



Generator systems are used to provide standby emergency backup power to the utility supply across a wide range of industries and applications. In many applications the generator system is located remotely at unattended applications such as backup power to a cell phone tower. In addition to the needs of monitoring a remote location, many generator systems provide backup power to life and economic critical applications including healthcare and data-base facilities. Regulatory bodies and codes writers for generator applications require these applications to have planned maintenance programs to ensure the generator system is maintained in a state of readiness to ensure it starts and can take the load when the primary power goes offline. A generator system is a combination of multiple components and many users prefer constant monitoring of all functions of the system to ensure issues are detected and corrected before the generator is required. This Information Sheet discusses remote annunciation of generator systems, their operation, regulatory bodies and the importance of adopting remote annunciation in many applications.

### 1.0 ADVANTAGES OF REMOTE ANNUNCIATION:

A remote annunciator panel, as defined in the dictionary, "is a bell, light, or other device that provides information on the state or condition of something by indicating which of several electrical circuits has been activated."

In power applications, the operational state of an engine and generator system can be accessed away from where the engine, generator or piece of equipment it is monitoring. The remote version allows users and operators to be made aware of the systems' operational status and any potential issues without a constant, on-site local presence.

**Figure One - Typical Nodes Monitored by an Annunciator Panel**

Fault and Status Conditions	Fault LEDs	Fault Horn	System Ready LED	Generator Running LED	Communication Status LED
Overcrank Shutdown	Red	On	Red	Off	Green
High Engine Temperature Warning	Yellow	On	Red	Green	Green
High Engine Temperature Warning Shutdown	Red	On	Red	Off	Green
Low Oil Pressure Warning	Yellow	On	Red	Green	Green
Low Oil Pressure Shutdown	Red	On	Red	Off	Green
Overspeed Shutdown	Red	On	Red	Off	Green
Emergency Stop	Red	On	Red	Off	Green
Low Coolant Level/Aux. Shutdown	Red	On	Red	Off	Green
Low Coolant Temperature	Yellow	On	Red	Off	Green
Low Cranking Voltage	Yellow	On	Red	Off	Green
Low Fuel - Level or Pressure	Yellow	On	Red	Green or Off	Green
Not-In-Auto	Red	On	Red	Green or Off	Green
Common Fault	Red	On	Green	Green or Off	Green
Battery Charger Fault (1)	Yellow	On	Red	Green or Off	Green
Battery Charger Fault (2)	Yellow	On	Green	Green or Off	Green
High Battery Voltage	Yellow	Off	Green	Green or Off	Green
Low Battery Voltage	Yellow	Off	Green	Green or Off	Green
User Input #1 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #1 (Shutdown)	Red	On	Green	Off	Green
User Input #2 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #2 (Shutdown)	Red	On	Green	Off	Green
User Input #3 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #3 (Shutdown)	Red	On	Green	Off	Green
User Input #4 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #4 (Shutdown)	Red	On	Green	Off	Green
User Input #5 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #5 (Shutdown)	Red	On	Green	Off	Green
EPS Supplying Load	Yellow	Off	Green	Green	Green
Communications Status (Fault mode)	-	Off	Green or Red	Green or Off	Red
ATS Fault	Red	On	Red or Yellow	Green or Off	Green

Green LEDs appear as steady on when activated.

Yellow LEDs slow flash when activated except steady on with EPS supplying load and high battery voltage.

Red LEDs slow flash when activated except fast flash with loss of communication and not-in-auto.

The installation information provided in this information sheet is informational in nature only, and should not be considered the advice of a properly licensed and qualified electrician or used in place of a detailed review of the applicable National Electric Codes and local codes. Specific questions about how this information may affect any particular situation should be addressed to a licensed and qualified electrician.

## 1.0 ADVANTAGES OF REMOTE ANNUNCIATION (CONTINUED):

An annunciator panel enables the operational status and parameters of the generator system to be sent to another location remote from the generator location. The annunciator panel can be hard-wired to a control room and via an Ethernet connection transmitted remotely to a remote computer.

The advantages to the user and service provider are:

- 1.1 Convenient Generator Location for Any Given Application** - It is not always convenient or practical to locate the generator adjacent to an existing or proposed primary power (i.e., utility) input and control room. With an annunciator panel a generator can be located remotely in the most convenient location, whether this is another part of the facility such as outside or on the roof.
- 1.2 Predictability/Reliability** - A good example is generators in a network of health facilities across a multi State area receiving planned maintenance programs from a single network service provider that undertakes regularly scheduled maintenance checks. A remote annunciator can telemetrically feed the status of key components. The service technician can arrive on site forewarned of any issues which is particularly useful in remote areas far from a parts supply.
- 1.3 Remote Start** - Should a service provider or operator wish to check on the operational readiness of a generator system they have the ability to remote start the generator and read the status of the system.
- 1.3 Safety/Cost Effective** - Identifying issues prior to them becoming an issue avoids the adverse impact of generator failure.

