DGC-2020ES

Digital Genset Controller

Configuration Instruction Manual

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Preface

This instruction manual provides information about the configuration of the DGC-2020ES. To accomplish this, the following information is provided:

- Device information and security settings
- Configuration via BESTCOMS*Plus*® and the front panel
- Communication settings
- Timekeeping
- Inputs and outputs
- Breaker management, synchronizer, bias control, and multiple generator management
- Alarm configuration
- Protection settings
- BESTlogic™*Plus* programmable logic
- Troubleshooting

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 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
9469200994	Installation
9469200995	Configuration (this manual)
9469200996	Operation
9469200997	Accessories

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Warning!

READ THIS MANUAL. Read this manual before installing, operating, or maintaining this equipment. 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.

Caution

Installing previous versions of firmware may result in compatibility issues causing the inability to operate properly and may not have the enhancements and resolutions to issues that more recent versions provide. Basler Electric highly recommends using the latest version of firmware at all times. Using previous versions of firmware is at the user's risk and may void the warranty of the unit.

Basler Electric does not assume any responsibility to compliance or noncompliance with national code, local code, or any other applicable code. This manual serves as reference material that must be well understood prior to installation, operation, or maintenance.

For terms of service relating to this product and software, see the *Commercial Terms of Products and Services* document available at www.basler.com/terms.

This publication contains confidential information of Basler Electric Company, an Illinois corporation. It is loaned for confidential use, subject to return on request, and with the mutual understanding that it will not be used in any manner detrimental to the interests of Basler Electric Company and used strictly for the purpose intended.

It is not the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice. Over time, improvements and revisions may be made to this publication. Before performing any of the following procedures, contact Basler Electric for the latest revision of this manual.

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

Revision History

A historical summary of the changes made to this instruction manual is provided below. Revisions are listed in reverse chronological order.

Visit https://www.basler.com to download the latest hardware, firmware, and BESTCOMS*Plus*® revision histories.

Instruction Manual Revision History

Manual Revision and Date	Change
D, Nov 2022	• Added settings and metering for Deutz ECU type. • Updated instructions on installing and updating BESTCOMS*Plus*® • Other text edits throughout manual.
C, Dec 2021	• Added support for firmware version 1.05.00 and BESTCOMSPlus version 5.02.00. • Added “Firmware Downgrade” caution boxes. • Clarified SPN 3701 in 04 Communication and 14 Exhaust Treatment. • Expanded description of Pre-Start resting state in 05 Device Configuration. • Expanded Battle Override description in 08 Contact Inputs.
B, Dec 2019	• Removed Rev Letter from all pages. • Changed sequential numbering to sectional numbering. • Moved Instruction Manual Revision History into Preface. • Removed standalone Revision History chapter. (Revision histories for hardware, firmware, and software are now in separate documents on www.basler.com.) • Added support for firmware version 1.04.00 and BESTCOMSPlus version 4.01.00.
A1, Apr 2019	• Updated Proposition 65 statement
A, Sep 2018	• Added description of voltage sensing fail function in the Engine Sender Inputs chapter • Updated Revision History chapter
—, Apr 2017	• Initial release

Contents

1 • Security

Password protection guards against unauthorized changing of DGC-2020ES settings. Three levels of password protection are available. Each level is described in the following paragraphs.

- *OEM Access.* This password level allows access to all settings. The default, OEM-access password is **OEM**.
- *Settings Access.* This password level allows all except uploading of firmware and clearing of device event log. The default, settings-access password is **SET**.
- *Operator Access.* The default, operator-access password is **OP**. This password level allows all settings to be read and allows changes to be made to the following:
    - LCD Contrast
    - Sleep Mode
    - Date/Time
    - All Sender Fail Time Delays
    - Metric Conversion
    - Low Fuel Pre-Alarm Level
    - Low Fuel Alarm Level
    - Pre-Start Contact after Cranking
    - Cooldown Time
    - Pre-Crank Time Delay
    - Reset of Maintenance Interval
    - All controls on the Control screen available via the Metering Explorer in BESTCOMS*Plus*®

Changing Passwords

Passwords can be changed only after communication between the PC and DGC-2020ES is established. Changes to passwords are made through the *Device Security Setup* screen. Use the Settings Explorer in BESTCOMS*Plus* to open the *General Settings, Device Security Setup* screen.

The content of the *Device Security Setup* screen depends on the password level used when accessing the screen. For example, someone logged in with a settings-access password will be able to change only the settings-access and operator-access passwords - not the OEM-access password.

The BESTCOMS*Plus* Device Security Setup screen is illustrated in Figure 1-1. All three access levels are shown.

A password is changed by clicking on the access level, entering the new password, and then clicking on the *Save Password* button. DGC-2020ES passwords are case sensitive.

Saving Passwords in a DGC-2020ES Settings File

The passwords can be modified while BESTCOMS*Plus* is connected to a DGC-2020ES. The settings from the BESTCOMS*Plus* session can then be saved into a settings file. The settings file will contain the new passwords. Also, the passwords in a settings file can be modified off line, saved with the file, and then later loaded into a DGC-2020ES.

Saving Passwords to a Settings File when On Line

The following procedure describes how to save passwords to a settings file when BESTCOMS*Plus* is connected to a DGC-2020ES (on line):

1. When connected to a DGC-2020ES with BESTCOMS*Plus*, click on SETTINGS EXPLORER > GENERAL SETTINGS > DEVICE SECURITY.
2. You will be prompted to enter a password.

3. Enter a password that is of a level as high as or higher than the password you wish to modify. BESTCOMS*Plus* will display all passwords of a level equal to and below the level of the password that was entered.
4. Click on the password you wish to modify. Type in the new password under the “Password” setting that became active when the password to modify was clicked.
5. Click the “Save” button to save the new password into BESTCOMS*Plus* memory (it’s not in the DGC-2020ES yet).
6. Repeat steps 4 and 5 for all password levels you with to modify.
7. Once all password modifications are complete, in the main menu of BESTCOMS*Plus*, select *Upload Security* from the *Communications* pull-down menu. This is the step where passwords are sent to the DGC-2020ES. Failure to perform this step might cause all password modifications to be lost.
8. Close the *Device Security* tab in BESTCOMS*Plus*.
9. Re-open the *Device Security* tab in BESTCOMS*Plus*. This will read the passwords back out of the DGC-2020ES.
10. Verify the passwords obtained from the DGC-2020ES are correct.
11. Once all desired settings have been loaded into the DGC-2020ES, save the settings file. The resulting settings file has the passwords saved as part of the saved settings.
12. At this point, the password information has been successfully saved in the settings file. The process of saving the passwords into the settings file is complete.

Saving Passwords to a Settings File when Off Line

The following procedure describes how to save passwords to a settings file when working off line:

1. When the settings file is open in BESTCOMS*Plus*, click on SETTINGS EXPLORER > GENERAL SETTINGS > DEVICE SECURITY.
2. You will be prompted to enter a password.
3. Enter a password that is of a level as high as or higher than the password you wish to modify. BESTCOMS*Plus* will display all passwords of a level equal to and below the level of the password that was entered.
4. Click on the password you wish to modify. Type in the new password under the “Password” setting that became active when the password to modify was clicked.
5. Click the “Save” button to save the new password into BESTCOMS*Plus* memory.
6. Repeat steps 4 and 5 for all password levels you wish to modify.
7. Close the *Device Security* tab in BESTCOMS*Plus*.
8. Save the settings file.
9. Close the settings file by clicking on the X in the upper right-hand corner of the settings file, or close BESTCOMS*Plus*.
10. Restart BESTCOMS*Plus* if you have shut it down.
11. Re-open the settings file that you have saved with the password information.
12. When the settings file is open in BESTCOMS*Plus*, click on SETTINGS EXPLORER > GENERAL SETTINGS > DEVICE SECURITY.
13. You will be prompted to enter a password.
14. Enter the password for the highest level of password modified; it should be the new modified password.
15. When passwords are shown, verify they are correct.

16. At this point the password information has been successfully saved in the settings file. The process of saving the passwords into the settings file is complete.

Loading Passwords from a Settings File into the DGC-2020ES

1. Connect to the DGC-2020ES with BESTCOMS*Plus*.
2. Once connected, click the “Open File” button that is used to load a settings file into the DGC-2020ES.
3. You will be prompted asking if you wish to load settings and logic into the DGC-2020ES. Select *Yes* if you need to upload settings logic. Select *No* if all you need to do is update security. If you select *No*, the settings file opens into BESTCOMS*Plus* memory.
4. Whether you have loaded settings and logic to the DGC-2020ES or not, the next step is to select *Upload Security* from the *Communications* pull-down menu.
5. DO NOT try to view the passwords before performing step 4. This would download the existing passwords from the DGC-2020ES and they will overwrite the new passwords that were loaded into BESTCOMS*Plus* memory from opening the settings file.
6. If you are prompted for a password, enter a password of a level equal to that of the highest-level password you wish to modify.
7. The passwords are uploaded to the DGC-2020ES.
8. After you have uploaded the new passwords, select GENERAL SETTINGS > DEVICE SECURITY SETUP in the settings explorer of BESTCOMS*Plus*. Verify the passwords are correct.
9. This concludes loading passwords from a settings file into the DGC-2020ES.

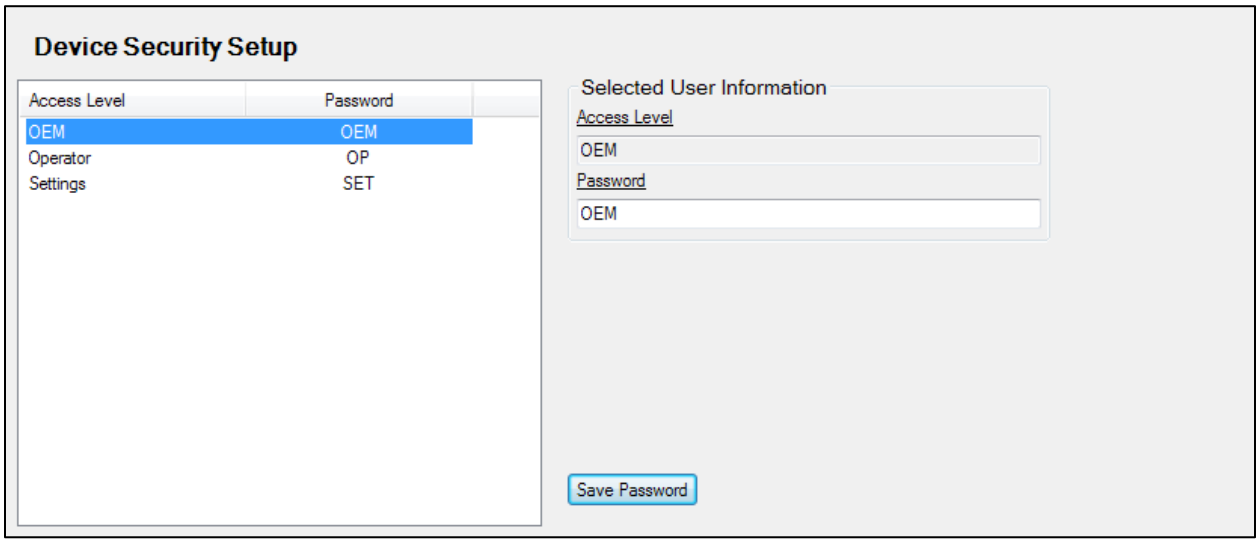


Figure 1-1. Settings Explorer, General Settings, Device Security Setup Screen

2 • Configuration through the Front Panel

This chapter provides information on configuring DGC-2020ES settings through the front panel.

Display Setup

The DGC-2020ES LCD can be customized to fit the needs of your specific application. The options can be adjusted using the front panel controls and through BESTCOMS*Plus*®. The display options are described below.

The *Front Panel HMI* screen is found in the BESTCOMS*Plus*® *Settings Explorer* under the *General Settings* category. If using the front panel, navigate to Settings > General Settings > Front Panel HMI.

Figure 2-1 shows the BESTCOMS*Plus*® Front Panel HMI settings screen.

1. LCD Contrast - Adjust this setting to reach the desired level of LCD contrast.
2. Front Panel Sleep Mode - Select *Enable* to send the DGC-2020ES into sleep mode. In sleep mode, the LEDs and LCD backlight turn off after 15 minutes of inactivity on the front panel to minimize battery drain.
3. One Line Diagram Display Enable - Select *Enable* to display one-line diagram.
4. Engine Hours Display – When Engine Hours Display is enabled, engine run-time hours are displayed on the front-panel Overview screen.
5. Overview Screen Type – The Overview Screen Type can be set for Text or Symbolic. When set to Symbolic, the parameters names are displayed as symbols.
6. Exhaust Display – When Exhaust Display is set to Inverted, the LCD background, where exhaust status is displayed, is dark with light text. When set to Normal, the LCD background is light with dark text.
7. Exhaust Status Display Screen – The Exhaust Status Display Screen setting defines where DEF level and exhaust status display are shown. Select Overview Screen to show the DEF level and exhaust status display on the Overview screen or select All Operating Screens to show the DEF level and exhaust status display on all screens that automatically appear during normal operation.
8. Battery Charger Display – When Battery Charger Display is enabled, battery charger output voltage and current are displayed on the front-panel Overview screen.
9. Display Fuel Level Below – Adjust this setting to display fuel level on the front-panel Overview screen only when the fuel level is below the desired value. When fuel level is not displayed, engine RPM is displayed in its place.
10. DEF Display Enable – This setting enables or disables the display of DEF levels on the front panel overview screen. Some engines that do not employ DEF-based exhaust treatment still broadcast a DEF level. In these cases, since the level is meaningless, the user can disable display of the DEF level on the front panel.
11. Battery and RPM Display – This setting selects whether battery voltage and/or rpm is displayed on the front panel overview screen. If the Alternate option is selected, the display will alternate between battery voltage and rpm.
12. Language Selection - Select from Chinese, English, French, German, or Spanish.
13. Scrolling Screens - Specify the parameters which are to appear on the front-panel LCD display.
    a. Configure the *Configurable HMI Summary Settings.*
    b. Set the *Scrolling Screen Enable* to *Enable*.
    c. Set the *Scrolling Screen Scroll Delay* parameter to the desired value.
14. Phase Toggle Delay - Set the phase toggle delay to a nonzero value if automatic scrolling through the phase information in the standard overview screen on the front panel is desired. If it is

left at zero, scrolling through phase information is accomplished using the up and down arrow buttons.

15. Initializing Message 1 - This parameter defines the first line of text that appears on the front panel of the DGC-2020ES as it is going through its power up and initializing sequence.
16. Initializing Message 2 - This parameter defines the second line of text that appears on the front panel of the DGC-2020ES as it is going through its power up and initializing sequence.

