DriveRack™
Multi-Axis Power Driver

I047 - Rev C2
September 10, 2019

MICROKINETICS
Corporation

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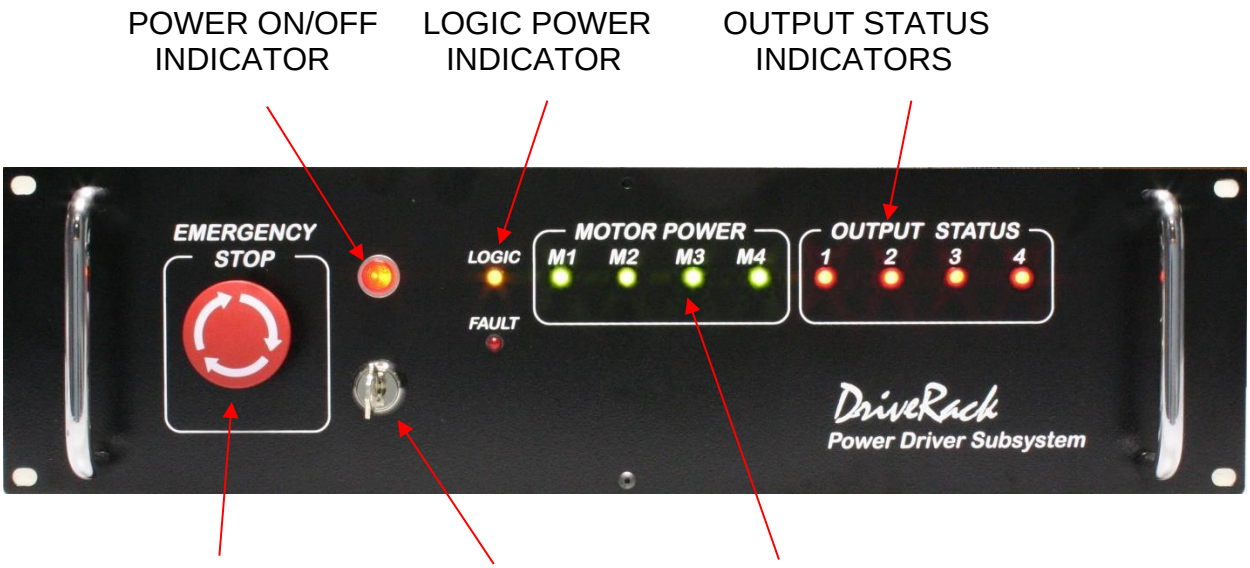
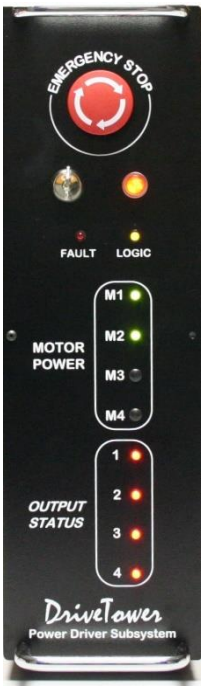
1. System Overview





FEATURES AND BENEFITS:

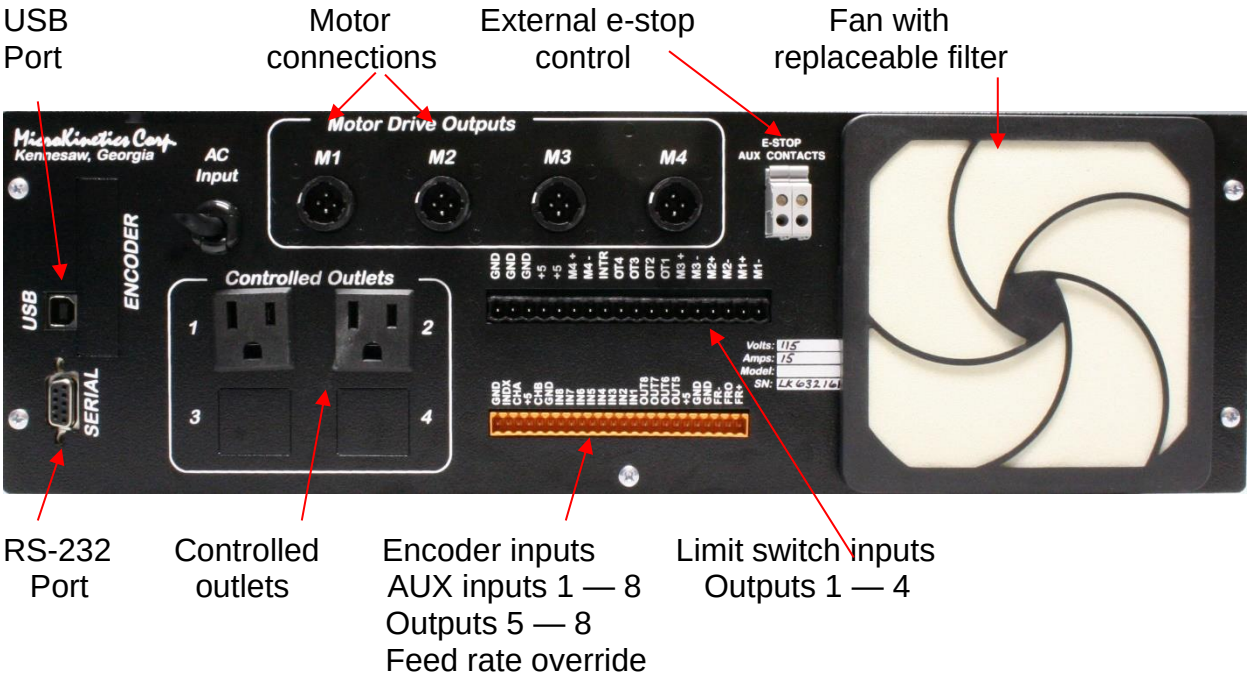
- Rugged all steel construction shields against RFI/EMI interference
- Completely wired and tested system for ease of installation
- Emergency stop and keylock for improved safety
- High (105) CFM fan increases reliability
- Externally removable and washable fan filter eases maintenance
- Solid state relays for AC control allows control of external devices

MicroKinetics' DriveRack is a rugged, enclosed unit suitable for benchtop and rack mount use. It houses an MN400 controller, all drive electronics, indicator lights, an electronically latched ON/OFF keylock switch, an emergency stop button, solid state relays to control spindle, vacuum, coolant, etc., a powerful fan, motor drivers, and power supplies. The DriveRack provides a complete multi-driver system that is ready for immediate use. It features USB and RS-232 communications. The DriveRack is available in full/half-stepping models and microstepping models.

Product	*Order #*
2 axis 80V F/H stepping	*999-3400-212*
2 axis 80V microstepping	*999-3400-214*
3 axis 80V F/H stepping	*999-3400-312*
3 axis 80V microstepping	*999-3400-314*
4 axis 80V F/H stepping	*999-3400-412*
4 axis 80V microstepping	*999-3400-414*

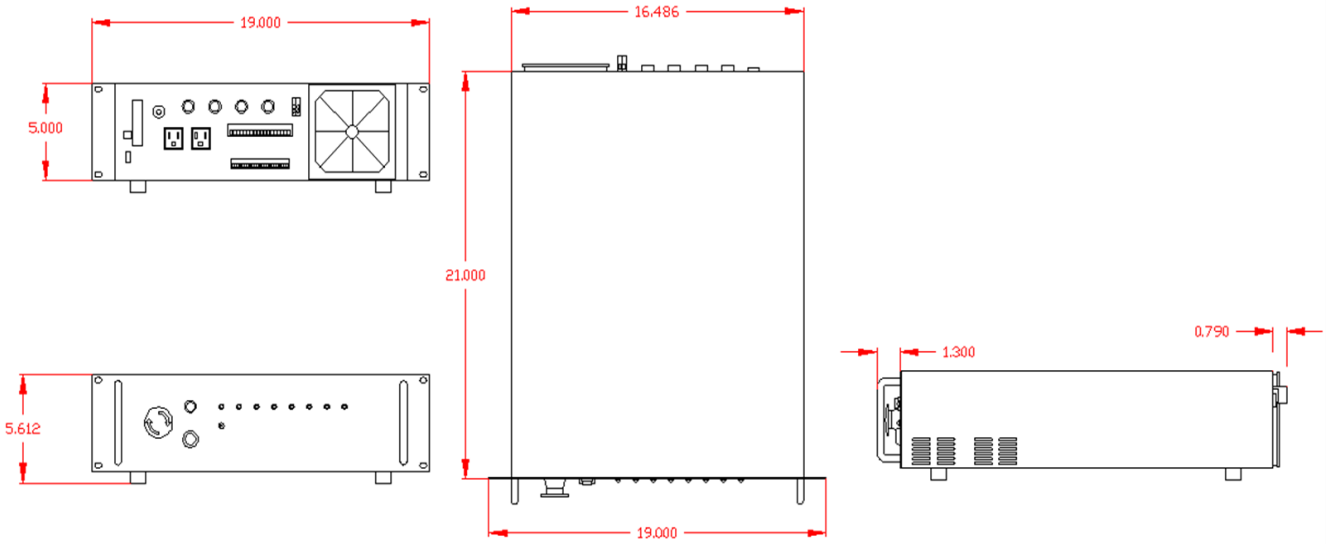
SPECIFICATIONS:

