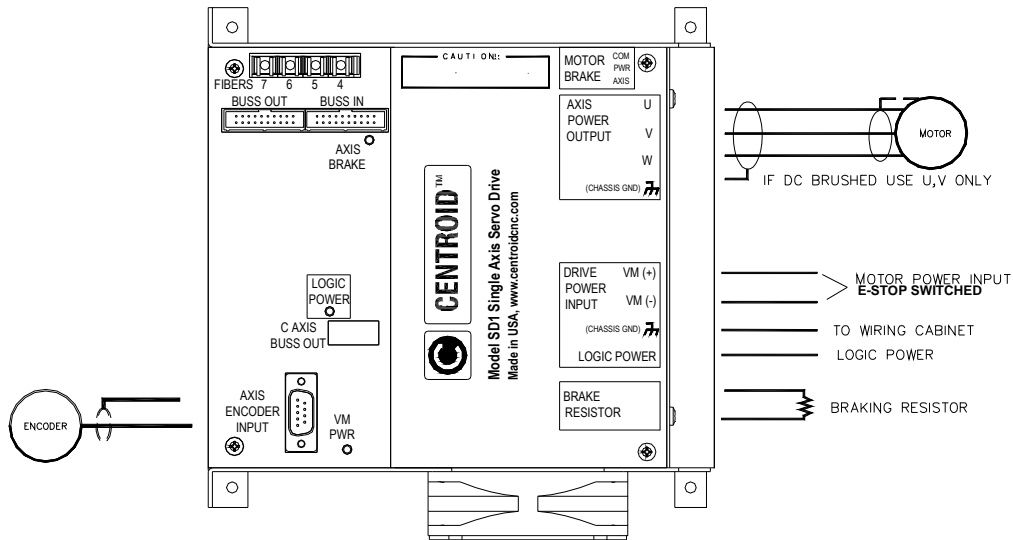
Only specified connectors are to be used.

Fiber optic cable connections are as shown. Note that the Data Transmit from the CPU connects to the Data Receive of the SD drive and the Data Receive connects to the Data Transmit.

F I B E R O P T I C E C A B L E S **C P U 9 B O A R D**

Input Power

Power to the drive is DC only. Motor power and Bias power can be from the same source. The Motor power must run through the E-STOP contactor before connecting to the drive. This voltage should match all the motors being driven. Motors of different voltage inputs may be used but a special input must be wired at the factory. Logic power voltage should be wired to come on with the main power disconnect. **If power is removed from Logic Power the machine power will need to be cycled to reboot the drive processors.**

DRIVE POWER INPUT	VM (+)		MOTOR POWER INPUT
	VM (-)		
	(CHASSIS GND)		CHASSIS GROUND STRIP
	LOGIC POWER		LOGIC POWER
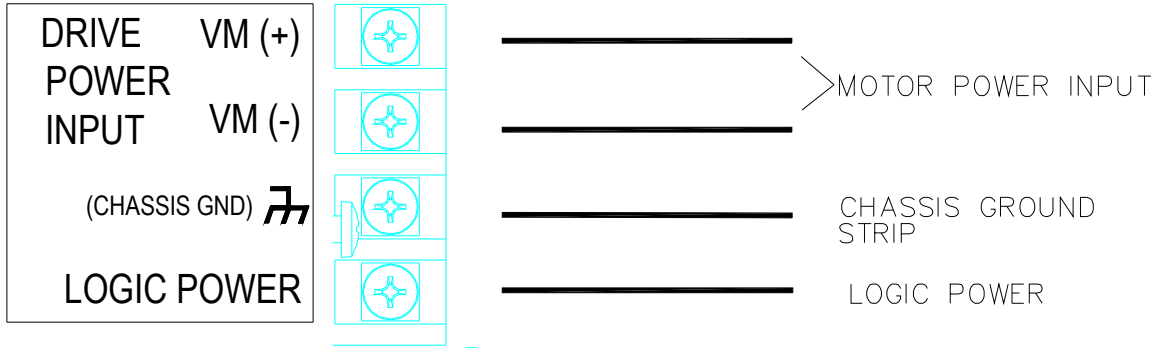
Brake resistor

A brake resistor must be installed on every system. High inertia systems may require braking, as in the case where a motor back generates into a drive and may cause damage. This resistor will help save the drive and slow the system under extreme braking. Braking current is limited to 10A for 5 seconds.

