

ME 463 Electronics Design

Following this procedure will help the e-shop personnel assist you to (1) improve the quality and viability of the electrical part of your project, and (2) increase the safety of your prototype.

A. Project Overview

In one paragraph, describing your project.

B. Relevant electrical details of project.

List the electrical components you will need for the project.
(motors/moving parts, controllers, sensors etc)

C. Safety and User Interface

Describe how the user will interact with device

Describe the master disconnect.

Describe the safety interlocks and guarding provisions.

D. Electrical Diagrams

a. Power list:

List of all power sources.

(batteries, AC lines, AC-DC converters and DC-DC converters, etc)

Device Name	Voltage	Current

b. Control Signal Assignment list:

(source and destination, type of signal and any special requirement

Device Name	Signal Type	Source	Destination	Notes

c. Auxiliary device list:

List any devices that do not provide/consume power or provide/receive control signals. (Distribution blocks, fuses, main disconnect switch...)

Device Name	Location	Purpose

d. Wiring layout:

Include a CAD diagram of the device with wire routing overlaid. Using information from (a), (b) and (c) above, you should identify device and each required wire, including gauge, color, and its specific route. Where appropriate, include raceway information if using installed raceways (conduit, Panduit etc). This is essential for building wiring harnesses and having a clean, easy to troubleshoot prototype.

General Notes:

- 1) When selecting wire, use standard colors.
For 120V AC wiring, Black is normally the 'hot' or 'load', white is 'Neutral' and Green is 'Ground'. For DC wiring, Red is normally positive, Black is ground.
- 2) Any exposed conductor with 40Volts or more (AC or DC) MUST be completely enclosed. (distribution blocks for example)
- 3) When selecting wire, be sure to size wire for the current it is to carry. Larger diameter wires can carry higher currents. The lower the 'gauge' of the wire, the larger it physically is and the higher its current capacity. (Wire supplied is rated at 300V)

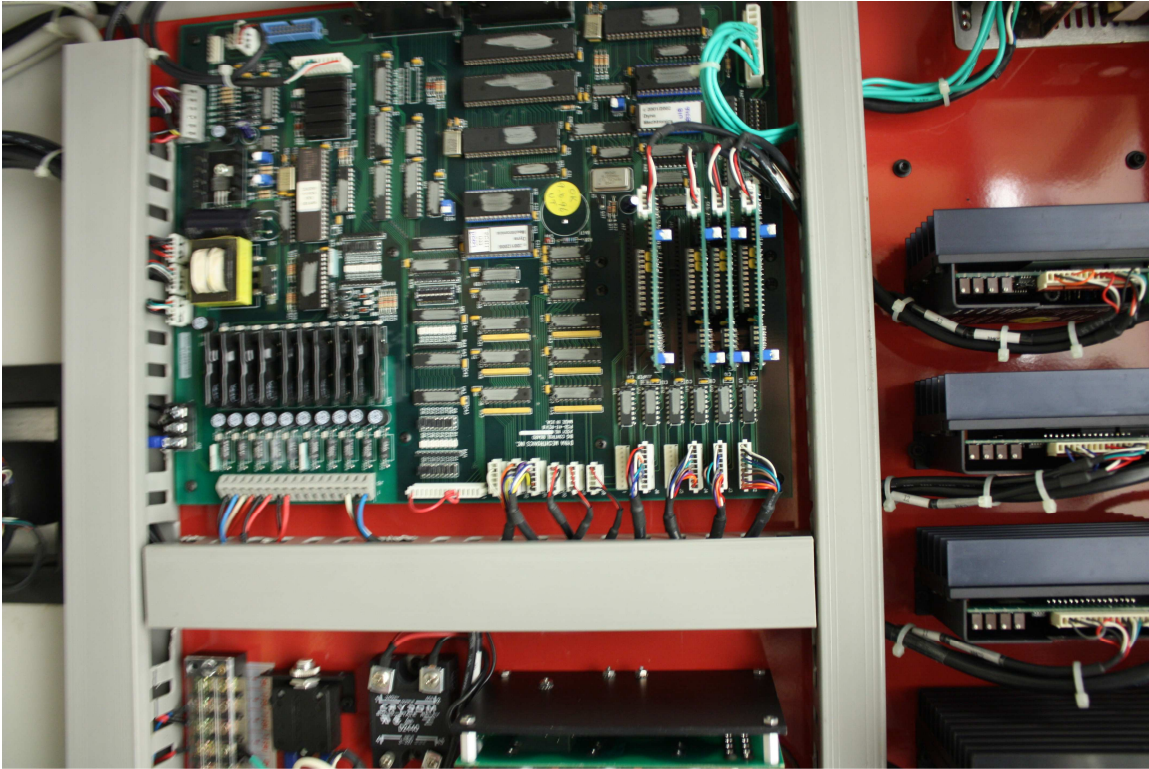
Simplified Chart of Maximum Amperage for a given Wire Size