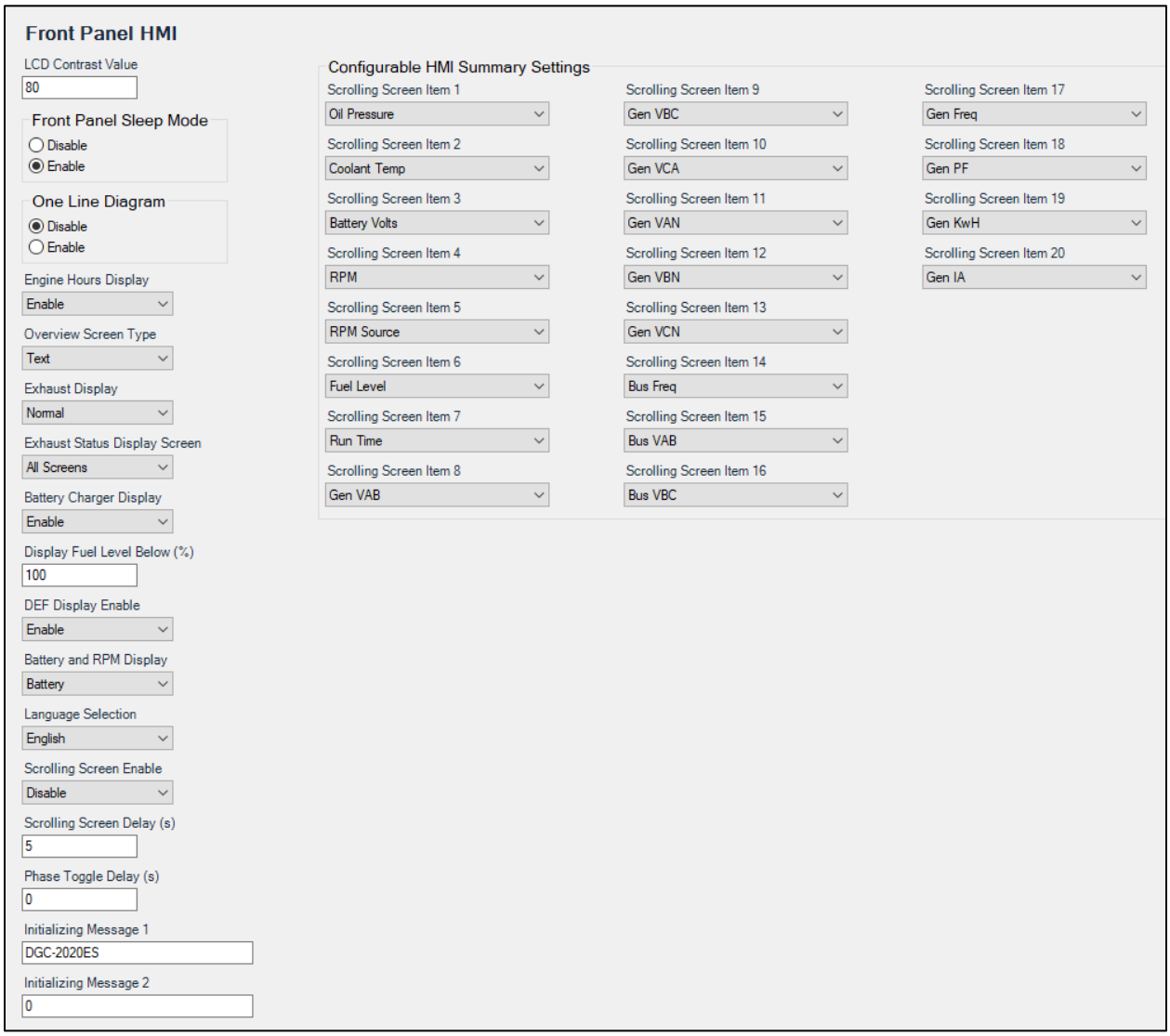


Figure 2-1. Settings Explorer, General Settings, Front Panel HMI Screen

Settings Menu

The display structure of the Settings menu on the front panel is provided below. Refer to the *Controls and Indicators* chapter in the *Operation* manual for a full description of DGC-2020ES controls and indicators.

GENERAL SETTINGS

- **FRONT PANEL HMI**
  - SUMMARY VIEW
  - SCROLL DELAY
  - PH TOG DELAY
  - LCD CONTRAST

- SLEEP MODE
- LANGUAGE
- CONFIGURABLE METERING
  - ITEM X (X = 1 to 20)
- ONE LINE DIAGRAM
- ENG HRS DISPLAY
- OVERVIEW
- EXH DISPLAY
- EXH DISPL SCRN
- BATT CHG DISPLAY
- DISPLAY FL LEVEL BELOW
- DEF DISPLAY
- BATTERY/RPM DISPLAY

- **CONFIGURE DATE/TIME**
  - YEAR
  - MONTH
  - DAY
  - HOURS
  - MINUTES
  - SECONDS
  - UTC OFFSET
  - DST ENABLED
  - CLK NOT SET WRN
- **VIEW DATE/TIME**
- **VERSION INFO**
  - DGC-2020ES
    - FIRMWARE VERSION
    - BOOT CODE VERSION
    - SERIAL NUMBER
    - PART NUMBER
    - MODEL NUMBER
    - LANGUAGE VERSION
    - LANGUAGE PART NUM
    - FONT VERSION
    - FONT PART NUM
    - STYLE CODE
  - CEM-2020 (Visible when CEM-2020 is enabled.)
    - FIRMWARE VERSION
    - BOOT CODE VERSION
    - SERIAL NUMBER
    - PART NUMBER
    - MODEL NUMBER
    - BUILD DATE

COMMUNICATIONS*

*(Visible when the optional J1939 CAN bus is enabled, style code xCx.)

- **CAN BUS SETUP**
  - CAN BUS SETUP
    - CAN BUS ENABLE
    - DTC ENABLE (Visible when CAN BUS is enabled.)
    - SPN CONV METHOD (Visible when CAN BUS is enabled.)
    - CAN BUS ADDR (Visible when CAN BUS is enabled.)
    - ENGINE ECU ADDRESS (Visible when CAN BUS is enabled.)
    - ECU OPT SLCT (Visible when CAN BUS is enabled.)
    - ECU PULSING (Visible when CAN BUS is enabled.)
    - ENG SHTDN TM (Visible when CAN BUS is enabled.)
    - PLS CYCL TM (Visible when CAN BUS is enabled.)
    - ECU SET TM (Visible when CAN BUS is enabled.)
    - RESP TIMEOUT (Visible when CAN BUS is enabled.)
    - COOL TEMP SRC (Visible when CAN BUS is enabled.)
    - OIL PRESS SRC (Visible when CAN BUS is enabled.)
    - ENGINE RUN TM SRC (Visible when CAN BUS is enabled.)

- ECU SETUP (Visible when CAN BUS is enabled.)
  - ECU CONF
  - CUMMINS ECU SETUP
    - CUMMINS GEN CONTROL
  - ISUZU ECU SETUP
    - CLEAR ECU MEMORY
    - ESCAPE MODE
  - YANMAR ECU SETUP
    - NUMBER OF CYLINDERS
  - GEN DATA TRANSMIT
  - ENGINE PARAM XMT
  - TRIP RESET (Visible when ECU is configured for Standard, Volvo Penta, *mtu* ADEC, GM/Doosan, Cummins, or *mtu* Smart Connect.)
  - START MODE
  - DPF REGENRATE SETUP (Visible when ECU is configured for Standard, Volvo Penta, *mtu* ADEC, GM/Doosan, Cummins, or *mtu* Smart Connect.)
    - DPF MANUAL REGEN
    - DPF REGEN DISABLE
  - BATT CHARGER SETUP
    - CHARGER 1 TYPE
    - CHARGER 2 TYPE
  - BATT CHARGR PREALARMS
    - CH1 COMMS FAIL
    - CH1 BATTERY FAIL
    - CH1 CHARGER FAIL
    - CH1 AC OFF
    - CH2 COMMS FAIL
    - CH2 BATTERY FAIL
    - CH2 CHARGER FAIL
    - CH2 AC OFF
  - SENS CHARGR PREALARMS
    - CH1 THERMAL LIMIT (Visible when CHARGER 1 TYPE is set to SENS)
    - CH1 HI DC VOLTS (Visible when CHARGER 1 TYPE is set to SENS)
    - CH1 LOW DC VOLTS (Visible when CHARGER 1 TYPE is set to SENS)
    - CH1 LO CRANK V (Visible when CHARGER 1 TYPE is set to SENS)
    - CH1 INVLD SETTINGS (Visible when CHARGER 1 TYPE is set to SENS)
    - CH1 SNGL UNIT FL (Visible when CHARGER 1 TYPE is set to SENS)
    - CH2 THERMAL LIMIT (Visible when CHARGER 2 TYPE is set to SENS)
    - CH2 HI DC VOLTS (Visible when CHARGER 2 TYPE is set to SENS)
    - CH2 LOW DC VOLTS (Visible when CHARGER 2 TYPE is set to SENS)
    - CH2 LO CRANK V (Visible when CHARGER 2 TYPE is set to SENS)
    - CH2 INVLD SETTINGS (Visible when CHARGER 2 TYPE is set to SENS)
    - CH2 SNGL UNIT FL (Visible when CHARGER 2 TYPE is set to SENS)
  - SPEED SELECT (Visible when ECU is configured for Volvo Penta.)
  - ACCEL POSITION (Visible when ECU is configured for Volvo Penta.)
  - MODULE TYPE (Visible when ECU is configured for *mtu* MDEC or *mtu* ECU7/ECU8.)
  - ALIVE MSG (Visible when ECU is configured for *mtu* MDEC or *mtu* ECU7/ECU8.)
  - SPEED SETUP
    - J1939 RPM ENABLE (Visible when ECU is configured for Standard, Volvo Penta, *mtu* ADEC, GM/Doosan, Cummins, or *mtu* Smart Connect.)
    - ENGINE RPM
    - SAVE RPM ADJUSTS
    - RPM BAND WIDTH
    - IDLE RPM
    - RPM CHECKSUM
    - SPEED UP (Visible when ECU is configured for *mtu* ADEC, *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)
    - SPEED DN (Visible when ECU is configured for *mtu* ADEC, *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)
    - TEST OVRSPEED (Visible when ECU is configured for *mtu* ADEC, *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)
    - SPD DMAND SRC (Visible when ECU is configured for *mtu* ADEC, *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)
    - IDLE REQUEST (Visible when ECU is configured for *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)

        - INCREASE IDLE (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
    - ECU SETUP (Visible when ECU is configured for *mtu* ADEC, *mtu* MDEC 304, *mtu* ECU7/ECU8, or *mtu* Smart Connect.)
        - TRIP RESET (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
        - INT OIL PRIME
        - GOV PRM SW (Visible when ECU is configured for *mtu* ADEC or *mtu* Smart Connect.)
        - ENG STRT PRIME (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
        - FAN OVERRIDE (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
        - MODE SWITCH (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
        - GOV PARAM SET (Visible when ECU is configured for *mtu* ECU7/ECU8.)
        - CAN RATING SW 1 (Visible when ECU is configured for *mtu* ECU7/ECU8.)
        - CAN RATING SW 2 (Visible when ECU is configured for *mtu* ECU7/ECU8.)
        - DIS CYL CUT 1 (Visible when ECU is configured for *mtu* MDEC 304, or *mtu* ECU7/ECU8.)
        - DIS CYL CUT 2 (Visible when ECU is configured for *mtu* MDEC 304, *mtu* ECU7/ECU8 or *mtu* Smart Connect.)
        - OPERATING MODE (Visible when ECU is configured for *mtu* Smart Connect.)
        - CAN START/STOP (Visible when ECU is configured for *mtu* ECU7/ECU8 or *mtu* ADEC or *mtu* Smart Connect.)

SYSTEM PARAMS

- **SYSTEM SETTINGS**
    - GEN CONNECT
    - BUS CONNECT
    - RATED kW
    - RATED VOLTS
    - RATED FREQ
    - ALTRNATE FRQ
    - RATED RPM
    - RATED PF
    - ROTATION
    - EPS
        - EPS THRESHLD
        - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
    - FUEL LVL TYP
    - SYSTEM UNITS
    - PRESSURE UNITS (Visible when Metric is selected for System Units.)
    - BATTERY VOLT
    - FLYWHL TEETH
    - SPEED SOURCE
    - MAINT RESET
    - NFPA LEVEL
    - POWER UP DELAY
- **REMOTE MODULE SETUP**
    - CEM SETUP
        - ENABLE
        - OUTPUTS (Visible when CEM-2020 is enabled.)
        - CAN BUS ADDR (Visible when CEM-2020 is enabled.)
        - VERSION INFO (Visible when CEM-2020 is enabled.)
            - FIRMWARE VERSION
            - BOOT CODE VERSION
            - SERIAL NUMBER
            - PART NUMBER
            - MODEL NUMBER
            - BUILD DATE

        - CEM DEBUG MENU (Visible when CEM-2020 is enabled.)
            - DGC TO CEM BP
            - CEM TO DGC BP
- **CRANK SETTINGS**
    - DISCNCT LMIT
    - PRECRNK DELY
    - PRESTRT CNTCT
    - STYLE
    - # CYCLES (Visible when Cycle is selected for Cranking Style.)
    - CONT TIME (Visible when Continuous is selected for Cranking Style.)
    - CYCLE TIME
    - REST TIME
    - MIN CRANK TIME
    - COOLDWN TIME
    - COOLDOWN CONFIG
    - RESTART DELAY
    - OFF MODE COOLDN
    - PRESTART REST CONFIG
        - CONF
    - OIL PRS CRANK DISC
        - ENABLE
        - CRANK DISC PRS
- **AUTOMATIC RESTART**
    - ENABLE
    - ATTEMPTS
    - INTERVAL
- **EXERCISE TIMER**
    - MODE
    - WEEK INTERVAL (Visible when Mode is set to N Week Intervals.)
    - START DAY OF MONTH (Visible when Mode is set to Monthly.)
    - WEEK OF MONTH (Visible when Mode is set to Weekday of Month.)
    - DAY OF WEEK (Visible when Mode is set to Weekly or Weekday of Month.)
    - START HOUR
    - START MINUTE
    - RUN HOURS
    - RUN MINUTES
    - RUN WITH LOAD
    - BEGIN DATE MONTH (Visible when Mode is set to N Week Intervals.)
    - BEGIN DATE DAY (Visible when Mode is set to N Week Intervals.)
    - BEGIN DATE YR (Visible when Mode is set to N Week Intervals.)
- **SENSING TRANS**
    - GEN PT PRI V
    - GEN PT SEC V
    - GEN CT PRI A
    - CT LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
    - BUS PT PRI V
    - BUS PT SEC V
- **RELAY CONTROL**
    - START
    - RUN
    - PRESTART
- **AUTO CONFIG DETECT**
    - ENABLE
    - LOW LINE THRESH
    - 1-PH THRESH
    - 1-PH GEN CONN
- **ENGINE STATISTICS**
    - START YEAR
    - START MONTH
    - START DAY
    - # STARTS
    - HRS TO MAINT
    - kW-HRS
    - TOTAL HRS

- LOADED HRS
- UNLOADED HRS

PROGRAMMABLE INPUTS

- **CONFIGURABLE INPUTS**
  - INPUT X (X = 1 to 7)
    - ALARM CONFIG
    - ACTIVATN DLY
    - RECOGNITION
- **PROG FUNCTIONS**
  - EMERGENCY STOP
    - INPUT
  - AUTO XFER SWITCH
    - INPUT MODE
    - N.O. INPUT
    - N.C. INPUT (Visible when INPUT MODE is complementary.)
    - CIRCUIT ERROR DELAY (Visible when INPUT MODE is complementary.)
    - CIRCUIT ERROR ACTION (Visible when INPUT MODE is complementary.)
  - GRND DELTA O-RIDE
    - INPUT
    - RECOGNITION (Visible when an INPUT is selected.)
  - BATTLE OVERRIDE
    - INPUT
    - RECOGNITION (Visible when an INPUT is selected.)
  - LOW LINE OVERRIDE
    - INPUT
    - RECOGNITION (Visible when an INPUT is selected.)
  - 1 PHASE O-RIDE
    - INPUT
    - RECOGNITION (Visible when an INPUT is selected.)
  - BATT CHRG FAIL
    - INPUT
    - ALARM CONFIG (Visible when an INPUT is selected.)
    - ACTIVATN DLY (Visible when an INPUT is selected.)
    - RECOGNITION (Visible when an INPUT is selected.)
  - LOW COOL LEVEL
    - INPUT
    - ALARM CONFIG (Visible when an INPUT is selected.)
    - ACTIVATN DLY (Visible when an INPUT is selected.)
    - RECOGNITION (Visible when an INPUT is selected.)
  - LOW FUEL LEVEL
    - INPUT
    - ALARM CONFIG (Visible when an INPUT is selected.)
    - ACTIVATN DLY (Visible when an INPUT is selected.)
    - RECOGNITION (Visible when an INPUT is selected.)
  - FUEL LEAK DETECT
    - INPUT
    - ALARM CONFIG (Visible when an INPUT is selected.)
    - ACTIVATN DLY (Visible when an INPUT is selected.)
    - RECOGNITION (Visible when an INPUT is selected.)