BRAKING RESISTOR
40 OHM 200W MINIMUM

(+)

(-)

BRAKING RESISTOR
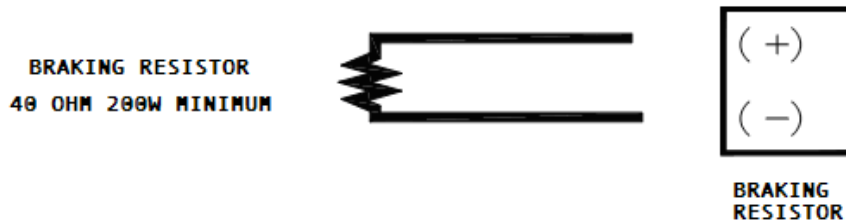
Motor power

Wiring to any motor must be with the approved connector and cable. The cable must include a shield that attaches at both ends. Brushless motors are wired to spin clockwise as viewed from the front of the motor while performing the sync-up operation in the drive menu. **Brushed DC motors should wire the RED lead to the U connection and the BLACK lead to the V connection**. W will remain unconnected for brushed motors.
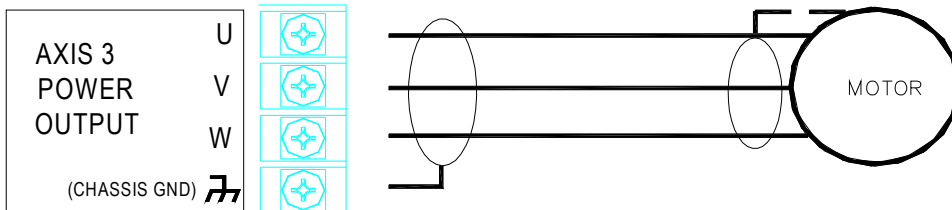
Encoder Input

Incremental encoders are used for either motor type but must be binary count for brushless motors (1024, 2048, 4096 lines). Encoders are wired to the drive only. Cables must be shielded with the shield screen attached to the drive side only. **DO NOT ATTACH SHIELD AT THE MOTOR SIDE!** To check encoder wiring, power system and go to the PID menu. Turn the shaft clockwise as viewed from the front of the motors; the absolute position should count up in positive numbers.

P1

Left	Pin		Right Pin	Right
XMOTORTEMP	5		15	-CHW0
+CHW0	10			
+CHV0	4		14	-CHV0
+CHU0	9			
+INDEX0	3		13	-CHU0
-INDEX0	8			
+CHB0	2		12	VCC
-CHB0	7			
+CHA0	1		11	GND
-CHA0	6			

CONN, HD
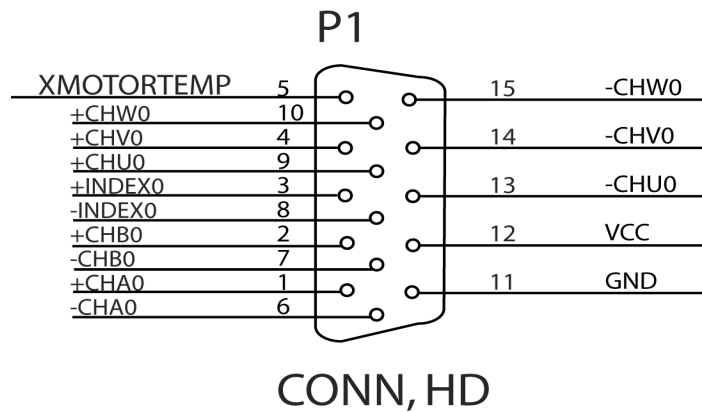
Spindle Encoder Input

This input does not require commutation channels and is compatible with previous wiring. This spindle input is always axis 6 in the setup. Parameter 35 should be set to 5 for a system with an SD3 drive. If a system doesn't contain an SD3 but has a couple of SD1 drives, plug spindle encoder into an axis on the CPU board and set parameter 35 according to the following equation:
Parameter 35 = Axis – 1 + 16 (e.g. If connecting the spindle to the Axis 4 location on the CPU board, parameter 35 should be (4 – 1 + 16) = 19).

	1	○	6	+Z
GND	2	○ ○	7	+B
-Z	3	○ ○	8	+A
-B	4	○ ○	9	+5V
-A	5	○ ○		
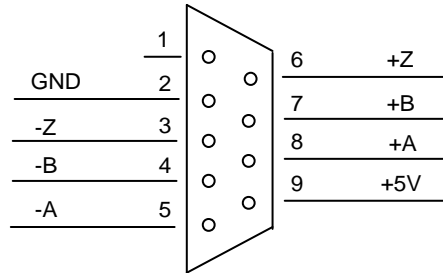
Axis Brake

A brake output is provided for each motor axis. It will engage whenever the motor drive is active. The circuit is an open-collector transistor that can be wired to a relay with a DC coil to operate the brake circuit. This circuit is isolated from the drive electronics and will need a separate power source ranging from 5VDC to a maximum of 24VDC.

