Application Note

Remote Start Wiring Integrity Monitoring for Emergency Standby using the DGC-2020 Family

Recent revisions to the NFPA 70 2017 edition of the NEC code requires monitoring of the integrity of remote start wiring for emergency standby gensets, and immediate automatic starting of the gensets if wiring integrity has been compromised.

The Basler Electric family of genset controllers is capable of meeting these requirements strictly by configuring settings and implementing a logic scheme with no additional hardware. This means cost savings to customers while being compliant with regulatory requirements to reduce reliability risk in the emergency power supply. Overall, customers will improve the safety and security of their onsite power system.

Sections 695.14(F) and 700.10(D)(3) of the NEC Tentative Interim Agreement (TIA) 17-17 require the integrity of standby generator remote start circuit wiring to be monitored. In the event of broken, disconnected, or shortened wires, the event must be annunciated, and the generators must start automatically.

TIA 17-17 has been adopted in the NFPA 70 2020 edition of the NEC code. While the enumeration of some of the referenced sections has changed, the content remains the same. Generator control wiring requirements are now listed in section 700.10. (D)(4), which references section 700.10. (D)(2).

In many emergency power installations, automatic transfer switches (ATS) provide the remote start signal to the standby generator(s). The DGC-2020 family of genset controllers performs the ATS function by receiving a contact input from an ATS, or setting the ATS logic element true through a combination of programmable logic. Once the ATS contact input is true or the ATS logic element is set, the emergency generator starts up and comes online.

Generally, an ATS has a set of contacts available to indicate when it is in the normal or the emergency position. This configuration requires a three wire circuit, which allows monitoring of the integrity of the wiring, based on the status of the contacts as illustrated in Table 1.

Scenario	Contact Positions		Start Circuit Status
	Normally Open	Normally Closed	
1	Closed	Open	Emergency Standby Mode - Send Start Signal
2	Open	Open	Remote Start Wiring Compromised - Send Start Signal
3	Closed	Closed	Remote Start Wiring Compromised - Send Start Signal
4	Open	Closed	Utility Power Mode - No Start Signal Needed

Table 1: Remote start wiring contact states

When the utility's power is lost, the normally open contact closes, and the normally closed contact opens. If any off the two contacts are in the same position, this is indication of a fault in the circuit. If both contacts are open, there is an open circuit fault, or disconnected wires. If both contacts are closed, there is a short circuit fault. In some systems, the remote start wiring circuit contacts are de-energized to send the start signal to initiate standby mode. The logic will be need to be inverted in that case.

The Basler Electric genset controllers are easily configurable to achieve the desired functionality shown in Table 1 without adding any hardware. In fact, the DGC-2020HD is fully capable of performing the ATS function without a physical ATS in the system, if the mains breakers, tie breakers, and generator breakers are configured for such operation. By simply terminating two wires at two different contact inputs, the user can create a logic scheme as shown in Figure 1 that will achieve the NEC 2017 TIA 17-17 requirement.

