Auto Solder

2.009
A handheld soldering tool that technicians can use to safely and efficiently solder wires together in tight spaces.
User Persona

Technician Tom

Electronics repair technician
Specializes in semi truck repair
Prefers to solder connections
Often cannot due to space constraints
Use Case

Technician Tom finds a broken communication wire behind the dashboard of this semi truck.

Tom grabs his Auto Solder, a portable and safe way to solder in tight spaces.

Using Auto Solder, Tom clamps together two sides of a broken wire. Within the device solder is heated, spooled, and dispensed onto the connection.

The wire is fully reconnected! Now, Tom can quickly move on to other broken wires.
## Product Contract

**Vision:** An easier, faster, safer handheld soldering device  
**Market:** Electrical repair and development  
**User:** Contractors, electrical repair technicians, makers

<table>
<thead>
<tr>
<th>User Needs</th>
<th>Product Attributes</th>
<th>Specifications</th>
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<tbody>
<tr>
<td>Joint has comparable strength to hand soldering</td>
<td>Tensile strength of solder joint</td>
<td>&gt; 6000 PSI</td>
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<tr>
<td>Quick joining process</td>
<td>Time to join wires</td>
<td>&lt; 15s per joint</td>
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<tr>
<td>Precision in tight spaces</td>
<td>Size of wire-interfacing tip</td>
<td>&lt; 0.7” radius circle</td>
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<tr>
<td>Reduced wrist strain</td>
<td>Weight</td>
<td>0.4-2.3 kg (1lb-5lb)</td>
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<td>Ability to be used on a variety of wires</td>
<td>Accepted gauge range of wires</td>
<td>26-18 gauge</td>
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<tr>
<td>Maneuverability</td>
<td>Power cord</td>
<td>No</td>
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</tbody>
</table>
Architecture

- Battery
- Power
- Software / Electronics
- Heating
- Clamping/Twisting
- Solder feeder
- Ergonomics

- User interface with electronics
- Controls
- Ease of use
- User safety
- User easily reaches buttons
Hardware

- Battery
- Heating + Clamping
- Solder Feed
Heating+ Clamping

Clamping

Conductive Heating
Solder Feed

- Solder Wire
- Push Wheel
- Gear Box
- Distributor
Conduction Electronics

- Thermocouple
- Analog Thermocouple Amplifier (AD8495)
- Heater Power Control
- Temperature Adjustment
Conduction Electronics

- 24mm
- 14mm
- 48mm
Induction Heating

Induction heater circuit diagram
Simulation results
Math for component values
Induction Heating

Circuit Diagram

[Diagram of Induction Heating Circuit]

- Battery
- 240V
- 1N5818
- IRF610
- AC Current Switching
- Inductive Heating Coil
- 0.01
- 0.5μH

Induction heater circuit diagram
Uses 1S lipo battery, 140kHz

Plot shows magnitude and frequency of current in heating coil
Induction Heating
Simulation Findings

- Desired resonant frequency: 17kHz-50kHz
  - Capacitor: 20-175 uF
Induction Heating

Next Steps

- Use eddy current power dissipation equation to determine heating coil current and frequency requirements
- Speak with knowledgeable electrical engineers to improve power electronics
- Prototype wire heating
Thanks for listening!
Questions