PROGRAMMABLE OUTPUTS

- **CONFIG ELEMENTS**
  - CONFIG ELEMENT X (X = 1 to 8)
    - ALARM CONFIG
    - ACTIVATN DLY
    - RECOGNITION

ALARM CONFIGURATION

- **HORN CONFIGURATION**
  - HORN
  - NOT IN AUTO HORN

- **PRE-ALARMS**
  - HIGH COOLANT TEMP
    - ENABLE
    - THRESHOLD
  - LOW COOLANT TEMP
    - ENABLE
    - THRESHOLD
  - LOW OIL PRESSURE
    - ENABLE
    - THRESHOLD
  - LOW FUEL LEVEL
    - ENABLE
    - THRESHOLD
    - HYSTERESIS
  - ENGINE OVERLOAD
    - ENG KW OVRLD-1
    - ENG KW OVRLD-2
    - ENG KW OVRLD-3
  - MAINTENANCE INTERVAL
    - ENABLE
    - THRESHOLD
  - BATTERY OVERVOLTAGE
    - ENABLE
    - THRESHOLD
  - LOW BATTERY VOLTAGE
    - ENABLE
    - THRESHOLD
    - ACTIVATN DLY
  - WEAK BATTERY VOLTAGE
    - ENABLE
    - THRESHOLD
    - ACTIVATN DLY
  - HIGH FUEL LEVEL
    - ENABLE
    - THRESHOLD
    - ACTIVATN DLY
    - HYSTERESIS
  - ACTIVE DTC (Visible when DTC is enabled.)
    - ENABLE
  - ECU COMMS FAIL (Visible when CAN BUS is enabled.)
    - ENABLE
  - COOLANT LEVEL (Visible when CAN BUS is enabled.)
    - ENABLE
    - THRESHOLD
  - CEM COMM FAIL (Visible when CEM-2020 is enabled.)
    - ENABLE
  - CHECKSUM FAIL
    - ENABLE
  - BRK CLOSE FAIL PALM
    - ENABLE
  - BRK OPEN FAIL PALM
    - ENABLE
  - REVERSE ROTATION
    - ENABLE
  - DEF PREALARMS
    - ENABLE
- **ALARMS**
  - HIGH COOLANT TEMP
    - ENABLE
    - THRESHOLD
    - ARMING DELAY
  - LOW OIL PRESSURE
    - ENABLE
    - THRESHOLD
    - ARMING DELAY

- LOW FUEL LEVEL
  - ENABLE
  - THRESHOLD
  - ACTIVATN DLY
- OVERSPEED
  - ENABLE
  - THRESHOLD
  - ACTIVATN DLY
- COOLANT LEVEL (Visible when CAN bus is enabled.)
  - ENABLE
  - THRESHOLD
- CAN LOW COOL LEVEL

> **Note**
>
> The HIGH COOLANT TEMP and LOW OIL PRESSURE alarms have an ARMING DLY setting that disables the alarm for the specified time after engine startup.

- **SENDER FAIL**
  - COOL TEMP SENDR FAIL
    - CONFIG TYPE
    - RECOGNITION
    - ACTIVATN DLY
    - MIN OHMS
    - MAX OHMS
    - SF DISPLAY
  - OIL PRESS SENDR FAIL
    - CONFIG TYPE
    - RECOGNITION
    - ACTIVATN DLY
    - MIN OHMS
    - MAX OHMS
    - SF DISPLAY
  - FUEL LEVL SENDR FAIL
    - CONFIG TYPE
    - RECOGNITION
    - ACTIVATN DLY
    - MIN OHMS
    - MAX OHMS
    - SF DISPLAY
  - VOLTAGE SENSE FAIL
    - CONFIG TYPE
    - ACTIVATN DLY
  - SPEED SENDR FAIL
    - TIME DELAY

GENERATOR PROTECTION

- **27 UNDERVOLTAGE**
  - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
  - 3 / 1 PHASE SETTINGS
    - PICKUP
    - HYSTERESIS
    - TIME DELAY
    - FREQ INHIBIT
    - ALARM CONFIG
- **59 OVERVOLTAGE**
  - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
  - 3 / 1 PHASE SETTINGS
    - PICKUP
    - HYSTERESIS
    - TIME DELAY
    - ALARM CONFIG

- **47 PHASE IMBALANCE**
  - PICKUP
  - HYSTERESIS
  - TIME DELAY
  - ALARM CONFIG
  - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
- **81 O/U FREQUENCY**
  - UNDERFREQUENCY
    - INHIBIT VOLTS
    - PICKUP
    - HYSTERESIS
    - TIME DELAY
    - ALARM CONFIG
  - OVERFREQUENCY
    - PICKUP
    - HYSTERESIS
    - TIME DELAY
    - ALARM CONFIG
  - ALTRNT FRQ SCALE FCTR
    - ALT FREQ SF
- **50 OVERCURRENT**
  - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
  - 3 / 1 PHASE SETTINGS
    - PICKUP
    - TIME DELAY
    - ALARM CONFIG

BREAKER MANAGEMENT

- **BREAKER HARDWARE**
  - MAINS FAIL TRANSFER
    - ENABLE
    - RETURN DELAY
    - TRANSFER DELAY
    - MAX TRANSFER TIME
  - CLOSE WAIT TIME
    - TIME
  - GEN BREAKER
    - CONTINUOUS
    - CLOSING TIME
    - OPEN CMD
    - CLOSE CMD
  - MAINS BREAKER
    - CONFIGURED
    - CONTINUOUS (Visible when configured.)
    - CLOSING TIME (Visible when configured.)
    - OPEN CMD (Visible when configured.)
    - CLOSE CMD (Visible when configured.)
  - BRK CLOSE FAIL PALM
  - BRK OPEN FAIL PALM
- **BUS CONDITION DETECT**
  - GEN DEAD
    - THRESHOLD
    - TIME DELAY
  - GEN STABLE
    - OV PICKUP
    - OV DROPOUT
    - UV PICKUP
    - UV DROPOUT
    - OF PICKUP
    - OF DROPOUT
    - UF PICKUP
    - UF DROPOUT
    - TIME DELAY

        - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
        - ALT FREQ SF
    - GEN FAILED
        - TIME DELAY
    - BUS DEAD
        - THRESHOLD
        - TIME DELAY
    - BUS STABLE
        - OV PICKUP
        - OV DROPOUT
        - UV PICKUP
        - UV DROPOUT
        - OF PICKUP
        - OF DROPOUT
        - UF PICKUP
        - UF DROPOUT
        - TIME DELAY
        - LOW LINE SF (Visible when an input is selected for the Low Line Override programmable function.)
        - ALT FREQ SF
    - BUS FAILED
        - TIME DELAY

LOGIC TIMERS

- **TIMER X (X = 1 to 10)**
    - HOURS
    - MINUTES
    - SECONDS

ENTER PASSWORD

LOGOUT (Visible when logged in through the front panel.)

3 • BESTCOMS*Plus*®

BESTCOMS*Plus*® is a Windows®-based, PC application that provides a user-friendly, graphical user interface (GUI) for use with Basler Electric communicating products. The name BESTCOMS*Plus* is an acronym that stands for Basler Electric Software Tool for Communications, Operations, Maintenance, and Settings.

BESTCOMS*Plus* provides the user with a point-and-click means to set and monitor the DGC-2020ES. The capabilities of BESTCOMS*Plus* make the configuration of one or several DGC-2020ES controllers fast and efficient. A primary advantage of BESTCOMS*Plus* is that a settings scheme can be created, saved as a file, and then uploaded to the DGC-2020ES at the user's convenience.

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.

The DGC-2020ES plugin opens inside the BESTCOMS*Plus* main shell. The same default logic scheme that is shipped with the DGC-2020ES is brought into BESTCOMS*Plus* by downloading settings and logic from the DGC-2020ES. This gives the user the option of developing a custom setting file by modifying the default logic scheme or by building a unique scheme from scratch.

BESTlogic™*Plus* Programmable Logic is used to program DGC-2020ES logic for protection elements, inputs, outputs, alarms, etc. This is accomplished by drag-and-drop method. The user can drag elements, components, inputs, and outputs onto the program grid and make connections between them to create the desired logic scheme.

Figure 3-1 illustrates the typical user interface components of the DGC-2020ES plugin with BESTCOMS*Plus*.

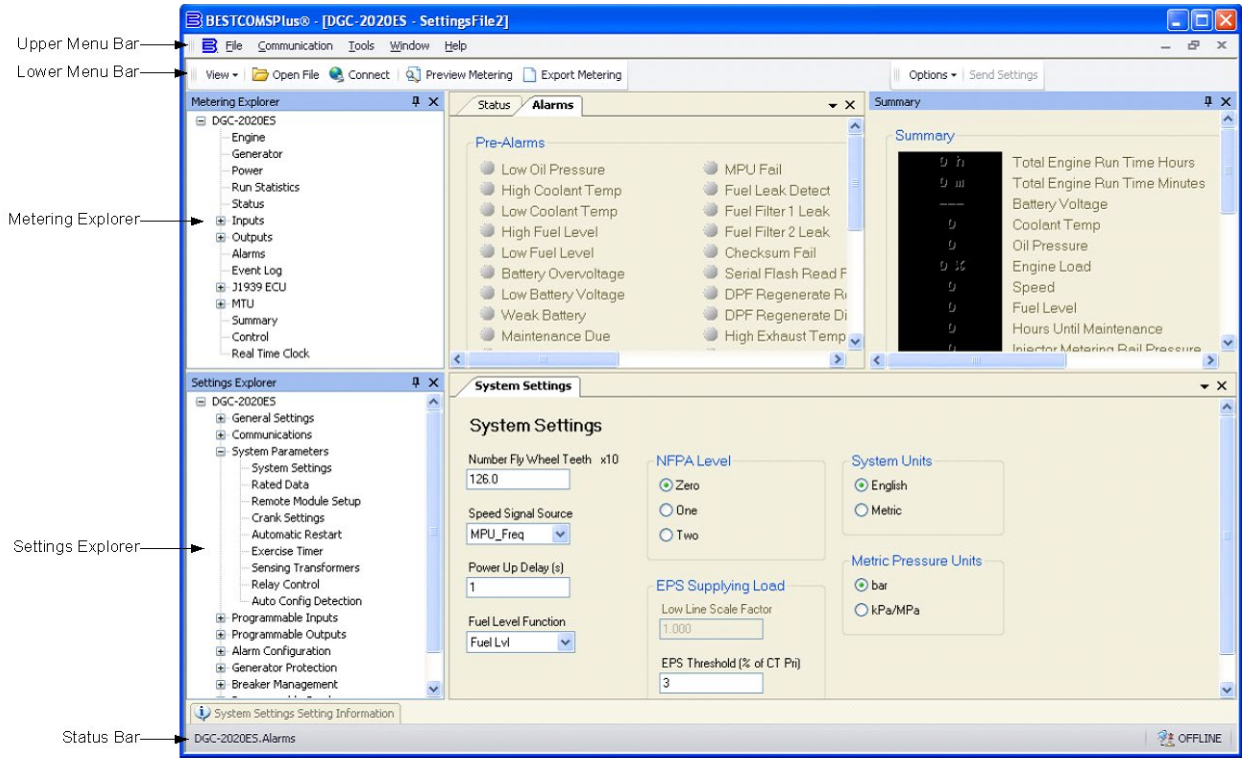


Figure 3-1. Typical User Interface Components

System Recommendations

BESTCOMS*Plus* software is built on the Microsoft® .NET Framework. The setup utility that installs BESTCOMS*Plus* on your PC also installs the DGC-2020ES plugin and the required version of .NET Framework (if not already installed). BESTCOMS*Plus* operates with systems using Windows® 7 SP1, Windows 8.1, and Windows 10 version 1607 (Anniversary Update). System recommendations for the .NET Framework and BESTCOMS*Plus* are listed in Table 3-1.

Table 3-1. System Recommendations for BESTCOMS*Plus* and the .NET Framework

System Type	Component	Recommendation
32/64 bit	Processor	2.0 GHz
32/64 bit	RAM	1 GB (minimum), 2 GB (recommended)
32 bit	Hard Drive	200 MB (if .NET Framework is already installed on PC)
		4.5 GB (if .NET Framework is not already installed on PC)
64 bit	Hard Drive	200 MB (if .NET Framework is already installed on PC)
		4.5 GB (if .NET Framework is not already installed on PC)

To install and run BESTCOMS*Plus*, a Windows user must have Administrator rights. A Windows user with limited rights may not be permitted to save files in certain folders.

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 BESTCOMS*Plus*

Use the following procedure to download BESTCOMS*Plus* from the Basler Electric website.

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

Install BESTCOMS*Plus*

Run the setup file for the BESTCOMS*Plus* application. The setup utility installs BESTCOMS*Plus*, the .NET Framework (if not already installed), the USB driver, and the DGC-2020 plugin for BESTCOMS*Plus* on your PC.

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 operating power to the DGC-2020ES. Wait until the boot sequence is complete.

Start BESTCOMS*Plus*® 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 3-2). 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.

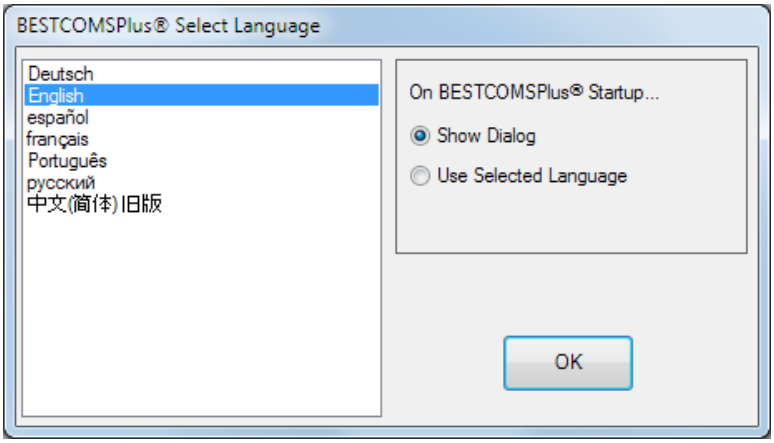


Figure 3-2. BESTCOMS*Plus* Language Selection Dialog

The BESTCOMS*Plus* platform window opens. Select *New Connection* from the *Communication* pull-down menu and select *DGC-2020ES*. See Figure 3-3. The DGC-2020ES plugin is activated automatically after connecting to a DGC-2020ES.

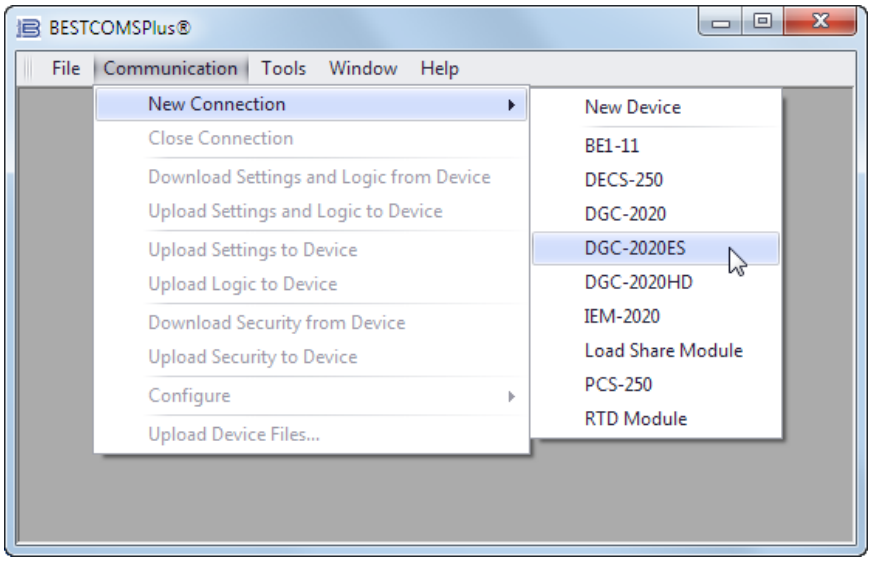


Figure 3-3. Communication Pull-Down Menu

The *DGC-2020ES Connection* screen, shown in Figure 3-4, appears.

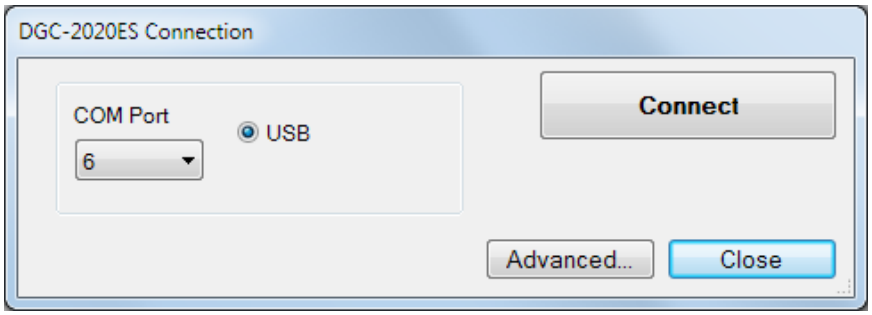


Figure 3-4. DGC-2020ES Connection Dialog

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 operating power is applied to the DGC-2020ES and the USB cable is connected before opening the Device Manager. See Figure 3-5.

