INSTRUCTION MANUAL

FOR

DGC-2020ES

DIGITAL GENSET CONTROLLER

Quick Start





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Preface

This instruction manual provides basic installation and setup information for the DGC-2020ES Digital Genset Controller. To accomplish this, the following information is provided:

- Mounting
- Terminals and connectors
- Typical applications
- BESTCOMSPlus[®] software
- Configuration
- BESTlogic[™]Plus
- Controls and indicators

Conventions Used in this Manual

Important safety and procedural information is emphasized and presented in this manual through Warning, Caution, and Note boxes. Each type is illustrated and defined as follows.

Warning!

Warning boxes call attention to conditions or actions that may cause personal injury or death.

Caution

Caution boxes call attention to operating conditions that may lead to equipment or property damage.

Note

Note boxes emphasize important information pertaining to Digital Genset Controller installation or operation.

DGC-2020ES Instruction Manual Catalog

Available instruction manuals for the DGC-2020ES are listed in Table 1.

Table 1. Instruction Manuals

Part Number	Description	
9469200993	Quick Start (this manual)	
9469200994	Installation	
9469200995	Configuration	
9469200996	Operation	
9469200997	Accessories	

Basler Electric

12570 State Route 143 Highland IL 62249-1074 USA www.basler.com info@basler.com Tel: +1 618.654.2341 Fax: +1 618.654.2351

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Warning!

READ THIS MANUAL. Read this manual before installing, operating, or maintaining the DGC-2020ES. Note all warnings, cautions, and notes in this manual as well as on the product. Keep this manual with the product for reference. Only qualified personnel should install, operate, or service this system. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

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The English-language version of this manual serves as the only approved manual version.

DGC-2020ES

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Introduction

This manual provides basic installation and setup information for the DGC-2020ES Digital Genset Controller. For complete information refer to the appropriate DGC-2020ES instruction manual.

Caution

This Quick Start manual is intended for use by qualified personnel only.

Default Settings

Each DGC-2020ES is delivered with default settings that are based on average values and may not be appropriate for your application. All settings must be properly configured for your application before running the engine-generator set.

Warning!

Do not place the DGC-2020ES controller into service until all settings have been properly configured.

Features and Functions

The DGC-2020ES Digital Genset Controller provides integrated engine-genset control, protection, and metering in a rugged and economical package. Its features set make the DGC-2020ES ideal for standalone genset applications where paralleling or load sharing is not required. Microprocessor based technology allows for exact measurement, setpoint adjustment, and timing functions. Front panel controls and indicators enable quick and simple DGC-2020ES operation. Basler Electric communication software (BESTCOMS*Plus*[®]) allows units to be easily customized for each application. Because of the low sensing burden in the DGC-2020ES, dedicated potential transformers (PTs) are not required. A liquid crystal display (LCD) with backlighting can be viewed under a wide range of ambient light and temperature conditions.

The DGC-2020ES Digital Genset Controller has the following features:

- Generator Control
- Engine and Generator Protection
- Automatic Transfer Switch Control (Mains Failure)
- Automatic Generator Configuration Detection
- Programmable Analog Engine Senders
- Seven Programmable Contact Inputs
- Programmable Logic
- Exercise Timer
- ECU Communications via SAE J1939
- Additional contact input/output module available to expand the capabilities of the DGC-2020ES

DGC-2020ES Digital Genset Controllers perform the following functions:

Generator Protection and Metering

Multifunction generator protection guards against generator overvoltage, undervoltage, reverse power, loss of excitation, underfrequency, overfrequency, and overcurrent. Each generator protection function has an adjustable pickup and time delay setting.

Metered generator parameters include voltage, current, real power (watts), apparent power (VA), and power factor (PF).

Engine Protection and Metering

Engine protection features include oil pressure and coolant temperature monitoring, overcrank protection, ECU specific protection elements, and diagnostic reporting.

Metered engine parameters include oil pressure, coolant temperature, battery voltage, speed, fuel level, engine load, coolant level (from ECU), ECU specific parameters, and run-time statistics.

Event Recording

An event log retains a history of system events in nonvolatile memory. Up to 30 event types are retained and each record contains a time stamp of the first and last occurrence, and the number of occurrences for each event.

Contact Inputs and Outputs

DGC-2020ES controllers have seven programmable contact inputs. All contact inputs recognize dry contacts. The programmable inputs can be configured to initiate a pre-alarm or alarm. An input can be programmed to receive an input from an automatic transfer switch. Inputs can also be programmed to override DGC-2020ES alarms and protection functions. Each input can be assigned a user-defined name for easy identification at the front panel display and in fault records.

Output contacts include three dedicated relays for energizing an engine's glow plugs, fuel solenoid, and starter solenoid. Four additional user-programmable output contacts are provided.

Additional contact inputs and output contact requirements can be accommodated with an optional CEM-2020 (Contact Expansion Module). Contact Basler Electric for ordering information.

Automatic Transfer Switch Control (Mains Failure)

The DGC-2020ES can detect a mains failure via a single- or three-phase bus input. A mains failure is established when any one of the following conditions are met:

- Any phase of bus voltage falls below dead the bus threshold
- Any phase of bus voltage is unstable due to overvoltage or undervoltage
- Any phase of bus voltage is unstable due to overfrequency or underfrequency

At this time, the DGC-2020ES will start the genset and when ready, apply power to the load via the genset. The DGC-2020ES implements open transitions to and from the mains. When the mains returns and is considered stable, the DGC-2020ES will transfer the load back to the mains.

Communication

DGC-2020ES communication features include a standard USB port for local (and temporary) communication, SAE J1939 interface for remote communication, and RS-485 interface for communication with an optional Remote Display Panel.

USB Port

The USB communication port can be used with BESTCOMS*Plus* software to quickly configure a DGC-2020ES with the desired settings or retrieve metering values and event log records.

CAN Interface

The CAN interface provides high-speed communication between the DGC-2020ES and the engine control unit (ECU) on an electronically controlled engine. This interface provides access to oil pressure, coolant temperature, and engine speed data by reading these parameters directly from the ECU. When available, engine diagnostic data can also be accessed. The CAN interface supports the following protocols:

 SAE J1939 Protocol - Oil pressure, coolant temperature, and engine speed data are received from the ECU. In addition, DTCs (Diagnostic Trouble Codes) help diagnose any engine or related failures. The engine DTCs are displayed on the front panel of the DGC-2020ES and may be obtained using BESTCOMS*Plus*[®] software. MTU Protocol - A DGC-2020ES connected to a genset equipped with an MTU ECU receives oil
pressure, coolant temperature, and engine speed data from the engine controller, along with
various alarms and pre-alarms that are MTU specific. In addition, the DGC-2020ES tracks and
displays the active fault codes issued by the MTU engine ECU.

Style Number

Standard-order DGC-2020ES controllers are identified by a style number which consists of a combination of letters and numbers that define the controller's electrical characteristics and operational features. The model number, together with the style number, describes the options included in a specific controller. Figure 1 illustrates the DGC-2020ES style number identification chart.



