FLUKE®

Use your troubleshooting superpowers for good

Application Note

Unleash your full troubleshooting powers with innovative new tools from Fluke.

You've got skill. You've got experience. Now you have some groundbreaking new tools that give you powers to document temperature issues, to be several places at once, and to assess vibration issues with just a touch.

Vibration is one of the earliest indicators of machine health, and the Fluke 805 Vibration Meter gives you a fast, foolproof and repeatable way to do vibration screening. Simply touch the sensor to motors, pumps, and other mechanical equipment to measure overall vibration as well as test bearing vibration.

Heat is the next major signal of trouble ahead. Where there's excess friction or resistance, there's heat. The VT02 Visual IR Thermometer is a ground-breaking troubleshooting camera with an infrared heat map. You get the complete picture of your target with blended visual and thermal heat map images, empowering you to find the exact location of the issue.

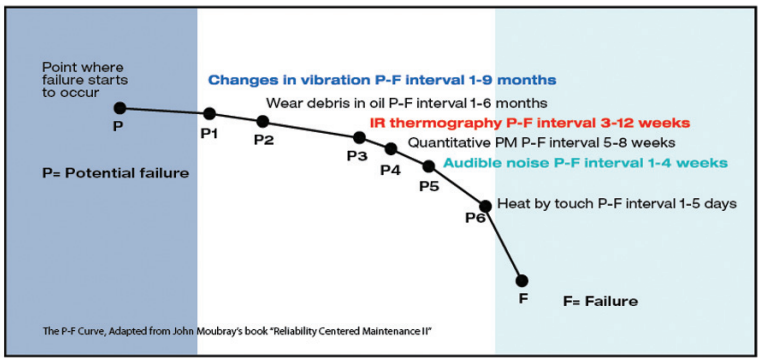
When solving problems requires you to measure, monitor and record multiple readings from multiple locations all at the same time, the Fluke CNX wireless system connects you to problems faster and more conveniently. Modules measure ac voltage, ac current, temperature and more. And you can see those live readings from the wireless CNX multimeter up to 20 meters away.

Alone, each of these tools offers fast, easy and affordable new ways to solve problems. Together, they vastly expand your troubleshooting powers. Quickly find out what's a problem and what's not. You'll stay out of panic mode, be able to proactively plan maintenance, and reduce overall downtime.

Fluke VT02
Visual IR Thermometer

Fluke CNX 3000 Wireless System

Fluke 805
Vibration Meter



Fluke tools help you detect mechanical problems earlier in the failure curve and prevent unplanned downtime.

Here are just a few scenarios that demonstrate how you can use your new powers.

You'll feel like a superhero.

#1 Breaker panel problems

When you're trying to track down problems in dirty, wet, or electrically hazardous environments, Fluke tools help you work more safely and save you the time of repeatedly suiting up in full personal protective equipment (PPE).

In this case, you and two other technicians suit up in full PPE and remove a 90-pound panel cover that encloses a three-phase breaker panel. Once it's open, you scan the panel with the VT02 Visual IR Thermometer. Instead of taking dozens of measurements with an IR thermometer to check for issues, the VT02's blended visual and thermal heat map image instantly reveals a hot spot on breaker #20. You capture the image along with the temperature, date and time. Now you know you have a problem, but you don't know what's causing it.

So next, you install a wireless CNX current clamp to the circuit and re-secure the cover. With the CNX radio turned on and the log button pushed, you can now remove your PPE and monitor the circuit from a safe distance, without gearing up again. You're free to walk away and do other jobs while the modules continue to work for you.

Periodically you stop back to check real-time readings with the CNX DMM, anywhere within three meters of the panel. If nothing looks abnormal at these spot checks, you can let the module keep logging. (It can capture up to 65,000 sets of min/max/avg readings over single or multiple recording session.)

At the end of the shift you bring your laptop over to the panel. With the CNX PC adapter plugged into your PC, you wirelessly download the logged readings directly into the SW3000 software for analysis. You don't have to reopen the cabinet door or suit back up in your PPE.

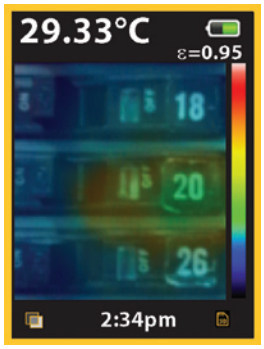
As you analyze the data, you notice some unusual surges in the current readings, which occur intermittently over the day. Using the time-stamped measurements you can now track the problem down to a particular process that

switches on at those times. If you have multiple CNX modules available for troubleshooting you can monitor multiple points simultaneously and isolate the problem much faster. But you can also use single clamp modules and some repetitive testing to find the source of the problem.

You suspect a motor that's connected to that circuit. Scanning that motor with the Fluke 805 reveals a bearing problem. Crest Fact+ technology allows you to make accurate high-frequency measurements to diagnose bearings. The four-level severity scale rates the bearing "unsatisfactory." You remove it from service and replace the bearing.

The next day, you recheck the motor with the Fluke 805. Now it gets a "good" rating. When you rescan the breaker panel with the VT02, you see no hot spots on breaker #20 or anywhere else on the panel. All other temperatures are now within the normal range.

