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Automation Service News

The Newsletter of Delta Automation Inc.

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Tech Tip!

Quick Resistance Test for Modbus Plus Systems

A typical Modbus Plus system segment consists of metallic media with a characteristic resistance of between 60 to 80 Ohms. For purposes of this discussion, a segment is the portion of a system contained between two terminating resistors which utilizes metallic cable for its' media.

The specifications for this typical segment are, that it must be less than 1500 feet in length, be properly grounded, depending on the connectors utilized, and in resistance between the two main conductors be within 60 to 80 Ohms. This basic resistance measurement is the easiest, quickest method to determine the overall health of the segment.

Although this is not a complete system check, it is a quick go/no-go for opens and shorts. In addition it can also help to indicate poor or improper connections and, excessive cable length.

The proper terminating resistors are 120 Ohms in resistance. With one resistor at each end, basic Ohms Law indicates that the resulting resistance will be 60 Ohms. This is the minimum level of resistance permitted. A reading below this usually indicates an additional termination point has been installed or a partial short along the cable. As cable and connections are added, the resistance will increase proportionately to the maximum of 80 Ohms and beyond. Since there is unlikely an equal length of cable between each and every node or connection, the total resistance reading will not indicate the same at all points along the system. Therefore, the system resistance reading should be taken at each end where the terminating resistors are located.

This reading is best done with all nodes disconnected, but for emergencies, it can be performed with the devices connected. However; this is only for locating *gross* faults.

Once it is determined that the reading is, or is not within specification (60-80 Ohms), then further action or troubleshooting can commence.

Most often the next step is to perform a test with a TDR to determine the source of the incorrect reading. The TDR will indicated shorts, resistive or open connections, a defective cable or even excessive cable length. All of these items can cause an incorrect resistance reading.

These tests are a part of the certification process which Delta Automation, Inc. incorporates in its' Modbus Plus Network certifications.

Analog Scaling of Inputs & Outputs

Scaling is necessary on analog input or output module values so calculations can be performed. The scaled values are often referred to as engineering units. Several terms are associated with scaling. Raw value is the signal produced by or to the analog module. Raw value range is the expected value range of the analog signal. Interpreted value is the value interpreted by the I/O module. Interpreted value range is the predefined value range produced by the I/O module. Scale factor (SF) is a constant based on the interpreted range and engineering range. Engineering range is the range defined by the desired scale. First calculate the SF using the formula.

$$SF = \frac{\text{Engineering Units}_{\text{high value}} - \text{Engineering Range}_{\text{low value}}}{\text{Interpreted Range}_{\text{high value}} - \text{Interpreted Range}_{\text{low value}}}$$

The scaled value (SV) can be calculated using formula:

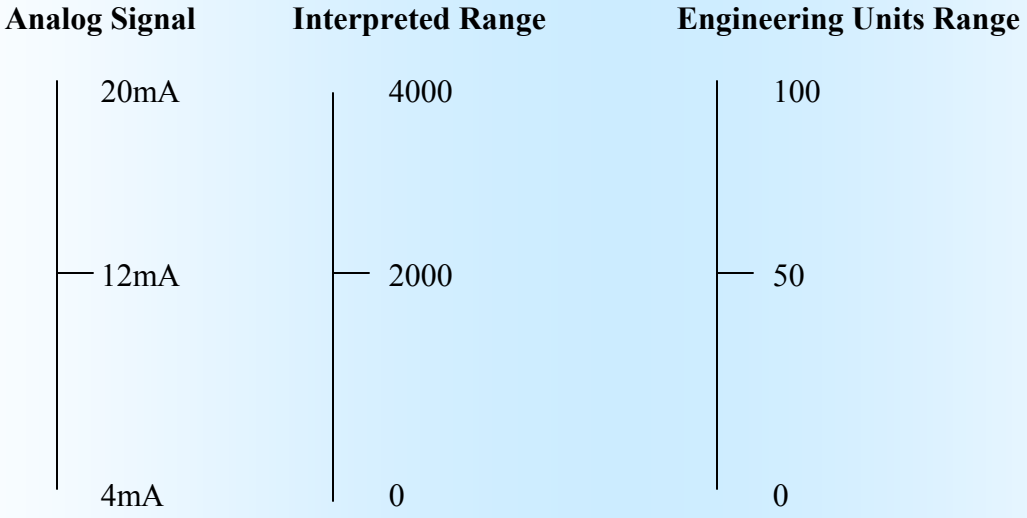
$SV = ((\text{Interpreted Value} - \text{Interpreted Range}_{\text{low value}}) * SF) + \text{Engineering Range}_{\text{low value}}$

Let's suppose we use a Compact Analog input module, (AS-BDAU-206) configured for Unipolar Mode with an offset and Extended Resolution (0-4000), using a 4 to 20 mA current signal. For this example we will define the engineering range as 0 to 100.