Figure 1. DGC-2020ES Style Chart

For example, a DGC-2020ES with style number **5A2**, has the following characteristics and features.

- 5 5 Aac Current Sensing Inputs
- A Analog Senders
- 2 Mains Failure Detection

Optional Features and Capabilities

CEM-2020 (Contact Expansion Module)

The optional CEM-2020 provides 10 additional contact inputs and 18 or 24 additional output contacts (depending on module type) to the DGC-2020ES. The CEM-2020 communicates with the DGC-2020ES through a CAN interface. Refer to the *CEM-2020* chapter in the *Accessories* manual for more information.

Remote Display Panel

The optional Remote Display Panel provides remote indication of many pre-alarm and alarm conditions. The DGC-2020ES communicates with the Remote Display Panel through an RS-485 interface. Refer to the *Communication* chapter in the *Configuration* manual for more information.



Mounting

DGC-2020ES controllers are delivered in sturdy cartons to prevent shipping damage. Upon receipt of a unit, check the part number against the requisition and packing list for agreement. Inspect for damage, and if there is evidence of such, immediately file a claim with the carrier and notify the Basler Electric regional sales office or your sales representative.

If the device is not installed immediately, store it in the original shipping package in a moisture- and dustfree environment.

Hardware

The front panel is resistant to moisture, salt fog, humidity, dust, dirt, and chemical contaminants. DGC-2020ES controllers are mounted using the four permanently attached 10-24 studs. The torque applied to the mounting hardware should not exceed 20 inch-pounds (2.2 newton meters).

Dimensions

Panel cutting and drilling dimensions are shown in Figure 2. Overall dimensions are shown in Figure 3. All dimensions are shown in inches with millimeters in parenthesis.









Terminals and Connectors

All DGC-2020ES terminals and connectors are located on the rear panel. DGC-2020ES terminals consist of a mini-B USB socket and plug-in connectors with spring clamp terminals.

Figure 4 illustrates the rear panel terminals. Locator letters in the illustration correspond to the terminal block and connector descriptions in Table 1.



P0067-84

Figure 4. Rear Panel

Locator	Description
A	The majority of external, DGC-2020ES wiring is terminated at 8- or 15-position connectors with spring clamp terminals. These connectors plug into headers on the DGC-2020ES. The connectors and headers have a dovetailed edge that ensures proper connector orientation. Each connector and header is uniquely keyed to ensure that a connector mates only with the correct header. Spring clamp terminals accept a maximum wire size of 12 AWG.
В	The mini-B USB socket mates with a standard USB cable and is used with a PC running BESTCOMS <i>Plus®</i> software for local communication with the DGC-2020ES.

Table 1. Rear Panel Terminal and Connector Descriptions

Note

Be sure that the DGC-2020ES is hard-wired to earth ground with no smaller than 12 AWG copper wire attached to the chassis ground terminal (terminal 16) on the rear of the controller.

Operating power from the battery must be of the correct polarity. Although reverse polarity will not cause damage, the DGC-2020ES will not operate.

For the DGC-2020ES to correctly meter power factor, the generator must be rotating clockwise (A-B-C).

Typical Connections

Typical connection diagrams are provided in this chapter as a guide when wiring the DGC-2020ES for communication, mechanical senders, contact inputs and outputs, sensing, and control power.

Connections for Typical Applications

Typical connections for applications using three-phase wye, three-phase delta, single-phase AB, and single-phase AC generator voltage sensing are shown on the following pages.

Figure 5 illustrates typical three-phase wye generator voltage sensing connections.



Figure 5. Three-Phase Wye Connections for Typical Applications



Figure 6 illustrates typical three-phase delta generator voltage sensing connections.

Figure 6. Three-Phase Delta Connections for Typical Applications



Figure 7 illustrates typical single-phase A-B generator voltage sensing connections.

Figure 7. Single-Phase A-B Connections for Typical Applications



Figure 8 illustrates typical single-phase A-C generator voltage sensing connections.

Figure 8. Single-Phase A-C Connections for Typical Applications

CAN Connections

Typical CAN connections are shown in Figure 9 and Figure 10.



 The J1939 drain (shield) should be grounded at one point only. If grounded elsewhere, do not connect the drain to the DGC-2020ES.



Figure 9. CAN Interface with DGC-2020ES Providing One End of the Bus





CEM-2020 Connections

The CEM-2020 (Contact Expansion Module) is an optional module that may be installed with the DGC-2020ES. It is a remote auxiliary device that provides additional contact inputs and outputs for the DGC-2020ES. This module interfaces to the DGC-2020ES via CAN, thus the CAN terminals are the only common connections (Figure 11) between the DGC-2020ES and CEM-2020. Refer to the *CEM-2020* chapter for more information.

Refer to Terminals and Connectors for details on DGC-2020ES CAN connections.



Figure 11. DGC-2020ES and CEM-2020 CAN Connections

Installation for CE Systems

For CE compliant systems, it may be required to route ac voltage and current sensing wires separately from other wires.

Installation in an Ungrounded System Application

When the DGC-2020ES is controlling equipment that is part of an ungrounded system, it is recommended that potential transformers be employed on the voltage sensing inputs to provide full isolation between the DGC-2020ES and monitored voltage phases.

BESTCOMS*Plus*[®]

BESTCOMS*Plus* provides the user with a point-and-click means to set and monitor the DGC-2020ES. BESTCOMS*Plus* uses plugins, allowing the user to manage several different Basler Electric products. The DGC-2020ES plugin must be activated before use. The plugin can be activated automatically by connecting to a DGC-2020ES, or manually by requesting an activation key from Basler Electric.

Figure 12 illustrates the typical user interface components of the DGC-2020ES plugin with BESTCOMS*Plus*.



Figure 12. Typical User Interface Components

Installation

Note Do not connect a USB cable until setup completes successfully. Connecting a USB cable before setup is complete may result in errors.

Download BESTCOMSPlus

DGC-2020ES controllers are delivered with a CD-ROM that contains BESTCOMS*Plus* software and instruction manuals. If a CD-ROM is not available, use the following procedure to download BESTCOMS*Plus* from the Basler Electric website.

- 1. Navigate to <u>https://www.basler.com/Downloads</u>.
- 2. Select DGC-2020ES from the model drop down menu.
- 3. Under the Software heading, click the download link for BESTCOMSPlus.
- 4. Sign in or create an account to continue with the download.

Install BESTCOMSPlus from CD

When BESTCOMS*Plus* installation is complete, a Basler Electric folder is added to the Windows programs menu. This folder is accessed by clicking the Windows *Start* button and then accessing the Basler Electric folder in the *Programs* menu. The Basler Electric folder contains an icon that starts BESTCOMS*Plus* when clicked.

Activation of the DGC-2020ES Plugin

The DGC-2020ES plugin is a module that runs inside the BESTCOMS*Plus* shell. The DGC-2020ES plugin contains specific operational and logic settings for only the DGC-2020ES. Uploading settings to the DGC-2020ES is possible only after activating the DGC-2020ES plugin.

