



An Extended Guide · No. 1695

Constant-Pressure and Variable-Speed Well Pumps

What a variable-speed
system means for your backup

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! Read this first — on a well, no power means no water

On a home with a private well, a power outage isn't just dark — it's dry. The pump that lifts your water runs on your home's electricity, so when the power stops, every tap, toilet, and hose stops with it. Keep a few days of stored drinking water on hand as a backup you can count on — a common guideline is about a gallon per person per day. And know this from the start: a well pump is almost always a 240-volt appliance wired straight into your electrical panel, so any backup hookup for it is a licensed electrician's job. Never try to feed it with a cord or by backfeeding an outlet — that is unsafe, against code, and can put deadly voltage on the power lines outside. If yours is one of the newer 'constant pressure' systems — where the water holds the same steady pressure no matter how many taps are running — then backing it up comes with one extra wrinkle worth knowing, and this guide walks through it gently.

A newer kind of well system — and one small wrinkle

If your water pressure stays rock-steady no matter what, you may have a constant-pressure, variable-speed well system. It is a lovely thing to live with — and it asks for one small extra bit of care when you plan your backup power.

I'm Bill, and I run Bill's Home Tech here in Portage County, Ohio. More of the wells I visit these days use one of these variable-speed systems, and folks are often surprised to learn their backup planning has a wrinkle a plain old pump does not. It is nothing to worry about — it just helps to know it is there.

This guide explains, in plain English, what a constant-pressure system is, why people like it, and the one thing that matters most when you back it up: these systems have sensitive electronics that prefer clean, steady power. We will cover what that means, and point you to the other guides for the parts they cover best.

★ Not sure what kind of pump you have?

That is one of the first things I can help you sort out — often just by looking at your setup and asking a question or two. Call or text me at (330) 200-8042 and we will figure out what you are working with, no obligation.

The whole guide, in about a minute

If you remember only these things, you are already most of the way to a calm, workable plan.

- ❑ A constant-pressure system holds your water at one steady pressure, with no swings.
- ❑ It does that by varying the pump motor's speed, instead of switching it fully on and off.
- ❑ These systems often use a smaller pressure tank than a conventional setup.
- ❑ They start more gently than a plain on/off pump — a softer jolt for your backup power to handle.
- ❑ But their electronics can be sensitive to rough, 'dirty' generator power.
- ❑ So they prefer clean, steady power — the kind an inverter-type generator or a battery gives.
- ❑ Confirm your system and your generator are compatible before you rely on them — ask the pump maker or installer.

✓ The one idea to hold onto

If you take one thing from this guide, let it be this: a variable-speed pump likes clean power and a quick compatibility check. Get those two right and the rest falls neatly into place.

What 'constant pressure' really means

The name says it plainly: the water pressure stays the same, steady and even, whether one tap is open or several.

With an older, conventional system, you may notice the pressure dip and surge a little — the shower cools off when someone starts the dishwasher, or the flow drops when a second faucet opens. That is the pump switching on and off between a low and a high setting, with the pressure riding up and down in between.

A constant-pressure system smooths all of that out. It holds one steady pressure, so the shower stays the same whether you are the only one using water or the whole house is busy. Folks who have it tend to love it — it feels a lot more like city water, without the swings.

✓ How to spot it

The easiest tell is in the shower: if the pressure never changes when another tap or appliance kicks on, there is a good chance you have a constant-pressure, variable-speed system.

How a variable-speed drive does it

Behind that steady pressure is a clever little piece of electronics called a variable-speed drive, or VFD for short. Here is the idea, without the jargon.

A plain pump has two settings: full on, and off. A variable-speed system, by contrast, can run its motor at many speeds. A small controller watches the water pressure constantly and adjusts the motor's speed to match — speeding up when you open more taps, easing off when you close them — to keep the pressure right where it should be.

Think of it like cruise control

It works a lot like cruise control in a car. Rather than flooring the gas and then coasting, over and over, cruise control makes small, steady adjustments to hold one speed up hills and down. A variable-speed pump does the same thing with water pressure — gentle, constant nudges instead of hard on-and-off.

✓ The 'drive' is the key part

That controller — the drive — is the brain of the whole system, and it is the part that cares most about the quality of the power you feed it. That is what the rest of this guide is really about.

Some good news for backup — a gentler start

Before we get to the one catch, here is a genuine advantage a variable-speed system brings to backup power.