Drive circuit	Bipolar constant current
Chopping rate	20 kHz nominal
Voltage	80 VDC
Output current	Up to 10A per phase
Stepping mode	Half/full or micro, depending on model
Current cutback	Half current after ½ second of idle
Limit switch inputs	8 TTL compatible, active low
Shield switch input	1 TTL compatible, active low
Auxiliary inputs	8 open-collector
Control outputs	Up to 4 solid-state relays; up to 8 open-collector outputs
Motor control outputs	4 connections per axis
Working temperature range	32°—158°F (0°—70°C)

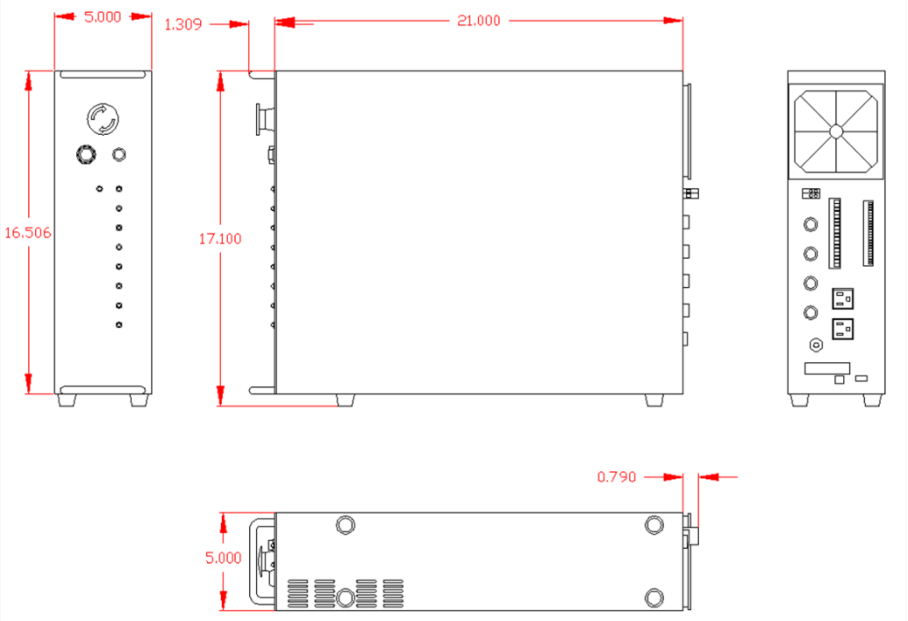


2. Outline Drawings

Rack Mount Configuration



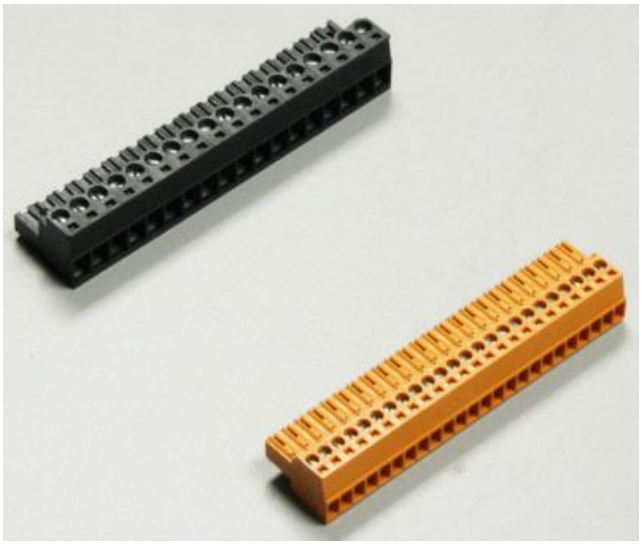
Tower Configuration



3. Setup and Wiring

1. Carefully unpack your DriveRack and place in a suitable location near your machine.
2. Plug the motor cables from your machine into the circular connectors on the back marked M1 – M4. M1 is the X-axis, M2 is the Z-axis, M3 is the Y-axis or tool changer and M4 is the A-axis or rotary table.
3. Hook up the cable with 2 unattached wires to the grey terminal marked **E Stop Aux Contacts.**
4. Add a second cable from the **E Stop Aux Contacts** to the INTR and GND terminals on the black connector.

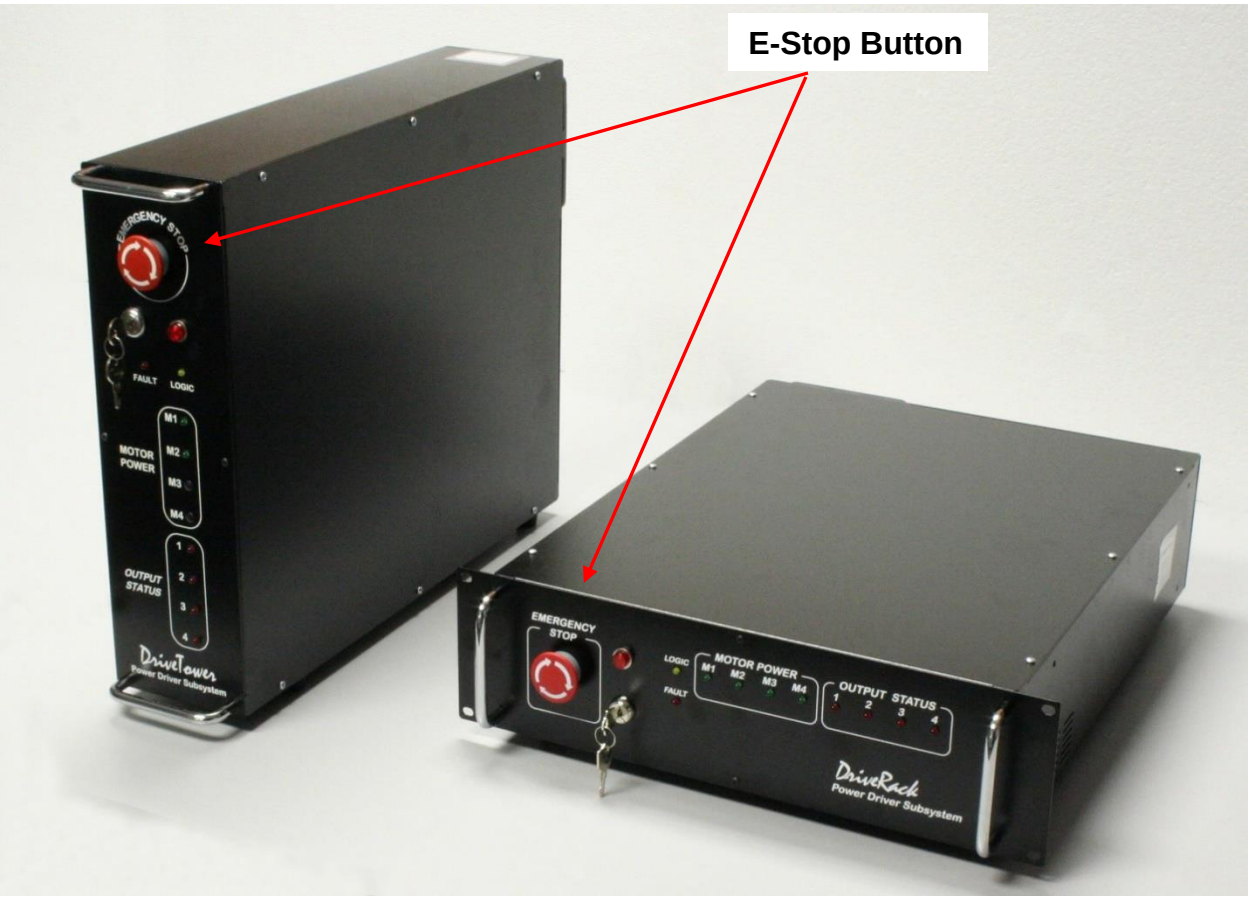
5. Hook up the limit switch wires to the appropriate M terminals on the black connector (see item 2 above for definition of M1-M4). Make sure to insert the wire towards the top of the connector (towards the screw) to ensure a tight connection.
6. Hook up the Feed Rate Override to the FRO terminals on the orange connector.
7. Plug both connectors into appropriate places on back of DriveRack (see picture below after item 13).



8. Plug the DriveRack into an available outlet (make sure the power supplies are set properly for the power available in your area (120VAC or 220VAC). See Section 10 for a diagram showing how to switch between the 2 voltages.
9. Download the software you purchased. See Section 4 for details on how to do this.
10. Plug USB cable supplied into the USB port on the back of the DriveRack and into a free USB port on your computer.
11. Using the supplied key, turn on the DriveRack.
12. Windows will install the driver.