The DGC-2020ES plugin can be activated automatically or manually. Automatic activation is achieved by using a USB cable to establish communication between the DGC-2020ES and BESTCOMS*Plus*. Manual activation is initiated by contacting Basler Electric for an activation key and entering the key into BESTCOMS*Plus*. Manual activation is useful if you want to create a settings file prior to receiving your DGC-2020ES. Refer to *Manual Activation of DGC-2020ES Plugin*.

Connect a USB Cable

The USB driver was copied to your PC during BESTCOMS*Plus* installation and is installed automatically after powering the DGC-2020ES. USB driver installation progress is shown in the Windows taskbar area. Windows will notify you when installation is complete.

Connect a USB cable between the PC and your DGC-2020ES. Apply control power to the DGC-2020ES. Wait until the boot sequence is complete.

Start BESTCOMSPlus® and Activate the DGC-2020ES Plugin Automatically

To start BESTCOMS*Plus*, click the Windows *Start* button, point to *Programs*, *Basler Electric*, and then click the *BESTCOMSPlus* icon. During initial startup, the *BESTCOMSPlus Select Language* screen is displayed (Figure 13). You can choose to have this screen displayed each time BESTCOMS*Plus* is started, or you can select a preferred language and this screen will be bypassed in the future. Click *OK* to continue. This screen can be accessed later by selecting *Tools* and *Select Language* from the menu bar.

BESTCOMSPlus® Select Language		
Deutsch English español français Português pycckul 中文(简(本)旧版	BESTCOMSPlus® Startup Show Dialog Jse Selected Language	

Figure 13. BESTCOMSPlus Language Selection Dialog

The BESTCOMS*Plus* platform window opens. Select <u>New Connection</u> from the <u>Communication</u> pull-down menu and select *DGC-2020ES*. See Figure 14. The DGC-2020ES plugin is activated automatically after connecting to a DGC-2020ES.

	New Concertion		
	New Connection		New Device
	Close Connection		BE1-11
	Download Settings and Logic from Device		DECS-250
	Upload Settings and Logic to Device		DGC-2020
	Upload Settings to Device		DGC-2020ES
	Upload Logic to Device Download Security from Device		DGC-2020HD
			IEM-2020
	Upload Security to Device		Load Share Module
	Configure		PCS-250
	Upload Device Files		RTD Module

Figure 14. Communication Pull-Down Menu

The DGC-2020ES Connection screen, shown in Figure 15, appears.

DGC-2020ES Connection	
COM Port 6 USB	Connect
	Advanced Close

Figure 15. DGC-2020ES Connection Dialog

Select *COM Port.* The USB drivers are installed automatically during the BESTCOMS*Plus* installation process. To select the correct *COM Port*, open the Windows Device Manager and expand the *Ports* (*COM & LPT*) branch. Locate the device named *CP2101 USB to UART Bridge Controller (COMx)*. The *COM Port* number will be displayed in parenthesis (*COMx*). Be sure control power is applied to the DGC-2020ES and the USB cable is connected before opening the Device Manager. See Figure 16.

🚽 Device Manager	3	
<u>File Action View H</u> elp		
▲ · I Ports (COM & LPT)		
Silicon Labs CP210x USB to UART Bridge (COM6)		

Figure 16. Device Manager

The DGC-2020ES plugin opens indicating that activation was successful. You can now configure the DGC-2020ES communication ports and other settings.

Installing the USB Driver if Automatic Installation Fails

To install the USB driver for the DGC-2020ES:

- 1. Apply control power to the DGC-2020ES and wait for the boot sequence to complete.
- 2. Connect a USB cable between the PC and DGC-2020ES.

- 3. The Found New Hardware Wizard dialog box appears.
- 4. Select "No, not this time" and select Next to continue.
- 5. Choose to "Install from a list or specific location (Advanced)" and select Next to continue.
- 6. Insert the CD-ROM labeled BESTCOMSPlus into the PC CD-ROM drive.
- 7. Navigate to C:\Program Files\Basler Electric\BESTCOMS*Plus*\USBDeviceDrivers\ and select *Next* to continue.

When installation of the driver is complete, you may be asked to restart your computer.

Manual Activation of the DGC-2020ES Plugin

Manual activation of the DGC-2020ES plugin is required only if your initial use of BESTCOMS*Plus* will be on a PC that is not connected to a DGC-2020ES. Manual activation is described in the following paragraphs.

Requesting an Activation Key

When initially running the DGC-2020ES plugin, the *Activate Device Plugin* pop-up appears. You must contact Basler Electric for an activation key before you can activate the DGC-2020ES plugin. You can request an activation key through email or the Basler Electric website. Click either the *Website* or *Email* button. Click the *Activate* button when you are ready to enter the activation key you received from Basler Electric. The *Activate Device Plugin* pop-up appears. Refer to Figure 17.

Entering an Activation Key

Select DGC-2020ES from the *Device* pull-down menu. Enter your *Email Address* and *Activation Key* provided by Basler Electric. If you received an email containing the *Activation Key*, you can select all of the text in the email and copy it to the Windows clipboard using normal Windows techniques. The *Get Data* button will extract the *Device, Email Address,* and *Activation Key* from the Windows clipboard and paste it into the appropriate fields. Click the *Activate* button to continue. The *Activate Device Plugin* screen is also found by selecting *Activate Device* from the <u>T</u>ools pull-down menu of the BESTCOMS*Plus* main screen.

Activate Device Plugin
Device
DGC-2020ES
Email Address
name@yourcompany.com
Activation Key
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
Get Data Get data from the Windows clipboard.
Activate device with current data.
Cancel

Figure 17. Activate Device Plugin

Establishing Communication

Communication between BESTCOMS*Plus* and the DGC-2020ES is established by clicking on the Connect button on the DGC-2020ES Connection screen (see Figure 15) or by clicking on the Connect button on the lower menu bar of the main BESTCOMS*Plus* screen (Figure 12). Download all settings and logic from the DGC-2020ES by selecting Download Settings and Logic from the <u>Communication pull-</u>

down menu. BESTCOMS*Plus* will read all settings and logic from the DGC-2020ES and load them into BESTCOMS*Plus* memory. See Figure 18.

ſ	Processing, Please Wait		
	Accessing Settings (Read)		
	(Please Wait)		

Figure 18. Processing, Please Wait...

Advanced Properties

Click the Advanced button on the Connection screen to display the Advanced Properties dialog. Default settings are shown in Figure 19.

Advanced Properties		
Auto Reconnect		
Enable		
Download Settings After Reconnect		
30000 🗘 Delay (ms)		
999999999 C Maximum Number of Attempts		
Miscellaneous		
Download Settings After Initial Connect		
OK Cancel		

Figure 19. Advanced Properties Dialog



Configuration

The DGC-2020ES must be properly configured for operation with a specific application prior to running. An incomplete list of basic settings to consider when configuring the DGC-2020ES is provided below with their locations in BESTCOMS *Plus* and the front panel. Ensure that all settings required for your application are configured in accordance with the generator/engine manufacturer(s) recommendations, authority having jurisdiction, and customer requirements. For detailed information on all settings, refer to the *Configuration* manual.