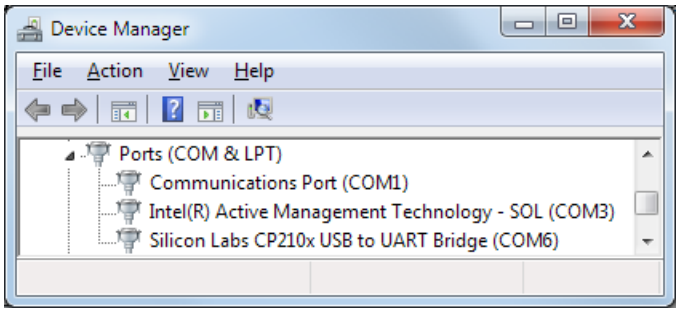


Figure 3-5. Device Manager

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 operating 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. 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 3-6.

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 *Tools* pull-down menu of the BESTCOMS*Plus* main screen.

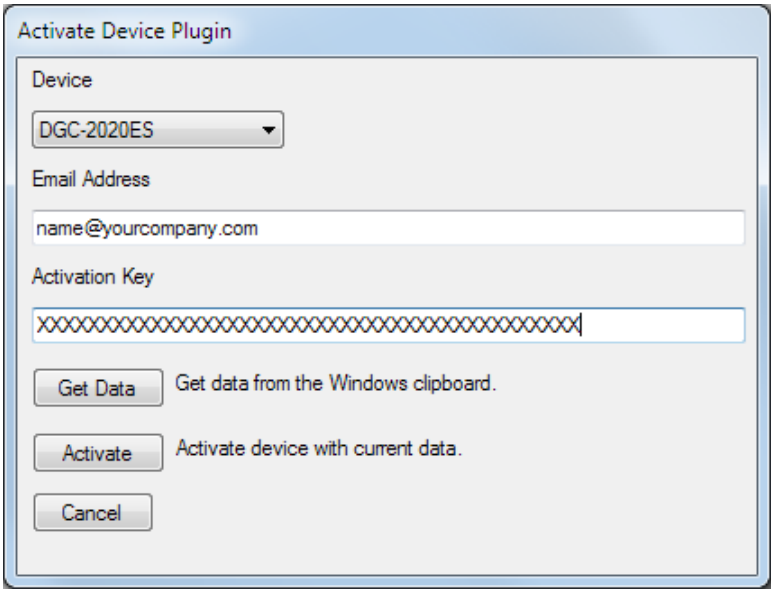


Figure 3-6. Activate Device Plugin

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 3-4) or by clicking on the Connect button on the lower menu bar of the main BESTCOMS*Plus* screen (Figure 3-1). Download all settings and logic from the DGC-2020ES by selecting Download Settings and Logic from the Communication pull-down menu. BESTCOMS*Plus* will read all settings and logic from the DGC-2020ES and load them into BESTCOMS*Plus* memory. See Figure 3-7.

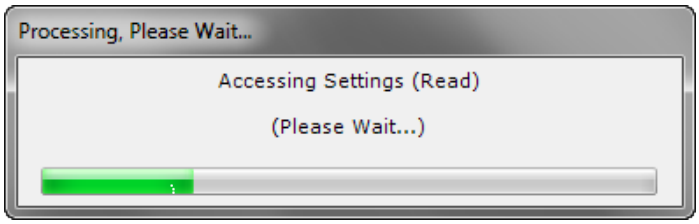


Figure 3-7. Processing, Please Wait…

Advanced Properties

Click the Advanced button on the Connection screen to display the Advanced Properties dialog. Default settings are shown in Figure 3-8.

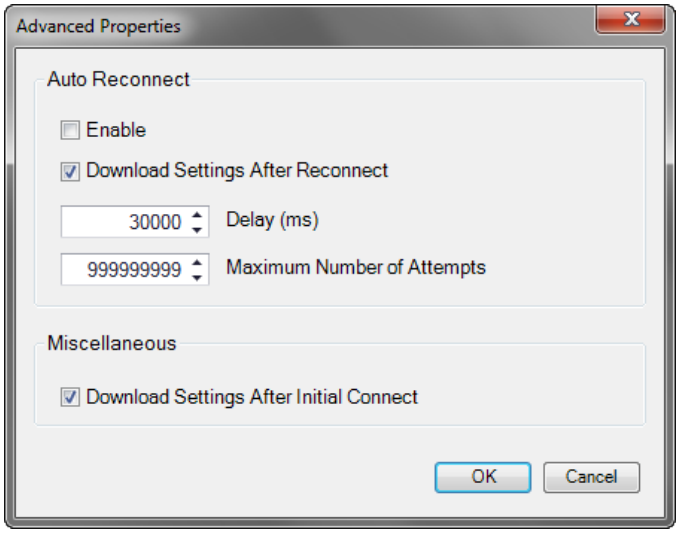


Figure 3-8. Advanced Properties Dialog

Menu Bars

The menu bars are located near the top of the BESTCOMS*Plus* window (see Figure 3-1). The upper menu bar has five pull-down menus. With the upper menu bar, it is possible to manage settings files, configure communication settings, upload and download settings/security files, and compare settings files. The lower menu bar consists of clickable icons. The lower menu bar is used to change BESTCOMS*Plus* views, save or load a BESTspace™ workspace, open a settings file, connect/disconnect, preview metering printout, export metering, switch to live mode, and send settings to the DGC-2020ES.

Upper Menu Bar (BESTCOMS*Plus*® Shell)

Upper menu bar functions are listed and described in Table 3-2.

Table 3-2. Upper Menu Bar (BESTCOMS*Plus* Shell)

Menu Item	Description
File	
New	Create a new settings file
Open	Open an existing settings file
Close	Close settings file
Save	Save settings file
Save As	Save settings file with a different name
Export To File	Save settings as a *.csv file

Menu Item	Description
Print	Print, export, or send a settings file
Properties	View properties of a settings file
History	View history of a settings file
Recent Files	Open a previously opened file
Exit	Close BESTCOMS*Plus* program
Communication	
New Connection	Choose new device or DGC-2020ES
Close Connection	Close communication between BESTCOMS*Plus* and DGC-2020ES
Download Settings and Logic from Device	Download operational and logic settings from the device
Upload Settings and Logic to Device	Upload operational and logic settings to the device
Upload Settings to Device	Upload operational settings to the device
Upload Logic to Device	Upload logic settings to the device
Download Security from Device	Download security settings from the device
Upload Security to Device	Upload security settings to the device
Upload Device Files	Upload firmware to the device
Tools	
Select Language	Select BESTCOMS*Plus* language
Activate Device	Activate the DGC-2020ES plugin
Set File Password	Password protect a settings file
Compare Settings Files	Compare two settings files
Auto Export Metering	Exports metering data on a user-defined interval
Event Log - View	View the BESTCOMS*Plus* event log
Event Log - Verbose Logging	Enable/disable verbose logging
Event Log - Verbose Communications Logging	Enable/disable verbose communications logging
Set Default Shell	Select the default product shell view for BESTCOMS*Plus*. Options include Classic view, Updated view, or Combined view.
Generate Certificate (this function is not applicable to the DGC-2020ES)	Generate a certificate
Accepted Devices (this function is not applicable to the DGC-2020ES)	View and delete accepted certificates
Help	
Check for Updates	Check for BESTCOMS*Plus* updates via the internet
Check for Update Settings	Enable or change automatic checking for updates
About	View general, detailed build, and system information

Lower Menu Bar (DGC-2020ES Plugin)

The lower menu bar functions are listed and described in Table 3-3.

Table 3-3. Lower Menu Bar (DGC-2020ES Plugin)

Menu Button	Description
View ▾	Enables you to show/hide the Metering Panel, Settings Panel, or Settings Info Panel.

	Opens and saves BESTspace™ workspaces. Customized workspaces make switching between tasks easier and more efficient.
Open File	Opens a saved settings file.
Connect	Connect: Opens the *DGC-2020ES Connection* screen which enables you to connect to the DGC-2020ES via USB or a modem. This button only appears when a DGC-2020ES is not connected.
Disconnect	Disconnect: Used to disconnect a connected DGC-2020ES. This button only appears when a DGC-2020ES is connected.
Preview Metering	Displays the *Print Preview* screen where a preview of the Metering printout is shown. Click on the printer button to send to a printer.
Export Metering	Enables all metering values to be exported into a *.csv file.
Options	Displays a drop-down list entitled *Live Mode Settings* which enables *Live* mode where settings are automatically sent to the device in real time as they are changed.
Send Settings	Sends settings to the DGC-2020ES when BESTCOMS*Plus* is not operating in Live Mode. Click this button after making a setting change to send the modified setting to the DGC-2020ES.

Settings Explorer

The Settings Explorer is a convenient tool within BESTCOMS*Plus* used to navigate through the various settings screens of the DGC-2020ES plugin.

These screens allow the user to edit general settings, communications, system parameters, programmable inputs, programmable outputs, alarm configuration, generator protection, breaker management, programmable senders, and BESTlogic*Plus* programmable logic.

Logic setup will be necessary after making certain setting changes. For more information, refer to the BESTlogic*Plus* chapter.

Settings Entry

When entering settings in BESTCOMS*Plus*, each setting is validated against prescribed limits. Entered settings that do not conform with the prescribed limits are accepted but flagged as noncompliant. Figure 3-9 illustrates an example of flagged, noncompliant settings (locator A) and the Setting Validation window (locator B) used to diagnose faulty settings.

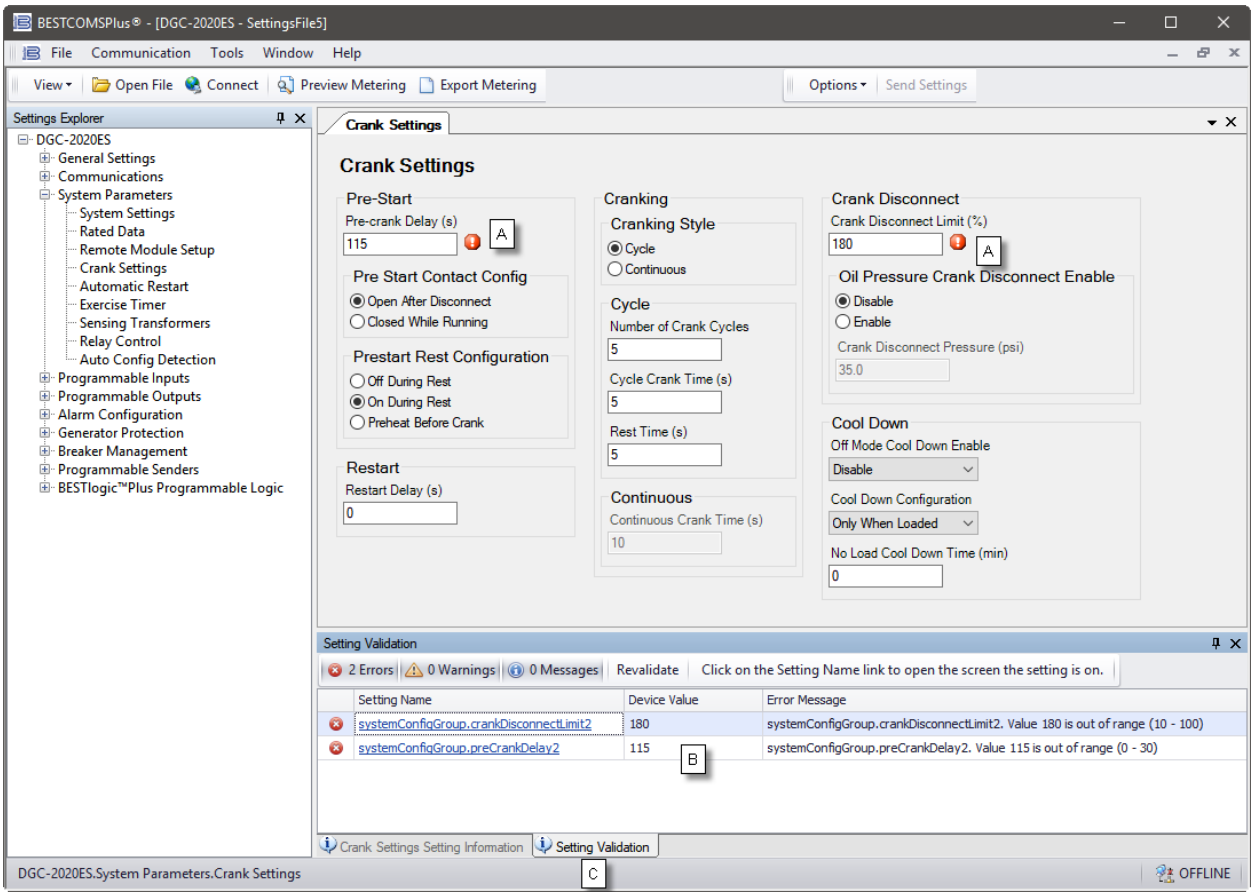


Figure 3-9. Flagged, Noncompliant Settings and the Seting Validation Window

The Setting Validation window, viewed by selecting the Setting Validation tab (locator C), displays three types of annunciations: errors, warnings, and messages. An error describes a problem such as a setting that is out of range. A warning describes a condition where supporting settings are invalid, causing other settings to be noncompliant with the prescribed limits. A message describes a minor setting issue that was automatically resolved by BESTCOMS*Plus*. An example of a condition triggering a message is entry of a settings value with a resolution that exceeds the limit imposed by BESTCOMS*Plus*. In this situation, the value is automatically rounded and a message is triggered. Each annunciation lists a hyperlinked name for the noncompliant setting and an error message describing the issue. Clicking the hyperlinked setting name takes you to the setting screen with the offending setting. Right-clicking the hyperlinked setting name will restore the setting to its default value.

Note

It is possible to save a DGC-2020ES settings file in BESTCOMS*Plus* with noncompliant settings. However, it is not possible to upload noncompliant settings to the DGC-2020ES.

Metering Explorer

The Metering Explorer is a convenient tool within BESTCOMS*Plus* used to navigate through the various metering screens of the DGC-2020ES plugin.

These screens allow the user to view real-time system data including generator voltages and currents, input/output status, alarms, reports, and other parameters. Refer to the Metering chapter in the *Operation* manual for more information on the Metering Explorer.

BESTspace™

BESTspace provides the ability to manage customized workspaces. A workspace consists of the position and size of all open screens within BESTCOMS*Plus*. Pre-saved workspaces can be quickly loaded to fit the specific task at hand. Any number of different workspaces can be saved including a default workspace which loads when the DGC-2020ES plug-in is started. The Metering Explorer screens and the Settings Explorer screens can be saved independently into the workspace file. A *Comments* box is provided for writing a description or leaving notes for each saved workspace. To access BESTspace, click *View* (on the lower menu bar) and hover over *BESTspace*. Figure 3-10 illustrates the BESTspace options found under the *View* pull-down menu. Figure 3-11 illustrates the options included in the Load/Save Workspace File screen.