Fluke VT02
Visual IR Thermometer



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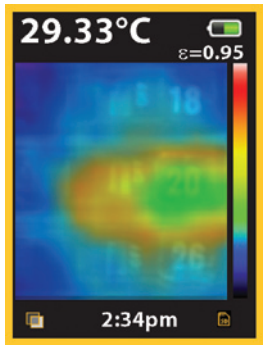

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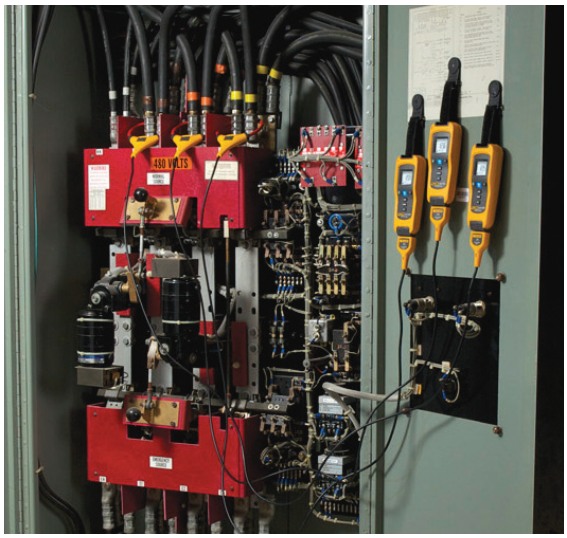
Blended visual and thermal images eliminate guesswork.



#2 Tracking down motor trouble

During your regular scheduled maintenance check of critical motors in your plant, you perform a vibration screening using the Fluke 805 Vibration Tester. You find a motor that gives an indication of an internal issue. You connect three wireless CNX modules and begin monitoring all three phases of motor current over the course of the week.

While the modules are collecting data, you make a quick check for hot spots from time to time with the VT02. Early in the week, you see that the motor has begun to generate moderate heat at the drive shaft. By the end of the week, the sides of the motor appear hot. A quick check with the 805 shows that overall vibration is satisfactory and the bearings are rated "good" on the severity scale. Ruling out a mechanical issue, it's time to search for an electrical problem.

At the end of the week, you wirelessly download the logged data to the SW3000 software on your laptop using the Fluke CNX PC Adapter. You discover from the data that the motor current is high based on its load. You suspect that this excessive current draw is due to an internal problem in the motor. It may be time to take the motor offline and do an insulation resistance test. You can use a Fluke insulation resistance tester to test the winding insulation to ground and discover the problem. You remove the motor from service and replace it with a different motor while the bad motor is refurbished and rewound at a rebuild facility.

#3 Troubleshooting a rooftop HVAC system

A rooftop air conditioner trips the breaker and shuts down after only 30 minutes of operation. Yet at restart, it operates within manufacturer's specifications. After it has been running a few minutes, you check bearings, belts and couplings for vibration using the Fluke 805. All components are rated "satisfactory" on the severity scale.

Next you use the VT02 to check around for hot spots. You check the motor itself to see if the sides are hot, which would implicate the windings. You then check the output of the belt the motor is driving. While you didn't see vibration on the motor side with the Fluke 805, the belt may have insulated the motor from a mechanical problem at the fan. Possibly the fan bearing is damaged, putting strain on the motor.

You use the VT02 to check motor functions, driven-device functions (such as the fan bearing) and the output temperature of the cooled, moving air. Nothing looks excessive, so it's time to do some monitoring.

With the unit continuing to operate, you attach wireless CNX current modules to the incoming power legs and a wireless CNX current clamp module at the load.

Start with an inrush test on motor startup. Use the "inrush" function on the flex clamps to see if inrush current to the motor falls within range for the motor ratings. If the measurement is acceptable you can then connect multiple current and voltage modules, letting them log readings from startup until the system shuts down.

The wireless modules give you a way to watch for issues without somebody "living" on the roof. You can check the live readings from a comfortable position within 20 meters/60 feet of the modules. Meanwhile, each module collects time-stamped measurements, the critical information you'll need for a proper diagnosis.

When you download the data later, it reveals a large current variance, an increase in amperage, and an over-heating condition, all with time stamps. You diagnose a drive component issue. The repair can be completed after hours. The system is back up and running quickly, and everyone keeps cool.

#4 Finding intermittent faults on a food processing line

When operating conditions limit access, such as complex production lines with moving parts and rotating equipment, innovative Fluke tools can help you make an assessment without contact. Maybe there's an intermittent fault on the line, but you can't isolate the problem. With the VT02, you can stand at a safe distance and quickly scan a relatively large area. Take a quick survey of the various motors, drives, and mechanical equipment to look for anything generating heat. When you find a hot spot on a robotic arm, you capture a blended visual and thermal heat map image you can find the exact location of the hot spot along with a temperature reading.

Now that you've narrowed it down, you only need to access that one particular piece of equipment. You get your opportunity when the line takes a break. Because of the arm's movement during operation, you can't make measurements with a standard meter. So you secure CNX current modules to the arm at suspect power points.When the line starts up again, you can monitor the readings from a safe distance using the CNX multimeter.