Basic Settings

For front panel interface components, refer to the *Controls and Indicators* chapter. For BESTCOMSPlus interface components, refer to the *BESTCOMSPlus Software* chapter.

System Settings

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, System Parameters, System Settings **Front Panel Navigation Path:** Settings > System Parameters > System Settings

CAN Bus Setup

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Communications, CAN Bus, CAN Bus Setup **Front Panel Navigation Path:** Settings > Communication > CAN Bus 1 (I/O) Setup and CAN Bus 2 (ECU) Setup

ECU Setup

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Communications, CAN Bus, ECU Setup **Front Panel Navigation Path:** Settings > Communication > CAN Bus 2 (ECU) Setup > ECU Setup

Rated Data

BESTCOMSPlus Navigation Paths: Settings Explorer, System Parameters, Rated Data, Generator Rated Data Front Panel Navigation Paths: Settings > System Parameters > Rated Data, Gen

Remote Module Setup

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, System Parameters, Remote Module Setup **Front Panel Navigation Path:** Settings > System Settings > Remote Module Setup

Crank Settings

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, System Parameters, Crank Settings **Front Panel Navigation Path:** Settings > System Parameters > Crank Settings

Relay Control Settings

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, System Parameters, Relay Control **Front Panel Navigation Path:** Settings > System Parameters > Relay Control

Engine Sender Characteristic Curves Setup: Fuel, Temperature, and Oil

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Programmable Senders **Front Panel Navigation Path:** Not available through the front panel

Contact Inputs

BESTCOMSPlus Navigation Path: Settings Explorer, Programmable Inputs, Contact Inputs

Front Panel Navigation Path: Settings > Programmable Inputs > Contact Inputs

Programmable Functions

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, Programmable Inputs, Programmable Functions

Front Panel Navigation Path: Settings > Programmable Inputs > Programmable Functions

Programmable Output Configuration

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Programmable Outputs, Contact Outputs **Front Panel Navigation Path:** Settings Explorer > Programmable Outputs > Contact Outputs

Configurable Elements

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Programmable Outputs, Configurable Elements **Front Panel Navigation Path:** Settings Explorer > Programmable Outputs > Configurable Elements

Generator Breaker Settings

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Breaker Management, Breaker Hardware **Front Panel Navigation Path:** Settings Explorer > Breaker Management > Breaker Hardware

Mains Breaker Settings

BESTCOMS*Plus*[®] **Navigation Path:** Settings Explorer, Breaker Management, Breaker Hardware **Front Panel Navigation Path:** Settings Explorer > Breaker Management > Breaker Hardware

Generator Protection

BESTCOMS*Plus* **Navigation Path:** Settings Explorer, Generator Protection **Front Panel Navigation Path:** Settings Explorer > Generator Protection

Saving Settings

Front Panel

When settings are configured through the front panel interface, they are automatically saved.

BESTCOMS*Plus*[®]

After the desired settings are configured in BESTCOMSPlus, the settings must be uploaded to a connected DGC-2020ES. Refer to the following procedure to upload settings via BESTCOMSPlus.

- 1. Ensure that communication between a PC running BESTCOMS*Plus* and the DGC-2020ES is established.
- 2. In the Upper Menu Bar, Click Communications > Upload Settings to Device
- 3. You are prompted to enter the password. The default password is "OEM".
- 4. Press Enter or click Log In and the settings are uploaded to the connected DGC-2020ES.

BESTlogic™*Plus*

BESTlogic*Plus* Programmable Logic is a programming method used for managing the input, output, protection, control, monitoring, and reporting capabilities of Basler Electric's DGC-2020ES Digital Genset Controller.

BESTlogic[™]Plus Composition

There are three main groups of objects used for programming BESTlogic*Plus*. These groups are *I/O*, *Components*, and *Elements*. For details on how these objects are used to program BESTlogic*Plus*, see the paragraphs on *Programming BESTlogicPlus*, later in this chapter.

Logic Schemes

A logic scheme is a group of logic variables written in equation form that defines the operation of a DGC-2020ES Digital Genset Controller. Each logic scheme is given a unique name. This gives you the ability to select a specific scheme and be confident that the selected scheme is in operation. One logic scheme is configured for typical control applications and is the default active logic scheme. Only one logic scheme can be active at a given time.

In most applications, preprogrammed logic schemes eliminate the need for custom programming. Preprogrammed logic schemes may provide more inputs, outputs, or features than are needed for a particular application. This is because a preprogrammed scheme is designed for a large number of applications with no special programming required. Unneeded logic block outputs may be left open to disable a function or a function block can be disabled through operating settings.

When a custom logic scheme is required, programming time is reduced by modifying the default logic scheme.

The Active Logic Scheme

Digital Genset Controllers must have an active logic scheme in order to function. All Basler Electric DGC-2020ES units are delivered with a default, active logic scheme pre-loaded in memory. If the function block configuration and output logic of the default logic scheme meets the requirements of your application, then only the operating settings (power system parameters and threshold settings) need to be adjusted before placing the DGC-2020ES in service.

Copying and Renaming Preprogrammed Logic Schemes

Copying a saved logic scheme to the active logic and assigning a unique name is accomplished by loading the saved logic scheme into BESTCOMS*Plus* and then typing over the logic scheme's name. Changes are not activated until the new settings have been saved and uploaded to the device.

Sending and Retrieving Logic Schemes

To retrieve settings from the DGC-2020ES, it must be connected to a computer through a communications port. Once the necessary connections are made, settings can be downloaded from the DGC-2020ES by selecting *Download Settings and Logic* on the <u>*Communication*</u> pull-down menu.

To send settings to the DGC-2020ES, it must be connected to a computer through a communications port. Once the necessary connections are made, settings can be uploaded to the DGC-2020ES by selecting *Upload Settings and Logic* on the <u>*Communication*</u> pull-down menu.



Programming BESTlogic™Plus

Use BESTCOMS*Plus* to program BESTlogic*Plus*. Using BESTCOMS*Plus* is analogous to physically attaching wire between discrete DGC-2020ES terminals. To program BESTlogic*Plus*, use the Settings Explorer within BESTCOMS*Plus* to open the *BESTlogicPlus Programmable Logic* tree branch as shown in Figure 20.



Figure 20. Settings Explorer, BESTlogic Plus Programmable Logic Screen

The drag and drop method is used to connect a variable or series of variables to the logic inputs, outputs, components, and elements. To draw a wire/link from port to port (triangles), click the left mouse button on a port, pull the wire onto another port, and release the left mouse button. A red port indicates that a connection to the port is required or missing. A black port indicates that a connection to the port is not required. Drawing wires/links from input to input or output to output is not allowed. Only one wire/link can be connected to any one output. If the proximity of the endpoint of the wire/link is not exact, it may attach to an unintended port.

If an object or element is disabled, it will have a yellow X on it. To enable the element, navigate to the settings page for that element. A red X indicates that an object or element is not available per the style number of the DGC-2020ES.

