

Powertrain Experience: <http://etischer.com/awdev/>

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**Designed and built my own drive inverter to run a 90kw Siemens EV motor for my 2001 VW Passat EV conversion.**

My homebuilt water-cooled 3 phase inverter runs vector torque control; 300A, 330VDC. Developed current/torque/regen EV control algorithms for a motor with no nameplate data. Developed electronic synchro mesh algorithm for clutchless shifting. This inverter has powered my converted VW Passat since 2009; over 90k EV miles. 100 mile range, 33kwh lithium battery.

Recent Work Experience:

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**Tesla** *Fremont, Palo Alto California. Sparks, Nevada.*  
*Senior Staff Controls Engineer, Powertrain*

**TESLA** Mar. 2011 to  
Jan. 2018

**Electrical engineering** includes: defining system architecture, hardware selection (BOM) & purchasing, oneline diagrams, safety compliance (TUV safety expert certified), network architecture, machine vision, servo drive/motor selection (AB motion analyzer), schematics (AutoCAD Electrical, NFPA 79, UL508A), AC & DC power distribution (SCCR), contract manufacturing and installation of electrical panels, commissioning.

**Controls engineering** includes: Defining PLC programming standards, Allen Bradley ControlLogix PLC & Safety PLC programming (RSLogix5000), Servo programming (Kinetix 5700, 5500...Linear motors, coordinated motion), system integration, vision systems (Cognex, Fanuc IR Vision), Laser profilometer systems (Keyence), HMI programming (WonderWare, PanelView), MES integration, Robot programming (Fanuc).

Member of Tesla interview panel, interviewing 100+ job applicants, specifically in technical aptitude. Created and maintained Tesla's machine vision lab for training and rapid prototype vision applications. Design review expert for machine safety. Extremely fast paced environment; High (99.9%) uptime requirements. Always passionate about improving efficiency!

Model 3 battery module (lines 1-3). Each machine contains **168 Axes of Kinetix 5700 servos**, 7 racks of Control Logix Safety PLC, 14 processors, 21 racks of Point IO, 2 Fanuc 6 axis robots, 12 VFDs, Cat4 PLe Safety. From concept to production I was the sole EE working with 12 mechanical engineers and 6 controls engineers. (2016-2017)

Potting Gantry for Tesla Roadster, B Class Mercedes, Toyota RAV 4, Model S 100kwh. 6 servo axis (gantry & dispense). Inserts a needle into 100+ holes to glue battery cells into 8 types of plastic trays to make battery modules. Compensates for dimensional variation in injection molded trays and bent needles using Cognex camera and laser measurement. (2011, 2017) From concept to production I was the sole electrical and controls engineer.

Robotic battery pack loading workcell. I programmed a Fanuc robot & machine vision to install (10) 120 lb. battery modules into 8 foot tall storage racks used for grid storage. From concept to production I was the sole electrical and controls engineer. (2016)

Pack Pulse test. Connects up to (6) Model S/X battery packs delivered via AGV, applies 180kw bi-directional load. From concept to production I was the sole electrical and controls engineer. (2015)

Tesla Portable Chiller (40+ built). Supplies PID temperature controlled coolant, as well as fill and drain functions for burn in testing of Tesla powertrain components From concept to production I was the sole electrical and controls engineer. (2015)

Charger Burn in tester (Lines 1-2). Load tests (9) Tesla chargers for burn in testing. Feeds each charger with 48A 277VAC, absorbs 450VDC output from charger and recirculates this power (120kw) back to the AC input on the chargers. From concept to production I was the sole electrical and controls engineer. (2014)

Supercharger Burn in tester (1-2). Load tests Tesla Supercharger for burn in testing. Feeds each supercharger with 480VAC, absorbs 150kw DC, and recirculates this power back to the AC input on the Supercharger. Cat4 PLe Safety. From concept to production I was the sole electrical and controls engineer. (2014)

Rotor Spinner (1-6). Preconditions copper rotor used in Model S & X motor. Spins rotor to 17.5k rpm. Reverse engineered motor tuning parameters for Model S stator so an industrial VFD could be used. From concept to production I was the sole electrical and controls engineer. (2012)

Rotor Bars workcells (1-2). 12 foot long copper bars are loaded on a cleated conveyor; grippers pick, feed and cut the bars used to make the copper rotor in the Model S & X motor. 4 axis servo, HMI. From concept to production I was the sole electrical and controls engineer. Running production 6 years and counting. (2013)

Module potting machines (1-5). Glues (444) 18650 battery cells into a top and bottom plastic tray to form the battery modules used on Model S & X battery packs. These 5 lines ran 100% of battery production for 5+ years. 11 Servo Axes, HMI, safety PLC. From concept to production I was the sole electrical and controls engineer. (2011-2013)

Many more projects where I was lead electrical/controls engineer... (Model X roof trim install, pack resistance check, Model 3 4-wheel alignment, Stator assembly line....). Perfect safety record (zero injuries) on all projects I worked on.