SD1:

MOTOR	COM
BRAKE	PWR
	AXIS

SD3:

MOTOR
B R A K E S
N C
C O M M O N
5 — 2 4 V
AXI S 4
AXI S 3
AXI S 2
AXI S 1

Drive

PWR

AXIS #

CNTL

COMMON
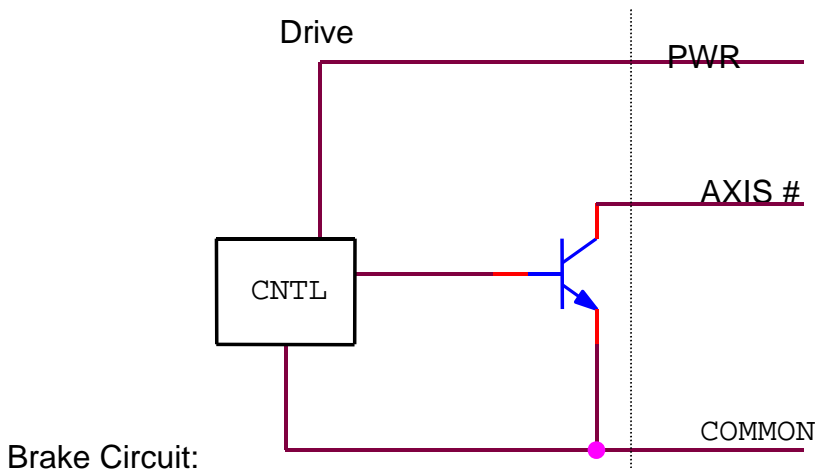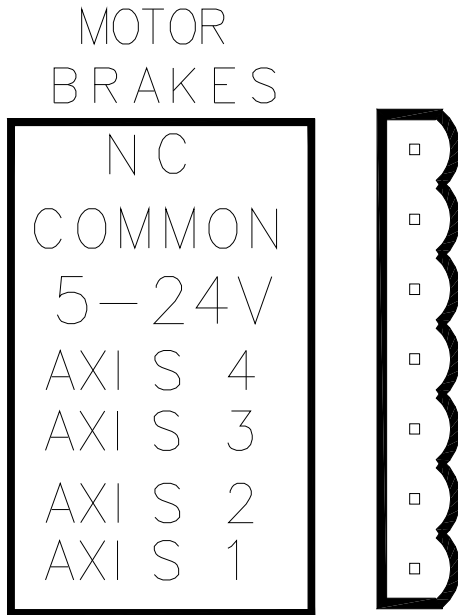
Brake Circuit:

Adding Fourth and Fifth Axis Drives to an SD3 drive

Additional axes may be added using the BUSS OUT connector, on the front panel of the SD3, and a shielded 20 pin twisted pair ribbon cable. The ribbon cable should be no more than 25 inches in length. This connects to an SD1 single axis servo drive for communications. An additional axis may then be connected to the SD1 for up to 5 axes of motion. The SD1 is powered separately but communicates through the BUSS OUT connection of the SD3 back to the CPU9SD, CPU10, or CPU10B. The SD1 drives must be configured for the fourth or fifth axis by setting the internal jumpers to the correct axis designator. The top cover must be removed to access these jumpers.

Jumper settings

To set drive for Axis 1, all jumpers should be in the 0 position. The axis number is a count from the binary addition of the jumpers. Axis 2 would have an axis select jumper 1 set and so on.

```
  4   2   1              4   2   1

 ▢   ▢   ▢   ▢ 1        ▢   ▢     ▢ 1
 █   █   █   ▢ 0        █   ▢   █
                            █     ▢ 0

     AXIS 1                  AXIS 3
```
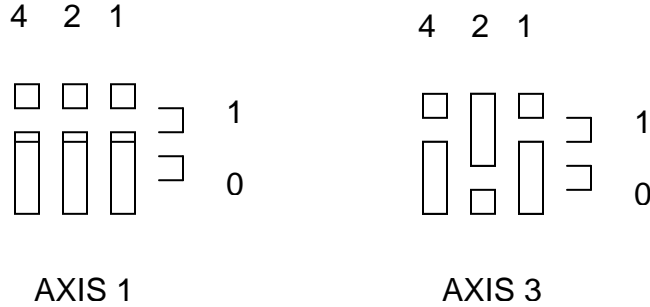
The J16 jumper, when installed, will disable communication using the fiber optic components and communicate using the ribbon cable into BUSS IN.