The view of the Main Logic, Physical Outputs, Remote Outputs, and LCR Outputs can be automatically arranged by clicking the right mouse button on the window and selecting *Auto-Layout*.

The following must be met before BESTCOMSPlus will allow logic to be uploaded to the DGC-2020ES:

- A minimum of two inputs and a maximum of four inputs on any multi-port (AND, OR, NAND, NOR, XOR, and XNOR) gate.
- A maximum of five logic levels for any particular path. A path being an input block or an output side of an element block through gates to an output block or an input side of an element block. This is to include any OR gates on the Physical Output or Remote Output tab/pages, but not the matched pairs of Physical Output blocks or Remote Output blocks.
- Only 20 gates per logic level. All output blocks and input sides of element blocks are at the maximum logic level of the diagram. All gates are pushed forward/upwards in logic levels and buffered to reach the final output block or element block if needed. A maximum of 50 gates allowed per diagram.
- At all levels there can only be 64 used link/wired or endpoints. Endpoints being inputs, outputs, both sides of element blocks.

Three status indicators are located in the lower right corner of the BESTlogic *Plus* window. These indicators show the *Logic Save Status*, *Logic Diagram Status*, and *Logic Layer Status*. Table 2 defines the colors for each indicator.

Indicator Col		Definition
Logic Save Status	Amber	Logic has changed since last save.
(Left Indicator)	Green	Logic has NOT changed since last save.
Logic Diagram Status	Red	Requirements NOT met as listed above.
(Center Indicator)	Green	Requirements met as listed above.
Logic Layer Status	Red	Requirements NOT met as listed above.
(Right Indicator)	Green	Requirements met as listed above.

Table 2. Status Indicators

Offline Logic Simulator

The offline logic simulator allows you to change the state of various logic elements to illustrate how that state travels through the system. Before running the logic simulator, you must click the Save button on the BESTlogic*Plus* toolbar to save the logic to memory. Changes to the logic (other than changing the state) are disabled when the simulator is enabled. Colors are selected by clicking the Options button on the BESTlogic*Plus* toolbar. By default, Logic 0 is red and Logic 1 is green. Using your mouse, double-click on a logic element to change its state.

An example of the offline logic simulator is shown in Figure 21. Output 1 is Logic 0 (red) when Virtual Switch 1 is Logic 0 (red) and Fixed 1 is Logic 1 (green).



Figure 21. Offline Logic Simulator Example

BESTlogic[™]Plus Examples

Example 1 - GENBRK Logic Block Connections

Figure 22 illustrates the GENBRK logic block, three input logic blocks, and two output logic blocks. Output 3 is active while the GENBRK is sending an "open breaker" command and Output 4 is active while the GENBRK is sending the "close breaker" command.





Example 2 - AND Gate Connections

Figure 23 illustrates a typical AND gate connection. In this example, Output 11 will become active when the Low Fuel alarm AND the Low Oil Pressure alarm are true.



Figure 23. Example 2 – AND Gate Connections

Example 3 - Multiple Logic Connections

In this example, there are two comment boxes, which may be placed on the logic diagram. Double-click a comment box to modify the inside text. Output 3 becomes true when the 27TRIP is true. Output 1

becomes true when the High Coolant Temp is true. Output 2 becomes true when the DGC-2020ES is in RUN mode (RUN Mode true). Refer to Figure 24.



Figure 24. Example 3 – Multiple Logic Connections



Controls and Indicators

DGC-2020ES controls and indicators are illustrated in Figure 25. Lettered locators in Figure 25 correspond to the control and indicator descriptions of Table 3.



Figure 25. Front Panel

Table 3. Front-Panel	HMI	Descriptions
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Locator	Description
A	<i>Liquid Crystal Display.</i> The backlit, 64 by 128 pixel LCD serves as the local information source for metering, alarms, pre-alarms, and protective functions. Display operation is maintained at -40° C.
В	<i>Supplying Load Indicator.</i> This green LED lights when the generator current is greater than Emergency Power Supply (EPS) threshold current.
С	Alarm Indicator. This red LED lights continuously during alarm conditions and flashes during pre-alarm conditions.
D	<i>Not in Auto Indicator.</i> This red LED lights when the DGC-2020ES is not operating in Auto mode. When the DGC-2020ES is operating in Run or Off mode, this LED is on.

E	<i>Run Pushbutton and Mode Indicator.</i> Pressing this button places the DGC-2020ES in Run mode. The green Run mode LED lights when Run mode is active.
F	<i>Off Pushbutton and Mode Indicator.</i> Pressing this button places the DGC-2020ES in Off mode. The red Off mode LED lights when the DGC-2020ES is in Off mode. This button also resets the Breaker Management Pre-Alarms and all MTU ECU Alarms.
G	Auto Pushbutton and Mode Indicator. Pressing the Auto button places the DGC-2020ES in Auto mode. The green Auto mode LED lights when Auto mode is active.
Н	<i>Back Pushbutton.</i> This button is pressed to cancel a settings editing session and discard any settings changes. When navigating through menus, pressing this button moves upward a level. When pressed momentarily, this button also resets the Breaker Management Pre-Alarms and all MTU ECU Alarms. This button is also used to reset the Maintenance Interval when pressed for 10 seconds while viewing Hours Until Maintenance or Maintenance Due Pre-Alarm.
I	Alarm Silence Pushbutton Combination. Simultaneously pressing both the Back and Edit buttons opens the relay output programmed as the horn output.
J	<i>Edit Pushbutton.</i> Pressing this button starts an editing session and enables changes to DGC-2020ES settings. At the conclusion of an editing session, the Edit pushbutton is pressed again to save the setting changes. When navigating through menus, pressing this button moves downward one level. When entering a string, such as a password, this button locks the selected character and moves to the next position. When finished, press Edit twice to submit the string.
К	Arrow Pushbuttons. These two buttons are used to navigate through the front-panel display menus and modify settings. Within a level, the up- and down-arrow buttons are used to move among items within the menu level. Pressing the down-arrow button moves to items lower in the list. Pressing the up-arrow button moves to items higher in the list. During a settings editing session, the up- and down-arrow buttons are used to raise and lower the value of the selected setting.
L	<i>Lamp Test Pushbutton Combination.</i> Simultaneously pressing both the Up- and Down- arrow buttons tests the DGC-2020ES indicators by exercising all LCD pixels and lighting all LEDs for as long as both buttons are held.

Troubleshooting

If you do not get the results that you expect from the DGC-2020ES, first check the programmable settings for the appropriate function. Use the following troubleshooting procedures when difficulties are encountered in the operation of your genset control system.

Communications

USB Port Does Not Operate Properly

Step 1. Verify that the proper port of your computer is being used. For more information, refer to the *Communication* chapter in the *Configuration* manual.