13. Open up your software and press Ctrl-J to bring up the jog screen. Click on either the X+ or X- button and confirm that your machine moves appropriately. If you get an error message stating that your computer cannot communicate with the MN400, see Section 12 for troubleshooting tips.

14. The DriveRack is turned off by pressing the large red Emergency Stop or E-Stop button. To turn it back on the E-Stop is first rotated to unlatch it and then the key is turned.



4. Software Installation

All of our software products are available for download from our website. The links below will lead you to the download page for each of them. If the computer you want to install the software on is not connected to the internet, download the software to a USB thumb drive or other removable media that the other computer can read. On the website click on the 'Full Install' link to download your product(s).

MillMaster Pro: http://www.microkinetics.com/index.php?page=mmpfw/instruct

TurnMaster Pro: http://www.microkinetics.com/index.php?page=tmpfw/instruct

MultiCam: http://www.microkinetics.com/index.php?page=mcfw/instruct

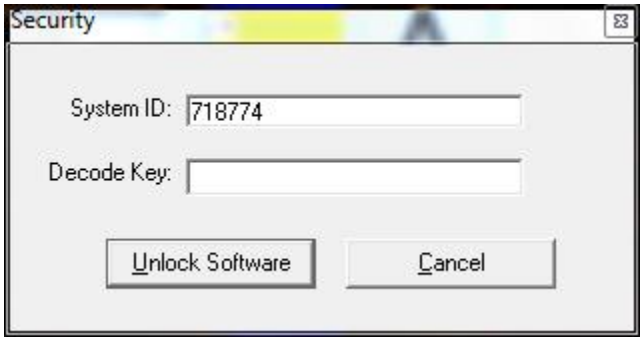
Once the file is downloaded, double click on the file to get started. Follow the onscreen instructions to complete the installation.

The software will initially run in demo mode. To obtain a User License or Decode Key:

1. Start the program.
2. When the main screen comes up, press ALT + H, or click <Help>, this will bring down the Help Menu
3. From this menu click on the item that says 'UNLOCK SOFTWARE'
4. This will bring up a small window. Next to the words 'System ID' there should be a number. Email the System ID number to: customer_service@microkinetics.com.

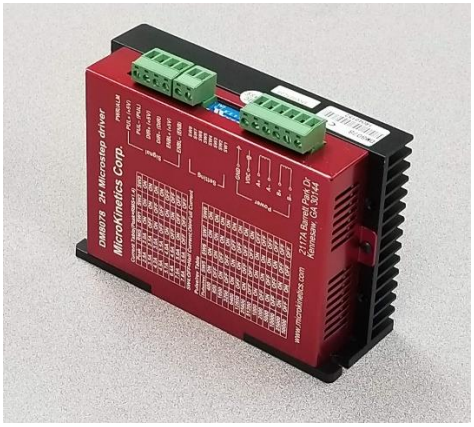
When we receive this number, we will email you a Decode Key. This Decode Key is your User License. Under the box that contains the System ID is a blank box labeled Decode Key. Enter the Decode Key we send you in this box and click <Unlock Software>.

Alternatively, you can call us at 770-422-7845 to receive your Decode Key.



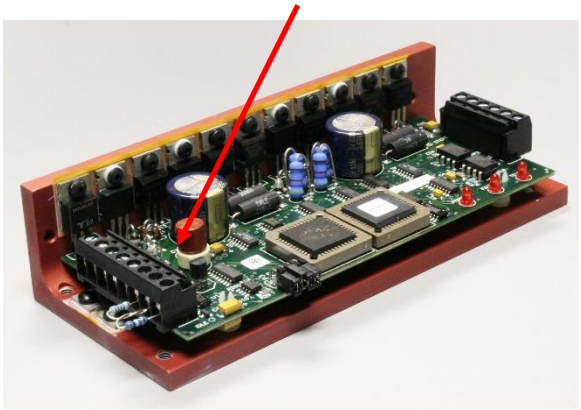
5. Setting Motor Output

DM8078
Set the output value and resolution by using the dip switches. See the manual for the DM8078 for details.



DR8010
Set the output value by using the dip switches indicated below. There is a base value of 0.7 A. Sliding the switch towards the label adds that amount to the total output. See the manual for the DR8010 for additional details if needed.

DM8010
Resistors are used to set the output on the DM8010 as indicated below. Exact values can be found in the manual located on our website.



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6. Driver Replacment

On the DR8078 there are (3) connectors that are easily depluggable without unscrewing any wires making replacing a drive very easy

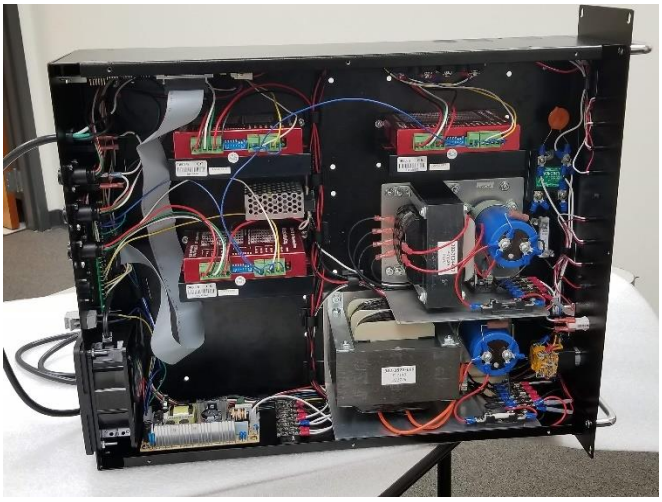
1) Disconnect power cord (and optionally all other cables).

2) Remove the (6) Phillips head screws from the top of the cabinet and one from the back.

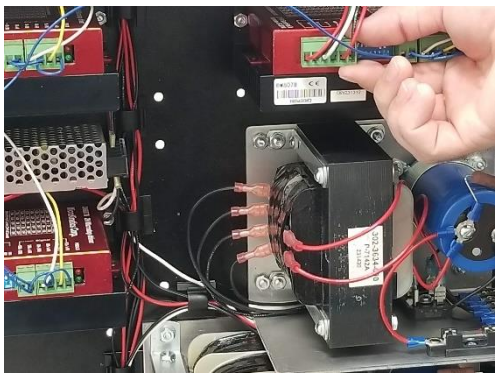
3) Remove the 6-32 socket head cap screw in the front.

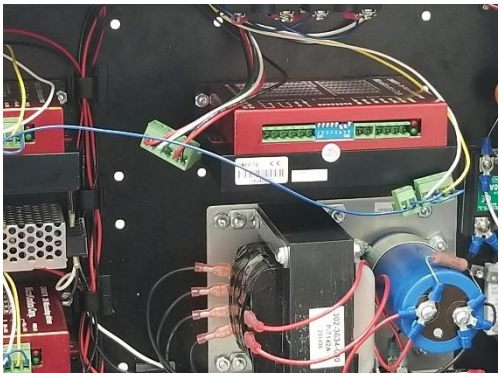
4) Remove the cover.

5) Position the DriveRack cabinet on its side.

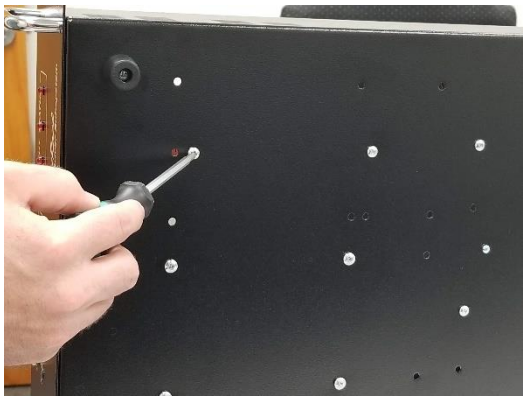


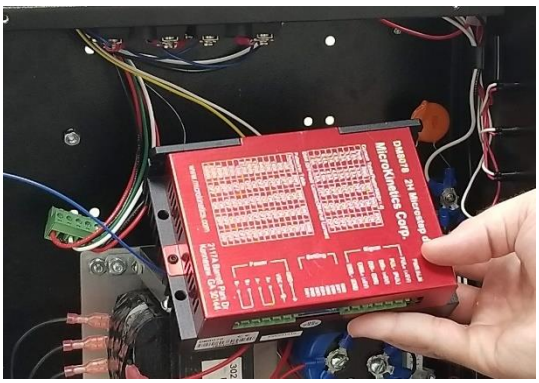
6) Hold the depluggable screw terminal connectors and pull away from the base.



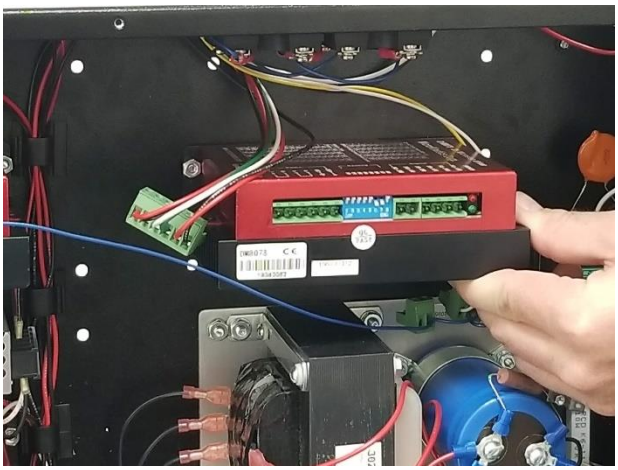


7) Locate the (2) screws/nuts that hold the driver in place on the underside of the cabinet. While holding the driver, remove the screws, then carefully pull out the driver.