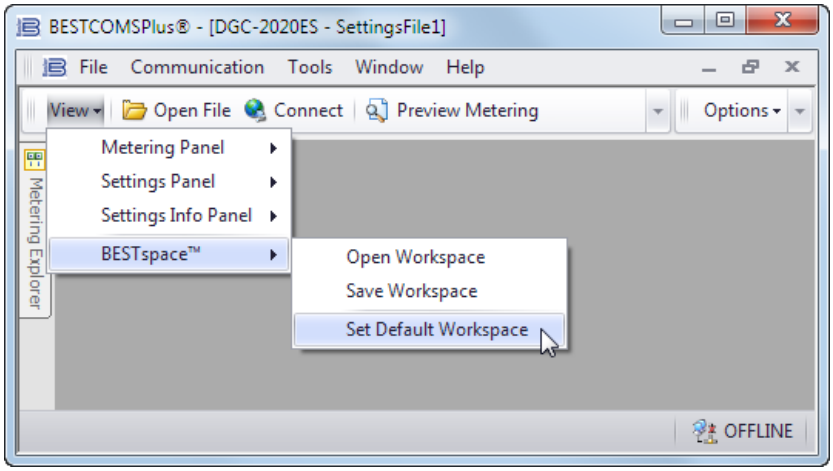


Figure 3-10. View Menu, BESTspace™ Options

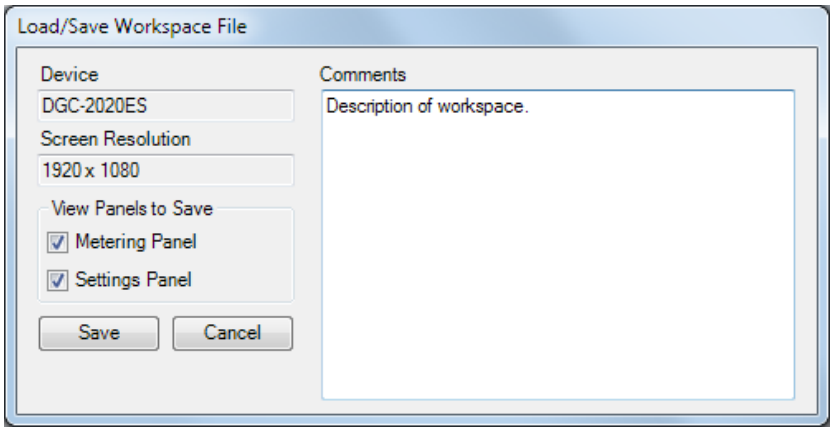


Figure 3-11. View Menu, BESTspace™, Save Workspace Screen

Settings File Management

A settings file contains all DGC-2020ES settings, including logic. A settings file assumes a file extension of "∗.bstx". It is possible to save the logic only as a separate logic library file on the BESTlogic*Plus* Programmable Logic screen. This function is helpful when similar logic is required for several devices. A logic library file assumes a file extension of "∗.bslx". It is important to note that settings and logic can be uploaded to the device together or separately, but are always downloaded together. For more information on logic files, refer to the *BESTlogicPlus* chapter.

Opening a Settings File

To open a DGC-2020ES settings file with BESTCOMS*Plus*, pull down the *File* menu and choose *Open*. The *Open* dialog box appears. This dialog box allows you to use normal Windows techniques to select the file that you want to open. Select the file and choose *Open*. You can also open a file by clicking on the *Open File* button on the lower menu bar. If connected to a device, you will be asked to upload the settings and logic from the file to the current device. If you choose *Yes*, the settings displayed in BESTCOMS*Plus* will be overwritten with the settings of the opened file.

Saving a Settings File

Select *Save* or *Save As* from the *File* pull-down menu. A dialog box appears allowing you to enter a filename and location to save the file. Select the *Save* button to complete the save.

Upload Settings and/or Logic to Device

To upload a settings file to the DGC-2020ES, open the file through BESTCOMS*Plus* or create the file using BESTCOMS*Plus*. Then pull down the *Communication* menu and select *Upload Settings and Logic to Device.* If you want to upload operational settings without logic, select *Upload Settings to Device*. If you want to upload logic without operational settings, select *Upload Logic to Device*. You are prompted to enter the password. The default password is “OEM”. If the password is correct, the upload begins and the progress bar is shown.

Download Settings and Logic from Device

To download settings and logic from the DGC-2020ES, pull down the *Communication* menu and select *Download Settings and Logic from Device*. If the settings in BESTCOMS*Plus* have changed, a dialog box will open asking if you want to save the current settings changes. You can choose *Yes* or *No*. After you have taken the required action to save or discard the current settings, downloading begins. BESTCOMS*Plus* will read all settings and logic from the DGC-2020ES and load them into BESTCOMS*Plus* memory.

Print a Settings File

To view a preview of the settings printout, select *Print Preview* from the *File* pull-down menu. To print the settings, select the printer icon in the upper left corner of the *Print Preview* screen.

You can skip the print preview and go directly to print by pulling down the *File* menu and selecting *Print*. A dialog box opens containing the typical Windows options for setting the properties of the printer. Configure these settings as necessary and then select *Print*.

Compare Settings Files

BESTCOMS*Plus* has the ability to compare two settings files. To compare files, pull down the *Tools* menu and select *Compare Settings Files*. The *BESTCOMSPlus Settings Compare Setup* dialog box appears (Figure 3-12). Select the location of the first file under *Left Settings Source* and select the location of the second file under *Right Settings Source*. If you are comparing a settings file located on your PC hard drive or portable media, click the folder button and navigate to the file. If you want to compare settings downloaded from a unit, click the *Select Unit* button to set up the communication port. Click the *Compare* button to compare the selected settings files.

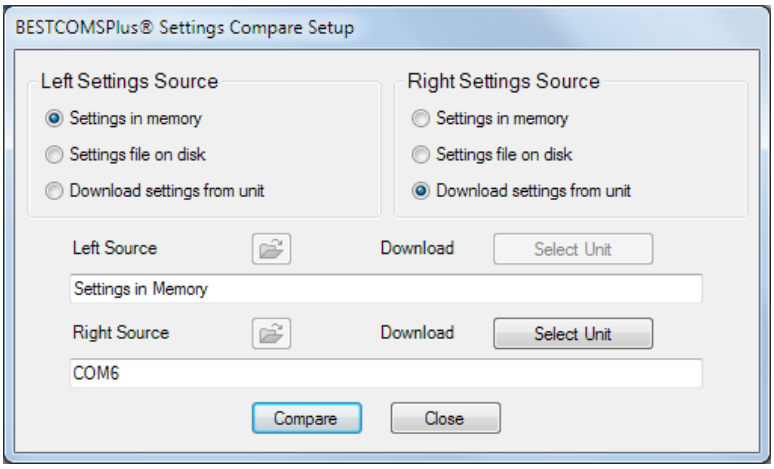


Figure 3-12. Tools, Compare Settings Files Screen

A dialog box appears, displaying the results of the comparison. The *BESTCOMSPlus Settings Compare* dialog box (Figure 3-13) is displayed where you can view all settings (*Show All Settings*), view only the differences (*Show Settings Differences*), view all logic *(Show All Logic Paths),* or view only logic differences *(Show Logic Path Differences).* Select *Close* when finished.

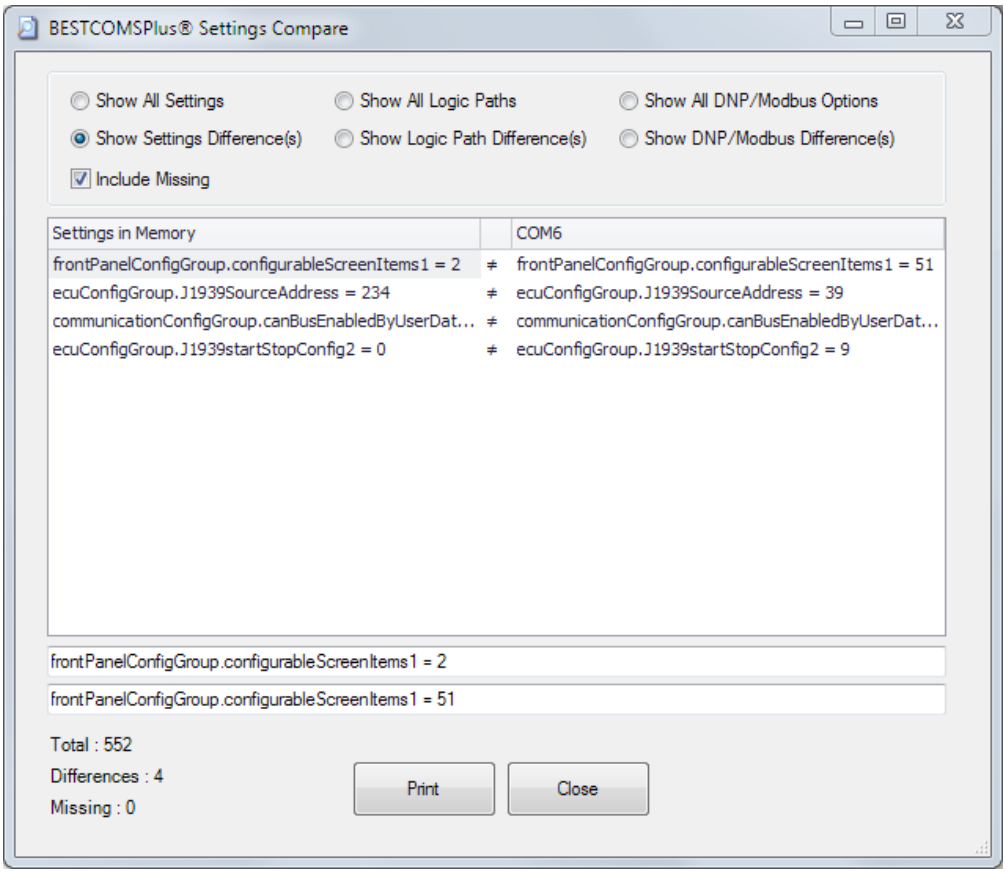


Figure 3-13. Settings Comparison Results Screen

Firmware Updates

Future enhancements to the DGC-2020ES functionality will make a firmware update desirable. Because default settings are loaded when DGC-2020ES firmware is updated, your settings should be saved in a file prior to upgrading firmware.

Caution

Installing previous versions of firmware may result in compatibility issues causing the inability to operate properly and may not have the enhancements and resolutions to issues that more recent versions provide. Basler Electric highly recommends using the latest version of firmware at all times. Using previous versions of firmware is at the user's risk and may void the warranty of the unit.

Note

The latest version of BESTCOMS*Plus* software should be downloaded from the Basler Electric website and installed before performing a firmware upgrade.

A device package contains firmware and a language module. Embedded firmware is the operating program that controls the actions of the DGC-2020ES. The DGC-2020ES stores firmware in nonvolatile flash memory that can be reprogrammed through the communication ports. It is not necessary to replace EPROM chips when updating the firmware with a newer version.

The language of the front panel LCD can be changed by uploading a different language module into the DGC-2020ES. The DGC-2020ES stores the language module in nonvolatile flash memory; the language module contains all language translations for the DGC-2020ES. The language module can be reprogrammed through the communications port. In general, any time a firmware upgrade is made to the DGC-2020ES, the language module should be uploaded as well.

The DGC-2020ES can be used in conjunction with the Contact Expansion Module (CEM-2020) which expands the DGC-2020ES capabilities. When upgrading the firmware in any component of this system, the firmware in ALL of the components of the system should be upgraded to ensure compatibility of communications between the components.

Caution

The order in which the components are upgraded is critical. Assuming a system of a DGC-2020ES and expansion module is in a state where the DGC-2020ES is communicating with the system expansion module, **the expansion module must be upgraded before the DGC-2020ES.** This is necessary because the DGC-2020ES must be able to communicate with the expansion module before the DGC-2020ES can send firmware to it. If the DGC-2020ES were upgraded first, and the new firmware included a change to the expansion module communication protocol, it is possible that the expansion module could no longer communicate with the upgraded DGC-2020ES. Without communications between the DGC-2020ES and the expansion module, upgrading the expansion module is not possible.

Note

If power is lost or communication is interrupted during file transfer to the DGC-2020ES, it will cease to operate and will not recover automatically. If this occurs or if the front panel HMI becomes blank and all LEDs are flashing at a two-second rate, the DGC-2020ES will not have valid firmware installed and the firmware must be uploaded again. To accomplish this, cycle power to the DGC-2020ES and activate the DGC-2020ES plugin in BESTCOMS*Plus*. Select *Upload Device Files* from the *Communication* pull-down menu and proceed normally.

Upgrading Firmware in Expansion Modules

The following procedure is used to upgrade firmware in the DGC-2020ES expansion module. This must be completed before upgrading firmware in the DGC-2020ES. If no expansion module is present, proceed to *Upgrading Firmware in the DGC-2020ES*.

1. Place the DGC-2020ES in OFF mode. This can be accomplished by clicking the *Off* button on the *Control* screen inside the Metering Explorer or by pressing the *Off* button on the DGC-2020ES front panel.
2. Enable the expansion module that is present in the system. If it has not already been enabled, enable the expansion module on the SETTINGS > SYSTEM PARAMETERS > REMOTE MODULE SETUP screen.
3. Verify that the DGC-2020ES and the associated expansion module are communicating. This can be verified by examining the pre-alarm status using the Metering Explorer in BESTCOMS*Plus* or from the front panel by navigating to METERING > ALARMS-STATUS > PRE-ALARMS. There should be no *Loss of Comms* pre-alarms in the pre-alarm status when communications are functioning properly.
4. Connect to the DGC-2020ES through the USB port if not already connected.
5. Select *Upload Device Files* from the Communication pull-down menu.
6. You will be asked to save the current settings file. Select *Yes* or *No*.
7. When the *Basler Electric Device Package Uploader* screen (Figure 3-14) appears, click on the *Open* button to browse for the device package you have received from Basler Electric. The *Package Files* along with *File Details* are listed. Place a check in the boxes next to the individual files you want to upload.

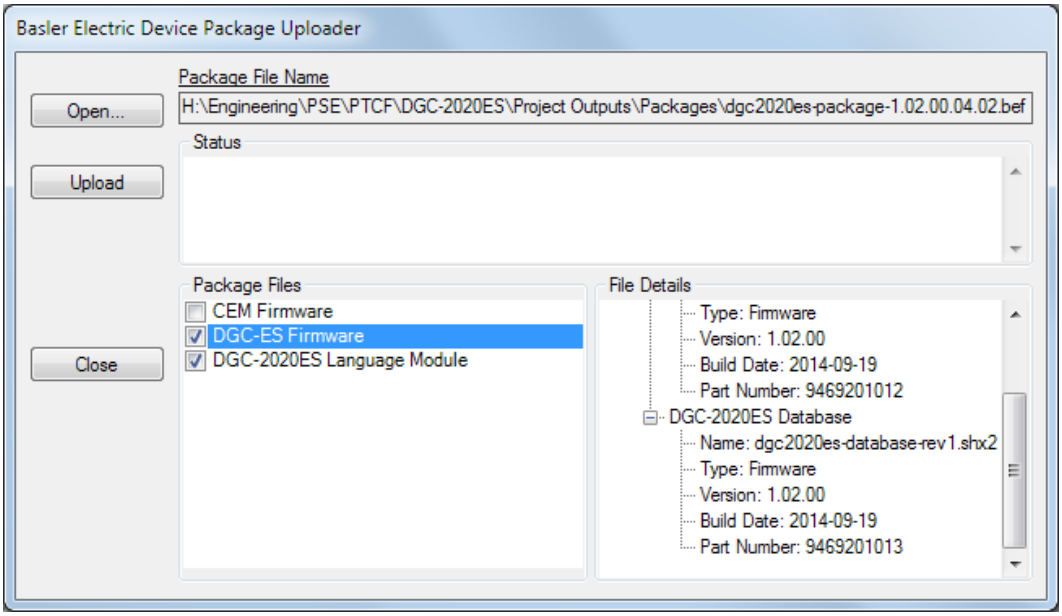


Figure 3-14. Basler Electric Device Package Uploader

8. Click on the *Upload* button and the *Proceed with Device Upload* screen will appear. Select *Yes* or *No*.
9. After selecting *Yes*, the *DGC-2020ES Selection* screen will appear. Select the communication port to begin upload. Refer to Figure 3-15.
10. After file(s) have been uploaded, click the *Close* button on the *Basler Electric Device Package Uploader* screen and disconnect communication to the DGC-2020ES.

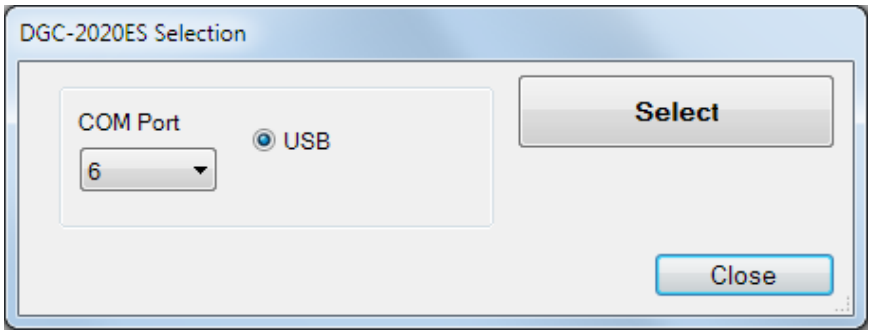


Figure 3-15. DGC-2020ES Selection

Upgrading Firmware in the DGC-2020ES

Upgrade DGC-2020ES firmware and then load a saved settings file.

