



CONTROL FREAK

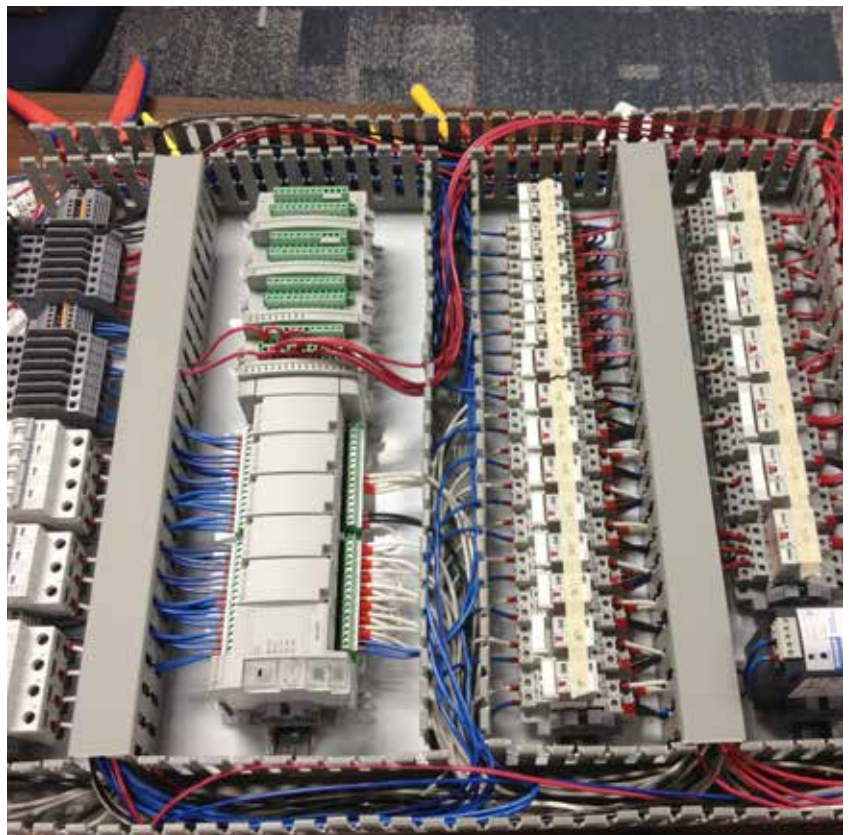
POWER's Justin Diedrick takes his work home

By Mark Murdock/ Photos by Justin Diedrick

At POWER, you're either an engineer or you get to work with them. Either way, you'll probably agree that engineering is more than a career choice. It's a way of looking at the world—a 24/7 obsession with problem solving. Even outside of work, there's nothing engineers enjoy more than coming up with better ways of doing things around the house. Yes, they have to endure countless eye-rolling from the ones they love, but they can't stop themselves. It's what they do.

POWER proud.

Diedrick and his panel during configuration and testing.



Justin Diedrick is one such self-proclaimed geek. He's an engineer and department manager for the Generation Instrumentation/Controls Group in Hailey. He's also an unabashed controls freak. By day, he designs control systems for big power plant projects, most recently in Turkey and Tanzania. By night, he designs a control system for the custom house he's building in Bellevue, Idaho.

Overkill is in the eye of the beholder

"It was always a thought in the back of my head as I was looking at stuff in the house that it would be cool if you took one of these PLCs (Programmable Logic Controller), a slimmed down version, and just have it run the entire house instead of having these smaller systems controlled by separate interfaces," says Diedrick.

It's not the first time Diedrick solved a control issue at home. His last house had a thermostat upstairs, so it was difficult in winter keeping the downstairs warm while not

overheating the upstairs. So he added a two-zone HVAC system (basically just a microprocessor and a couple of motorized dampers) so it could look at two thermostats and control the temperature separately between his upstairs and downstairs. As he began jotting down ideas for his new home, the POWER controls engineer started taking over.

"I thought it would be nice to have radiant floors, and if I had radiant floors, I could use solar thermal cells to supplement heating for the floors, and if I had solar thermal, I could store it and use it for

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Cutting, crimping and cable ties.

Initial layout of control panel (above, left). Wiring of panel in progress (above, right).

WHAT THE SUBCONTRACTORS HAD TO SAY...

