MEMBER
EGSA Electrical Generating Systems Association

NEC 2017 Provision 700.10(D)(3) Generator Control Wiring REVIEW

MANUFACTURERS' REPRESENTATIVE
STOCKING DISTRIBUTOR
MANUFACTURER

Daytona Beach, Florida
Chicago, Illinois

What is the National Electric Code?

The National Electric Code (NEC) is a regionally adoptable standard for the safe installation of electrical wiring and equipment in the United States.

It is also known as **National Fire Protection Agency 70** or **NFPA 70**.

It is updated every three (3) years.

Despite the name “national”, it isn’t federal law.

It is typically adopted by states individually.

The authority having jurisdiction typically inspects to this standard or cites it.

It isn’t retroactive or punitive.

NEC® in Effect 4/1/2021

2020 NEC
- Georgia

2017 NEC
- Florida
- Kentucky
- Michigan
- North Carolina
- Ohio
- South Carolina
- Tennessee
- West Virginia

2014 NEC
- Alabama

2008
- Indiana

2020 NEC® - 11
2017 NEC® - 25
2014 NEC® - 8
2008 NEC® - 2
County/Municipality NEC® regulation only - 4

Source: dynaplo.net (c)

Puerto Rico is currently NEC 2017

National Electric Code 2017 Provision 700.10(D)(3)
Generator Control Wiring

Original Provision

Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(1). The integrity of the generator control wiring remote start circuit shall be continuously monitored for broken, disconnected, or shorted wires. Loss of integrity of the remote start circuit(s) shall initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and start the generator(s).

National Electric Code 2017 Provision 700.10(D)(3)
Generator Control Wiring Tentative Interim Amendment (TIA)

Deleted from Provision by the TIA Effective September 3rd, 2018

Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.10(D)(1). The integrity of the generator ~~control wiring~~ remote start circuit shall be ~~continuously~~ monitored for broken, disconnected, or shorted wires. Loss of integrity ~~of the remote start circuit(s)~~ shall ~~initiate visual and audible annunciation of generator malfunction at the generator local and remote annunciator(s) and~~ start the generator(s).

National Electric Code 2017 Provision 700.10(D)(3)
Generator Control Wiring

Final Provision

Generator control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of **700.10(D)(1)**. The integrity of the generator remote start circuit shall be monitored for broken, disconnected, or shorted wires. Loss of integrity shall start the generator(s).

Simplified Version

Quite simply, remote start wiring between the automatic transfer switches(s) or switchgear and the generator controller(s) needs to be monitored for failure. If the wiring fails (open or short) the generator will start. No alarm is required, but additional fire protection for the remote start circuit wiring may be required depending on the building application.