## Work Experience Continued:

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**Solyndra**, Fremont California. [www.solyndra.com](http://www.solyndra.com)  
Senior Controls Engineer Solyndra manufactures cylindrical shaped photovoltaic solar panels.

 **Feb. 2008 to Mar. 2011**

Building and programming control systems for production equipment in a fast paced startup environment. ANSI/RIA15.06 (Robot safety), NFPA79, UL508A, OSHA 3170-02R compliance.

Tube Transfer system. 8 of these machines feed every sputtering tool in Solyndra's factory. 8 axis coordinated servo system transfers 48 tubes from trays to ceramic carriers. From concept to production I was the sole electrical and controls engineer. Cell controller for Robot enclosures. 10 of these systems control and safeguard all of Solyndra's Back End production robot work cells. I was the lead electrical designer and safety PLC programmer. Other projects include: Helium leak checker, Gas mix analyzer, Flash "Sun simulator", End Effector design, Laser glass cutter, ASRS & AGV interface hardware, Portable PLC/Servo stand for prototyping.

**Drivex**, Livermore California. [www.drivex.com](http://www.drivex.com) (A company of 3 employees)  
Senior Controls Engineer. Drivex engineers custom control systems for industrial machinery

 **Feb. 2002 to Feb. 2008**

Advanced motion control, specializing in precise torque and speed control for high speed material handling, tension control, blown film, vacuum deposition and winding applications.

PLC and HMI programmer for 5 layer blown film line with flying shears, used for making printed potato chip bags.

PLC and HMI programmer for 7 chamber vacuum system with flying shear, used for sheet metal solar cell manufacturing.

Programmed 8 racks of I/O and an HMI for a machine manufacturing "warm superconductors". The control system for this project was featured in Siemens & Control Engineering Magazine, and I was a presenter at Siemens Automation summit, 2007. HMI featured user modifiable state machine logic.

Drive programming for a machine that perforates, cuts, creases and winds 500' rolls of drywall tape every 30 seconds

PLC and HMI programming for a metallic deposition lens coating machine. User definable step sequencer on HMI

**FormFactor Inc**, Livermore California. [www.formfactor.com/](http://www.formfactor.com/)  
Internship. FFI produces probe cards (bed of nails) used for wafer testing.

 **Summer 2000, Summer 2001**

Design and fabrication of a tip replacement tool used to weld a blade to the end of an eyelash sized spring. Completed fabrication of a wafer processing station, and controlled temperature bath.

Design and fabrication of FormFactor's "replacement springs" for C4 and T2 product line which involved:

Finite Element Analysis, Generating wafer masks, Photolithography of "elephant shaped" springs on silicon wafers.

Operation of a laser cutting tool, plastic welder, and milling machines. Class 100 clean room experience.

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Education: **California State University Chico**

**Graduated: Dec. 2001**

Major: **Mechatronic Engineering**, a combination of Mechanical Engineering and Computer control systems.

First place in 1999 and 2000 National Steel Bridge Design Competition.

Design and fabrication of a steel bridge with considerations to weight, cost, deflection, and construction speed.

Currently on advisory board for engineering department 2018-present. Providing industry feedback on course curriculum.

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## Hobbies:

- Building custom molded fiberglass camera cases, laptop cases, and car parts.
- International travel, the most unusual place I've been is Chernobyl, Ukraine.
- Self taught Aluminum MIG & TIG Welding
- Building electric bicycles
- Engine conversions; Subaru flat 6 engine in my Porsche 914. Mazda Rotary engine in my MG Midget. Custom cable shift kit for Porsche 901 transaxle. Passat EV conversion. For more details visit [www.etischer.com](http://www.etischer.com)
- Scuba diving, building underwater camera enclosures.
- General fabrication and prototyping