A plain on/off pump slams to full power the instant it starts, which asks for a big jolt of electricity — often several times its normal running draw — for a second or two. That large starting surge is usually the single hardest thing a generator has to handle out on a well, and our sizing guide and our guide on the startup surge go deep on it.

A variable-speed pump ramps up gradually instead. Because the drive eases the motor up to speed rather than throwing it on all at once, the start is a good deal gentler, with less of a hard jolt for your backup power to swallow. That is a real point in its favor.

✓ Gentler, but still a real motor

A softer start is a nice advantage, but a variable-speed pump is still a serious motor on a serious circuit. Do not take the gentle start to mean it will run on just anything — the sizing still matters, and so does the quality of the power.

The one catch — sensitive electronics

Here is the wrinkle the whole guide is built around, and it is an easy one to plan for once you know it.

That clever drive is a piece of electronics, and like most electronics it prefers clean, steady power — the smooth kind you get from the utility. Some generators, especially older or basic ones, put out power that is rougher and less even, what people often call 'dirty' power.

Feed a variable-speed drive rough power and it may not like it. Depending on the system, it can throw a fault, refuse to run, or shut itself down to protect itself. A plain pump motor is more forgiving of rough power; a sensitive drive is pickier. That is not a flaw — it is just something to plan around.

! Rough power is the thing to avoid

The main risk with a variable-speed system is not the pump straining — it is the drive objecting to poor-quality power. Plan for clean, steady power from the start and you sidestep the whole problem.

Clean power, in plain terms

So what is 'clean' power, and how do you get it? Here it is without the engineering.

Electricity from the wall arrives as a smooth, even wave. Some generators reproduce that smooth wave closely; others put out a rougher, more jagged version. Engineers measure the roughness as 'harmonic distortion' — but you can just think of it as how smooth or how choppy the power is. A sensitive drive wants smooth.

- **Inverter-type generators** are built to produce especially clean, steady power — close to what the utility gives you — which is exactly what a variable-speed drive prefers.
- **Clean power protects the electronics**, so the drive runs happily instead of faulting or shutting down.
- **Size still matters.** Clean power alone is not enough — the generator must also be sized with headroom, which our sizing guide walks through step by step.
- **The hookup rules do not change.** A constant-pressure submersible is still a 240-volt, hardwired pump, so a licensed electrician and a proper transfer switch or interlock are still the way to connect it.

✓ Ask about clean power when you shop

If a variable-speed pump is in the picture, clean, inverter-grade power belongs at the top of your list when you choose a generator. Our sizing guide and our guide on running a well pump with a portable generator go deeper on picking the right unit.

Confirm compatibility before you rely on it

This is the single most important step with a variable-speed system, and it costs nothing but a phone call.

Because these drives can be particular about power, the makers usually have clear guidance on what works with them — and some are pickier than others about running on generator power at all. Do not assume; ask. The people who make or installed your system can tell you whether it is meant to run on a generator, and what kind.

The best sources are the pump or drive maker and the well or pump professional who installed it. A quick conversation — here is my system, here is the generator I am considering, will they get along? — can save you a faulted drive and a dry house at the worst possible moment.

★ I will help you ask the right questions

Not sure who to call or what to ask? That is exactly the kind of thing I help with. Call or text me at (330) 200-8042 and we will put together the questions and, if you like, make the calls together.

A smaller tank means a smaller cushion

Here is one more way a variable-speed system differs from a conventional one — and it matters a little during an outage.

Because the drive holds pressure so smoothly, many of these systems use a smaller pressure tank than a conventional setup would. In everyday life that is no downside at all — the system simply does not need a big tank to keep the pressure even.

During a power outage, though, that pressure tank is your reserve — the water still on hand after the power quits. A conventional system with a big tank hands you a slightly larger head start; a variable-speed system with a small tank gives you less of one. It is not a big difference, but it is worth knowing, and it is one more reason to keep stored water on hand. Our pressure-tank guide explains how to make the most of whatever reserve you have.

✓ Fill what you can before a storm

If you see an outage coming, topping off stored water matters a little more with a small-tank system, since the built-in reserve is smaller. A few minutes of prep buys real peace of mind.

Two kinds of homes, two sets of needs

Variable-speed pumps show up in both kinds of homes, but they matter most out on a well — so it is worth being clear about who this guide is really for.