RIBBON CABLE   RIBBON CABLE   4 FIBERS TO CPU

AXIS 5   AXIS 4

REFER TO SD1 MANUAL FOR SD1 POWER AND MOTOR HOOKUP
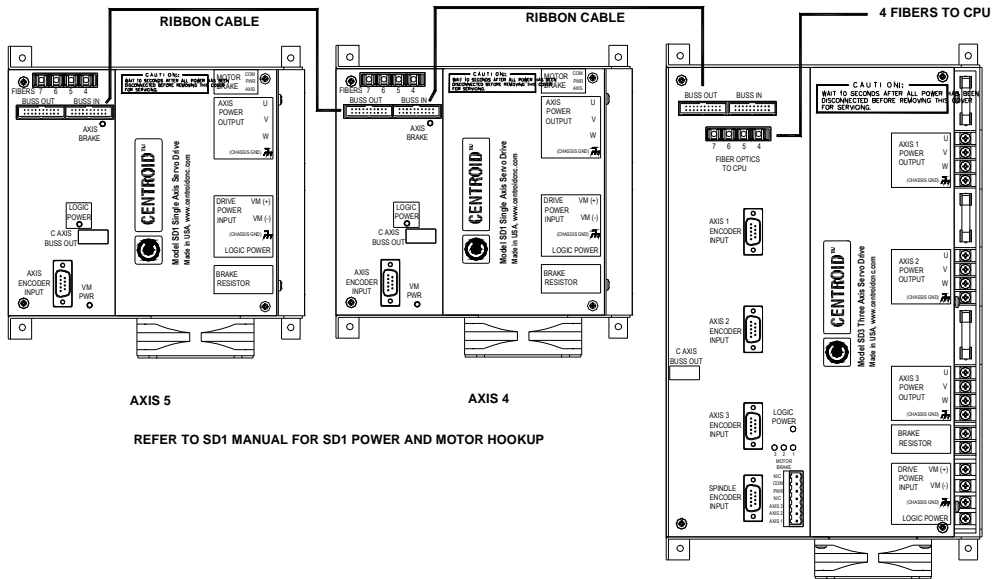
Systems of SD1 drives

        The SD1 drive may be used without the SD3 for systems requiring 3 and 4 KW motors. The fiber optic communication cables connect into one of the SD1s, which will be Axis 1, and the rest connect via ribbon cables for up to 5 axes of motion. This means that every SD1 drive except Axis 1 will have the jumper, J16, installed. An additional SD1 must be used for the spindle encoder input if using a CPU9SD. This SD1 must be set-up as Axis 6. All SD1s are powered separately and communicate through the BUSS OUT connection of the first SD1, which in turn communicates to the CPU9SD, CPU10, or CPU10B board. Each of the SD1 drives must be configured for a particular axis with internal jumpers. The top cover must be removed to access these jumpers.

SD1B and SD3B drives

        There have been a few field failures in which the Servo Drive Data Output Error(439) message would be seen which was caused by noise getting into the communication line. A couple of changes were made to minimize these errors. The first, was a change in the communication cable between SD drives. It has been changed from a ribbon cable covered with copper tape to a shielded twisted pair ribbon cable. The second, was a change to the SD drives' communication drivers. The new communication drivers are less susceptible to noise. In order to use the new communication drivers, a change to the CPU10B firmware was needed. An SD1 drive with a s/n of 612 or higher is an SD1B drive. An SD3 drive with a s/n of 671 or higher is an SD3B drive. The SD drives also have a visual sticker designating it as a regular SDx or SDxB drive. This sticker is the same sticker on which the drive's serial number is located. **If using an SDxB drive, a CPU10B with a s/n of 1400 or higher must be used. CPU10Bs with a s/n less than 1400 cannot be used with SDxB drives. CPU10Bs with a s/n higher than 1400 can still be used with original SDx drives. SDx drives CANNOT be mixed with SDxB drives.**