See 700.10(D)(1) Fire Protection to follow…

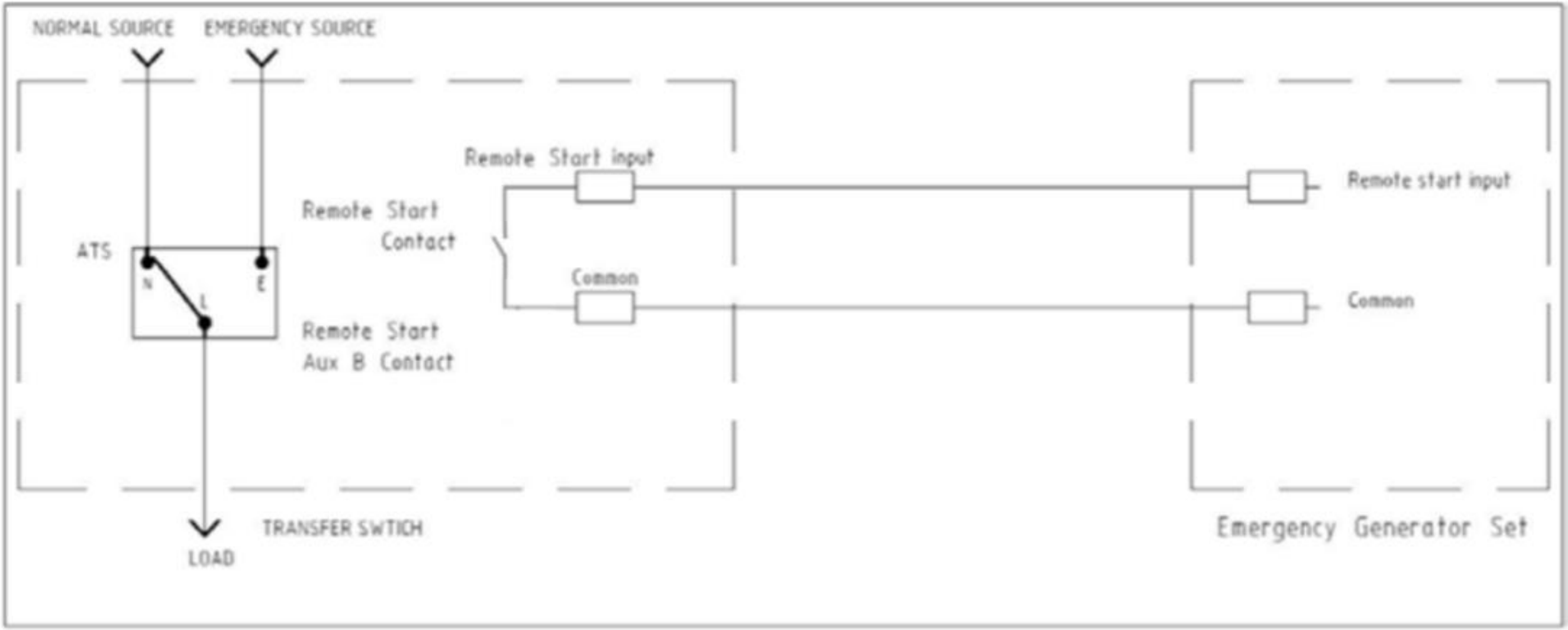
700.10(D)(1) Fire Protection

If the application has any of the following building conditions, it will be required to have additional fire protection for the remote start wiring.

- *Assembly occupancies for not less than 1000 persons*
- *Buildings above 23 m (75 ft) in height*
- *Health care occupancies where persons are not capable of self preservation*
- *Educational occupancies with more than 300 occupants*

Typical Two-wire **Normally Closed** Generator Control Wiring (Also known as Remote Start Circuit)