CAN Communication Does Not Operate Properly

- Step 1: Verify that there is a 120-ohm termination resistor on each end of the bus section of the wiring, and that there are not any termination resistors at any node connections that are on stubs from the main bus.
- Step 2: Check all CAN wiring for loose connections and verify that the CAN H and CAN L wires have not gotten switched somewhere on the network.
- Step 3: Verify that the cable length of the bus section of the wiring does not exceed 40 meters (131 feet), and verify that any stubs from the main bus do not exceed 3 meters (9.8 feet) in length.
- Step 4: If the engine is equipped with a Volvo or MTU ECU, verify that the ECU Configuration setting is set to match the actual ECU configuration.

Inputs and Outputs

Programmable Inputs Do Not Operate as Expected

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Confirm that the inputs are programmed properly.
- Step 3. Ensure that the input at the DGC-2020ES is actually connected to the BATT- terminal (17).

Programmable Outputs Do Not Operate as Expected

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Confirm that the outputs are programmed properly.

Metering/Display

Incorrect Display of Battery Voltage, Coolant Temperature, Oil Pressure, or Fuel Level

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Confirm that the SENDER COM terminal (2) is connected to the negative battery terminal and the engine-block side of the senders. Current from other devices sharing this connection can cause erroneous readings.
- Step 3. If the displayed battery voltage is incorrect, ensure that the proper voltage is present between the BATT+ terminal (18) and the SENDER COM terminal (2).
- Step 4. Verify that the correct senders are being used.

- Step 5. Use a voltmeter connected between the BATT– terminal (17) and the SENDER COM terminal (2) on the DGC-2020ES to verify that there is no voltage difference at any time. Any voltage differences may manifest themselves as erratic sender readings. Wiring should be corrected so that no differences exist.
- Step 6: Check the sender wiring and isolate sender wiring from any of the ac wiring in the system. The sender wiring should be located away from any power ac wiring from the generator and any ignition wiring. Separate conduits should be used for sender wiring and any ac wiring.

Incorrect Display of Generator Voltage

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Ensure that the proper voltage is present at the DGC-2020ES voltage sensing inputs (40, 41, 43, and 45).
- Step 3. Verify that the voltage transformer ratio and sensing configuration is correct.
- Step 4. Confirm that the voltage sensing transformers are correct and properly installed.

Incorrect Measurement or Display of Generator Current

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Ensure that the proper current is present at the DGC-2020ES current sensing inputs 33, 34, 35, 36, 37, and 38.
- Step 3. Verify that the current sensing transformer ratios are correct.
- Step 4. Confirm that the current sensing transformers are correct and properly installed.

Incorrect Display of Engine RPM

- Step 1. Verify that all wiring is properly connected. Refer to the *Typical Connections* chapter in the *Installation* manual.
- Step 2. Verify that the flywheel teeth setting is correct.
- Step 3. Verify that the prime mover governor is operating properly.
- Step 4. Verify that the measured frequency of the voltage at the MPU input (31 and 32) is correct.
- Step 5. If the MPU is shared with the governor, verify that the polarity of the MPU input to the governor matches the polarity of the MPU input to the DGC-2020ES.

DGC-2020ES Indicates Incorrect Power Factor

Check the rotation of the machine and the labeling of the A-B-C terminals. The machine must be rotating in the same phase sequence as dictated by the generator phase rotation setting for correct power factor metering. A power factor indication of 0.5 with resistive load present is a symptom of incorrect phase rotation.

LCD is Blank and all LEDs are Flashing at Approximately Two-Second Intervals

This indicates that the DGC-2020ES does not detect that valid application firmware is installed. The unit is running its boot loader program, waiting to accept a firmware upload.

- Step 1. Start BESTCOMSPlus[®]. Use the top pull-down menu and select FILE > NEW > DGC-2020ES.
- Step 2. Select COMMUNICATIONS > UPLOAD DEVICE FILES and select the device package file that contains the firmware and language you want to upload.
- Step 3. Check the boxes for DGC-2020ES Firmware and DGC-2020ES Language Module. Click the UPLOAD button to start the upload process.

Ground Faults Detected in Ungrounded System Applications

- Step 1: Verify that there is no connection from the neutral connection of the generator to the system ground.
- Step 2: Perform insulation resistance tests on the system wiring to check for insulation integrity in the overall system.
- Step 3: If ground faults are detected on a DGC-2020ES in an ungrounded system application, it is recommended that potential transformers be employed on the voltage sensing inputs to provide full isolation between the DGC-2020ES and monitored voltage phases.
- Step 4: If potential transformers are in place, remove the connectors from the DGC-2020ES one at a time. If removal of a connector removes the ground fault, check the system wiring to that connector and out into the system to verify that connections are secure and all wiring insulation is in good condition.

Generator Breaker and Mains Breaker

Generator Breaker Will Not Close to a Dead Bus

- Step 1: Review the description of how the generator breaker logic element functions contained in the GENBRK logic element description in the BESTlogic [™]Plus chapter in the Configuration manual.
- Step 2: Review the section on breaker close requests in the *Breaker Management* chapter in the *Configuration* manual.
- Step 3: Navigate to the SETTINGS > BREAKER MANAGEMENT > BREAKER HARDWARE > GEN BREAKER screen and set DEAD BUS CL ENBL to ENABLE.
- Step 4: Verify that the Generator status is stable. The breaker will not close if the generator status is not stable. Check status by using the Metering Explorer in BESTCOMS*Plus* and verify that when the generator is running, the GEN STABLE status LED is lit. If necessary, modify the settings on the SETTINGS > BREAKER MANAGEMENT > BUS CONDITION DETECTION screen.
- Step 5: Verify the bus status is DEAD. Check status by using the Metering Explorer in BESTCOMS*Plus* and verify that when the generator is running, the BUS DEAD status LED is lit. If necessary, modify the settings on the SETTINGS > BREAKER MANAGEMENT > BUS CONDITION DETECTION screen.
- Step 6: Verify the connections in BESTlogic*Plus* Programmable Logic to the generator breaker logic element. The *Status* input must be driven by an "A" or normally open contact from the generator breaker. The OPEN and CLOSE command inputs on the left side of the logic block are inputs for open and close commands. These can be wired to physical inputs if it is desired to have open and close command switches. If they are wired, they must either be pulsed inputs, or some logic must be employed so that the open and close command inputs are never driven at the same time. If these are both driven at the same time, the breaker is receiving open and close commanded to open and close at the same time.
- Step 7: Verify the breaker is receiving a close command. Breaker close command sources are:
 - The DGC-2020ES itself when the automatic mains fail transfer (ATS) feature is enabled.
 - The DGC-2020ES itself when the RUN WITH LOAD logic element receives a *Start* pulse in the programmable logic.
 - The DGC-2020ES itself when started from the Exercise Timer and the Run with Load box is checked in the Generator Exerciser settings.
 - Manual Breaker Close Input Contacts applied to the Open and Close inputs on the left side of the Generator Breaker logic element in the programmable logic.