RIBBON CABLE   RIBBON CABLE   4 FIBERS TO CPU

AXIS 3   AXIS 2   AXIS 1
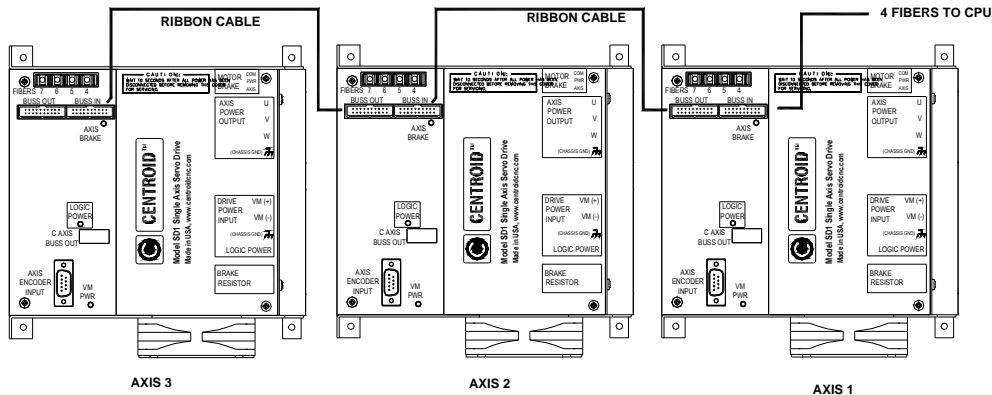
REFER TO SD1 MANUAL FOR SD1 POWER AND MOTOR HOOKUP

Operation

There are no manual adjustments on the SD drives or the CPU9SD, CPU10, or CPU10B. All configurations are done with software via the machine configuration, PID setups and Drive Configuration menu. Drive current may be limited for smaller motors through the Drive menu settings. The maximum current setting is 16. It translates to 22 amps per axis for an SD3 and an SD1. If using a High-Powered SD1, the maximum current setting of 16 translates to 45 amps per axis. Maximum output current can be changed by changing the current setting. (e.g. If current setting is changed to an 8, maximum current will now be ½ of SD drive capability. If using an SD1, it will be 11 amps and if using a High-Powered SD1, it will be 22 amps.) Brushless motors are designed with multiples of magnetic poles requiring numbers of cycles of the sine wave inputs to rotate the shaft a full revolution. Brushless motors may have 4, 6, or 8 poles and must be configured in the DRIVE MENU. A setting of 0 (zero) poles changes that axis to a Brushed DC axis. PID settings in the drive menu are factory set and must not be changed.

Driving brushless motors requires the knowledge of the motor's rotational position at all times. The encoder commutation channels give the angular information to the drive. The drive generates 3 sine wave voltages phased relative to the motor position and the direction the motor is commanded to turn.

There are two configuration jumpers intended for future features on the PCB: J3 is used to enable the spindle DSP and J15 is used to disable the fiber input. A jumper should be installed on J3 for the standard setup.

Motor Sync Procedure
This procedure may be performed at any time to verify the operation of the motor and the encoder feedback.

a) Go to the Drive menu by pressing **F1-Setup**, **F3-Config**, and type in the password, **F4-PID**, and **F8-Drive**.
b) Press **F2-Move Sync.**
c) Press **F1-Change Axis**.
d) Press **F10-Go** to move the motor, verify that the motor turns clockwise. Verify also that the encoder reading counts up and rolls over at the max line count. The commutation reading should count sequentially from 1 up to 6. A commutation of 0 or 7 means that there is a problem.
e) Repeat steps b) through d) 4 times for each motor.

Repeat procedure for remaining motors.

After the procedure is complete back out to the first menu by pressing **ESC** four times. **If the encoder has been repositioned then power must be cycled.** Press Cycle Start to start the homing procedure.

SD MACHINE CONFIGURATION

```
WCS #1 (G54)    Current Position (inches)   Job Name: NCFILES
X               +0.0000                     Tool:       T---H---
                                            Feedrate: 100%
Y               +0.0000                     Spindle:    0
                                            Feed Hold: Off
Z               +0.0000
                                            Stopped
B               +0.0000                     Press CYCLE START to start job
```

Machine Configuration

Axis	Slow Jog (in/min)	Fast Jog (in/min)	Max Rate (in/min)	Deadstart (in/min)	Delta Vmax (in/min)	Travel (−) (inches)	Travel (+) (inches)
1	24	100	400	3.0000	3.0000	0.0000	0.0000
2	24	100	400	3.0000	3.0000	0.0000	0.0000
3	24	100	400	3.0000	3.0000	0.0000	0.0000
4	24	100	400	3.0000	3.0000	0.0000	0.0000

Axis	Label	Motor revs/in	Encoder counts/rev	Lash Comp. (inches)	Limit −	Limit +	Home −	Home +	Dir Rev	Screw Comp
1	X	5.00000	8192	0.00000	0	0	0	0	N	N
2	Y	5.00000	8192	0.00000	0	0	0	0	N	N
3	Z	5.00000	8192	0.00000	0	0	0	0	N	N
4	B	5.00000	8192	0.00000	0	0	0	0	N	N

Jog	Motor	Find Home	Set Home	M Comp
F1	F2	F3	F4	F5

Setup notes:

-**Encoder counts / rev** must be a binary count – 2048, 4096, 8192, 16384…
This is four times the line count of the encoder and is usually printed on the encoder device. SD drives accept only binary count encoders with matching commutation tracks. Brushed motors accept all line count encoders and do not require commutation tracks. Centroid's standard encoder count on a 750W, 1kW, and 2kW motor is 8192 and on a 3kW and 4kW is 16384.
-**If any axis is disabled then enabled using the label, the systems power must be turned off then on again.**

SD PID MENU SETUP

```
WCS #1 (G54)    Current Position (Inches)   Job Name: DHANDLE.CNC
                                            Tool:       T---H---
X                   +0.0000                 Feedrate: 100%
                                            Spindle:    0
Y                   +0.0000                 Feed Hold: Off

Z                   +0.0000                 ┌──────────────────────────┐
                                            │                          │
B                   +0.0000                 │ Stopped                  │
                                            │ Press CYCLE START to start job │
                                            └──────────────────────────┘
                        PID Configuration
```

Axis	Kp	Ki	Kd	Limit	Kg	Kv1	Ka	Accel.	(Max. Vel.)
X	2.000	0.01250	10.000	32000	0	10	20	0.400	400.0
Y	2.000	0.01250	10.000	32000	0	10	20	0.400	400.0
Z	2.000	0.01250	10.000	32000	0	10	20	0.400	400.0
B	2.000	0.01250	10.000	32000	0	10	20	0.400	400.0