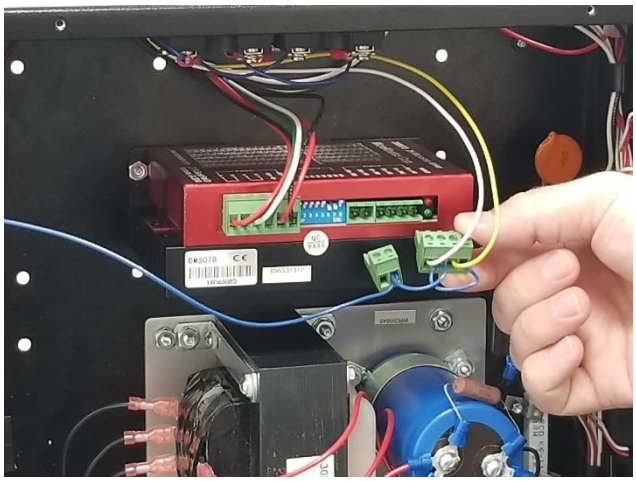




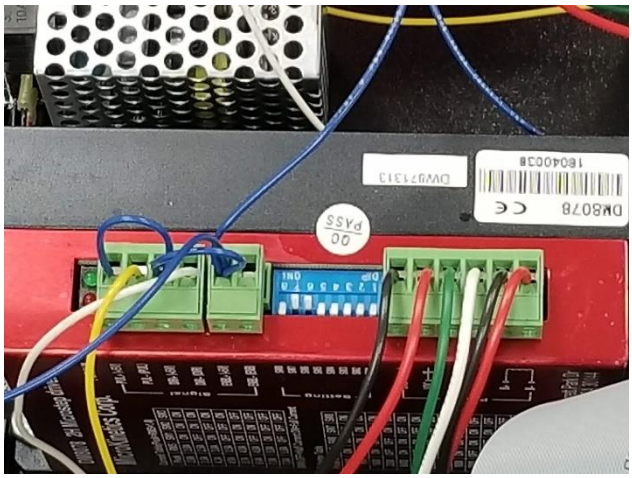
8) Position the new driver in the same spot and orientation. Insert the screws and tighten.



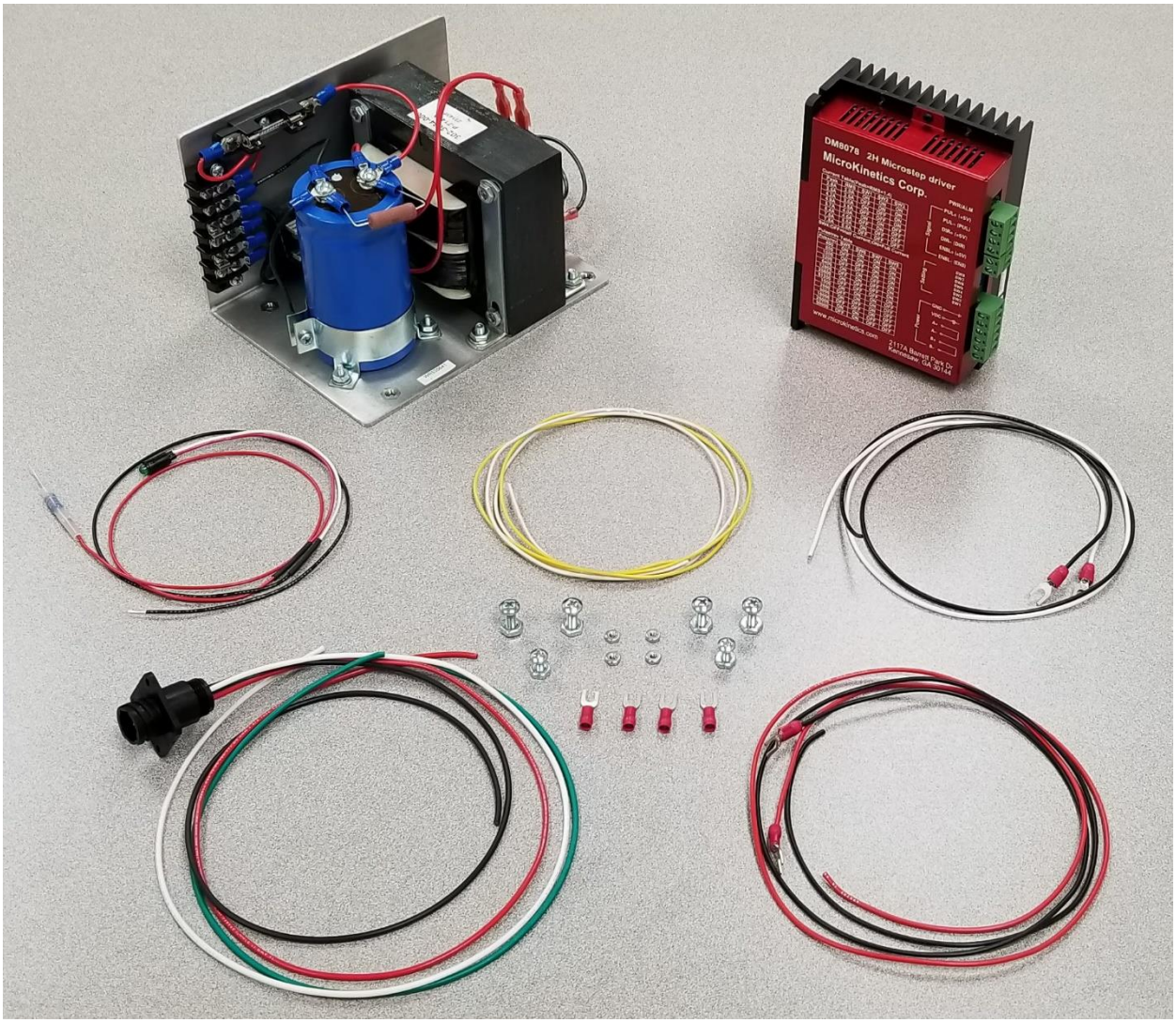
9) Position the cabinet flat and reinstall the depluggable connectors.



10) Adjust the dip switch settings to match the old driver board.



7. Additional Axis Installation



This kit includes a power supply, driver board, cable harness, and miscellaneous wires to connect the various electrical signals.

Instructions:

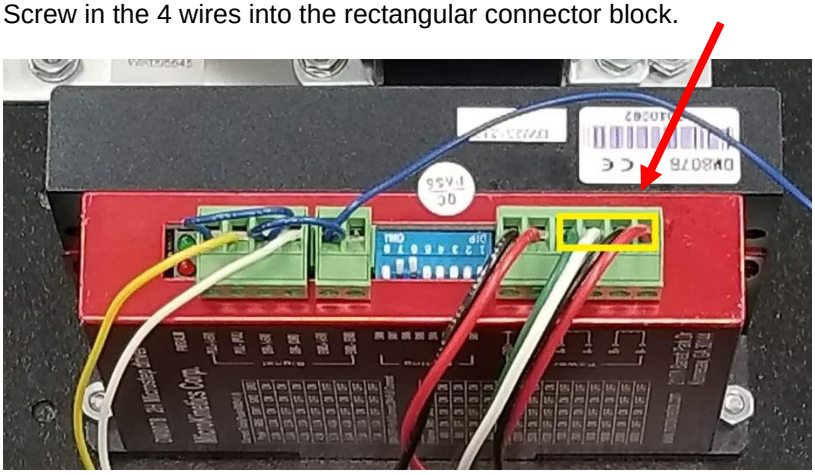
1. Start by installing the driver board in the DriveRack.
2. Position the DriveRack on its side.
3. Align one mount ear with an existing hole. Mark the 2nd hole location. Drill hole about the same size as the other one.
4. Place the driver board with the same orientation as the other boards.
5. Align the holes and secure using the existing bolts and nuts from the bottom of the cabinet.
6. Put the DriveRack upright.

