

How to easily troubleshoot a 2-Wire System without breaking the wire path.

- 1) Establish a benchmark for your system by calculating out the approximate mA draw on the system when in good health based on the quantity and type of decoders installed. Multiply your approximate station count by 0.5mA and add 6mA for all sensor decoders installed. If you have 100 decoders on the system and one sensor decoder you should be reading approximately 56 mA draw at the controller. Note this somewhere at the controller location for future reference. If you're reading dramatically more than this established benchmark you've probably got a short or leak to ground on the 2-Wire system.
- 2) Check the LCD display on the controller and look for any alarms, excess mA draw being noted on the LCD or the controller constantly resetting. If the controller is constantly resetting itself, the leak to ground on the 2-Wire path is most likely so high the controller is putting itself into protection mode by resetting itself. Try disconnecting the 2-Wire path at the controller terminal. If the Controller returns to normal operation your problem is definitely on the 2-Wire path not the controller. To operate the controller while there's such a large leak to ground without it constantly resetting you have to effectively reduce the size of the leak. A great way to do this is by introducing greater resistance to the wire path. Wire a regular 24V valve solenoid into one side of the 2-Wire path at the controller to reduce the mA leaking to ground on the wire path. This will stop the controller from constantly resetting.
- 3) Put the controller into short finding mode via the setup/test/short finding menu.
- 4) At the controller location position your Tucor approved clamp meter over each leg (usually Red and Black) of the 2-Wire path making sure that the clamp meter is set to 50/60mHz mode. Identify which wire on the 2-Wire path has the highest mA draw on it let's say 360mA. Ignore the wire path that has the lowest read on it (let's say 356 mA) here on in. Seriously, ignore it. CHASE THE HIGH NUMBER! If the highest mA draw is located on, let's say the red wire **only** read mA draw on the Red wire here on in. Ignore the black wire! Or Vice Versa.
- 5) Once you've established a higher than benchmark mA draw (360mA) at the controller on a single wire path you need to chase it into the field. Ask the someone familiar with the property if there's been any groundwork in the vicinity of the 2-Wire path conducted recently and if so where and note it.
- 6) Go to the closest valve box to the approximate midpoint of the wire path from the controller and check your mA draw on the identified high number wire path (Red). If the number is approximately the same as at the controller (360mA less the draw of the decoders behind you) your leak is still between your current location (at the midpoint) and the rest of the wire path ahead of you out into the field and away from the controller. If the mA read is a lot lower than what you saw at the controller lets say 25ma the leak is between you and the controller location so it's behind you back towards the controller location. If the leak to ground or short is behind you i.e. between your current location (at the midpoint) and the controller the approximate read on your Clamp Meter should be equivalent to approximate number of stations and sensor decoders you have installed ahead of you from that location out into the rest of the system. If there's approximately 50 station decoders and no sensor decoders between your current location (at the midpoint) and the ends of

the wire path system ahead of you, you should be reading approximately 25 mA on the path or 50x 0.5 mA for each of the 50 decoders on that part of the system. This is the current that the decoders are trickle charging off the 2-Wire path to keep their capacitors fully charged and ready to lift their associated solenoids.

- 7) Having established that the leak to ground or short is behind you or between your current location at the midpoint of the system and the controller location we now half the system again and head to the valve box location that's approximately halfway between your current location and the controller. At that point you may be at a three-way splice that reads 360 mA in, 125mA down a side leg and 25mA out to the rest of the system. This means that your large leak to ground or short is again still between your current location and the controller. But you most likely have a smaller leak on the wire path down the side leg. For now, we'll ignore that 125mA draw down the side leg because we have to fix the High Number or the biggest leak first. Remember! Chase the High Number!
- 8) Split the distance again and head back towards the controller. At this next valve box we read 360mA into the three-way splice 210mA down a side leg and 150mA out towards the last splice we checked. The side leg that has a 210 mA read is where the large short or leak to ground is located. There's only two stations on this leg and the last one on the leg isn't working. There's a new tree that's been recently installed adjacent to the 2-Wire path between the last working valve and the non working valve. Guess where the leak to ground is! Dig down to repair the 2-Wire path by installing 2 new valve boxes and pulling enough cable back out of the ground to meet the Tucor cable repair and maintenance guidelines. Add a whole new leg of cable between the two new boxes preferably in a different color so it's clear that's where you did the repair.
- 9) Once this repair is complete head back to the controller and repeat the process. If you remember we saw a 125mA leak at the second splice, we checked in the field but correctly kept chasing the high number. Back at the controller we should now see a read of approximately 56mA draw for all of the station and sensor decoders on the system plus the leak to ground of around 125mA. Head back out into the field to the splice where you saw the 125mA leak down the side leg and identify where the leak or short if located using the same method noted above, repair it and make your way back to the controller. The controller now reads 60mA. You're in the zone! There may be some loss on the path but it's minimal and tolerable for the system.

Great Job! You just successfully fixed your 2-Wire controller using the best technique, tools and practice and you didn't break any of your wire path causing yourself more problems and a potential weak spot in the future. Using this technique, you should be able to troubleshoot any 2-Wire system that's Short Finding capable and identify the locations of your issue (s) in the field within seven steps or less.

Make sure to visit www.tucor.com for more installation tips, troubleshooting advice or support.