If you live in town or the suburbs

In town or the suburbs on city water, you will not have a well pump to back up at all. But you may still meet a variable-speed pump in another spot: some homes use a small variable-speed booster pump to firm up city-water pressure. The same idea applies — it has sensitive electronics — though it is usually a far smaller job than a whole well system.

- Your household water keeps flowing in an outage, so this is not the urgent worry it is on a well.
- If you do have a booster pump, the clean-power idea still applies — but it is a much smaller load than a well pump.
- Our sizing guide and our guide on choosing a generator are the better starting points for a city-water home.
- A variable-speed booster is usually a modest motor, not the big 240-volt surge a well pump brings.

If you are out in the country on a well

Out on a well, a constant-pressure system is the reason this guide exists. Everything comes down to two things: feed the drive clean power, and confirm your system and your generator are compatible before you count on them.

- Clean, steady power comes first — an inverter-type generator or a battery gives the drive what it likes.
- Confirm compatibility with the pump or drive maker, or your installer, before an outage — not during one.
- The pump is still a 240-volt, hardwired appliance, so a licensed electrician and a transfer switch or interlock are still required.
- Keep stored water on hand, especially since a smaller pressure tank leaves a slightly smaller reserve.

★ Rural, and running constant pressure?

This is exactly the setup I enjoy helping well-water families plan. Tell me about your system and the power you are considering, and we will make sure they will get along. Call (330) 200-8042.

A soft starter and a variable-speed drive are not the same

This one trips people up, so let us clear it up plainly: if you already have a variable-speed pump, you almost certainly do not need a soft starter too.

A soft starter is an add-on for a plain on/off pump. Its whole job is to ease that big starting jolt so a smaller generator can get the pump going. A variable-speed drive already ramps the motor up gently, so it is doing that job by design. Bolting a soft starter onto a system that already starts softly is solving a problem you do not have.

A soft starter	A variable-speed drive
An add-on you install	Built into the system
Eases a hard starting jolt	Already starts gently
Does not change pump speed	Varies speed to hold pressure
For a plain on/off pump	Is the constant-pressure system

✓ Different tools for different pumps

In short: soft starters are for plain pumps that start hard; a variable-speed drive is a different animal that already starts soft. Our guide on the startup surge and soft starters covers that device in full, for the pumps that actually need it.

Standby generators can be a fine match

If you are weighing a permanent, automatic standby generator, a variable-speed pump can pair with one nicely — with the usual homework.

A standby generator is a permanent unit that sits outside, starts itself when the power fails, and is wired in by a licensed electrician. A good one, properly sized and set up, can deliver clean, steady power — which is just what a variable-speed drive wants. For a home that leans on constant pressure, that can be a comfortable, hands-off match.

The same two rules still apply, though: the power has to be clean enough for the drive, and you should confirm the specific generator and pump are compatible before you rely on the pairing. A quick check with the pump maker and the installer settles it. Our standby-generator guide covers how these units work and what installing one involves.

✓ Let the pros confirm the pairing

When a standby generator is installed, ask the electrician and your well professional to confirm together that it will run your variable-speed pump cleanly. It is a normal question, and a good installer will welcome it.

Batteries and power stations — clean, with caveats

Battery power has one natural advantage for a variable-speed pump, and a couple of real limits worth understanding.

Power from a battery or power station comes through an inverter, which produces clean, smooth power by nature. That part the drive likes. But the usual limits for running any well pump on a battery still apply here, and they decide the matter more often than power quality does.

- **240 volts is the first hurdle.** Most portable power stations put out 120 volts only, and a typical constant-pressure submersible is a 240-volt pump — so many units cannot feed it at all.
- **Capacity and runtime matter.** A pump can draw a battery down quickly, so size and runtime need an honest look.
- **The hookup is unchanged.** It is still a hardwired, 240-volt pump, so a licensed electrician and a proper transfer switch or interlock are still required.
- **Never promise before you verify.** Confirm the specific pump, drive, and battery will work together before you count on them.

! Clean is not the same as enough

A battery's power is clean, which the drive appreciates — but clean does not mean sufficient. The 240-volt and capacity questions decide it. Our guide on power stations and batteries, and our whole-home battery guide, walk through the honest picture.

Protecting the drive from surges

Since the drive is the sensitive, valuable brain of the system, it is worth guarding against the power spikes that can harm electronics.