7. Next install the power supply

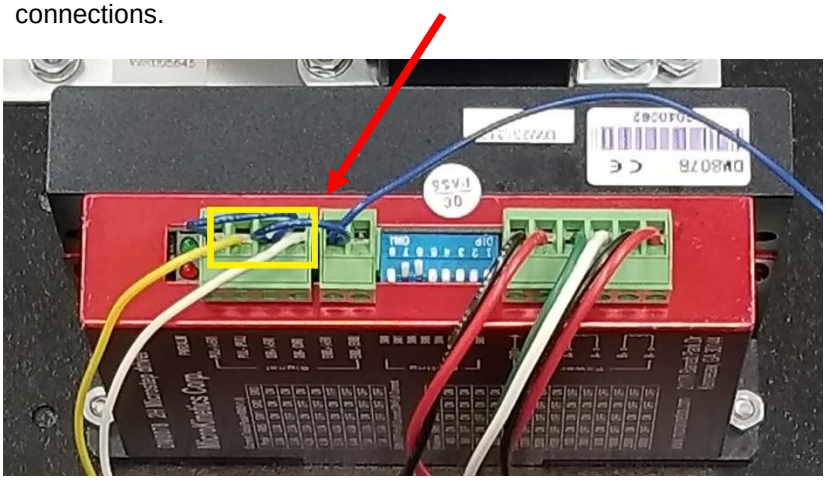
8. Align holes, follow the same orientation as the installed power supply, insert screws from bottom of cabinet and tighten nuts.

9. Attach the supplied cable harness to the back panel orienting the black circular connector the same way as the others.

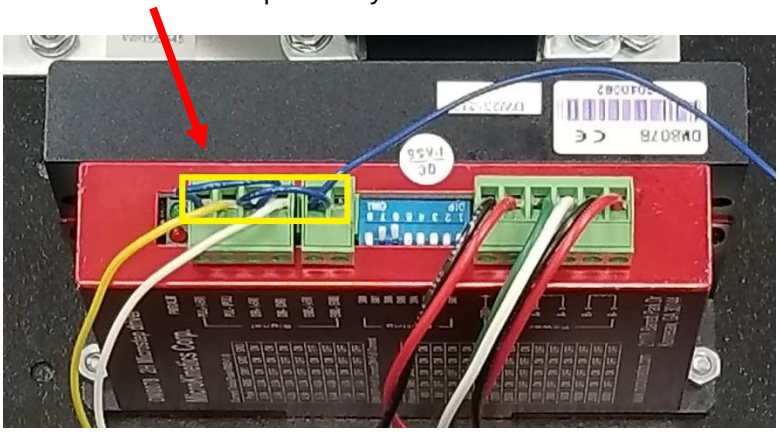
10. Screw in the 4 wires into the rectangular connector block.



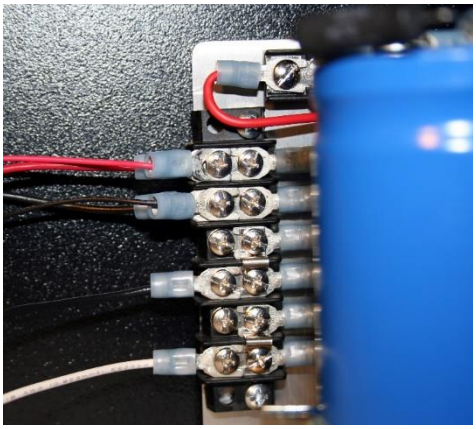
11. Use the white and yellow wires to connect the step (PUL-) and direction (DIR-) inputs to the M3 direction and M3 step connections on the breakout board. It will be the next pair of empty connections.



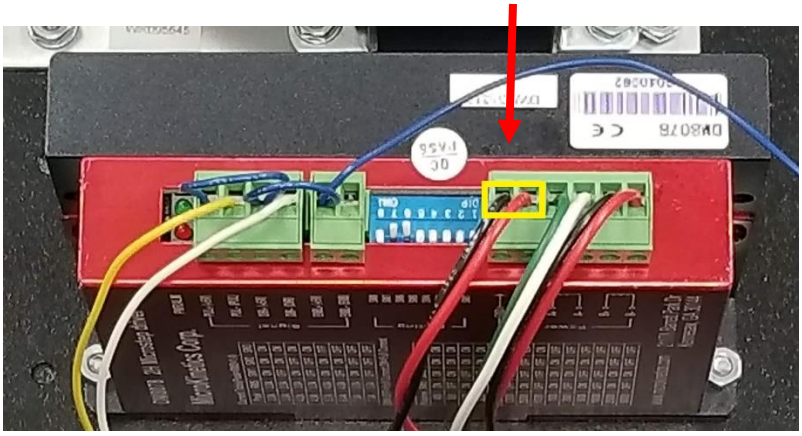
12. Use the blue wire to jumper between the last previously installed driver and the one being installed. Cut and strip 2 2” pieces of blue wire and use one of them to jumper between positions 1 (PUL+) and 3 (DIR+) of the 4-position connector. The other goes between position 3 (DIR+) on the 4-position connector and position 1 (ENBL+) on the 2-position connector. Use the rest of the wire to connect to the previously installed driver between the 2 ENBL+ positions.



13. Screw in the spade terminals for supplying power to the power supply. These extend from the terminal strip mounted on the side to the input of the power supply. Follow suit as the other power supply(ies) in the system.

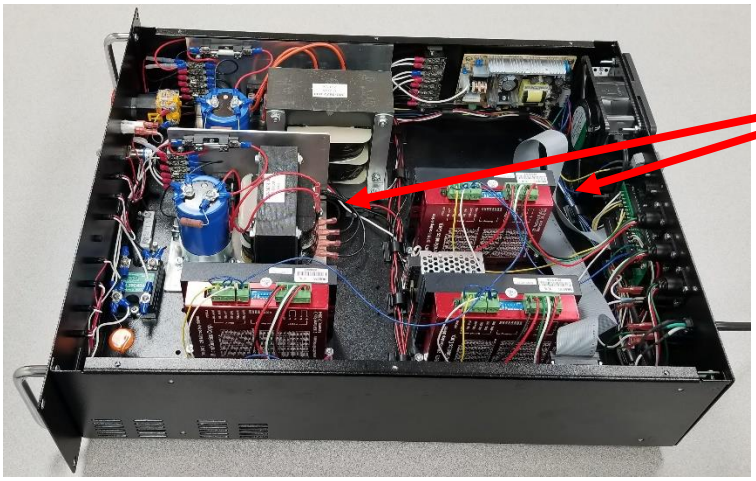


14. Wire the output from terminals on the power supply. Connect the red to the +72 VDC to the VDC input on the motor end connector. Connect the black ground spade terminal to the power supply GND connection to the drivers GND input on the high voltage end of the driver board.



15. Remove plug on front panel next to the installed green LED's.
16. Install Front Panel LED
17. Feed wires of included LED through the hole and press into place.
18. Crimp spade terminals onto both wires of LED.
19. Connect Red wire to top position on new power supply and black wire just below it.

Final Assembly



Additional Axis Kit - Bill of Materials
Part Number: 999-1236-441

Part #	*Description*		*Qty per unit*
210-0440-100	Nut Hex 4-40		4
210-0832-008	Screw 8-32 x 3/8 Mach Phlps		4
210-1032-001	Screw 10-32X1/2 PH Mach Phlps		4
210-1032-999	Nut Hex 10-32		4
330-2060-001	CONN 11-4 RECEPTICAL PANEL		1
330-2060-007	CONN CRIMP PIN 14-18 AWG		4
330-3414-805	CONN TERM SNAP-SPADE #8 14		8
330-8010-002	Heat Sink Putty		1
332-1800-001	WIRE 18 AWG BLACK		3
332-1802-001	WIRE 18 AWG RED		2
332-1805-001	WIRE 18 AWG GREEN		1
332-1809-001	WIRE 18 AWG WHITE		2
332-2200-001	WIRE 22 AWG BLACK		1
332-2204-001	WIRE 22 AWG YELLOW		1
332-2206-001	WIRE 22 AWG BLUE		1
332-2209-001	WIRE 22 AWG WHITE		1
900-0000-008	PWR7205 Power Supply		1
931-8010-000	DRIVER DR8010 BIPOLAR		1