## 2.0 NFPA 110 LEVEL 1:

Generator systems installed in applications following the National Fire Protection Association (NFPA) 110 codes have to comply with the monitoring as defined by NFPA 110. The generator functions monitored for NFPA 110 are detailed in figure-two.

## 3.0 ANNUNCIATOR OPERATIONAL SYSTEM AND NODES SENSED:

Figure - Two: Monitoring Functions for NFPA Compliance			
Engine Functions			General Functions
High battery voltage warning	Low coolant level/aux. shutdown	Low oil pressure shutdown	Audible alarm silence
High engine temp. shutdown	Low coolant temp. warning	Low oil pressure warning	Battery charger fault
High engine temp. warning	Low cranking voltage	Overcrank shutdown	Lamp test
Low battery voltage warning	Low fuel warning (level or PSI)	Overspeed shutdown	Master switch not-in-auto

Functions of the generator system follow the internationally accepted CAN standards. A Controller Area Network (CAN bus) was developed as a robust vehicle bus standard designed to allow micro controllers and devices to communicate with each other's applications without a host computer. The CAN system is used by generator system manufacturers as a multi-master serial bus standard for connecting Electronic Control Units (ECUs) also known as nodes.

Figure-one, page one, details a typical generator numbering system for the various communication nodes monitored in a generator system.

By adoption of an international system, manufacturers can use monitoring equipment developed by a wide range of suppliers. The advantage to generator users and operators is they can communicate with generators of various manufacturers should their facility and/or network have various sizes of generators from different manufacturers.

## 4.0 OPERATION OF A REMOTE ANNUNCIATOR SYSTEM:

The annunciator is hard wired through 12/24 volt DC hard wiring to the various output and input devices of the generator. The annunciator can be connected in several configurations.

- 4.1 Local Direct Wire Connection** - In this mode the annunciator feeds to the Automatic Transfer Switch (ATS) and the generator set controller. The annunciator's hard wire feeds to the controller and all the nodes being monitored on the generator system. Frequently the generator set is installed away from the generator controls and ATS. The generator controls and ATS could be inside the facility with the generator outside the facility. In this case the annunciator would be hard wired to the ATS and generator controller for operators and service technicians to read generator operation from the control room. Hard wiring has maximum recommended lengths between generator annunciator and controller/ATS, typical no more than 4000 ft.
- 4.2 Remote Communication Via the Ethernet** - Many generator manufacturers will also supply the software for a user/service technician to read all the outputs from the annunciator via a desktop or portable PC. In this mode the annunciator feeds to the Automatic Transfer Switch (ATS) and the generator set controller. The annunciator's hard wire feeds to the controller all the nodes being monitored on the generator system. The controller then via an Ethernet connection transmits to the internet or can be sent via a router for a wireless connection to the internet.

## 5.0 FURTHER READING AND REFERENCES:

The following should be consulted for more information on remote annunciation panels for use with generator systems:

- 5.1 Your Local Authorized Generator Distributor** - Your generator distributor is very experienced in the application and operation of annunciator panels applied to generator systems. Consult with them regarding accessing your generator functions remotely.
- 5.2 NFPA** - The NFPA is one of the principal bodies whose codes are used by local authorities and specifiers in the application of generator systems.  
<https://www.nfpa.org/Codes-and-Standards/All-Codes-and-Standards/Free-access>

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CANAL WINCHESTER, OH  
8155 Howe Industrial Parkway  
Canal Winchester, OH 43110  
(614) 751-4515  
(866) 889-2628

CINCINNATI, OH  
4992 Rialto Road  
West Chester, OH 45069  
(513) 755-2323  
(800) 368-7422

CLEVELAND, OH  
8465 Tower Drive  
Twinsburg, OH 44087-0394  
(330) 425-9165  
(800) 966-2825

TOLEDO, OH  
12400 Williams Road  
Perrysburg, OH 43551  
(855) 638-2728

CHICAGO, IL  
1308 Marquette Drive  
Romeoville, IL 60446  
(630) 914-3000

INDIANAPOLIS, IN  
1707 S. Franklin Road  
Indianapolis, IN 46239  
(317) 271-9661  
(800) 632-0339

FORT WAYNE, IN  
7525 Maplecrest Road #221  
Fort Wayne, IN 46835  
(855) 638-2721