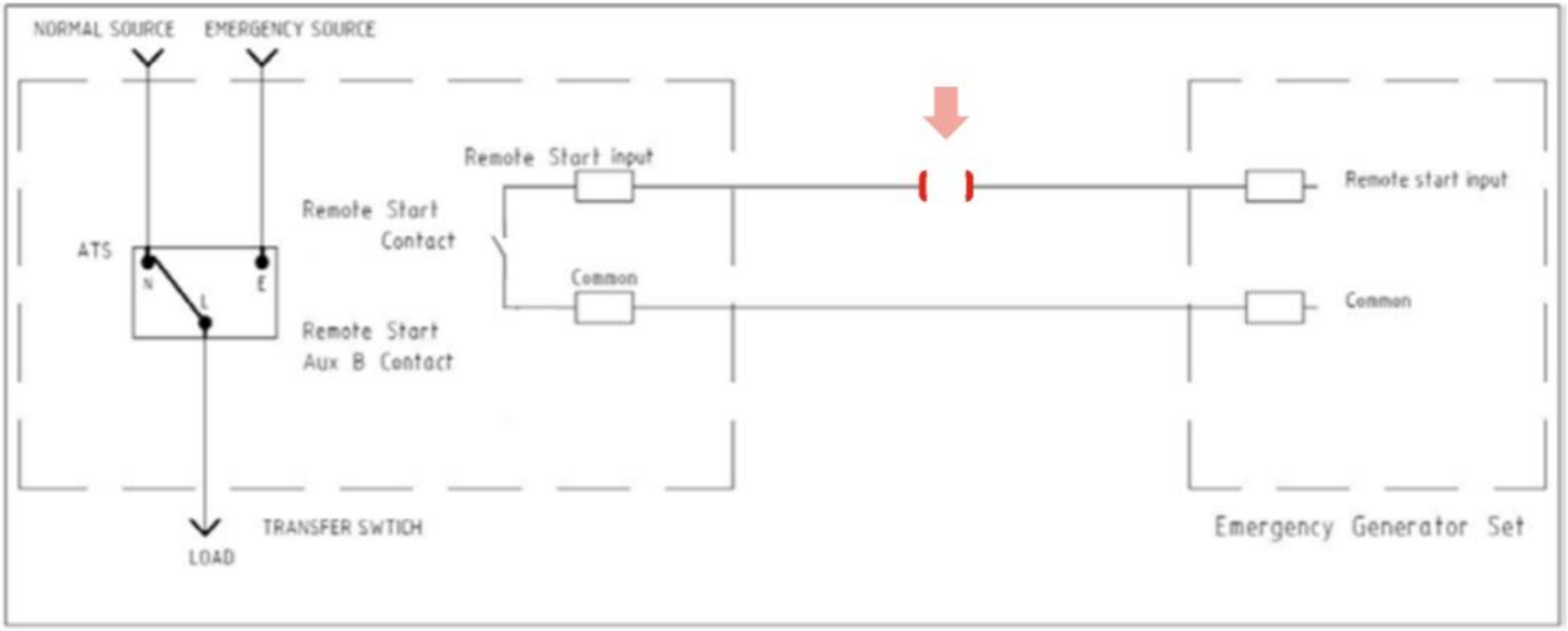
NORMAL OPERATION



Typical Two-wire Generator Control Wiring

FAULT: Open, Line Break or Disconnected

NO START SIGNAL



Typical Two-wire Generator Control Wiring

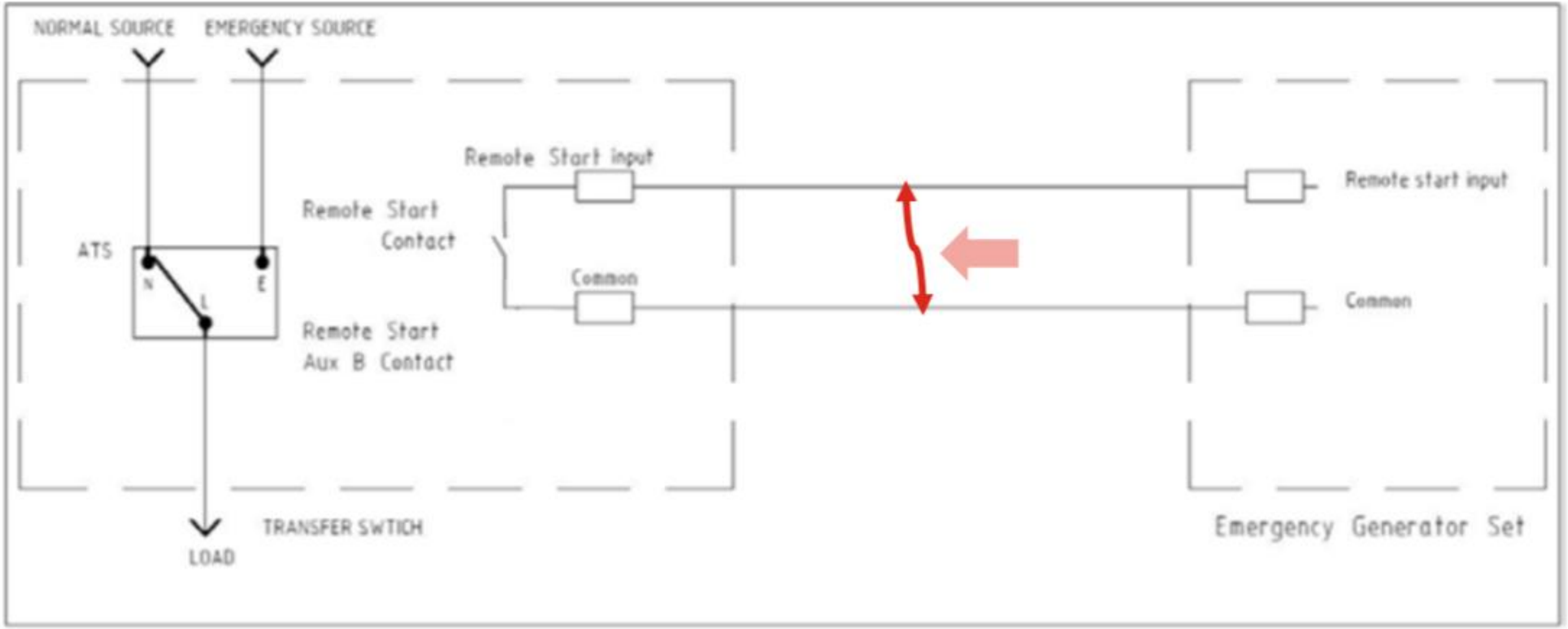
OPEN FAULT

In the event of an open two-wire remote start circuit the generator will fail to start, when the utility power fails, an ATS(s) has been manually selected to initiate a transfer or an exercise timer has automatically activated a loaded or unloaded run. During a utility failure, the lack of emergency power will be an immediate indicator of a failure in the Emergency Power Supply System. There will be no remote annunciator indication of a fault. The generator can be started manually and the transfer switch(s) will transfer as normal. Upon the return of utility power, the transfer switch(s) will transfer to utility power and the generator will need to be shut-off manually. Once again, no indication on the remote annunicator of a failure or fault.

Typical Two-wire Generator Control Wiring

FAULT: Line Short

IMMEDIATE START SIGNAL WITH UTILITY POWER AVAILABLE



Typical Two-wire Generator Control Wiring