Conductor Size (AWG)	Maximum Current		Conductor Size (AWG)	Maximum Current
4/0	300A		12	20A
2/0	200A		14	15A
2	150A		16	12.5A
4	100A		18	10A
6	50A		20	5A
8	40A		22	2.5A
10	30A		24	1A

YOUR LOAD and/or WIRE may have different limits based on your specific application. When in doubt, consult the Electronics Shop for guidance.

- 4) Try to keep AC power isolated in as small an area as is possible. Keep AC and DC power separated from signal lines as much as possible in cable routing.
- 5) For signal lines, use either twisted pair or coax cables to limit noise.
- 6) Ground your chassis whenever possible
- 7) When using batteries, place a fuse as close to the positive terminal of your battery pack as possible. This protects your prototype and battery from overloads and shorts
- 8) Always install a battery disconnect and battery disconnect switch. You need some way to de-energize your prototype.
- 9) Always secure batteries with mechanical fastenings. These could be Velcro strips for small batteries or straps for larger batteries.
- 10) Always mount circuit boards with standoffs and watch for potential to short circuit board on the reverse (bottom) side.
- 11) If you have several modules, consider using a 'mounting panel' or 'sub panel' to install your devices.
- 12) When using commercial electronic modules, be sure to purchase appropriate connections to go with the module.
- 13) For splicing wires, use solder/heat shrink to connect wires inline. Consider using a barrier strip, distribution block or similar device for connecting large numbers of wires together.
- 14) Use Cable routing hardware to protect cabling and create cable raceways. These include fiberglass braids, flexible/rigid conduits, plastic bundlers, cable ties, Panduit, Wiremold and more.

Assembled Projects - Examples



Project has Panduit raceways (grey), a subpanel (red plate) for components and uses bundled wires.



Project has flex loom to contain signal and power wires running to motors that move up and down

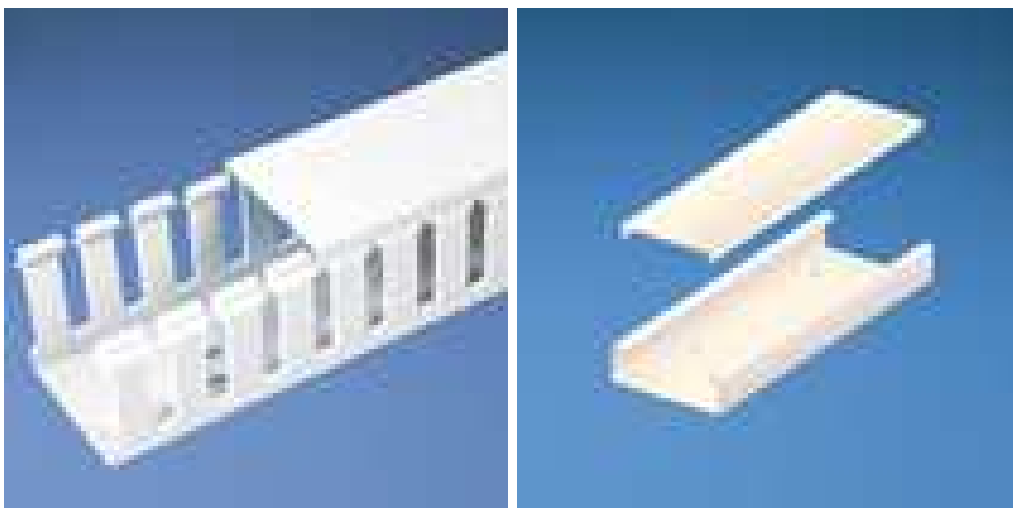
Components



Distribution blocks – Barrier Strip and Fused distribution blocks



Wiring Looms – Split Loom and Expanding Braid Loom



Surface Mount Raceways (Panduit + Wiremold)

Liquid-tight Flexible Conduits

-Liquid-tight conduit is ideal when used with liquid tight fittings for applications where a high degree of liquid tightness is required.



<http://www.delikon.com>



Conduit – Flexible and Rigid



Wire Bundle Routing