Step 8: Verify the wiring to the breaker from the DGC-2020ES. If it seems OK, you can do a manual close and open by modifying the programmable logic. Map some unused outputs to the OPEN and CLOSE outputs from the Gen Breaker Block in the programmable logic. Map a virtual switch to the logic output that would normally be the breaker open output. Map another virtual switch to the logic output that would normally be the breaker close output. Connect with BESTCOMS*Plus*, and exercise the virtual switches using the Control panel located in the Metering Explorer. Never turn open and close on at the same time. This could damage the breaker and/or motor operator. If everything is working as expected, restore the logic to its original diagram.

Generator Breaker Does Not Open When It Should

- Step 1: Review the description of how the generator breaker logic element functions contained in the GENBRK logic element description in the *BESTlogicPlus* chapter in the *Configuration* manual.
- Step 2: Review the section on breaker operation requests in the *Breaker Management* chapter in the *Configuration* manual.
- Step 3: Verify the connections in BESTlogic*Plus* Programmable Logic to the generator breaker logic element. The *Status* input must be driven by an "A" or normally open contact from the generator breaker. The OPEN and CLOSE command inputs on the left side of the logic block are inputs for open and close commands. These can be wired to physical inputs if it is desired to have open and close command switches. If they are wired, they must either be pulsed inputs, or some logic must be employed so that the open and close command inputs are never driven at the same time. If these are both driven at the same time, the breaker is receiving open and close commanded to open and close at the same time.
- Step 4: Verify the breaker is receiving an open command. Breaker open command sources are:
 - The DGC-2020ES itself when the automatic transfer (ATS) feature is enabled.
 - The DGC-2020ES itself when the RUN WITH LOAD logic element receives a *Stop* pulse in the programmable logic.
 - The DGC-2020ES itself when shutting down the engine due to an active alarm.
 - The DGC-2020ES itself when ending a run session from the Exercise Timer and the *Run with Load* box is checked in the Generator Exerciser settings.
 - Manual Breaker Open Input Contacts applied to the Open and Close inputs on the left side of the Generator Breaker logic element in the programmable logic.
- Step 5: Verify the wiring to the breaker from the DGC-2020ES. If it seems OK, you can do a manual close and open by modifying the programmable logic. Map some unused outputs to the OPEN and CLOSE outputs from the Gen Breaker Block in the programmable logic. Map a virtual switch to the logic output that would normally be the breaker open output. Map another virtual switch to the logic output that would normally be the breaker close output. Connect with BESTCOMS*Plus*, and exercise the virtual switches using the Control panel located in the Metering Explorer. Never turn open and close on at the same time. This could damage the breaker and/or motor operator. If everything is working as expected, restore the logic to its original diagram.

Mains Breaker Does Not Open When Mains Fails

- Step 1: Verify that a Mains Breaker has been configured by examining the settings on the SETTINGS > BREAKER MANAGEMENT > BREAKER HARDWARE screen.
- Step 2: Verify the mains breaker has been correctly included in the programmable logic.
- Step 3: Verify that the MAINS FAIL TRANSFER parameter is set to ENABLE on the SETTINGS > BREAKER MANAGEMENT > BREAKER HARDWARE screen.
- Step 4: Verify that a failure of the mains is detected by the DGC-2020ES. Check status using the Metering Explorer in BESTCOMS*Plus* and verify that the MAINS FAIL status LED is lit when

the power on the DGC-2020ES bus voltage input is either out of voltage or frequency range. If necessary, modify the settings on the SETTINGS > BREAKER MANAGEMENT > BUS CONDITION DETECTION screen to achieve correct detection.

Step 5: Verify the wiring to the breaker from the DGC-2020ES. If it seems OK, you can do a manual close and open by modifying the programmable logic. Map some unused outputs to the OPEN and CLOSE outputs from the Gen Breaker Block in the programmable logic. Map a virtual switch to the logic output that would normally be the breaker close output. Map another virtual switch to the logic output that would normally be the breaker close output. Connect with BESTCOMS*Plus*, and exercise the virtual switches using the Control panel located in the Metering Explorer. Never turn open and close on at the same time. This could damage the breaker and/or motor operator. If everything is working as expected, restore the logic to its original diagram.

Mains Breaker Does Not Close After Mains Returns

- Step 1: Verify that a Mains Breaker has been configured by examining the settings on the SETTINGS > BREAKER MANAGEMENT > BREAKER HARDWARE screen.
- Step 2: Verify the mains breaker has been correctly included in the programmable logic.
- Step 3: Verify that the MAINS FAIL TRANSFER parameter is set to ENABLE on the SETTINGS > BREAKER MANAGEMENT > BREAKER HARDWARE screen.
- Step 4: Verify that stable mains power is detected by the DGC-2020ES. Check status using the Metering Explorer in BESTCOMS*Plus* and verify that the MAINS STABLE status LED is lit when the power on the DGC-2020ES bus voltage input is good. If necessary, modify the settings on the SETTINGS > BREAKER MANAGEMENT > BUS CONDITION DETECTION screen to achieve correct detection.
- Step 5: Verify the wiring to the breaker from the DGC-2020ES. If it seems OK, you can do a manual close and open by modifying the programmable logic. Map some unused outputs to the OPEN and CLOSE outputs from the Gen Breaker Block in the programmable logic. Map a virtual switch to the logic output that would normally be the breaker open output. Map another virtual switch to the logic output that would normally be the breaker close output. Connect with BESTCOMS*Plus*, and exercise the virtual switches using the Control panel located in the Metering Explorer. Never turn open and close on at the same time. This could damage the breaker and/or motor operator. If everything is working as expected, restore the logic to its original diagram.

DGC-2020ES Front Panel Debug Screen

There is one debug screen in the DGC-2020ES that can be useful for debugging I/O module related issues. The following debug screen is available: CEM DEBUG

CEM DEBUG

This screen shows the binary data that is being sent between the CEM-2020 (Contact Expansion Module) and the DGC-2020ES.

The CEM DEBUG screen is located on the front panel at SETTINGS > SYSTEM PARAMS > REMOTE MODULE SETUP > CEM SETUP > CEM DEBUG MENU.

The following parameters are visible on the CEM DEBUG screen:

- DGC TO CEM BP: DGC-2020ES to CEM-2020 Binary Points. This is the status of the CEM-2020 output relays being transmitted from the DGC-2020ES to the CEM-2020. This is a 32-bit, bit packed number representing the desired states of the CEM-2020 outputs. The left most bit is the first output, etc.
- CEM TO DGC BP: CEM-2020 to DGC-2020ES Binary Points. This is the status of the CEM-2020 inputs being transmitted from the CEM-2020 to the DGC-2020ES. This is a 32-bit, bit packed number representing the metered states of the CEM-2020 inputs. The left most bit is the first input, etc.



Revision History

Table 4 provides a historical summary of the changes made to the DGC-2020ES hardware. Firmware changes are listed in Table 5 and software changes are listed in Table 6. The corresponding revisions made to this instruction manual are summarized in Table 7. Revisions are listed in chronological order.