1. Upgrade the DGC-2020ES firmware and language module.
    a. Connect to the DGC-2020ES with BESTCOMS*Plus*. Check the firmware Application Version on the GENERAL SETTINGS > VERSION INFO > DGC-2020ES screen.
    b. Select *Upload Device Files* from the *Communication* pull-down menu. You do not have to be connected to the DGC-2020ES at this time. Save settings when prompted, if desired.
    c. Open the desired device package file (****DGC-2020ES-*****_xxyyzz.bef, where **** may be additional descriptive text of varying length, and xx.yy.zz is the version number of the device package file.)
    d. Check the boxes for *DGC-2020ES Firmware* and *DGC-2020ES Language Module*. Note the version number of the DGC-2020ES firmware; this is the version that will be used to set the Application Version in the settings file in a later step. This is NOT the same as the version of the package file that is contained in the fields xx.yy.zz in the package file name.
    e. Click the *Upload* button and follow the instructions that appear to begin the upgrade process.
    f. After the upload is complete, disconnect communication to the DGC-2020ES.
2. Load the saved settings file into the DGC-2020ES.
    a. Close all settings files.
    b. From the *File* pull-down menu, select *New*, *DGC-2020ES*.
    c. Connect to the DGC-2020ES.
    d. Once all settings have been read from the DGC-2020ES, open the saved settings file by selecting the file with *File, Open File* in the BESTCOMS*Plus* menu.
    e. When BESTCOMS*Plus* asks if you wish to upload settings and logic to the device, click *Yes*.
    f. If you are receiving upload failures and indications that the logic is incompatible with the firmware version, check that the DGC-2020ES style number in the saved file matches that of the DGC-2020ES into which the file is being uploaded. The style number in the settings file is found under GENERAL SETTINGS > STYLE NUMBER in BESTCOMS*Plus*.
    g. If the style number of the settings file does not match that of the DGC-2020ES into which it is to be loaded, disconnect from the DGC-2020ES, then modify the style number in the settings file. Then repeat the steps titled *Load the Settings File into the DGC-2020ES.*

BESTCOMSPlus® Updates

Ongoing DGC-2020ES functionality enhancements may make future DGC-2020ES firmware updates desirable. Enhancements to DGC-2020ES firmware typically coincide with enhancements to the DGC-2020ES plugin for BESTCOMS*Plus*. When a DGC-2020ES is updated with the latest version of firmware, the latest version of BESTCOMS*Plus* should also be obtained.

- You can check for BESTCOMS*Plus* updates by visiting www.basler.com.
- BESTCOMS*Plus* automatically checks for updates when Check Automatically is selected on the Check for Updates User Settings screen. This screen is accessed under the Help drop-down menu. (An internet connection is required.)
- You can use the manual “check for updates” function in BESTCOMS*Plus* to ensure that the latest version is installed by selecting Check for Updates in the Help drop-down menu. (An internet connection is required.)

4 • Communication

DGC-2020ES communication ports include a mini-B USB port, CAN terminals, and provisions for an optional Remote Display Panel. The following paragraphs describe the DGC-2020ES communication ports in detail.

Caution

This product contains one or more *nonvolatile memory* devices. Nonvolatile memory is used to store information (such as settings) that needs to be preserved when the product is power-cycled or otherwise restarted. Established nonvolatile memory technologies have a physical limit on the number of times they can be erased and written. In this product, the limit is 100,000 erase/write cycles. During product application, consideration should be given to communications, logic, and other factors that may cause frequent/repeated writes of settings or other information that is retained by the product. Applications that result in such frequent/repeated writes may reduce the useable product life and result in loss of information and/or product inoperability.

USB

The rear-panel, mini-B USB port enables local communication with a PC running BESTCOMS*Plus*® software. The DGC-2020ES is connected to a PC using a standard USB cable. BESTCOMS*Plus* is a Windows®-based communication software package that is supplied with the DGC-2020ES. A detailed description of BESTCOMS*Plus* is provided in the BESTCOMS*Plus* chapter.

CAN

A Controller Area Network (CAN) is a standard interface that enables communication between multiple controllers on a common network using a standard message protocol. DGC-2020ES controllers have a CAN interface that supports the SAE J1939 protocol and the *mtu* protocol.

Applications using an engine-driven generator set controlled by a DGC-2020ES may also have an Engine Control Unit (ECU). The CAN interface allows the ECU and DGC-2020ES to communicate. The ECU reports operating information to the DGC-2020ES through the CAN interface. Operating parameters and diagnostic information, if supported by the ECU, are decoded and displayed for monitoring.

The primary use of the CAN interface is to obtain engine operating parameters for monitoring speed, coolant temperature, oil pressure, coolant level, and engine hours without the need for direct connection to individual senders. Table 4-1 lists the ECU parameters and Table 4-2 lists the engine configuration parameters supported by the DGC-2020ES CAN interface. These parameters are transmitted via the CAN interface at preset intervals. See the column labeled Update Rate in Table 4-1 for transmission rates.

CAN interface connections are made at 13 (CAN H), 14 (CAN L), and 15 (SHIELD).

Table 4-1. ECU Parameters Obtained from CAN Interface

ECU Parameter	Metric Units	English Units	Update Rate	* SPN
Actual Engine Percent Torque	%	%	Engine Speed Dependent	513
Aftertreatment Diesel Particulate Filter Status	0 = Regeneration not needed 1 = Regeneration needed, lowest level 2 = Regeneration needed, moderate level 3 = Regeneration needed, highest level 4–6 = Reserved 7 = Not available		500 ms	3701
Aftertreatment 1 Diesel Particulate Filter Intake Temperature (DOC Inlet Temperature)	°C	°F	500 ms	3242
Aftertreatment 1 Diesel Particulate Filter Intermediate Temperature (DOC Outlet Temperature)	°C	°F	500 ms	3250
Aftertreatment 1 Diesel Particulate Filter Outlet Temperature	°C	°F	500 ms	3246
Air Filter Differential Pressure	kPa	psi	500 ms	107
Air Inlet Temperature	kPa	°F	1 s	172
Alarm Reset Feedback	Binary (0 or 1)		1 s	2815
Ambient Air Temperature	°C	°F	1 s	171
Auxiliary Pressure 1	kPa	psi	On Request	1387
Auxiliary Pressure 2	kPa	psi	On Request	1388
Barometric Pressure	kPa	psi	1 s	108
Battery Charger 1 State	0 = Idle (not Connected to Battery) 1 = Charging 2 = Maintaining Battery Charge 3–12 = Reserved 13 = Battery Failure 14 = Charger Failure 15 = Not Available		1 s	4990
Battery Charger 1 AC Line State	0 = Disconnected 1 = Connected 2 = Error 3 = N/A		1 s	4991
Battery Charger 1 Output Voltage	Vdc	Vdc	1 s	4992
Battery Charger 1 Output Current	Adc	Adc	1 s	4993
Battery Charger 2 State	0 = Idle (not Connected to Battery) 1 = Charging 2 = Maintaining Battery Charge 3–12 = Reserved 13 = Battery Failure 14 = Charger Failure 15 = Not Available		1 s	4994
Battery Charger 2 AC Line State	0 = Disconnected 1 = Connected 2 = Error 3 = N/A		1 s	4995
Battery Charger 2 Output Voltage	Vdc	Vdc	1 s	4996
Battery Charger 2 Output Current	Adc	Adc	1 s	4997
Battery 1 Temperature	°C	°F	1 s	1800

ECU Parameter	Metric Units	English Units	Update Rate	* SPN
Battery 2 Temperature	°C	°F	1 s	1801
Battery Voltage	Vdc	Vdc	1 s	168
Boost Pressure	kPa	psi	500 ms	102
Charge Air Temperature	°C	°F	1 s	2629
Coolant Level	%	%	500 ms	111
Coolant Pressure	kPa	psi	500 ms	109
DEF Inducement Level - Level of Inducement Not to Run the Engine	%	%	1 s	5246
DEF Severity Level - Severity of Tank Low Level	%	%	1 s	5245
DEF Tank 1 Level	%	%	1 s	1761
DEF Tank 2 Level	%	%	1 s	4367
DPF Ash Level %	%	%	On Request	3720
DPF Soot Level %	%	%	On Request	3719
ECU Temperature	°C	°F	1 s	1136
Engine Coolant Preheated State	Binary (0 or 1)		500 ms	3552
Engine Coolant Temperature	°C	°F	1 s	110
Engine Desired Operating Speed	rpm	rpm	250 ms	515
Engine Intake Manifold #1 Absolute Pressure	kPa	psi	500 ms	3563
Engine Intercooler Coolant Level	%	%	500 ms	3668
Engine Intercooler Temperature	°C	°F	1 s	52
Engine Oil Level	%	%	500 ms	98
Engine Oil Pressure	kPa	psi	500 ms	100
Engine Oil Temperature	°C	°F	1 s	175
Engine Speed	rpm	rpm	Engine Speed Dependent	190
Exhaust Gas Temperature	°C	°F	500 ms	173
Exhaust Temperature A	°C	°F	500 ms	2433
Exhaust Temperature B	°C	°F	500 ms	2434
Fuel Delivery Pressure	kPa	psi	500 ms	94
Fuel Leak Filter 1	Binary (0 or 1)		1 s	1239
Fuel Leak Filter 2	Binary (0 or 1)		1 s	1240
Fuel Rate	liter/hr	gal/hr	100 ms	183
Fuel Temperature	°C	°F	1 s	174
High Exhaust System Temp (HEST) Lamp/Indicator	—	—	500 ms	3698
Injection Control Pressure	MPa	psi	500 ms	164
Injector Metering Rail Pressure	MPa	psi	500 ms	157
Intake Manifold Temperature	°C	°F	500 ms	105
Particulate Filter (DPF) Lamp/Indicator	—	—	500 ms	3697
Percent Load at Current rpm	%	%	50 ms	92
Rated Power	watts	watts	On Request	166
Rated rpm	rpm	rpm	On Request	189

ECU Parameter	Metric Units	English Units	Update Rate	* SPN
Regeneration Disabled (Inhibit) Lamp/Indicator	—	—	500 ms	3703
Shutdown from ECU	Binary (0 or 1)		1 s	1110
Switched Battery Voltage (at ECU)	Vdc	Vdc	1 s	158
Throttle (Accelerator Pedal) Position	%	%	50 ms	91
Total Engine Hours	hours	hours	Requested 1.5 s	247
Total Fuel Used	liters	gallons	Requested 1.5 s	250
Transmission Oil Pressure	kPa	psi	1 s	127
Transmission Oil Temperature	°C	°F	1 s	177
Trip Average Fuel Rate	liters	gallons	500 ms	1029
Trip Fuel	liters	gallons	Requested 1.5 s	182
Winding 1 Temperature	°C	°F	1 s	1124
Winding 2 Temperature	°C	°F	1 s	1125
Winding 3 Temperature	°C	°F	1 s	1126

* SPN is suspect parameter number.

Table 4-2. Engine Configuration Parameters Obtained from CAN Interface

ECU Parameter	Metric Units	English Units	Update Rate	* SPN
Engine Speed at High Idle Point 6	rpm	rpm	5 s	532
Engine Speed at Idle Point 1	rpm	rpm	5 s	188
Engine Speed at Point 2	rpm	rpm	5 s	528
Engine Speed at Point 3	rpm	rpm	5 s	529
Engine Speed at Point 4	rpm	rpm	5 s	530
Engine Speed at Point 5	rpm	rpm	5 s	531
Gain (Kp) of End Speed Governor	%/rpm	%/rpm	5 s	545
Maximum Momentary Engine Override Speed Point 7	rpm	rpm	5 s	533
Maximum Momentary Engine Override Time Limit	seconds	seconds	5 s	534
Percent Torque at Idle Point 1	%	%	5 s	539
Percent Torque at Point 2	%	%	5 s	540
Percent Torque at Point 3	%	%	5 s	541
Percent Torque at Point 4	%	%	5 s	542
Percent Torque at Point 5	%	%	5 s	543
Reference Engine Torque	N•m	ft-lb	5 s	544
Requested Speed Control Range Lower Limit	rpm	rpm	5 s	535
Requested Speed Control Range Upper Limit	rpm	rpm	5 s	536
Requested Torque Control Range Lower Limit	%	%	5 s	537
Requested Torque Control Range Upper Limit	%	%	5 s	538

* SPN is suspect parameter number.

Caution

When the CAN is enabled, the DGC-2020ES ignores the following sender inputs: oil pressure, coolant temperature, and magnetic pickup.

Under certain circumstances, the following strings may be displayed on the front panel HMI and in the Metering Explorer of BESTCOMS*Plus*:

- *NC (Not Connected)* - String displayed for a J1939 parameter when the engine ECU is not connected to the DGC-2020ES.
- *SF (Sender Fail)* - String displayed for a J1939 parameter when the engine ECU sends a special code indicating a measurement failure for the parameter. For example, if oil sender is determined to be bad by the ECU, it sends a special code in place of the J1939 oil pressure data indicating a sender fail condition.
- *NS (Not Sent)* - String displayed for a J1939 parameter when the J1939 parameter has not been sent to the DGC-2020ES by the engine ECU.
- *NA (Not Applicable)* - String displayed for a J1939 parameter when the engine ECU sends a special code for the parameter indicating that the parameter is not implemented or not applicable in the ECU.
- *UF (Unknown Failure)* - String displayed when the J1939 parameter data received by the ECU is not within the valid J1939 data range for the parameter but is not one of the special codes above.

Table 4-3 lists the J1939 data transmitted from the DGC-2020ES.

Table 4-3. J1939 Data Transmitted from the DGC-2020ES

ECU Parameter	Update Rate	* SPN
Battle Override Switch	100 ms	1237
Speed Request	10 ms	898
Note: Requests from the DGC-2020 to the Engine ECU for various parameters are made by issuing the request.		
Address Claim Request	Once on power up, and any time a Global Request for Address Claim (GRAC) PGN is received.	NA
Currently Active Diagnostic Trouble Codes Request	Whenever a refresh of Currently Active Diagnostic Trouble Code Requests is received.	NA
Previously Active Diagnostic Trouble Codes Request	2 s	NA
Clear Currently Active Diagnostic Trouble Codes Request	Whenever a request to reset Currently Active Diagnostic Trouble Code Request is made.	NA
Clear Previously Active Diagnostic Trouble Codes Request	Whenever a request to reset Previously Active Diagnostic Trouble Code Request is made.	NA
Engine Hours/Revolutions Request	2 s	NA
Fuel Consumption Request	2 s	NA
Electronic Engine Controller #4 (Rated Speed and Power) Request	2 s	NA
Auxiliary Analog Information	2 s	N/A

CAN Setup

The following paragraphs describe the settings found on the CAN Setup screen. This screen is found in the BESTCOMS*Plus Settings Explorer*, under the *Communications, CAN Bus* category. If using the front panel, navigate to Settings > Communications > CAN Bus Setup > CAN Bus Setup. Figure 4-1 illustrates the BESTCOMS*Plus* CAN Bus Setup screen.

Enable ECU Support

Set to Enabled for the DGC-2020ES to communicate with the ECU.

Enable DTC (Diagnostic Trouble Code) Support

If the ECU is a J1939 ECU, enable DTC support. If the ECU does not support it, no diagnostic trouble codes will be logged by the DGC-2020ES.

SPN Conversion Method

The most common SPN conversion method is 4 and is the default for the DGC-2020ES. Refer to ECU manufacturer documentation to determine the correct SPN conversion method of the ECU and set the SPN Conversion Method setting in the DGC-2020ES accordingly.

CAN bus Address

This parameter sets a unique address number for the DGC-2020ES operating on a CAN. The CAN Address is set internally by the DGC-2020ES when certain types of ECUs are selected on the ECU Setup screen, and in this case, the user-entered value does not apply. See Table 4-4.

Table 4-4. CAN Bus Address per ECU Type

ECU Type	CAN Bus Address
Cummins	220
Daimler CPC4	User-selectable
Deutz	User-selectable
GM/Doosan	User-selectable
Isuzu	User-selectable
John Deere	User-selectable
mtu ADEC	1
mtu ECU7/ECU8	6
mtu MDEC	6
mtu Smart Connect	234
Scania	39
Standard	User-selectable
Volvo Penta	17
Yanmar	User-selectable

Engine ECU Address

Set this parameter to the address claimed by the Engine ECU operating on the J1939 network. In certain cases, there is more than one ECU transmitting data on the J1939 network. This setting specifies the ECU on the network to which the DGC-2020ES should transmit data. For more information on J1939 address handling, see J1939 Addresses below. When GM/Doosan is selected as the ECU type, the value of this setting is ignored and the Engine ECU Address value is always 0.