SHORT FAULT

In the event of a shorted two-wire remote start circuit, the utility will be suppling power and the generator will start and run until either the wiring failure has been discovered or the generator fuel source is no longer available. Without load and undiscovered, that run time could be a week or more. Assuming the utility power is better quality than the generator output, the transfer switch will maintain normal or utility power without transferring. No remote annunciator indication of a fault or failure. The generator will require a manual shutdown before the troubleshooting begins.

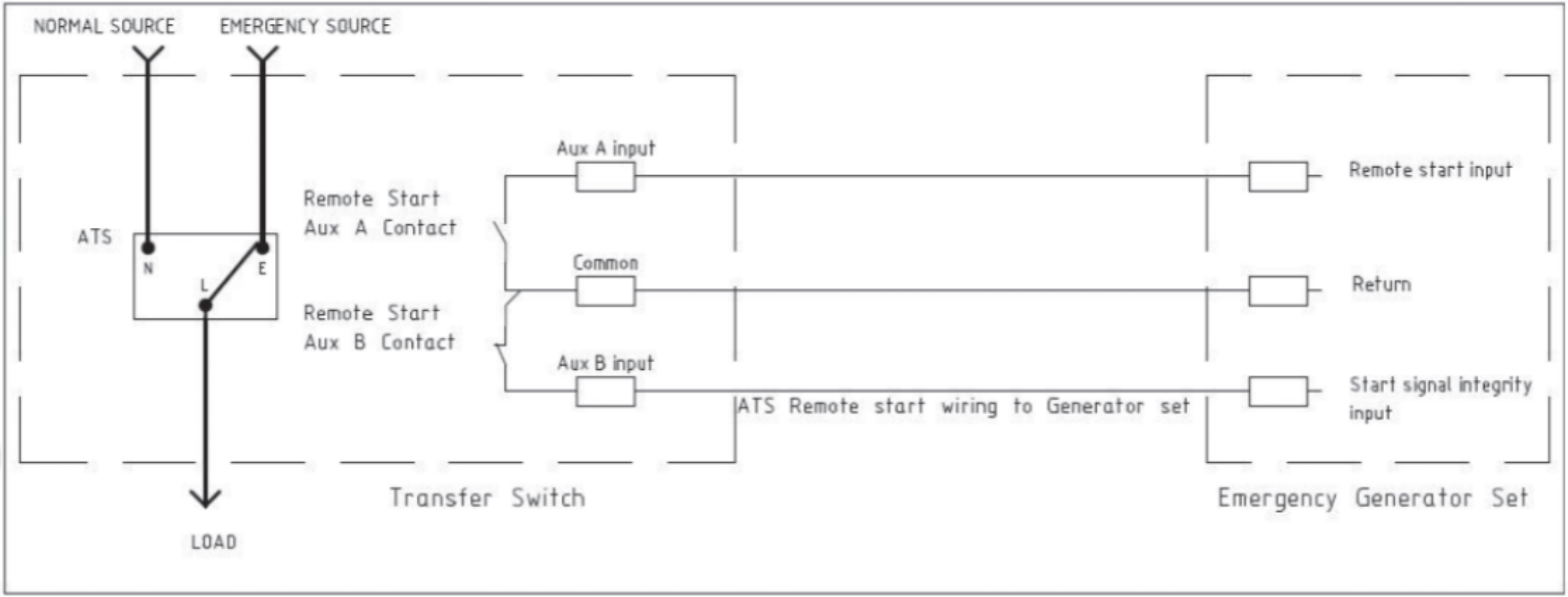
MAINTENANCE CONSIDERATIONS

Any NEC Article 700 **Emergency System** or NEC Article 701 **Legally Required Standby System**, should have an inhouse owner/operator or outside vendor maintenance program that includes verifying the weekly required exercise of the generator by witnessing the event or documenting the hourmeter readings. This maintenance operation will capture the point of failure within one week of normal standby operation (an unaccounted power failure notwithstanding).