“How are you going to do that?”

“You’re going to do WHAT?”

“I’ve never seen anything like that before.”

“I guess that’s why you work for POWER.”

“Dude, you put J.A.R.V.I.S.* in your house!”

“That is COOL!”

**Editor’s note—J.A.R.V.I.S. is Tony Stark’s (Iron Man) artificially intelligent computer.*

domestic hot water, and one thing led to another and I started drawing up plans and P&IDs (Piping and Instrumentation Diagrams).”

Easy as pi

Actually, Diedrick is not approaching his home any differently than he would a typical generation project. The P&IDs tell him how the system will come together and what needs to be monitored. Then he builds an instrument list, an I/O (Input/Output) list and selects the PLC and the HMI (Human Machine Interface, or display screen which will control the system). Next he designs the panel—a 2’ X 3’ grey box that houses everything—and the panel wiring schematics. Then he builds it, configures it, tests it, and installs it in the house. Lastly, he wires it to the various systems and performs final tests.

Every project has its challenges, and Diedrick’s home controller was no exception. Aside from writing the logic so that everything worked in sync and building the HMI screens with a non-engineer user in mind, the biggest challenge turned out to be getting the subcontractors on board with what he was doing. “When I first started explaining it, they said, ‘You’re going to do what? How are you going to do that?’ So I told them, Look, I am going to control almost all your stuff, and what I need you to do for me is to put it in and make sure it’s going to work when I tell it to work.”

They obviously had no idea who they were dealing with. But Diedrick’s wife, Gabby, sure did.

Critical client relationships

After the customary eye roll, and the insistence that the house be warm in the winter and cool in the summer, Gabby had only one additional request: that if he were ever away traveling, she would be able to turn the heat on no matter what. That request was simple to implement. Diedrick put a switch on the front of the panel with two settings, AUTO and MANUAL. In the manual mode, Diedrick designed the wiring to bypass the PLC and all the logic. So if the PLC faulted and wasn’t working, all she had to do was put it in manual mode and use the thermostat like it was a normal heating system.

Smarter than any smart home

Needless to say, Diedrick’s control system is much more sophisticated than any off-the-shelf smart home system. Smart homes have very simple controllers that typically look at minimal inputs and don’t interface with other systems. Diedrick’s PLC controls his HVAC, solar system, hot water, radiant floors, exhaust fans, water supply and more. For inputs, along with all the thermostats, he has temperature transmitters on every floor and outside, humidity sensors both inside and out, and leak detectors in the laundry room and the mechanical room which will cut the house water supply if a leak is detected. The PLC also monitors the health/fault conditions of all the major equipment.

“I have the ability to tell this thing to do anything that I want it to do. The adaptability and the flexibility is the really cool thing. You can sit there and just play with it until it starts doing what you want it to.”

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Diedrick's goal is to get the systems in his house to be as efficient as possible. Take cooling for example. His basement temperature will stay in the mid-fifties to mid-sixties year round. So in the summer, instead of using power for air conditioning, what his system will do is look at the temperature in the basement and the temperature in, say, the second floor. If there is a delta of 15 to 20 degrees, the controller will toggle the necessary feed and return dampers, turn on the air handler and suck the cool air from the basement and send it to the second floor.

In Bellevue it really cools off at night in the summer, so once the conditions are right, Diedrick can open the doors and windows and the whole-house exhaust fan will push out the warm air out through the attic and replace it with cool air from outside—all in about 15 minutes. For heating, the solar thermal system will be able to supplement the heat for the radiant floors, as well as heat the

domestic hot water. So really, when it is all up and tuned, his energy bills should be minimal.

Before you go to Home Depot

Right about now, there's sure to be a bunch of engineers dreaming up ways to add more controls to their homes. Diedrick recommends taking your time and being as detailed as possible.

"For example, don't wire a panel without actually having drawings because you might be troubleshooting mistakes for a long time. That kind of thing."

It's great advice and exactly what you'd expect from someone like Diedrick. After all,

he's an engineer, and that's just how they roll. ☞

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Mark Murdock is the publications editor for the Corporate Communications Department and is located in Boise.

Everything's under control.

Finished panel and touch-screen HMI (above, left). Panel installed in house during wiring and testing (above, right).