Case/Stand Design
General Concepts

- Electrical enclosure securely mounted on stand
- Enclosure modified for mounting of fans, LCD display, Ipod dock

System Functions

Stand
- Support electrical enclosure
- Adjust to suit biker’s eye level and arm reach

Enclosure
- House electrical components safely
- Protect/isolate biker from accidental incidents inside (surge etc)
- Provide mounting space for fans/LCD/Ipod dock
- Easy access for repair/testing of electrical components
# Stand/Enclosure Specifications

## General Concept

<table>
<thead>
<tr>
<th>Revision</th>
<th>Spec. #</th>
<th>Importance</th>
<th>Source</th>
<th>Specification (description)</th>
<th>Unit of Measure</th>
<th>Marginal Value</th>
<th>Ideal Value</th>
<th>Comments/Status</th>
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![Diagram of stand/enclosure](image)

- **Enclosure body attached to mounting plate**
- **Mounting Plate**
- **Rotational DOF adjustable height**
Electrical Enclosure Selection

NEMA Ratings
- Describes protection offered from each enclosure

### About NEMA and IP Enclosure Ratings

NEMA Ratings - NEMA (National Electrical Manufacturer’s Association) has a standard, NEMA 250-2003, to designate the degree of protection provided by electrical enclosures.

#### Environments:
- Indoor and outdoor use
- Foul liquids and light splashing
- Nonhazardous dust, lint, fiber
- Washdown and splashing water
- Oil and coolant seepage
- Oil and coolant spraying and splashing
- Corrosive agents
- Occasional temporary submersion
- Occasional prolonged submersion
- Prevention of external hazard from internal explosion
- Prevention of combustible dust ignition

#### IP Ratings - The IEC (International Electrotechnical Commission) developed their own IP (Ingress Protection) Standards, IEC 60529, for the degree of protection provided by enclosures. IEC designations consist of the letters “IP” followed by a two-digit number:

- **First Digit** - Protection from entry of solid foreign objects:
  - 1 - Protection from solid objects greater than 12.5 mm dia.
  - 2 - Protection from solid objects greater than 50 mm dia.
  - 3 - Protection from solid objects greater than 1 mm dia.
  - 4 - Protection from solid objects greater than 15 mm dia.
  - 5 - Protection from dust that would interfere with equipment operation
  - 6 - Dust tight

- **Second Digit** - Protection from harmful entry of water:
  - 0 - No protection
  - 1 - Protection from vertically dripping water
  - 2 - Protection from splashed water
  - 3 - Protection from water projected from a nozzle
  - 4 - Protection from heavy seas or power jets of water
  - 5 - Protection from temporary submersion
  - 6 - Protection from continuous submersion

Polycarbonate NEMA 4X Enclosures

Protection needed in typical gym environment
- Small impact (bumping etc)
- Airborn particles
- Moisture (splash from water bottle, sweat)

Conclusion: NEMA 4 or 4X will probably be a cost-efficient solution
Electrical Enclosure Selection
(cont)

PN #69945K123
• NEMA Rating: 4X
• Dimensions: 14.9” x 7.4” x 5.1” (actual mounting depth ~4.5”)
• Polycarbonate

Pros
• Modifiable (slots/holes) for mounting fans/LCD
• Cover screws for easy access for repair
• Cost efficient
Concept for Fan/LCD Mounting

Approximate Space needed for mounting
Fans: 3.15” x 3.15”
LCD: 5.5” x 4”
Stand Concept

“On-Stage” Monitor Stand (or similar product)
- 34”-61” Adjustable Height
- 100 lb rated load capacity
- Welded Steel
- 9” square mounting plate
- Mounting plate can be modified to bolt enclosure
- No tilting DOF
- May make cover difficult to take off (bottom may be flush against mounting plate
- Center of Mass remains centered on stand

Image from MusiciansFriend.com
Alternate Stand Concept

- Has tilting DOF
- Removable cover faces out, so easier to remove
- May lose some stability since center of mass can move with tilting
Ipod Dock Mounting

Design Challenge
Ipod dock needs to be mounted within arm’s reach of biker, but stand needs to be far enough away from bike to stay clear of mechanical system and spinning front wheel.

Mounting Concepts (see diagram below)
1) Top of enclosure
2) On mounting plate in front of enclosure
3) On Stand Pole
4) Tray bolted to mounting plate
5) On handle bars
Near-Term Action Items For Stand/Enclosure Design

1) Concept selection matrix for ipod mounting dock/locations
2) Continue product research for stands/enclosure/dock
3) Refine design based on Design Review Feedback
4) Final Selection of Concepts/Parts
5) Begin ordering parts
6) Start needed modification of arrived parts