Axis	Error	Sum	Delta	PID Out	Abs Pos	Line	PID Collection Program
X	0	0	0	OFF	0	1	G01X1F300
Y	0	0	0	OFF	0	2	
Z	0	0	0	OFF	0	3	
B	0	0	0	OFF	0	4	
						5	

```
PID Collection Axis: X    Density:    1   Type (0-4): 0    File:

┌─────┐ ┌──────┐ ┌───────┐   ┌──────┐ ┌──────┐ ┌───────┐ ┌───────┐ ┌──────┐
│ PID │ │ Prog.│ │Collect│   │ Tune │ │ Drag │ │ Laser │ │ Drive │ │ Plot │
│  F1 │ │  F2  │ │  F3   │   │  F5  │ │  F6  │ │  F7   │ │  F8   │ │  F9  │
└─────┘ └──────┘ └───────┘   └──────┘ └──────┘ └───────┘ └───────┘ └──────┘
```

F1-PID key will enable you to adjust the above parameters. Ka should be left at zero, while the Kg and the Kv1 may be set by observing the PID Out while the axis is at rest and during a slow jog respectively.

F3-Collect key
   -The Data Density can range from 1-32. (It is passed to the CPU as 0-31).
   -The Data Type can range from 0-4.
   0=Collect Error (n), Sum Error (n), Delta Error (n)
   1=Collect ADC Input A, ADC Input B, ADC Input C
   2=Collect PID Request A, ADC Input A, PID Adjusted A
   3=Collect PID Request B, ADC Input B, PID Adjusted B
   4=Collect PID Request C, ADC Input C, PID Adjusted C
   -The Data Density and the Data Type are encoded into one byte and sent to the CPU board via the Set PID Parameters Command 8.
   - The File Extension should be unique to your collection.
-The **Drive Configuration Screen (F8-Drive)** is to be keylocked. It is not for general viewing and definitely not for modification by any unauthorized individual.

SD DRIVE MENU SETUP

```
WCS #1 (G54)    Current Position (Inches)   Job Name: TRYLGNG.PID
X          +0.0000               Tool:      T---H---
                                 Feedrate: 100%
Y          +0.0000               Spindle:   0
                                 Feed Hold: Off
Z          +0.0000
                                 ┌─────────────────┐
B          +0.0000               │                 │
                                 │ Stopped         │
                                 └─────────────────┘
                    Drive Configuration
```

Axis	Motor Poles	Drive Curr.	Drive Angle	Current Feedback Kp	Ki	Kd	Feed Forward %Fixed	%/RPM	Encoder counts/rev
X	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
Y	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
Z	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
B	4	8	5	1.000	0.01250	1.000	0.25000	0.10000	(8192)

```
          Axis X                   Encoder Reading:     0
                                   Commutation:         0

┌───────┐┌───────┐
│ Drive ││ Move  │
│ PID   ││ Sync  │
│ F1    ││ F2    │
└───────┘└───────┘
```

This menu will only appear if the control has been configured for an SD drive, with a cnc9.hex present in the CNC10 directory.

-The Drive Configurations are kept in the cnc10.cfg Configuration File.

-The Report, Backup, Restore and Update functions must be modified to include the Drive Configuration Parameters.

F1-DRIVE PID

-The Motor Poles are 4, 6, or 8 for Brushless Motors.

750W, 1KW, 2KW, 3KW, 4KW, are 8 pole motors. 400W is a 4 pole motor.

- **Drive current** is a scaleable current output from the drive with a value of 1 to 16. A value of 16 will supply the maximum amount of current the SD drive is capable of. A value of 8 will supply ½ the amount of current the SD drive is capable of and so on. A value of zero will automatically default to 16. Drive current directly effects the acceleration of a motor and its heating. **Smaller motors such as the 750 watt and 1KW motors should use a reduced current setting of 8 for 750 and 12 for 1KW.**

- **Current Feedback PID and Feed Forward** – current loop PID parameters; use the default parameters for the application. Consult the factory if you feel it is necessary to make a change.

- The Encoder Counts/Rev. parameter is information only in this screen. To modify it, you must go to the Machine Configuration Setup Menu.

F2-MOVE SYNC
- Move Sync causes the axis motor to move to a Sync Position and hold power, ignoring the encoder input. If the rotor is at the correct Sync Position, the Index Pulse will be at Encoder Position 0 or within +/- 20 counts.
- Move Sync may be executed several times to move the motor to the proper quadrant. It takes four cycles on an 8-pole motor. This is a good tool for trouble shooting motor – encoder problems.