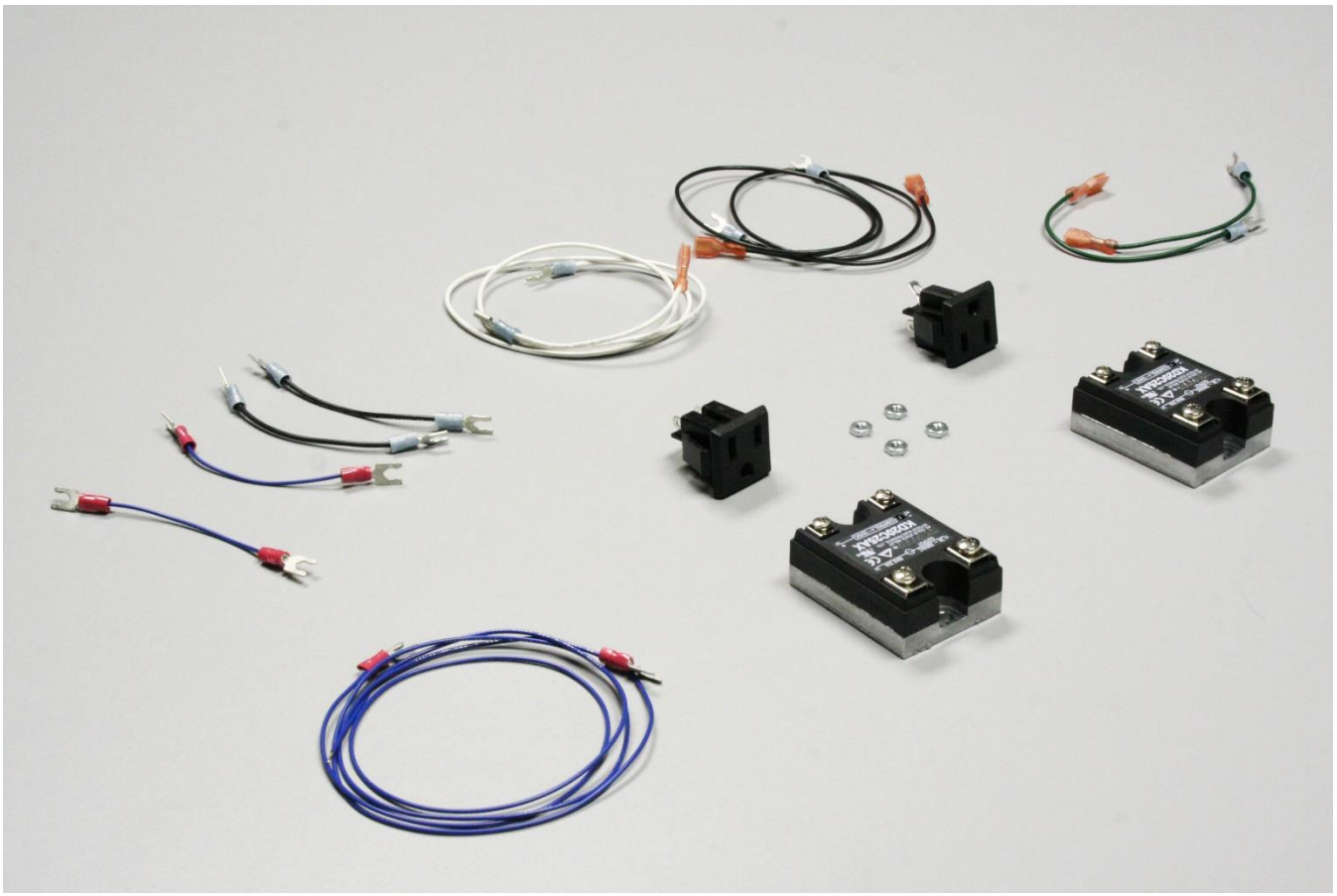
8. Additional Controlled Outlets Installation

The DriveRack comes standard with 2 AC controlled outlets populated. These are located on the rear of the unit. The cabinet allows the installation of 2 additional outlets for a total of 4 software controlled AC outlets.

A 2-outlet expansion kit is available for this consisting of 2 solid state relays, 2 115 Volt AC outlets, and wiring and connectors to complete this upgrade in the field.

Prior to installation, review the kit contents, outlet positioning and procedures to complete this task.

Here are kit contents:



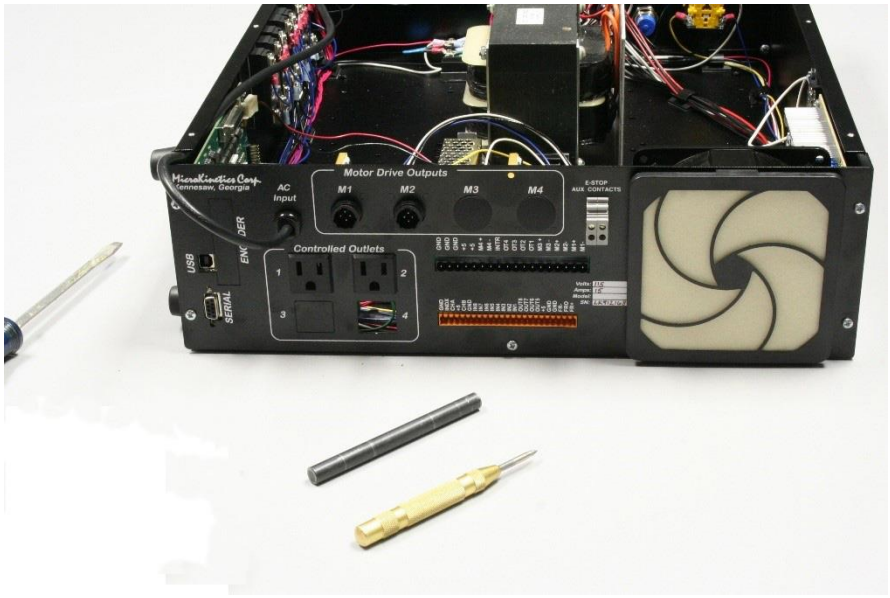
Additional Outlet Kit - Bill of Materials

Assembly Part Number: 999-3400-140

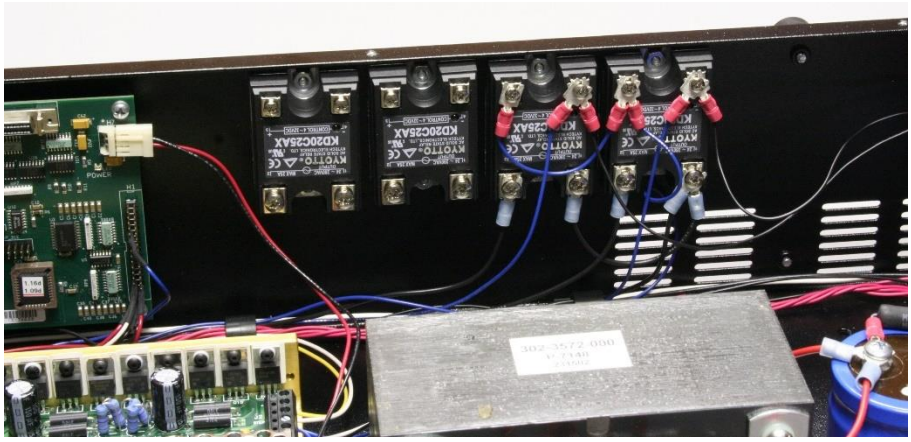
Part #	Description	Qty
210-0632-100	Nut Hex 6-32	4
300-2401-250	Relay SS DC-AC 25A	2
330-0038-001	CONN .250 QDC FEMALE BARE	1
330-2202-316	CONN .188 QDC FEMALE	5
330-3414-805	CONN TERM SNAP-SPADE #8 14-16	9
330-3414-807	CONN TERM SNAP SPADE #8 18-22	6
332-1800-001	WIRE 18 AWG BLACK	2.83
332-1805-001	WIRE 18AWG GREEN	0.68
332-1809-001	WIRE 18 AWG WHITE	2.83
332-2200-001	WIRE 22 AWG BLACK	0.67
332-2206-001	WIRE 22 AWG BLUE	2.5
340-2000-001	AC SNAP-IN RECEPTICLE	2

1) Make sure to unplug your DriveRack from the outlet.

2) Remove the metal plate blanks for the outlets from back panel and snap the outlets in observing proper orientation.



3) Mount the solid-state relays on the side panel next to the existing solid state relays using supplied nuts.



4) Connect the green safety earth ground terminal from the outlet to the case ground.

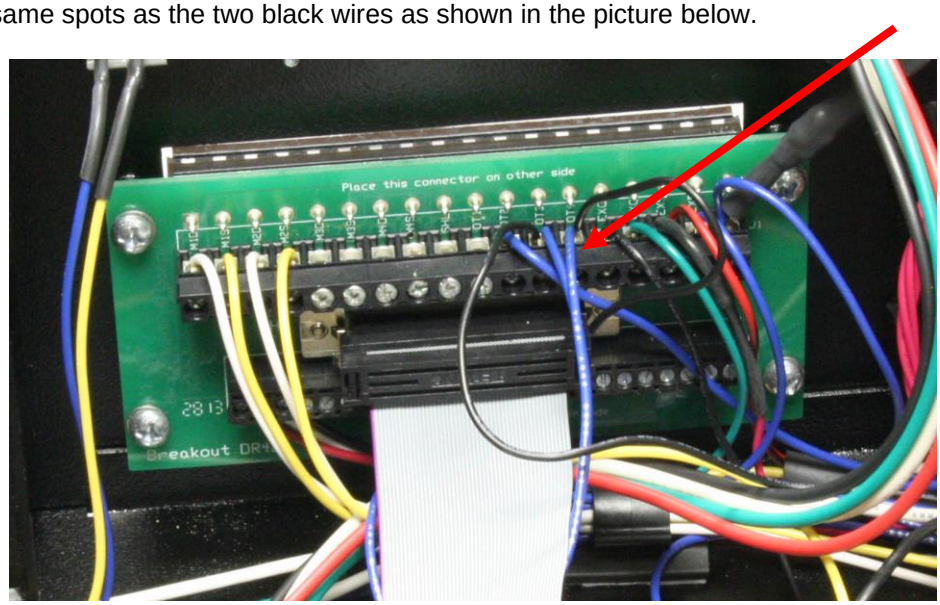
5) Connect the white 18AWG wire from system neutral to the neutral terminal (mimicking the other outlets).