Sudden spikes — from switching a generator on or off, from a nearby lightning strike, or from rough power — are hard on sensitive electronics. Surge protection helps absorb those spikes before they reach the drive, the same way you might protect a computer or a television.

This is worth doing thoughtfully rather than guessing at, and it is best set up by the electrician or pump professional who knows your system. Our guide on protecting the pump and its controls goes into surge protection in depth, so I will point you there rather than repeat it all here.

✓ A small step that protects a big investment

Good surge protection is a modest thing next to the cost of a drive, and it is easiest to add when the system is being wired or serviced. Ask your electrician or well professional whether yours is protected.

What can go wrong with rough power

It helps to know what trouble looks like, so you can stop and rethink rather than push on and make it worse.

If a variable-speed drive is fed power it does not like, it usually does not fail dramatically — it protects itself. You may see it throw a fault, refuse to start, or shut down and lock out until it is reset. That is the drive doing its job, not necessarily a sign that anything is broken.

- **A fault or error on the controller** — often a light or a code where you would not normally see one.
- **The pump will not start**, or it starts and quickly stops again.
- **The system locks out** and needs a reset before it will try once more.

! Do not force repeated tries

If the drive keeps faulting, resist the urge to switch it off and on again and again to force it. Repeated attempts on bad power can stress the electronics. Stop, and sort out the power quality or the compatibility first — ideally with your installer.

Getting your system's real details

As with any well question, the honest answer starts with real information — not a guess.

Your variable-speed system has a controller or drive with a nameplate or label, usually near the pressure tank or on the control unit, that names the maker and model. That label, plus any paperwork from when the system was installed, is the key to real compatibility guidance rather than guesswork.

If you cannot find it, the well or pump professional who installed or services your system will have the details on file, and can tell you what the drive needs and whether it is meant to run on a generator. I never guess at these things, and I would not want you to either — the right answer is a phone call away.

★ Bring me what you can find

A photo of the controller's label, or just the name of the company that installed it, is plenty for us to start with. Call or text me at (330) 200-8042 and we will track down what your system needs, honestly.

What I help with — and who does the licensed work

I want to be plain about my role here, because a variable-speed system touches a couple of trades.

- **What I do:** help you understand your system, figure out what kind of pump you have, gather the right questions, plan for clean power, and be there for the first test — all at your pace.
- **A licensed electrician does** the panel work — the transfer switch or interlock and anything 240-volt — which usually needs a permit and inspection.
- **A well or pump professional does** the pump, the drive, and the pressure tank, and can confirm your system's compatibility and its real details.

I am a tech helper with 30-plus years of patient experience, not a licensed electrician, plumber, or well contractor, and I will never pretend otherwise. What I am is the person who helps you make sense of it all, ask the right questions, and line up the folks who do the licensed work.

★ One friendly point of contact

Think of me as the person in your corner who helps you connect the dots between the electrician, the well company, and the generator. Call or text (330) 200-8042.

Questions to ask your pump maker or installer

These are the questions that get you a real, usable answer about running your system on backup power.

Q: Is my variable-speed pump meant to run on a generator at all?

Some are, and some are fussier — the maker or your installer can tell you plainly, and it is the first thing to settle.

Q: What kind of power does the drive need to run cleanly?

Ask whether it needs clean, inverter-grade power, and whether the generator you are considering meets that. This is the heart of it.

Q: Is my system 120 or 240 volts, and how is it wired?

This shapes what can power it, and confirms that a licensed electrician and a transfer switch or interlock are needed for the hookup.

Q: Is the drive protected against power surges?

Ask whether surge protection is in place and, if not, whether it should be added — see our guide on protecting the pump and its controls.

✓ Write the answers down

Keep these answers with your home papers, alongside your generator's manual. Future-you, mid-outage, will be very glad you did.

Common Questions

The questions I hear most about constant-pressure systems and backup, answered plainly.

Q: How do I know if I even have a variable-speed pump?

The clearest sign is steady pressure that never dips when another tap or appliance turns on. If you are unsure, ask your well company or check the label on the controller.

Q: Can I run it on any generator I already own?

Maybe, but do not assume. A variable-speed drive prefers clean power and can fault on rough power — confirm compatibility with the maker or installer first.

Q: Does the gentle start mean I can use a smaller generator?