Hardware Version and Date	Change
A, Mar-13	Initial release
B, Jun-13	Maintenance release
C, Apr-14	Released firmware version 1.01.00
D, May-14	Released firmware version 1.01.01
E, Nov-14	Released firmware version 1.02.00 and BESTCOMSPlus 3.07.00
F, Jul-15	Released firmware version 1.03.00 and BESTCOMSPlus 3.14.00
G, Aug-16	Front panel upgraded with a membrane switch overlay

Table 4. Hardware Revision History

Table 5. Firmware Revision History

Firmerrana		
Firmware	Change	
Version and Date		
1.00.00, Mar-13	Initial release	
1.01.00, Jan-14	Changed to make horn always sound for pre-alarm after alarm	
	silence button is pressed	
	 Extended minimum range of Low Coolant Temp Pre-alarm down to 0 degrees F 	
	Changed to prevent default run statistics after firmware upload	
	 Modified Diesel Particulate Filter Soot Level and Regeneration 	
	Required Status Information to use the Diesel Particulate Filter Status parameter (SPN 3701)	
	Added a one-line diagram to the Front-Panel Overview screen	
	Improved the Event Log	
	 Increased number of events to 50 	
	Added Scania Engine ECU support	
	 Added Diesel Exhaust Fluid Level on Overview screen on systems which have Selective Catalytic Reduction with Diesel Exhaust Fluid implemented 	
	 Added Diesel Exhaust Fluid Tank Level and Percent kW Load to Configurable Metering 	
	 Modified Cummins Proprietary J1939 communications to support Cummins QSX-15 model and run at RPM selected under Speed Setup 	
	 Modified Volvo Proprietary J1939 communications to support RPM selection 	
	 Added ATS Programmable Function Setting to HMI 	
	 Removed Contact Input Recognition Parameter as a setting for the ATS Programmable Function 	
	 Removed Contact Input Recognition Parameter as a setting for the Low Coolant Level, Batt Charger Fail, and Fuel Leak Detect Programmable Functions 	
	Removed Contact Input Recognition Parameter as a setting for the Low Fuel Level Programmable Function	
	 Added logic point for DPF Lamp Status from Diesel Particulate Filter Control 1 PGN 	

Firmware	Change
Version and Date	Change
	 Changed to prevent Oil Pressure Crank Disconnect from operating if there is a valid RPM Source Removed the letter "DPF" from DPF Regenerate Required and DPF Regeneration Inhibited Strings Added Selective Catalytic Reduction Parameters to the list of strings displayed for SPN's in Diagnostic Trouble Codes Modified front panel so that if MTU Fault Codes are in effect while an alarm or pre-alarm is in effect, the DGC-2020ES will alternate between the Alarm or Pre-alarm display and the MTU Fault Code display Added a Mains Fail Transfer Status screen on the front panel Changed to prevent unit from starting the machine when Battle Override is engaged after an alarm occurs, but the OFF button has never been pressed to clear the alarm, if the DGC pulses while in the alarm state, at the end of the pulse cycle
	 Generator Status string now displays Alarm if Battle Override is applied after an alarm shutdown
1.01.01, Apr-14	 Made the J1939 data menu available through the HMI when the unit is configured for Scania ECU type
1.02.00, Oct-14	 Added MTU Speed Demand Switch setting from logic capability Added a rest timer for cyclic cranking Added Mains Fail Return Fail pre-alarm and Mains Fail Max Return Time setting Added John Deere to list of ECU configurations Changed DEF EMPTY pre-alarm to DEF LOW SEVERE Changed DEF ENGINE DERATE pre-alarm to DEF INDUCEMENT Added descriptive text for Diagnostic Trouble Codes (DTC's) broadcast by Mercedes, PSI, and MTU-ECU9 engine ECU's Added ECU9 Fault Code list for MTU
1.03.00, May-16	 Added Cylinder Cutout Enable Override logic element Added a setting for Expected Engine ECU Address Added a setting for CAN Bus Low Coolant Level Alarm Enable Changed to set Expected Engine ECU Address to 0 when ECU CONFIG is GM/DOOSAN. Added Chinese language support Modified checksum handling to prevent a false Checksum Fail pre- alarm Changed alarm annunciation so alarms are not suppressed if the OFF mode logic element is held true and prevents unit start attempt if the OFF mode logic element is held true and an alarm is active Improved J1939 transmit buffer handling Changed how the DGC-2020ES sends an Acknowledgement PGN indicating No Acknowledgement (NACK) when a request PGN is received that had the Global Address as the Destination Address Improved ac line-to-line voltage calculation to allow for hardware gain differences between voltage channel inputs

Table 6. Software Revision History

Software Version and Date	Change
3.03.00, Mar-13	Initial Release
3.03.03, Jun-13	Maintenance release (BE1-11 changes)
3.04.00, Aug-13	Maintenance release (BE1-11 changes)

Software	Change
Version and Date	onange
3.05.02, Jan-14	Maintenance release (BE1-11 changes)
3.05.03, Mar-14	Maintenance release (DGC-2020HD changes)
3.06.00, Apr-14	Maintenance release (BE1-11 changes)
3.07.00, Oct-14	 Updated to support firmware version 1.02.00 (see firmware revision history)
	 Removed duplicate results in the device discovery list
	 Improvements to device directory on Connection screen
	 Changed to allow a comma in the Device ID
	 Changed to annunciate a connection failure message when a device is not present on a selected port
	 Improved prompts to save settings when choosing to close all open views
	Changed to allow the middle mouse button to close the security view
	 Improved display of raw analog input currents
	 Changed to make BESTlogicPlus status LEDs report all logic errors
3.07.03, Jan-15	Maintenance release (DECS-250 changes)
3.08.00, Feb-15	 Added a setting to download settings after initial connect
	Added file save error message when trying to save an event log with
	an invalid filename
3.08.02, Mar-15	Minor regional settings improvement
3.09.00, Jun-15	Maintenance release (DGC-2020HD changes)
3.10.00, Jul-15	Maintenance release (DECS-150 launch)
3.11.00, Dec-15	 Maintenance release (DECS-150, DGC-2020HD, BE1-11 changes)
3.12.00, Apr-16	 Added Windows 10 compatibility
	 Changed to prevent Offline Simulator button from disabling after
	sending settings to the device
3.14.00, Jun-16	 Updated to support firmware version 1.03.00 (see firmware revision history)
	 Added several pre-alarm status inputs to logic
	 Added MTU Combined Red Alarm status to logic
	Added Chinese language support
3.15.00, Aug-16	 Maintenance release (DGC-2020HD changes)

Table 7. Instruction Manual Revision History

Manual Revision and Date	Change
—, Apr-17	Initial release





12570 Route 143 Highland IL 62249-1074 USA Tel: +1 618.654.2341 Fax: +1 618.654.2351 email: <u>info@basler.com</u> No. 59 Heshun Road Loufeng District (N) Suzhou Industrial Park 215122 Suzhou P.R. CHINA Tel: +86 512.8227.2888 Fax: +86 512.8227.2887 email: <u>chinainfo@basler.com</u> 111 North Bridge Road 15-06 Peninsula Plaza Singapore 179098 Tel: +65 68.44.6445 Fax: +65 68.44.8902 email: <u>singaporeinfo@baster.com</u>