6) Connect the black wire to each terminal and run that to each of the solid-state relays AC out terminal.

7) Daisy chain the black wire AC input lines together and to the terminal strip.

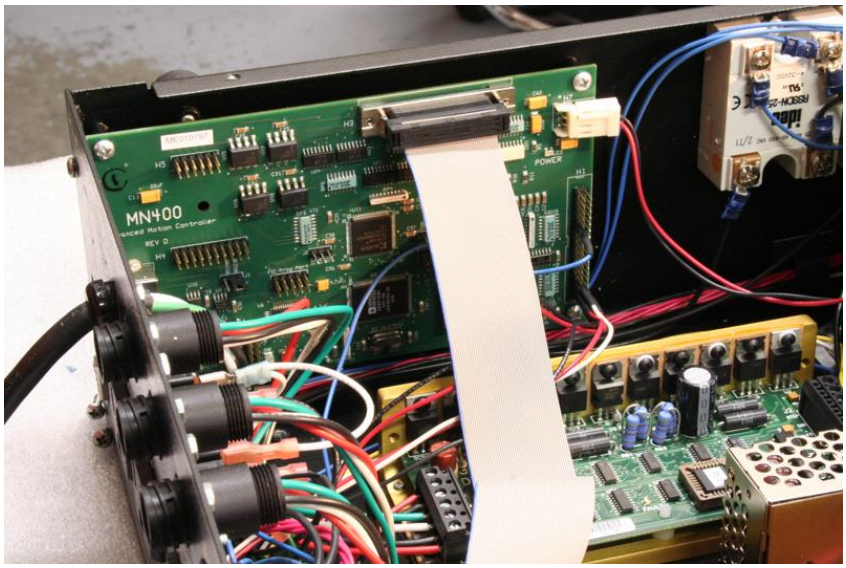
8) Daisy chain the blue (+5V) wires from + terminal of the control side of the existing relays to the new ones.

9) Connect the (-) control side contact on the solid-state relays 3 and 4 to the out 3 and out 4 respectively on the breakout board with blue 22 gauge wire. The designations on the back of the DriveRack do not correspond one to one with the terminals on the inside. Place the blue wires in the same spots as the two black wires as shown in the picture below.

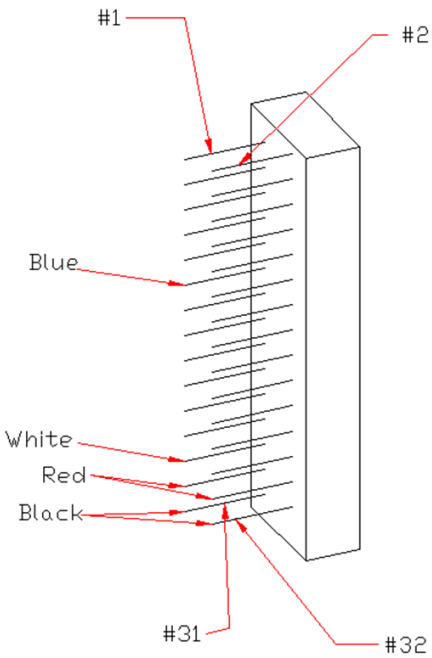


9. MN400 Controller Board Replacement

1. Remove the top of the DriveRack as shown elsewhere in this manual.
2. The MN400 board is located against the side of the cabinet at the rear. This is the board that the USB cable plugs into.



3. Detach the ribbon cable from the board.
4. Unplug the USB cable from the board.
5. Unhook the power connector at the end of the board.
6. Move the wires from the old board to the new board making sure they are on the same pins as they were originally.



7. Remove the 4 screws that secure the board to the case and set the board aside
8. Secure the new board to the case with the screws that were just removed.
9. Plug the ribbon cable back in.
10. Plug the power connector in.
11. Replace the top on the DriveRack
12. You are now ready to replug in the USB cable and power the DriveRack up for normal use.

10. Changing Current from 115VAC to 230VAC

The system comes pre-configured for use with alternating current of 115 VAC. It is possible to re-configure the input on the power supplies to accept 230 VAC.

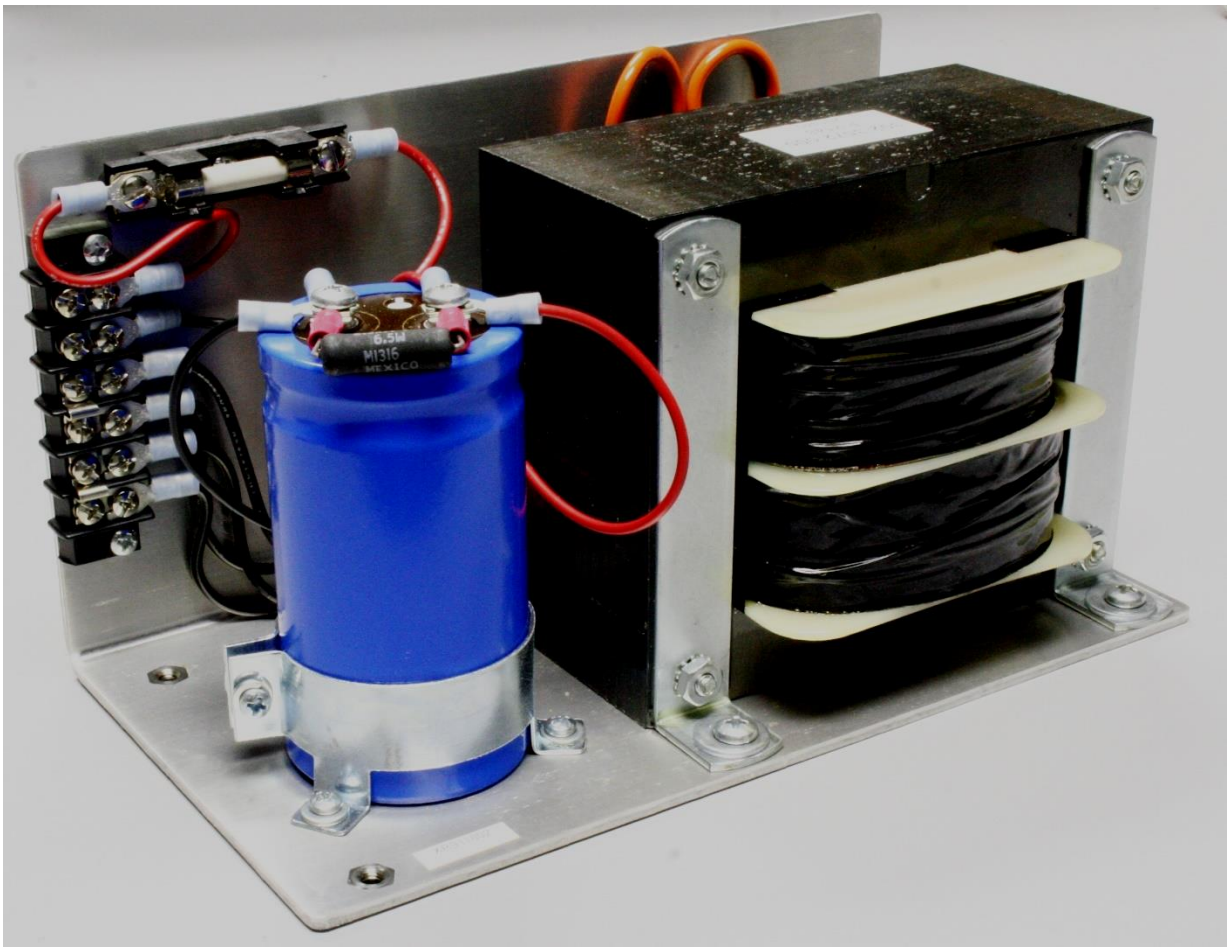
Please refer to the following diagram to properly set the unit's power supplies appropriately.

Wiring Configuration

For 115 VAC input, place the jumpers across 3 & 4, and across 5 & 6.

For 230 VAC input, place one jumper across 4 & 5.