The softer start helps, but clean power and proper sizing still decide it. Do not size right to the edge — our sizing guide walks through it.

Q: What if the pump keeps faulting on my generator?

Stop forcing it. Repeated tries on bad power can stress the drive. Sort out the power quality or the compatibility first, ideally with your installer.

★ Still working it out?

A variable-speed system is one of the more particular parts of well-water backup, and I enjoy helping folks get it right. Call or text me at (330) 200-8042 and we will sort it out together.

A word on safety — do not rig around a fault

Almost everything in this guide is calm and low-stress. This one page is the firm line.

If your drive is throwing a fault or refusing to run on backup power, that is information, not an obstacle to muscle past. Do not try to bypass, rewire, or trick the drive into running on power it is objecting to. The electronics are protecting themselves, and forcing the issue risks the very part that is most expensive to replace.

And the bedrock rule for any well pump still holds here: the pump is a 240-volt, hardwired appliance, so connecting backup power to it is a licensed electrician's job, every time. Never feed it with a cord or by backfeeding an outlet — that is unsafe, against code, and can put deadly voltage on the lines outside.

! Leave the electrical work to a pro

Sizing, planning, and understanding your system — I am glad to help with all of that. But the panel work and any wiring belong to a licensed electrician, and sorting out a stubborn drive belongs to your well professional. That is not caution for its own sake; it is how you keep everyone safe and protect the system.

Bringing it all together

A constant-pressure system is a genuinely nice thing to live with, and backing it up comes down to two clear ideas.

First, feed the drive clean, steady power — the kind an inverter-type generator or a battery provides. Second, confirm your specific system and your backup power are compatible before you rely on them, by asking the pump maker or your installer. Get those two right and everything else — sizing, the hookup, surge protection — follows the same honest path as any other well pump.

None of this requires guessing at a number or cutting a corner. It takes a little homework up front and the right pros for the licensed parts, and then you have a steady, comfortable water system you can trust the next time the power goes out.

★ Let us make sure it all gets along

Backing up a constant-pressure well system is exactly the kind of project I like helping with. Call or text me at (330) 200-8042, and we will make sure your pump, your power, and your plan all fit together.

You don't have to do this alone

You just have to remember that a friendly, patient person is one call away.

I hope this guide made backing up a constant-pressure well system feel a little less daunting and a lot more doable. Keep it in a drawer with your other home papers, come back to a page whenever you need it, and don't worry about memorizing anything.

When you'd rather have a hand, that's exactly what I do. I come to your home, work at your pace, and never make you feel rushed or silly for asking. A first visit is a flat \$99, and for the parts that don't need me on-site I can often help right on your screen for \$49. Every visit comes with a 30-day, come-back-free guarantee. I don't do the licensed electrical or gas work myself — for that I'll help you line up a trustworthy local pro.

★ Bill's Home Tech — real help, close to home

Call or text me at (330) 200-8042, or visit BillsHomeTech.com. Serving Atwater and all of Portage County. 30+ years of patient, plain-English tech help — and if you're ever not 100% happy with a visit, I'll make it right or refund it. That's a promise. — Bill

Conventional vs. Constant-Pressure

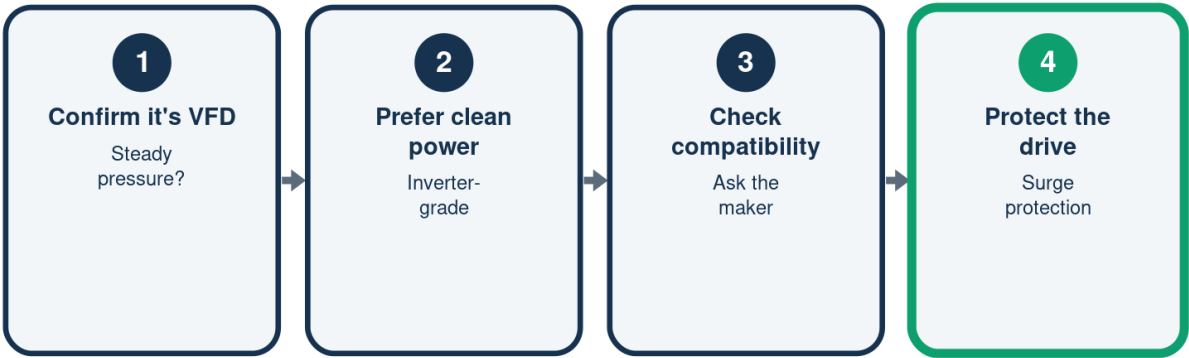
Two ways a well delivers water

	Conventional	Constant-pressure
Pressure	Swings a little	Held steady
Motor speed	Full on / off	Varies
Pressure tank	Larger reserve	Often smaller
Starting	A big surge	Gentler

Constant-pressure is smoother -- but its electronics are pickier.