DRIVE MENU SETTINGS FOR A DC MOTOR

```
WCS #1 (G54)   Current Position (Inches)   Job Name: TRYLGNG.PID
X                                          Tool:      T---H---
          +0.0000                          Feedrate: 100%
                                           Spindle:   0
Y         +0.0000                          Feed Hold: Off

Z         +0.0000

B         +0.0000                          Stopped

                       Drive Configuration
```

Axis	Motor Poles	Drive Curr.	Drive Angle	Current Feedback Kp	Ki	Kd	Feed Forward %Fixed	%/RPM	Encoder counts/rev
X	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
Y	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
Z	8	16	5	0.500	0.01250	1.000	0.25000	0.10000	(8192)
B	0	16	0	2.000	0.00000	4.000	0.00000	0.00000	(8192)

```
              Axis X                  Encoder Reading:      0
                                      Commutation:         0

 Drive   Move
  PID    Sync
  F1      F2
```

- Since a DC motor is brushed and has no poles, the **Motor Poles is set to 0.**
- **Drive current is set to 16 for DC motors that have torque capabilities of 19 in-lbs or greater. DC motors with 17 in-lbs of torque should have the drive current set to 8**. Drive current directly effects motor heat and should be checked during normal operation.
- **The Drive Angle and the Feed Forward %'s should be set to 0.**
- **The Encoder counts/rev should be set to the encoder attached to the DC motor**.
- **All PID constants should be set to the motor's specific PID constants**.

TROUBLE SHOOTING GUIDE

Symptom	Cause	Corrective Action
Motor Power Indicator OFF	This indicates the proper level of input voltage to the supply input. This voltage must be above 100VDC.	Check supply voltage for a value greater than 100VDC. Check for any blown axes fuses on SD drive. If fuses are blown, send back to factory.
Logic Power Indicator OFF	This indicates the presence of power to the logic circuits internal to the SD drive.	If this lamp is out and the Motor power lamp is on then there is no power to the logic circuit. The factory must service the unit.
Motor turns backwards during the alignment procedure.	The motor power wiring must be backwards in the cable or on the SD drive.	Examine the cable itself and the connector on the SD drive. Reverse two of the motor wires.
Encoder Counts runs backwards.	The A and B signals from the encoder may be swapped. Encoder may operate in the reverse.	Check encoder cable. Check encoder spec- A must lead B when rotated clockwise as viewed from the front of the motor.
Motor jerks when first moved.	The motor may be wired backward or the encoder counts backwards. Motor may have lost its alignment from movement when unpowered or never been aligned.	Go through the motor sync procedure in the DRIVE menu with the **motor unloaded**.
Servo Drive Data Output error. (439)	This is a loss of signal coming back from the drive to the CPU9SD, CPU10, or CPU10B.	Check the Logic Power Indicator. If illuminated then check for proper fiber connections.
Servo Drive Over voltage. (441)	Indicates the Input power has gone higher than 400VDC and will shut down the drive and remove power. The Motor brake will engage for 5 seconds in this condition.	Check input motor voltage. It must be below 340VDC.

Servo Drive Under voltage. (442)	Indicates that the input motor voltage is less than 100VDC.	Check supply voltage.
Bad Encoder Detected. (412)	The SD drive checks the encoder line for differential signals. –A must have the opposite voltage level as +A.	Check the wiring of the encoder cable, then the encoder itself.
Servo Drive Over Temperature. (444)	There is a temperature sensor mounted on the heat sink internal to the SD drive that detects over temperature.	The cooling fan is not functioning or the inlet or outlet is blocked.
Current Brake Applied. (451)	Individual axis current is monitored and will display this message when a level is measured above the preset limit.	If you continue to get this message, slowing down the feedrate should make this message disappear. If not, check for a short in the motor output.
Axis runaway.	If the motor moves when not commanded it is possible that noise is getting on the encoder line and creating a constant position error.	Check that the motor cable shields are attached. Check that the encoder shield is attached at the drive end only. **Check that the SD drive is electrically grounded to the machine to which the motors are mounted.** Separate the motor power cables from the encoder cables and other power cables.
Encoder Commutation Error. (443)	Control detected invalid commutation zone value.	Perform a Move Sync in the Drive menu. A (0) or (7) is an invalid zone. Check for wiring problems in the cable including the encoder shield. Check for motor power shields. It could be a bad encoder.