Coolant Temperature Source

With From ECU selected, the DGC-2020ES accepts coolant temperature data from the ECU on CAN 2 (ECU). With From DGC Input selected, the DGC-2020ES accepts coolant temperature data from the coolant temperature engine sender input.

Oil Pressure Source

With From ECU selected, the DGC-2020ES accepts oil pressure data from the ECU on CAN 2 (ECU). With From DGC Input selected, the DGC-2020ES accepts oil pressure data from the oil pressure engine sender input.

Engine Run Time Source

With From ECU selected, the DGC-2020ES accepts Engine Run Time data from the ECU on CAN 2 (ECU). With From DGC Input selected, the DGC-2020ES uses its internally tracked Engine Run Time data.

ECU Contact Control - Output Select

Select whether the RUN output relay or the PRE (Prestart) output relay closes to give the ECU its “energize to run” signal. In some implementations, this relay may actually be providing ECU power.

ECU Contact Control - Pulsing Enable

Select if the ECU is not to be on line at all times. Often ECUs are allowed to go “off line” to conserve battery drain when the engine is not running. The DGC-2020ES will “pulse” it periodically to force it to be active to allow the DGC-2020ES to read data such as coolant temperature and coolant level. This is required if the DGC-2020ES is to report low coolant temperature conditions (which may indicate a failure of a block heater), or low coolant level conditions (if a leak occurs while the machine is not running). Pulsing is also used to check the integrity of CAN communications when the machine is not running.

ECU Related Time Values - Engine Shut Down

Set this parameter for a value longer than the duration required to stop the engine after being shut down. The ECU is pulsed after this time expires. If the time is too short, the pulse may occur while the engine is still turning which could cause a brief re-start and possibly damage the flywheel and starter system.

ECU Related Time Values - Pulse Cycle Time

Set this parameter for the desired time between ECU pulse cycles.

ECU Related Time Values - Settling Time

This parameter is the duration of the “on line” time of the pulse cycle during which the DGC-2020ES reads data from the ECU. The settling time should be set long enough so that any ECU parameters that require time to “settle down” after the ECU is on line can do so. Since the DGC-2020ES may use some of the ECU data for alarm or pre-alarm annunciation, it is important that the data have time to settle.

ECU Related Time Values - Response Timeout

This setting defines the amount of time that the DGC-2020ES will wait to receive data from the ECU during a pulse cycle or start attempt. If no data is received during this time in a pulse cycle, a LOSS OF ECU COMMS pre-alarm is annunciated. If no data is received in this time during an engine starting attempt, a LOSS OF ECU COMMS alarm is annunciated.

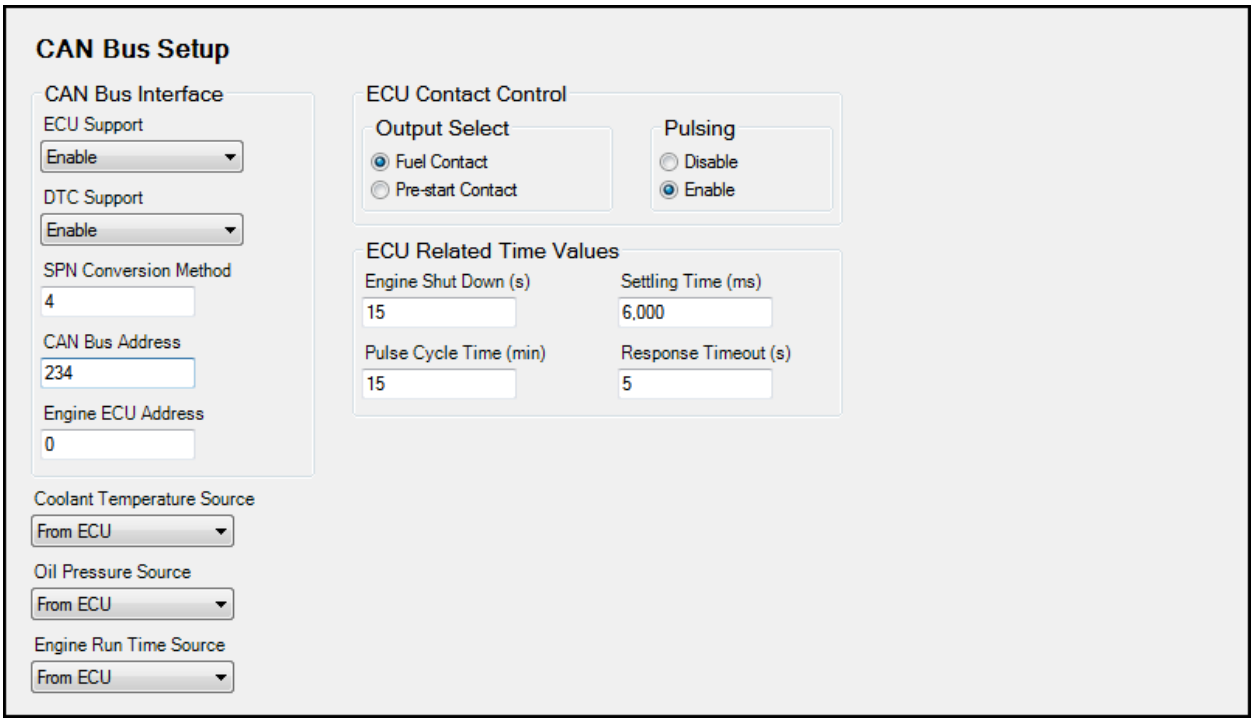


Figure 4-1. Settings Explorer, Communications, CAN Bus, CAN Bus Setup

ECU Setup

The following paragraphs describe the settings on the ECU Setup screen. This screen is found in the BESTCOMS*Plus Settings Explorer*, under the *Communications, CAN Bus* category. If using the front panel, navigate to Settings > Communications > CAN Bus Setup > ECU Setup. Refer to Figure 4-2.

ECU Type

The DGC-2020ES can be configured for Standard, Volvo Penta, *mtu* MDEC, *mtu* ADEC, *mtu* ECU7/ECU8, GM/Doosan, Cummins, *mtu* Smart Connect, Scania, John Deere, Isuzu, Daimler CPC4, Yanmar, or Deutz.

Generator Parameter Transmit

When the Generator Parameter Transmit setting is enabled, the DGC-2020ES broadcasts generator metered parameters over CAN as listed in Table 4-5. The Generator Parameter Transmit setting is not used when ECU Type is set for *mtu* MDEC, *mtu* ECU7/ECU8, or *mtu* Smart Connect.

Engine Parameter Transmit

When the Engine Parameter Transmit setting is enabled, the DGC-2020ES broadcasts engine metered parameters over CAN. When the Engine Parameter Transmit setting is disabled, transmission of J1939 commands from the DGC-2020ES to the engine are disabled, but commands from the engine to the DGC-2020ES are allowed.

Table 4-5. Generator Parameter Transmit

PGN Name	PGN	Hex	SPN	Parameter	Bytes Within PGN Data
Generator Total AC Energy	65018	FDFA	2468	Generator Total kW Hours Export	1 to 4
			2469	Generator Total kW Hours Import	5 to 8
Generator Total AC Reactive Power	65028	FE04	2456	Generator Total Reactive Power	1 to 4
			2464	Generator Overall Power Factor	5 to 6
			2518	Generator Overall Power Factor Lagging	7, bits 1 & 2
Generator Total AC Power	65029	FE05	2452	Generator Total Real Power	1 to 4
			2460	Generator Total Apparent Power	5 to 8
Generator Average Basic AC Quantities	65030	FE06	2440	Generator Average L-L AC RMS Voltage	1 to 2
			2444	Generator Average L-N AC RMS Voltage	3 to 4
			2436	Generator Average AC Frequency	5 to 6
			2448	Generator Average AC RMS Current	7 to 8
Engine Temperature	65262	FEEE	110	Engine Coolant Temperature (Not sent when CAN is enabled.)	1
Engine Fluid Level/Pressure	65263	FEEF	100	Engine Oil Pressure (Not sent when CAN is enabled.	4
Dash Display	65276	FEFC	96	Fuel Level	2

Diesel Particulate Filter (DPF)

The diesel particulate filter settings are used when the ECU is configured for Standard, Volvo Penta, *mtu* ADEC, GM/Doosan, Cummins, or *mtu* Smart Connect. The DGC-2020ES supports the CAN parameters that are related to the diesel particulate filter implemented on certain engines to meet Tier 4 emission requirements.

Two parameters are provided to initiate or disable DPF regeneration. The first, *Manual Regeneration*, is transmitted to the engine via CAN to initiate DPF regeneration. The second, *Disable Regeneration*, is transmitted to the engine via CAN to disable DPF regeneration. Extended operation with regeneration disabled is not recommended.

Speed Setup

Speed control over J1939 and ECU7/ECU8 is implemented over CAN when the CAN bus RPM Request setting is enabled. This is implemented for all ECUs.

Engine RPM: The Engine RPM setting defines the nominal requested engine rpm.

Idle RPM: The Idle RPM setting is the requested rpm when the IDLE REQUEST logic element is true.

Remember Speed Adjustments: A Remember Speed Adjustments setting is provided to establish how RPM adjustments by raise/lower commands are saved. When Yes is selected, adjustments to RPM by raise/lower commands are saved to memory and used for all subsequent run sessions. This is true even when power is cycled to the DGC- 2020ES. When No is selected, adjustments to rpm by raise/lower commands are retained for the duration of only the current run session. The adjustments are discarded the next time the engine is run or the DGC-2020ES is power cycled.

RPM Bandwidth: The RPM Bandwidth setting defines the speed adjustment range. For example, if the Engine RPM setting is 1800 and the RPM Bandwidth is set to 100, the rpm can be adjusted from 1750 to 1850 rpm.

RPM Checksum: Some newer engine ECUs will not respond to TSC1 speed request when the speed is a constant value unless a Message Counter and Checksum are implemented. This setting enables or disables the Message Counter and RPM Checksum.

Start Mode

The Start mode specifies whether the engine should start normally or as rapidly as possible. When Normal mode is selected, the engine will go through a normal start sequence when started. When Rapid mode is selected, the engine will go through a rapid start sequence if the engine ECU is programmed for a rapid start. A normal start could be employed when starting the generator is not time critical. However, if there was a power outage, a rapid start could be employed to restore power as soon as possible.

Volvo Penta

Configuring the DGC-2020ES for Volvo Penta* necessitates the configuration of two additional settings: Speed Select and Accelerator Position. The Speed Select setting configures the Volvo Penta ECU to operate the engine at the primary or secondary base speed. If the engine is configured by Volvo for 60 Hz applications, the primary base speed is 1,800 rpm and the secondary base speed is 1,500 rpm. If the engine is configured by Volvo for 50 Hz applications, the primary base speed is 1,500 rpm and the secondary base speed is 1,800 rpm. The Accelerator Position setting is expressed as a percentage and tells the Volvo Penta ECU where to set the engine speed (trim) relative to the base speed. The range of the setting is the base speed ±120 rpm. A setting of 0% will cause the engine to run at 120 rpm below the base speed, a setting of 50% will cause the engine to run at the base speed, and a setting of 100% will cause the engine to run at 120 rpm above the base speed. The Accelerator Position setting is linear with a gain of 2.4 rpm/percentage. This setting is not saved in nonvolatile memory and defaults back to 50% after DGC-2020ES control power is cycled.

The DGC-2020ES sends the following parameters to a Volvo Penta ECU through Volvo Proprietary J1939 communications:

- Start Request - sent when starting the engine.
- Stop Request - sent when shutting down the engine.
- Idle Request - sent when the Idle Request logic element is true in BESTlogic*Plus*.
- Preheat Request - sent anytime the DGC-2020ES would normally have its PRE relay closed for engines requiring a preheat contact.
- Accelerator Pedal Position - sent based on the Accelerator Position setting. If the Accelerator Pedal Position setting is left at the default 50%, this is calculated and sent based on the programmable Engine RPM setting to achieve the desired engine RPM.
- Primary/Secondary Engine Speed - sent based on the Speed Select setting and the state of the Alternate Frequency Override element in BESTlogic*Plus*. Primary speed is sent when the Speed Select setting is set for Primary and Secondary speed is sent when the Speed Select setting is set for Secondary. However, these are reversed if the Alternate Frequency Override is true. A setting of Primary results in Secondary being sent and a setting of Secondary results in Primary being sent when the Alternate Frequency Override is true.

∗ The Volvo Penta ECU configuration is applicable only to the EDC3 and EMS2 models of Volvo Penta engine controllers.

Cummins

When Cummins is selected as the ECU type, the following parameters are sent to the engine via Cummins Proprietary J1939 communications:

- Start Request - sent when starting or running the engine.
- Stop Request - sent when stopping the engine.
- Idle Request - sent when the Idle Request logic element is true in BESTlogic*Plus*.
- Rated Speed (50 or 60 Hz) - sent based on the Rated Speed setting of the DGC-2020ES. However, these are reversed if the Alternate Frequency Override is true. A setting of 60 Hz Rated Speed results in 50 Hz being sent and a setting of 50 Hz Rated Speed results in 60 Hz being sent when the Alternate Frequency Override is true.

Generator Control Communications Configuration: A parameter is provided to configure generator control communications. If the standard PGNs for Generator Control One and Generator Control Two are broadcast by the generator controller, the Cummins ECU will use those. If they are not broadcast, the ECU will expect the Cummins Engine Governing PGN (0xFF69) and Cummins Generator Control PGN (0xFF73). If the user selects Standard for the Generator Control Communications setting, the DGC-2020ES will not broadcast 0xFF69 and 0xFF73 in order to minimize loading on the CAN Bus.

mtu

If the engine is configured as *mtu* MDEC, the configuration of the following settings is necessary:

- MDEC Module Type - Specifies the type of MDEC module.
- Speed Demand Switch - Specifies speed demand source for the *mtu* engine ECU.
- NMT Alive Transmit Rate - Specifies the rate at which messages are transmitted to the *mtu* engine.

If the engine is configured as *mtu* ADEC, the configuration of the following settings is necessary:

- Speed Demand Switch - Specifies speed demand source for the *mtu* engine ECU.
- Overspeed Test - Temporarily drives an *mtu* ECU into overspeed for testing overspeed.
- Governor Param Switch Over - Specifies which governor parameters an *mtu* ECU should use.
- Trip Reset - Resets trip information such as trip fuel used, trip hours, trip idle time, etc.
- Int Oil Prime - Causes an *mtu* ECU engine to perform an internal lubrication cycle.
- CAN Start Stop Configuration – Specifies when to broadcast Start / Stop status.

If the engine is configured as *mtu* ECU7/ECU8, the configuration of the following settings is necessary:

- Speed Demand Switch - Specifies speed demand source for the *mtu* engine ECU.
- Overspeed Test - Temporarily drives an *mtu* ECU into overspeed for testing overspeed.
- Speed Up - Increases speed of the *mtu* ECU.
- Speed Down - Decreases speed of the *mtu* ECU.
- Idle Request - Turns the idle request on or off.
- Increased Idle - Sets the *mtu* ECU idle.
- Trip Reset - Resets trip information such as trip fuel used, trip hours, trip idle time, etc.
- Int Oil Prime - Causes an *mtu* ECU engine to perform an internal lubrication cycle.
- *mtu* 50 Hz 60 Hz Switch Setting - Set automatically based on rated frequency of the DGC-2020ES and the state of the alternate frequency override.
- Engine Start Prime - Turns the engine start prime on or off.
- Fan Override - Turns the fan override on or off.
- Mode Switch - Turns the mode switch on or off.
- Governor Param Set Select - Sets the governor parameter set select.
- CAN Rating Switch 1 & 2 - Turns the CAN rating switch 1 & 2 on or off.
- Cylinder Cutout Disable 1 & 2 - Turns the cylinder cutout disable 1 & 2 on or off.
- *mtu* ECU7/ECU8 Module Type - Specifies ECU7/ECU8 Module type.
- NMT Alive Transmit Rate - Specifies the rate at which messages are transmitted to the *mtu* engine.
- CAN Start Stop Configuration – Specifies when to broadcast Start / Stop status.