Backing Up a Variable-Speed System

Four things to get right



Clean power and verified compatibility come first.

What a VFD Wants From Backup

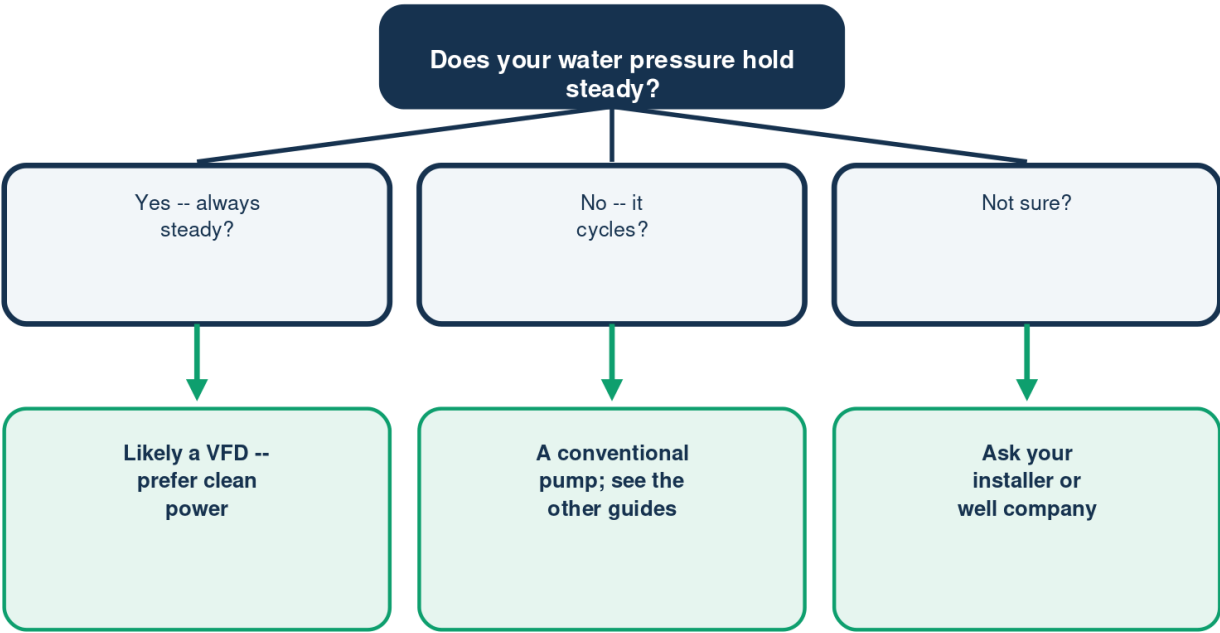
Treat the drive gently

Wants		Why
Clean power	Inverter-grade	Protects the drive
Right sizing	Running + margin	No brownouts
Surge protection	Guards it	From spikes

Rough power can fault a sensitive drive.

Do You Have a Variable-Speed Pump?

Steady pressure is the clue



Confirm generator compatibility before you rely on it.

Illustration - a schematic, not to scale. Your setup may differ.



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A Note From Bill

A quick note from Bill.

I write these guides to make home tech a little less frustrating, and I do my best to keep every step accurate and up to date. Still, every home, device, and setup is a bit different, so I can't promise a guide will match yours exactly or fix your particular problem. These guides are for general information only — they're not professional, legal, or financial advice, and they don't replace your device's own manual or the manufacturer's instructions. Please go slow, use your own good judgment, and use everything here at your own risk. If a step involves electrical wiring, a gas appliance, a water heater, plumbing, or climbing a ladder — or if anything just doesn't feel safe — please stop and call a licensed professional (or give me a call at 330-200-8042). Bill's Home Tech and Bill Davis can't be responsible for any damage, data loss, or injury that comes from using these guides. Thanks for reading, and stay safe out there.

— *Bill*



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