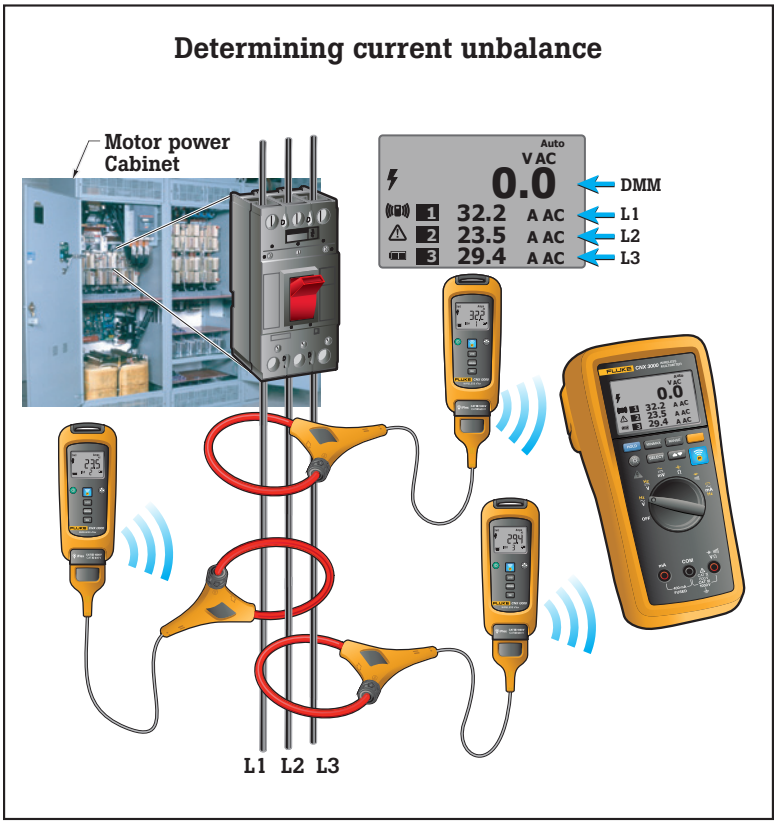
You watch for a few minutes, but the problem doesn't occur while you're standing nearby, so you continue on to other jobs and let the CNX module continue logging the data for you.

A fault occurs late in the shift and the CNX module has captured a time-stamped event, which you discover after you wirelessly download the data to your PC. It's time to pull out the big guns and request that a technician perform a full vibration analysis of the robotic arms using a Fluke 810 Vibration Meter.

#5 Intermittent motor overload

To troubleshoot an intermittent motor overload condition—once you've ruled out a faulty motor—start by connecting the CNX wireless voltage module to the motor starter within the motor control center and the CNX wireless current module to the field disconnect switch adjacent to the motor. Then, while the motor is operating, verify and view the supply voltage and current with the CNX multimeter, while checking temperature with the VT02, to help you narrow down the variables. If the supply voltage drops, the power company has a problem that's overworking the motor. If current draw is excessive, there may be a mechanical problem with the motor, which you can quickly check out with the Fluke 805 to detect overall vibration or to find a faulty bearing. The VT02 will help you identify any areas generating excess heat. If there's heat, but you're not detecting vibration, perhaps the problem is from the load the motor drives. Check to see if vibration in the load is causing the motor to work too hard.

If you can't identify the problem on the spot, just leave the modules in place to log data. Later you can download it for full review and evaluation to isolate the source of the problem.



#6 Diagnosing a three-phase motor without suiting up

If you have a big motor you need to diagnose, such as a 408 V AC 200 HP motor with a wye-delta, you can use the CNX wireless system to test without needing personal protective equipment (PPE). Disconnect power before you open the motor control center (MCC) cabinet. Then connect three hard jaw clamp CNX current modules—one per phase—to measure three-phase current. Or, connect three CNX voltage modules or use a combination of both. Close the MCC cabinet, re-apply power and start the motor. Now you can take all the measurements without PPE. These tests will show you if the motor is working too hard electrically. If it is, you still need to find out why. The 805 will show you mechanical problems. The VT02 will reveal hot spots. Heat with no vibration could help verify internal electrical faults.

#7 Pump occasionally blows a fuse

You have a pump motor that occasionally blows a fuse, and you can't find an obvious cause. Set up a CNX current module, securing it to an electrical disconnect and feeding the module wires through a ½ inch knockout. Now you can monitor the amps wirelessly and discover what's causing the fuse to blow—or at least you'll know the timing of the event. By the next morning, you'll know the exact time when the event occurs.

You may find that at the time of the fault, multiple processes start up, creating an excessive load on a branch circuit, causing a nuisance trip. Resizing the breaker or redistributing the loads may solve this type of problem. It could also be a loose connection. The VT02 is helpful for finding those. Check for hot spots that signal loose connections in the circuit, possibly at one of the loads.

Fluke. *Keeping your world up and running.®*

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Printed in U.S.A. 03/2013 4331701A A-EN