Additionally, the owner/operator or outside vendor should be initiating a simulated utility outage from a different transfer switch at least once per month as a function of testing the individual transfer switches and the remote start wiring thereof. Each transfer switch should be tested to initiate a transfer at least once every twelve months. This maintenance operation will immediately capture the fault upon failure.

Compliant Three-wire Generator Control Wiring

NORMAL OPERATION

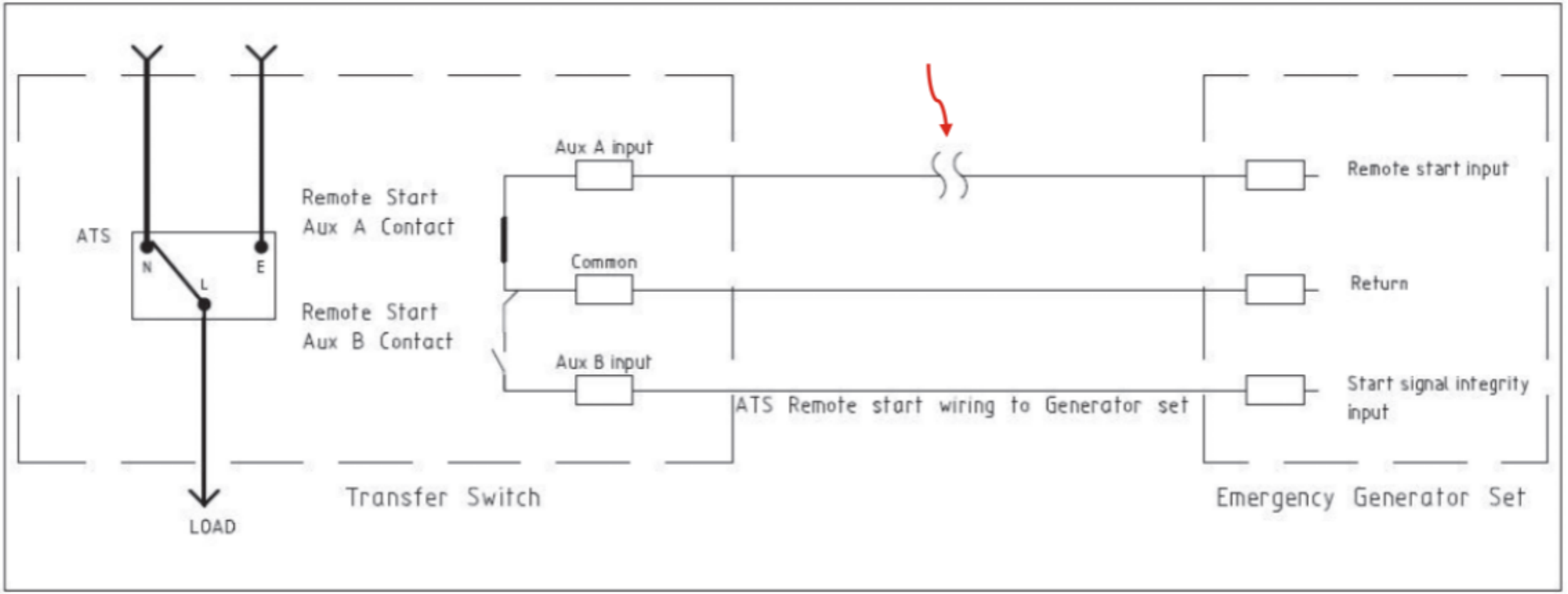


Compliant Three-wire Generator Control Wiring

FAULT: Aux A Input; Open, Line Break or Disconnected

Aux B Input Normal Operation

Aux B Input START SIGNAL

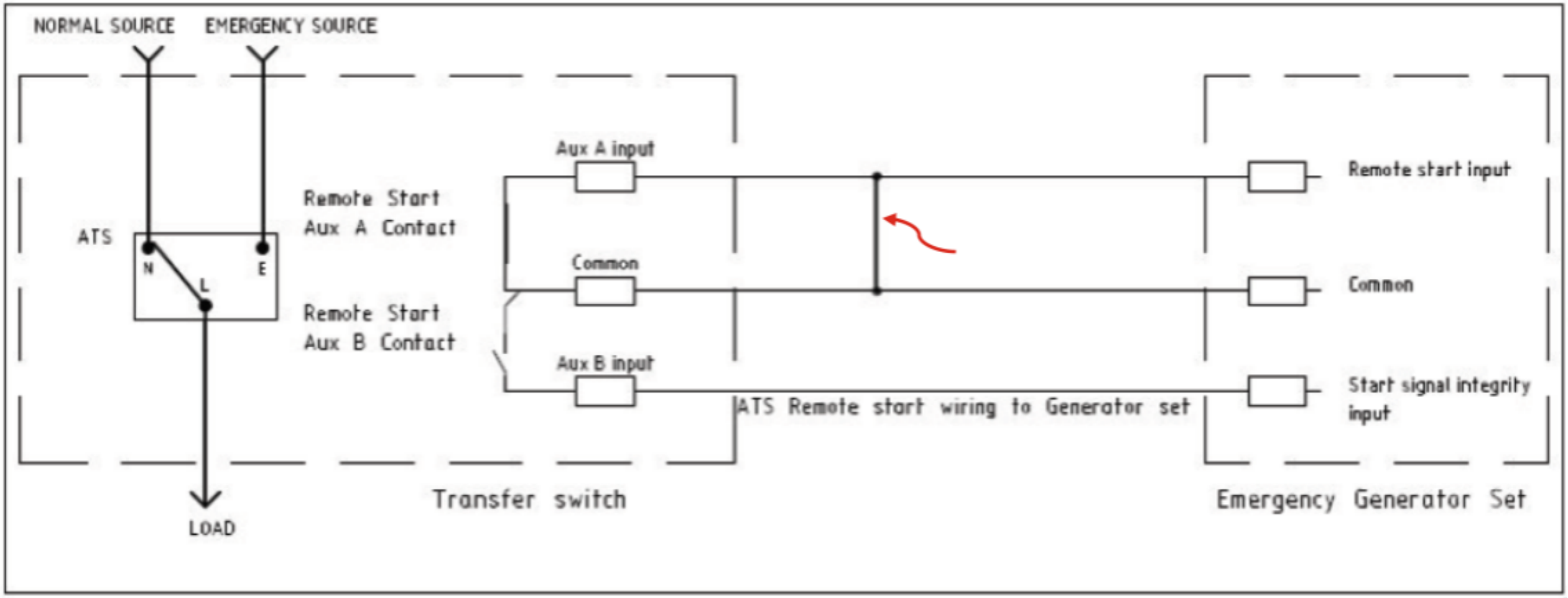


Compliant Three-wire Generator Control Wiring

FAULT: Aux A Input; Line Short

Aux B Input Normal Operation

Aux B Input START SIGNAL



Updating a Two-wire Remote Start Circuit to Compliant Three-wire

Since most two-wire generator remote start circuits consist of a normally open circuit and the three-wire generator remote start circuit consist of both a normally open and normally closed circuit, the addition of a normally closed circuit to both the generator controller and the ATS(s) or switchgear can effectively update the traditional two-wire remote start circuit to compliance with an additional common wire and programming an additional output on the ATS(s) or switchgear and an additional input on the generator controller. No additional logic, relays or expensive devices required, assuming you have additional I/O on both ends of the circuit.

Compliant Three-wire Generator Control Wiring
For use with a Temporary Generator & Permanently Wired Generator Docking Station

If a permanent site generator and ATS(s) or switchgear have this system installed and they use a docking station for the connection of a temporary generator, they would require a **three-point terminal strip** for the connection for the remote start circuit as a parallel connection to the existing three-point remote start circuit.

Requirement: Three-point Terminal Strip on the Docking Station

We provide this information to serve our customers and their business interests. We endeavor to provide the most accurate information possible. With code or compliance related information, it is subject to change or revision. Please use this document as a reference tool regarding National Electric Code 2017 Provision 700.10(D)(1).

If you discover an error or a critical omission, please contact us and we will update our data accordingly.

Davidson Sales Company