

Five Points to Consider When Connecting and Monitoring an Engine Via a Gateway

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Introduction

System Integrators (SIs) in the heavy-duty vehicle industry agree that their biggest headache is integrating a diesel generator (the combination of a diesel engine and electric generator) with the large variety of diesel generator monitoring systems (DGMSs) or programmable logic controllers (PLCs). The job is complicated by the many different communication protocols and interfaces used in the industry, arduous pre-configuration methods, and time-consuming troubleshooting.

The Emergence of DGMSs

The monitoring of diesel generators has taken on a much more important role in power generation as more emphasis is placed on Overall Equipment Efficiency (OEE). A continuous power supply as well as high-voltage power is required to maintain nonstop operations in mission-critical industries, such as backup power systems, automatic transfer switches (ATSs), heavy-duty trucks, and tractors. Diesel generators have been widely adopted as power generation instruments because they are deployed easily at any field site or industrial plant, and they don't take up a lot of space. Their implementation costs are also very low.



A DGMS monitors the status of a diesel engine or a diesel generator, including voltage, amperage, RMS, PR, RMO, and other parameters. It also sets off an alarm in the case of an engine failure. Additional monitoring functions pertain to the generator's fuel status, including fuel pressure and fuel consumption (especially to alert the control room when thefts occur).

A Global Positioning System (GPS) located at the field site transmits the data to a control room. Furthermore, some diesel generator plants also use an auto-on/off mechanism preconfigured by an engineer. When the engine switches on or off, the engineer is notified.

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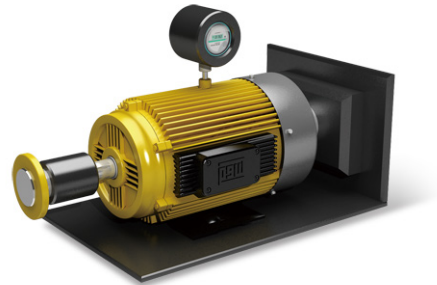
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It should also be mentioned that at some plants, PLC systems are also used to control and monitor diesel generators. Unlike DGMSs, they are mainly used to control and monitor diesel generators according to the logic control program configured by an engineer.

Getting It Right

When dealing with so many different types of DGMSs or PLCs—which vary from application to application, country to country, and design to design—it is necessary to find the right protocol gateway to achieve integration. Most diesel generators run the CAN-SAE J1939 protocol, which enables communication and diagnostics among vehicle components, diesel generators, and compression engines, and is suitable for the heavy-duty truck industry and backup power systems at field sites. On the other hand, DGMSs and PLCs employ a number of different protocols. Some DGMSs or PLCs use Modbus, whereas others use Ethernet/IP or PROFIBUS; it all depends on the vendor, the country, and the industry.



Hence, a protocol conversion gateway is required to connect the diesel generator to a DGMS or PLC, functioning as a communication bridge between J1939 and Modbus, EtherNet/IP, or other protocols. However, simply acquiring and setting up a protocol gateway is easier said than done. Installation and maintenance turn out to be quite tricky for field engineers when bridging a diesel generator with a DGMS or PLC via a protocol gateway.

In many cases, SIs have to buy different gateways from different vendors, each with its own configuration methodology. Of course, the most obvious solution is to find a provider that offers various models catering to the large variety of DGMS/PLC systems out there. The snag, however, is that SIs still have to buy many different kinds of models to get the job done—and a big purchase requires a big budget. The reason behind the large number of required models is that, for example, many DGMSs and PLCs support up to four different protocols, requiring SIs to get four different models, each supporting one of the four supported protocols, to bridge communication between diesel generators and DGMSs or PLCs.

All-In-One Design

The trend among protocol gateway providers is to design gateways that have identical hardware in order to minimize I/O interfaces, thereby cutting costs on hardware spending. Moreover, the various configuration interfaces, i.e., the software functions, have been consolidated into one software suite, eliminating the need for users to download a lot of different firmware files to execute different protocol conversions. A comprehensive software program benefits users in that they only have to work with one type of configuration interface, and no longer need to familiarize themselves with many different configuration interfaces. Users simply have to choose any of the two required protocols from a list provided via a web console for the intended protocol conversion to be carried out.

Bridging Diesel Generators and DGMSs or PLCs

A number of factors need to be considered before SIs set their sights on a gateway that best fits their purposes. These factors are discussed in more detail below:

1. *Setting J1939 Manually*

A diesel generator might have a lot of J1939 Parameter Group Number (PGN) commands, which, depending on the diesel generator, the engineer may need to key in manually. This is a time-consuming operation prone to human error. A well-designed gateway should support a command-learning function, allowing it to learn all the J1939 PGN input commands in only a few steps. Even if many J1939-supported devices are deployed on the same CAN bus, the gateway will be able to recognize each J1939-supported device, with its J1939 commands, individually on the same CAN bus. The operational efficiency will be much higher, and the total cost of ownership will be lower.

2. *A Web Console for Easy Configuration*

It is safe to say that most field engineers are knowledgeable about J1939 and know how to set it up, and they may also know enough about DGMSs and PLCs. However, they may not be as familiar with protocol gateways, which are not always easy to set up. The easiest way to set up a gateway is through a web console, making the installation of an additional vendor-provided utility unnecessary. All that is required is a laptop with an Ethernet cable and a web browser to log in to the web page of the protocol gateway.

3. *A Shrapnel-Type Terminal Block*

A shrapnel-type terminal block is preferred over a screw-type terminal block since cables tend to come loose in the latter after a long period of use, often due to vibrations. Furthermore, an extension cable slot for a CAN (Control Area Network) bus is also required to allow CAN devices to connect in a daisy-chain topology. For this reason, a shrapnel-type terminal block with separate inbound and outbound slots is required as it is more suitable for daisy-chain wiring.

4. *A Built-In SD Card Design*

Many SIs can vouch for just how time-consuming it is to configure all the gateways at a site, since the configuration process usually involves repeating the same configuration method for each gateway. A gateway with a built-in SD card slot can save SIs time and frustration in this regard. After setting up the first gateway, the configuration instructions can be automatically stored on the SD card, which can then be used to complete the configuration of the rest of the gateways. The engineer only needs to insert the SD card and turn on the gateway. All the configurations will be set in the new gateway automatically, freeing up valuable time for engineers.

5. *Easy Troubleshooting*

Field engineers are often unfamiliar with protocol gateways, which to them are essentially third-party devices. They tend to struggle to connect the gateway to the DGMS/PLC correctly, since they do not know enough about the communication protocols. A built-in traffic monitor function monitors J1939 protocol traffic, permitting users to monitor the status of the

connected CAN devices, including error count, packet count, and bus-offline. The traffic monitor function can also be used to troubleshoot CAN-supported devices. Furthermore, the diagnostic tool helps users check CAN device settings and indicates the availability of CAN devices by reading the J1939 network address.

Moxa Solutions

Moxa's MGate 5118 series does away with the need to purchase, deploy, and set up multiple devices to perform various protocol conversions. In a single device, it supports the protocol conversions for J1939 to Modbus RTU/ASCII, Modbus TCP, PROFINET, or EtherNet/IP, which are the mainstream protocols used in the field. Furthermore, the Moxa MGate 5118 provides an innovative command-learning mechanism. All you need to do to set a J1939 command is click on the AutoLearn button through a web console; the user interface will show you how many J1939 devices are connected to a daisy-chain CAN bus. It also displays the J1939 input commands of each J1939 device, and reduces human error by cutting back on the time spent manually keying in all the J1939 commands. To learn more, visit <http://www.moxa.com/Event/Tech/2016/J1939/index.htm>

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