CENTROID AC MOTOR DATA

October 1, 2004

Motor	Working RPM	Kv V/KRPM	KT IN/LBS/ AMP	Ip (Peak Current) AMPS	Peak Torque with Centroid drive (in.lbs)	Constant stall Torque (in.lbs)	Power Rating
6 in.lbs AC(SEM)	6000 @ 220VAC	44	4.5	7	31	6 @ 1.4A	400W
35 in.lbs AC(LD85)	3600 @ 220VAC	48	10	7	60 (11Amps)	35 @ 3.5A	750 W
50 in.lbs AC (CM1K-0-1)	3500 @ 220VAC	48	8.6	16	137 (16Amp)	50 @ 6A	1 KW
50 in.lbs AC (CM1K-0-2)	2200 @ 220VAC	79	12	22	264 (16Amps)	50 @ 4A	1 KW
50 in.lbs AC(SEM)	3200 @ 220VAC	66	6.6	34	148 (22.5A)	50 @ 8A	1KW
100 in.lbs (CM2K-0-2)	2000 @ 220VAC	84	12.4	23	280 (22.5A)	100 @ 8A	2 KW
100 in.lbs (SEM)	2500 @ 220VAC	88	9	33	202 (22.5A)	100 @ 11A	2 KW
150 in.lbs (CM3K-0-2)	1700 @ 220VAC	100	12.8	25	288 (22.5A)	150 @ 12A	3KW
150 in.lbs (SEM)***	1350 @220VAC	130	13.5	42	455 (34Amps)	150 @ 11A	3KW
200 in.lbs (SEM)***	1350 @ 220VAC	130	13.5	70	607 (45Amps)	200 @ 14.8	4KW

SD DRIVE Brushless Motor Configuration

MOTOR	Motor Power	PID MENU								Drive Menu							
		Kp	Ki	Kd	Kg*	Kv1*	Ka*	Accel*	MaxVel**	Motor Poles	%Current Select ***	Drive Angle	Current PID Tuning			Feed Forward	
													Kp	Ki	Kd	% Fixed	% RPM
HJ130C8-64S	1 KW	2	0.0125	10	0	10	0	0.4	3400 / (pitch)	8	16	5	0.5	0.0125	1	0.25	0.1
HJ130E8 (S)	1.6 KW	2	0.0125	10	0	10	0	0.4	3400 / (pitch)	8	16	5	0.5	0.0125	1	0.25	0.1
HJ130G8-88S	2 KW	2	0.0125	10	0	10	0	0.4	2500 / (pitch)	8	16	5	0.5	0.0125	1	0.25	0.1
HJT155B8-110S	3 KW	2	0.0125	10	0	10	0	0.4	1350 / (pitch)	8	12****	5	0.5	0.0125	1	0.25	0.1
HJT155D8-110S	4 KW	2	0.0125	10	0	10	0	0.4	1350 / (pitch)	8	16****	5	0.5	0.0125	1	0.25	0.1
HR70A4 (S)	400 W	2	0.0125	10	0	10	0	0.2	3400 / (pitch)	4	8	5	1	0.0125	1	0.25	0.1
LD85 750W	750W	2	0.0125	10	0	10	0	0.4	3600 /(pitch)	8	**8**	5	0.5	0.0125	1	0.25	0.1
CM1K-0-1	1KW	2	0.0125	10	0	10	0	0.4	3400 /(pitch)	8	**12**	5	0.5	0.0125	1	0.25	0.1
CM1K-0-2	1KW	2	0.0125	10	0	10	0	0.4	2200 /(pitch)	8	**16**	5	0.5	0.0125	1	0.25	0.1
CM2K-0-2	2KW	2	0.0125	10	0	10	0	0.4	2000 /(pitch)	8	16	5	0.5	0.0125	1	0.25	0.1
CM3K-0-2	3KW	2	0.0125	10	0	10	0	0.4	1700 /(pitch)	8	16	5	0.5	0.0125	1	0.25	0.1

* Kg, Kv1, Ka, accel are values to be set before autotune is performed, autotune will then calculate values suited to the application.

** This is the value expected after autotune, it is dependant on the pitch of the ball screw and the belting.

*** % Current Selector will select the amount of current that is supplied to the motor. Example 16 = 100%, 12 = 75%, 8 = 50%, and 4 = 25%

**** 45 AMP SD1 ONLY

ATTENTION!! : <u>Drive Current must be set to correct value to prevent damage to motor</u>.

SD DRIVE Brushless Motor Configuration

		PID MENU								Drive Menu			Current PID Tuning			Feed Forward	
Rotary Table	Motor	Kp	Ki	Kd	Kg*	Kv1*	Ka*	Accel*		Motor Poles	% Current Select **	Drive Angle	Kp	Ki	Kd	% Fixed	% RPM
RT-200	DC 17	1	0.00391	5	0	10	0	0.4		0	8	0	2	0	4	0.0	0.0
	AC 750	2	0.0125	10	0	10	0	0.4		8	8	5	0.5	0.0125	1	0.25	0.1
RT-150	DC 17	1	0.00391	5	0	10	0	0.4		0	8	0	2	0	4	0.0	0.0
	AC 750	2	0.0125	10	0	10	0	0.4		8	8	5	0.5	0.0125	1	0.25	0.1

* Kg, Kv1, Ka, accel are values to be set before autotune is performed, autotune will then calculate values suited to the application.

** % Current Selector will select the amount of current that is supplied to the motor. Example 16 = 100%, 12 = 75%, 8 = 50%, and 4 = 25%