Step one would yield a scale factor of .025 $SF = \frac{100-0}{4000-0} = \frac{1}{40}$ or .025

We know if we put a 12mA signal to an Input module, we expect to read a value in the assigned 3XXX register that is half the full range in the interpreted range or 2000 in this case. When we apply the formula for SV, then the scale value should be 50.

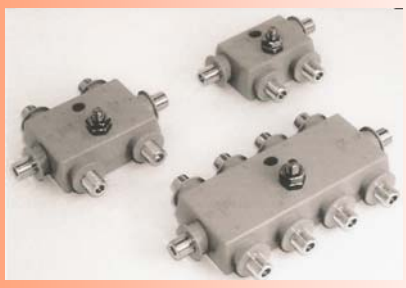
SV=((2000-0)*0.025) +0 =50 So a 4mA signal would equal 0 in engineering units and 20mA would equal 100 in engineering units.



When applying ladder logic to the formula you may use the integer math blocks, however if you require better precision, we suggest you use the extended math function blocks (EMTH).

(Source reference: White paper by George Caudle 11/14/2000)

Remote I/O Taps with Integral Lightning Protection



During a recent on-site service call, Delta Automation, Inc. was asked to start up an outside installation of 25 remote drops located over a two acre site. Some locations contained more than one drop, and lightning protection was an issue. For this RG-11 quad-shield system, the Relcom taps were selected. These taps come in several styles and port layouts. They have gas discharge surge protection at each of the ports to absorb high currents induced by near lightning strikes. Only specific ports may be used on Modicon remote I/O systems due to phasing issues. Additionally, the drop losses are –20dB as opposed to the –14dB of the standard Modicon specified tap. This needs to be considered when designing a system utilizing these devices. If you have a need for this type of device on your remote I/O system, please contact Delta Automation, Inc.

RG-11 Quad Shield Connectors

Since the demise of the Raychem EZF-11 Quad shield connector several years ago, there have been several types of connectors that have been suggested replacements. In most cases, the replacement functions well with a *particular* cable. Where problems occur, is when different styles of jacket or different manufacturers are substituted and the same connector is expected to perform.

If the connector does not properly fit the cable, the entire system is subject to intermittent operation at best.

With RG-11 Quad cable, there are two basic issues: the center conductor/stinger connection and the shield/barrel connection. The RG-11 center conductor is typically a copper clad steel 14 AWG wire. This must be coupled to an 18 AWG “stinger”. This is accomplished one of several ways. Some have reverse facing teeth which allow the center conductor to go in, but not pull out. The other types have “petals” that fold over the center conductor and grip it with teeth as it is inserted.

The shield to barrel connection is usually dependant on the connector being able to collapse onto the shield. This dimension is critical. If the cable is too big or too small, the connector either will not fit onto the cable or it will not collapse enough to properly grip it. Another variable in this equation is the jacket itself. It must be flexible enough to allow the connector to slip under it to connect properly to the shield.

The most important consideration is to make sure that the connectors utilized are designed to fit the brand and type of cable used, as recommended by the *connector manufacturer*.

Important Info

An important issue on all types of variable frequency drives is the maintenance of the cooling fans. On smaller horsepower units there is usually only one fan. The bigger drives have sometimes two or three fans. These units typically have filter media of some type that must be kept clear and clean.

As we all know, filters get better with age and use, they not only filter out the impurities but eventually filter out even the air. There must be airflow to properly cool the internal electronics. Some drives have circuitry to monitor the fans performance, or lack of, and give an alarm to the front panel (if so equipped) or to an external alarm. Some models of drives monitor the very presence of the fans electronically before allowing the unit to pass power up diagnostics. If the fans have failed or have been disconnected for some reason (during troubleshooting for instance) the drive may exhibit some fault. Occasionally this fault may seem erroneous depending upon the manufacturers method of detecting these errors.

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For after hours

Emergency Service or Parts

Call our main number 888-723-3582

Extension 55

Leave a message and someone will respond within fifteen minutes to answer your call.

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