72 VDC	1	⊘	⊘
GND	2	⊘	⊘
AC in	3	⊘	⊘
	4	⊘	⊘
	5	⊘	⊘
AC in	6	⊘	⊘



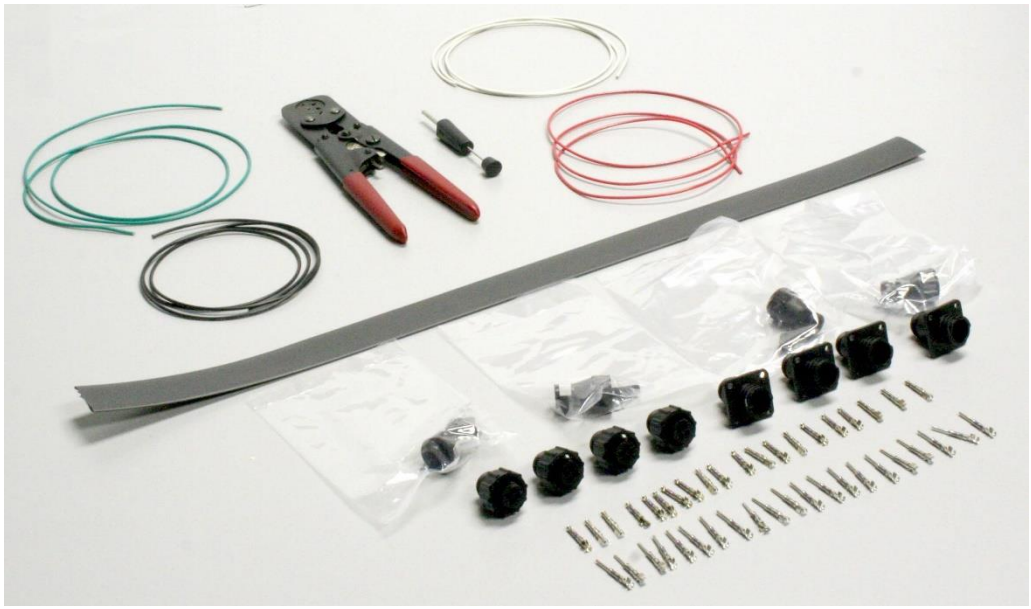
11. Replacing Connectors and Contacts

The DriveRack unit has connectors where the motor cables plug in. The high current demand can impose electrical requirements that can lead to failure if not used properly.

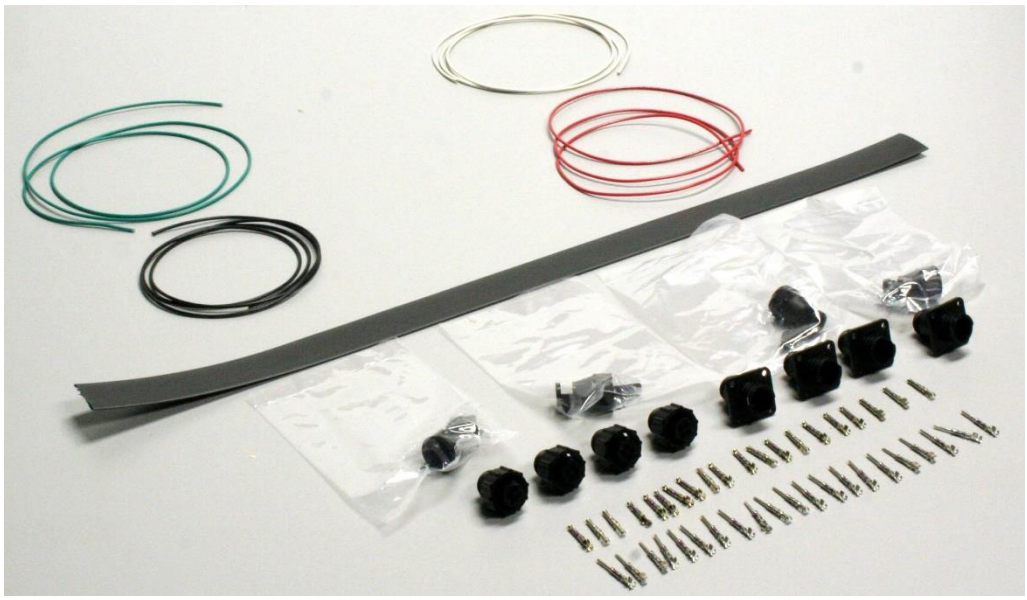
Replacing these contacts requires the exact part# replacement parts as well as proper crimping and pin extraction tools.

If you would like to service your own system, you should consider obtaining one of these service kits:

999-5900-000 Connector service kit with tools



999-5900-001
Connector service kit parts only



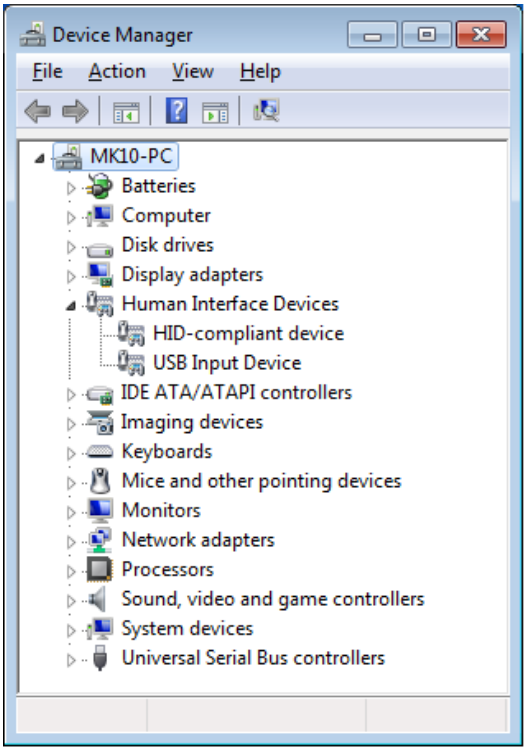
12. Troubleshooting USB Communications

If you have previously tried one or more USB ports on your computer and the software will not communicate with the DriveRack, you will need to uninstall the drivers for each USB port, and reboot the computer between each uninstall. In this case, once you uninstall the windows device driver from one port do not plug anything back into that port until you have completed the uninstall process for all USB ports.

Avoid using USB 3.0 ports. These may be too sensitive for industrial use. Most laptops have both types of USB ports. The 3.0 port is color coded blue and the 2.0 is typically black.

In order to uninstall the Windows device driver for the USB connection do the following with the USB cable plugged into the port in question and the DriveRack turned on.

Open the Windows Device Manager (On Windows XP and earlier, you must be logged in as an administrator. Click on Start Menu->Control Panel, then double click on Administrative Tools and choose computer management. The Device Manager will be one of the options in the left hand pane. Windows 7, 8 and 10, use the search box to find the device manager.)



In Device Manger, look for a small yellow triangle on one of the items in the device list. This should be under human interface device or USB controller.

Right click on the item and choose uninstall. On some versions of Windows you will see a checkbox to delete the device driver, make sure it is checked.

Shut down the computer with the DriveRack powered on and the USB cable plugged into the computer.

Turn off the controller and unplug USB cable from computer. Repeat these steps for each USB port that was tried.

Finally, power up the computer and connect to the internet. Power on the controller, then plug USB cable into the computer and see if the driver installs successfully this time.

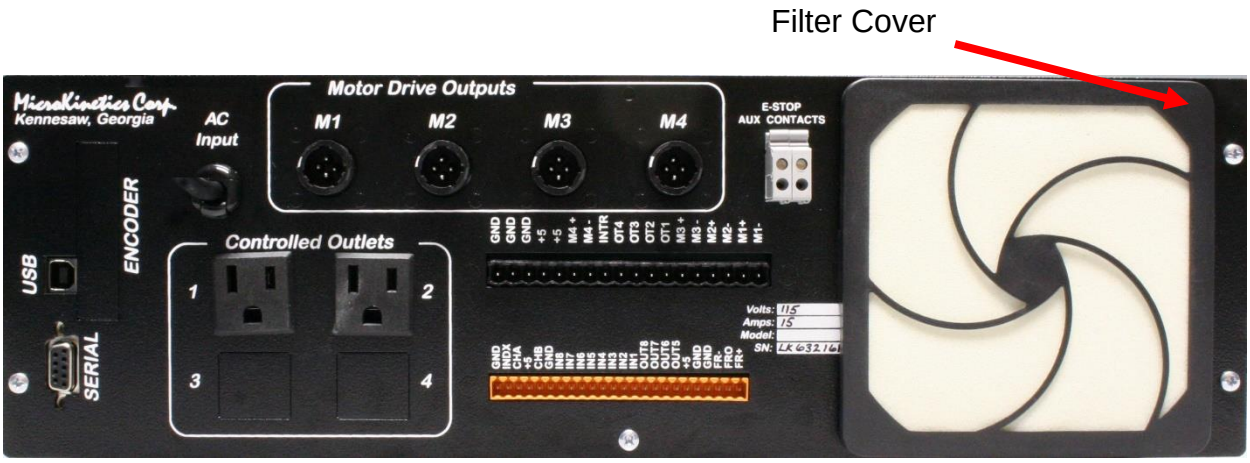
If not the next step is to run Windows update with the USB cable plugged in and the DriveRack turned on. In the Windows update window, click on Check for Updates. Install any updates that are marked important, reboot the

computer if necessary. Check to see if TurnMaster Pro or MillMaster Pro will now recognize the controller.

If this fails repeat the process. It is best to stick to one USB port but you can try others after the driver is uninstalled and the computer is shut down.

If you're still experiencing communication problems you may want to try another computer to determine if it is a computer or controller issue.

13. Replacing Fan Filter



1. Carefully pry the tabs with fingernail or flat-bladed screwdriver and remove plastic filter cover from rear of DriveRack. (Filter Part Number 300-9700-090)
2. Discard old filter.
3. Put new filter into plastic cover.
4. Snap cover and filter back onto rear of DriveRack.