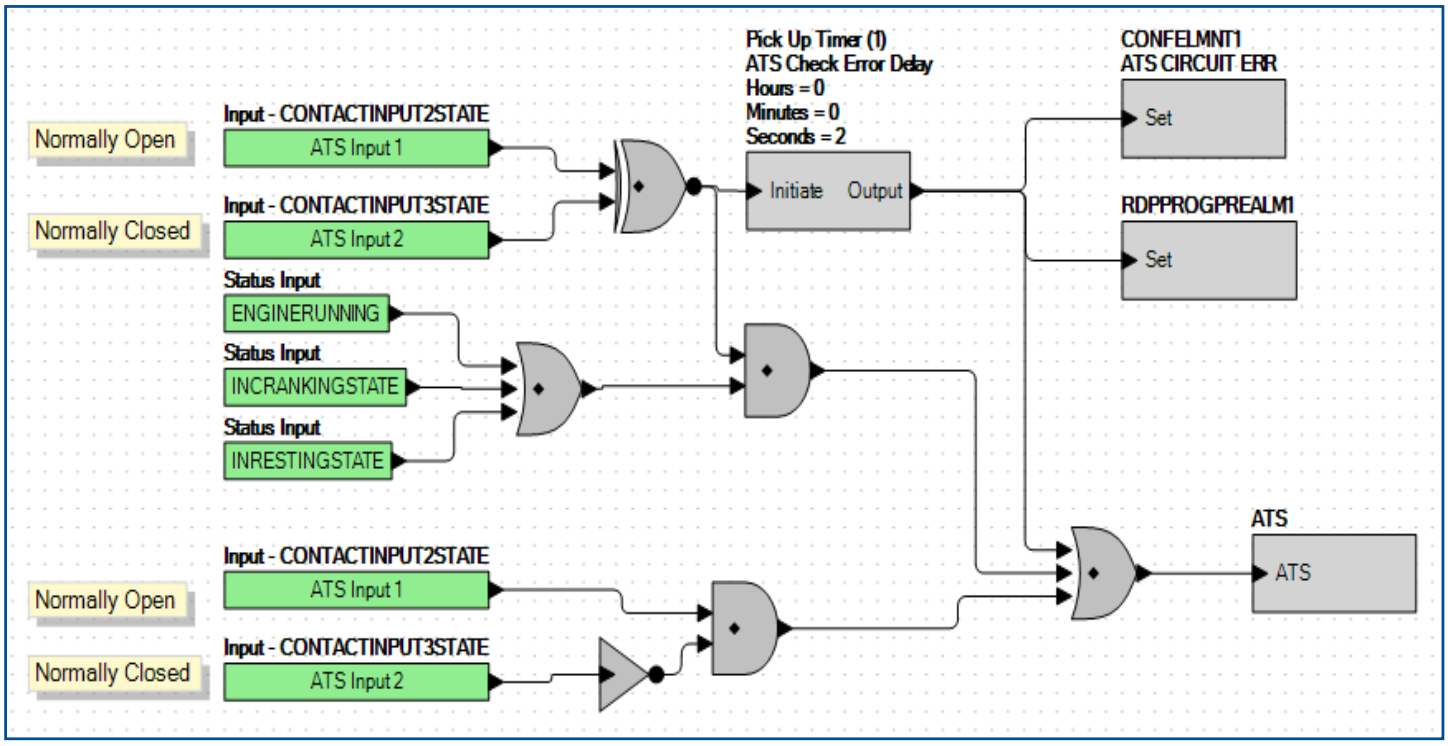

Figure 1: Logic scheme for two wire remote start wiring integrity monitoring

The normally open and normally closed contacts are connected to an and gate. Once the output of the and gate is true, the ATS logic element will be set, representing scenario 1 in Table 1.

To detect a faulty circuit, ATS input 1 & ATS input 2 are connected through an XNOR gate. The output of the XNOR gate is only true when both of the inputs are the same, representing scenarios 2 and 3 in Table 1 above. The output of the XNOR gate goes through a brief time delay before setting the ATS logic element to account for the transition time between contact operations. When switching contacts, there will be short times where the two contacts would be in the same state. Without the timer this will result in short bumps of the ATS logic element.

Once a faulty circuit is detected, after a two second delay, the ATS logic element will be set, the RDP programmable pre-alarm will annunciate, and the configurable element will be set. Setting the ATS logic element will result in a genset starting and coming online. The RDP has programmable pre-alarm elements available, one of which can be used to annunciate a remote start circuit wiring fault.

Another scenario that is accounted for, is when an engine is already running due to a true ATS start, and then a fault develops in the remote start wiring circuit (scenario 2 or 3). The true ATS signal will no longer be present, but a fault mode ATS signal will be initiated immediately after the time delay. Jogging the engine in this manner will cut out and restart fueling, leading to potential engine damage. The logic scheme in Figure 1 addresses this by diverting the "faulty circuit present" bit around the timer to set the ATS logic element with no time delay when the engine is running or cranking.

In summary, the Basler Electric Family of Digital Genset Controllers meet the NEC 2017 Edition TIA 17-17, positioning customers to be compliant the requirements of monitoring the integrity of remote start wiring, annunciating fault conditions, and remotely starting gensets when a fault condition occurs. Customer will avoid the costs of purchasing additional modules and integrating more equipment into their power system, thus limiting the number of points of failure in the system. In addition, customers will enhance the reliability of their onsite power supply.

To immediately address this need, users can create a logic scheme similar to the one shown in Figure 1 without the need for any additional hardware. In a future firmware release, this logic will be hard coded for both 2 and 3 wire remote start circuits in the DGC-2020ES, the DGC-2020, and the DGC-2020HD. Customers will be able to choose an option for a 2 or 3 wire remote start circuit.

For more information

For more information on the DGC-2020 family of genset controllers, download the product bulletins or instruction manuals at www.basler.com. For assistance with product orders or questions, visit www.basler.com/support, contact your Application Engineer, or contact Technical Support at +1 618.654.2341.

Basler Electric®

Highland, Illinois USA
Tel +1 618.654.2341
Fax +1 618.654.2351
email: info@basler.com

Suzhou, P.R. China
Tel +86 512.8227.2888
Fax +86 512.8227.2887
email: chinainfo@basler.com

Quality System Certification
Basler
ISO 9001:2015