If the engine is configured as *mtu* Smart Connect, the configuration of the following settings is necessary:

- Speed Demand Switch - Specifies speed demand source for the *mtu* engine ECU.
- Overspeed Test - Temporarily drives an *mtu* ECU into overspeed for testing overspeed.
- Speed Up - Increases speed of the *mtu* ECU.
- Speed Down - Decreases speed of the *mtu* ECU.
- Idle Request - Turns the idle request on or off.
- Trip Reset - Resets trip information such as trip fuel used, trip hours, trip idle time, etc.
- Int Oil Prime - Causes an *mtu* ECU engine to perform an internal lubrication cycle.
- Governor Param Switch Over - Specifies which governor parameters an *mtu* ECU should use.
- Cylinder Cutout Disable 2 - Turns the cylinder cutout disable 2 on or off.
- Engine Operating Mode - Selects engine operating mode 1 or 2.
- CAN Start Stop Configuration – Specifies when to broadcast Start / Stop status.

CAN Start Stop Configuration: When this setting is set to Constant, either start or stop is true at all times. When set to On for Start/Stop, start is true only while starting and stop is true only while stopping. When set to Disabled, start and stop are implemented in the protocol, but are never set to true. When set to Not Implemented, the J1939 boolean start and stop parameters are set to 0x03 (Not Implemented) for *mtu* ADEC and *mtu* Smart Connect ECUs, and neither start nor stop are sent in MCS5 Protocol for *mtu* ECU7/8 ECUs.

Scania

The majority of CAN Bus parameters are sent from Scania Engine ECUs via standard J1939 communications. However, some additional proprietary parameters are sent via Scania proprietary J1939 communications. Proprietary Start, Stop, and Emergency Stop commands are sent from the DGC-2020ES to the Scania ECU. The ECU communicates Diesel Exhaust Fluid (DEF) Levels, as well as DEF Fluid Low, DEF Low Severe, DEF Inducement, and DEF Severe Inducement Pre-Alarms to the DGC-2020ES through Proprietary Scania parameters. Additional information on DEF related parameters can be found in the *Exhaust Treatment* chapter.

John Deere

The Regeneration Interlock setting enables John Deere proprietary parameters to be broadcast over the J1939 CAN Bus.

The Regeneration Interlock parameter is sent via the Stationary Regeneration/Cleaning CAN Lockout Message PGN, which is PGN 61194. When the DGC Regeneration Interlock value is set to Enabled, the DGC-2020ES sends a value of 01 (binary) for the two bit “Allowed” configuration which allows regeneration to occur. When the DGC-2020ES Regeneration Interlock value is set to Disabled, the DGC-2020ES sends a value of 00 (binary) for the two bit “Not Allowed” configuration which inhibits regeneration.

The DGC-2020ES sends starter engagement requests to the ECU via the SAE J1939 Engine Start Control PGN. When the DGC-2020ES requests the starter to be engaged it sends a value of 01 (binary) for the two-bit starter engagement parameter. Otherwise the DGC-2020ES sends a value of 00 (binary) for the two-bit starter engagement parameter.

Isuzu

When the ECU type is set for Isuzu, the Clear ECU Memory and Escape Mode Request buttons are operational. When the Clear ECU Memory button is clicked, it will remain on for five seconds and then turn off, sending a five-second long memory clear request to the engine ECU. When the Escape Mode Request button is clicked, a temporary override of inducement to not operate the engine is sent to the ECU.

Daimler CPC4

When the ECU type is set for Daimler CPC4, the DGC-2020ES monitors the Torque Limit (LIM) Lamp Status broadcast via proprietary J1939 communications from the Daimler engine ECU to the DGC-2020ES. When the monitored LIM Lamp status indicates the lamp is on solid, the DGC-2020 annunciates a pre-alarm displaying the LIM symbol and text “Torque Limit”. When the monitored LIM Lamp status indicates the lamp is flashing, the DGC-2020ES annunciates a pre-alarm displaying the LIM symbol and text “Torque Limit Severe”. The DGC-2020ES also displays the LIM symbol in the exhaust status display portion of the front panel display.

Yanmar

Some DTC-FMI combinations report different Yanmar P Codes depending on whether the engine has three or four cylinders. The Number of Cylinders setting specifies how many cylinders exist in the engine.

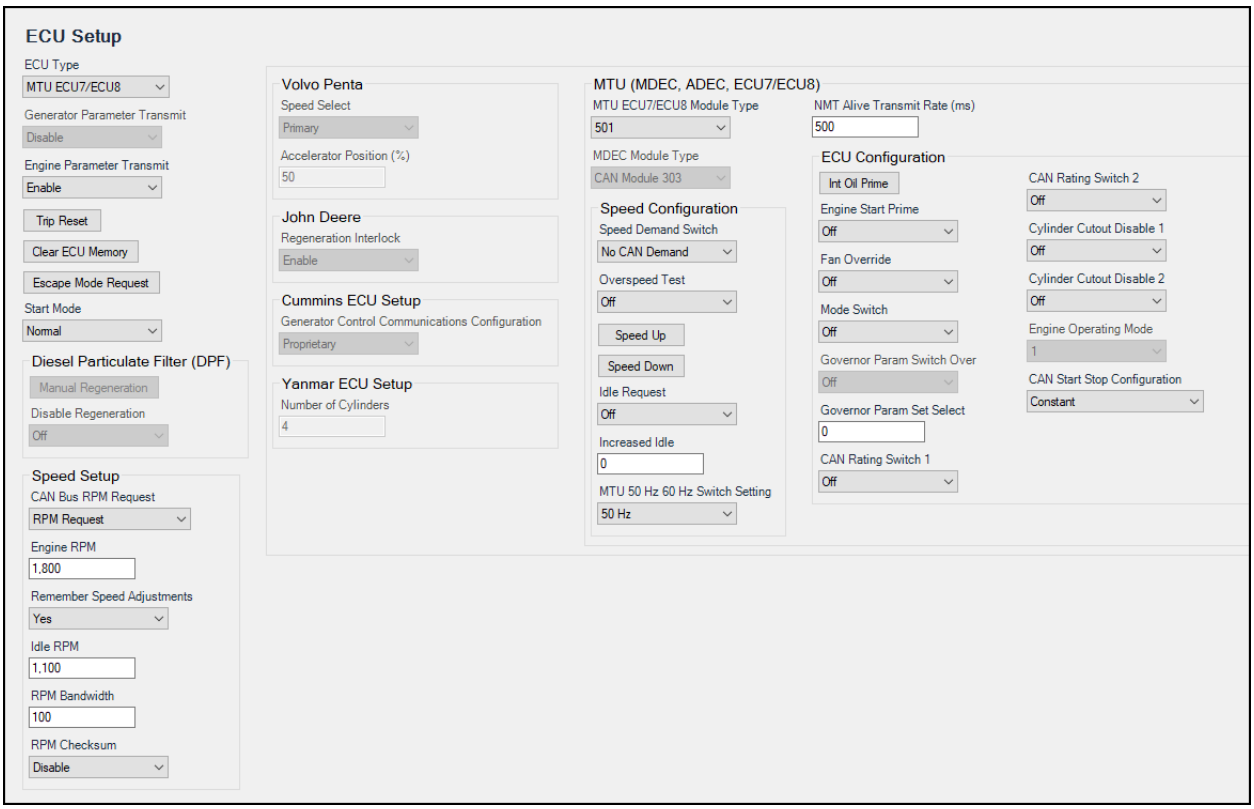


Figure 4-2. Settings Explorer, CAN Bus, ECU Setup

Remote Display Panel (optional)

Applications that require remote annunciation can use Basler Electric's Remote Display Panel. This device provides remote indication of many pre-alarm and alarm conditions.

Remote Display Panel connections are made at 10 (RDP TxD–), 11 (RDP TxD+), 17 (BATT–), and 18 (BATT+).

The following pre-alarm conditions are indicated by LEDs on the Remote Display Panel:

- High coolant temperature
- Low coolant temperature
- Low oil pressure
- Low fuel level∗
- Weak battery
- Battery overvoltage†
- Battery charger failure∗†

The following alarm conditions are indicated by LEDs and an audible alarm on the Remote Display Panel:

- Low coolant level∗
- High coolant temperature
- Low oil pressure
- Overcrank
- Overspeed
- Emergency stop activated
- Fuel leak/Sender failure∗†
- Sender failure†

∗ This can be configured in the DGC-2020ES as *None*, *Alarm*, or *Pre-alarm*. See the *Contact Inputs* chapter for more information. The LED on the Remote Display Panel illuminates when the input that is

assigned to the programmable function is closed, whether the function is configured as *None*, *Alarm*, or *Pre-alarm*.

† This LED can be reprogrammed in the DGC-2020ES to suit the needs of a particular application. The condition listed above is annunciated by default.

Additionally, the Remote Display Panel indicates when the DGC-2020ES is not operating in Auto mode and when the generator is supplying load or when the DGC-2020ES is in an alarm state not listed above.

Refer to Basler Publication 9318100990 for more information on the Remote Display Panel.

See the *Terminals and Connectors* chapter in the *Installation* manual for more information on connecting the Remote Display Panel to the DGC-2020ES.

5 • Device Configuration

System parameters configure the DGC-2020ES for operation with a specific application. This chapter lists items to consider when configuring the DGC-2020ES. These items consist of system settings and rated data, remote module setup, crank settings, automatic restart settings, exercise timer settings, sensing transformer ratings, relay control settings, and system configuration detection settings.

System Settings

The System Settings parameters consist of number of fly wheel teeth, speed signal source, power-up delay, fuel level function, NFPA compliance level, EPS supplying load, system units, and metric pressure units. The System Settings screen is found in the BESTCOMS*Plus*® Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > System Settings.

Number Flywheel Teeth

The Number Fly Wheel Teeth setting accepts a value from 1 to 500, in increments of 0.1. This value is used when calculating engine rpm.

Speed Signal Source

The DGC-2020ES can be configured to detect engine speed from a magnetic pickup (MPU), the genset frequency, or both the MPU and genset frequency. On engines with CAN ECUs, if MPU or MPU Freq is selected as the Speed Signal Source, the DGC-2020ES uses CAN as the speed source when CAN is enabled. If Gen Freq is set as the Speed Signal Source, the DGC-2020ES uses the generator frequency.

When engine speed is obtained from the genset frequency, the DGC-2020ES uses the rated (nominal) genset frequency and nominal rpm rating when calculating engine rpm.

When engine speed is obtained from an MPU, the DGC-2020ES uses the nominal rpm rating and the number of flywheel teeth when calculating engine rpm.

The speed signal from the MPU takes priority when both the genset frequency and MPU are selected as the engine speed source. If both MPU and genset frequency are selected and the MPU fails, the DGC-2020ES automatically switches to the genset frequency as the engine speed source.

Power Up Delay

In some cases, the ECU takes longer than the DGC-2020ES to power up. The power up delay setting is used to delay the initial pulsing of the ECU for data on DGC-2020ES power up. This setting ranges from 0 to 60 seconds in 1 second increments.

Fuel Level Function

This setting determines whether the fuel level indications and the related alarm and pre-alarm are enabled or disabled. Setting selections include, Fuel Lvl (Fuel Level), Natural Gas, Liquid Propane, or Disabled. Selecting a fuel type other than Fuel Lvl disables any fuel level indication, alarm, or pre-alarm. This includes the Fuel Level value on the *Metering Explorer, Engine* screen in BESTCOMS*Plus*.

NFPA Compliance Level

The DGC-2020ES can be used in an application requiring compliance with NFPA Standard 110. Levels 1 and 2 of Standard 110 are supported. Selecting level 1 or 2 affects DGC-2020ES operation in the following ways:

- The number of crank cycles is fixed at 3
- Crank cycle time is fixed at 15 seconds
- Continuous crank time is fixed at 45 seconds
- The low coolant temperature pre-alarm setting is fixed at 70°F

EPS Supplying Load

EPS Supplying Load settings consist of Low Line Scale Factor and EPS Threshold. These settings are described in the following paragraphs.

Low Line Scale Factor

Low Line Scale Factor automatically adjusts the EPS threshold setting in applications utilizing more than one type of genset connection. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate scaling of the settings. The value of the scale factor setting serves as a multiplier for the threshold setting. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the threshold setting is doubled (2.000 x Threshold setting).

EPS Threshold

Indication that the emergency power system is supplying load is determined by a user-adjustable threshold setting. This setting is expressed as a percentage of the genset CT (nominal) primary rating.

This setting accepts values from 3 to 10, in increments of 1%.

System Units

Engine oil pressure and coolant temperature can be displayed in English or metric units of measure.

Metric Pressure Units

This setting allows engine oil pressure to be displayed in bar or kPa/MPa.

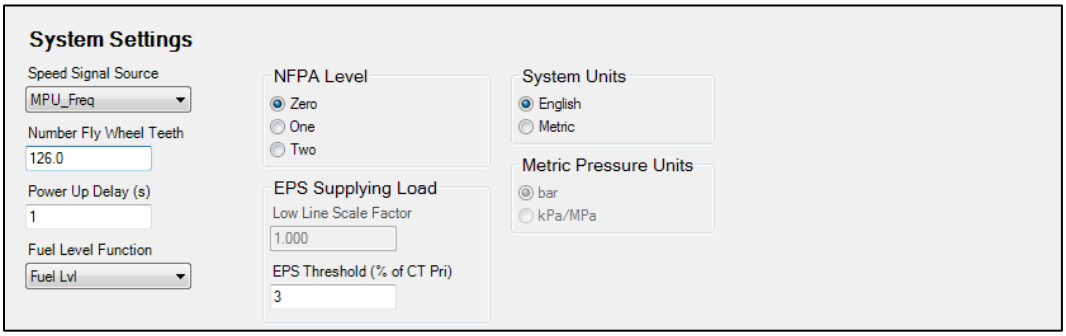


Figure 5-1. Settings Explorer, System Parameters, System Settings Screen

Rated Data

Rated Data parameters consist of sensing transformer ratings, voltage, power factor, kW, engine RPM, frequency, battery volts, generator and bus connection types, and phase rotation. The Rated Data screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > System Settings.

Click the Edit button on the BESTCOMS*Plus* Rated Data settings screen to adjust values. Click OK to accept the changes, and Cancel to discard them.

Sensing Transformers

For information on sensing transformers settings, see *Sensing Transformers*, below.

Rated Data

Genset nameplate data used by the DGC-2020ES includes the rated voltage, power factor, kW, and engine RPM.

Rated Volts (V L-L)

This setting accepts values from 1 to 99,999, in increments of 1.

Rated Power Factor (PF)

This setting accepts values from -1 to 1, in increments of 0.001.

Genset kW Rating

This setting accepts values from 5 to 9,999, in increments of 1.

Rated Engine RPM

This setting accepts values from 25 to 3,600, in increments of 1.

Calculated Rated Data

Rated Secondary Volts, Rated Phase Amps, Rated Secondary Phase Amps, Rated kVA, and Rated kvar are calculated automatically. The equations used for these calculations are listed below.

$$\text{Rated Secondary Volts} = \text{Rated Volts}\left(\frac{\text{Gen PT Secondary Volts}}{\text{Gen PT Primary Volts}}\right)$$

$$\text{Rated Phase Amps}\,(3-\text{phase machine}) = \frac{\text{Rated kVA}}{\text{Rated L}-\text{L Volts}\sqrt{3}}$$

$$\text{Rated Phase Amps}\,(1-\text{phase machine}) = \frac{\text{Rated kVA}}{\text{Rated L}-\text{L Volts}}$$

$$\text{Rated Secondary Phase Amps} = \text{Rated Phase Amps}\left(\frac{\text{CT Secondary Amps}}{\text{CT Primary Amps}}\right)$$

$$\text{Rated kVA} = \frac{\text{Rated kW}}{\text{Rated PF}}$$

$$\text{Rated kvar} = \text{Rated kVA}\sqrt{1-\text{Rated PF}^2}$$

Frequency

The frequency settings allow selection of the rated frequency of the generator and an alternate frequency.

Rated Frequency of the Unit

Rated frequency settings consist of 50 and 60 Hz.

Alternate Frequency

This setting accepts values from 10 to 450, in increments of 0.01.

Battery Volts

The nominal voltage of the starter battery is used by the DGC-2020ES to detect and annunciate battery overvoltage and low or weak battery voltage. The Battery Volts settings consist of 12 V and 24 V.

Generator Connection

Genset connection types accommodated by the DGC-2020ES include three, three-phase connections (delta, wye, and grounded delta) and a single-phase configuration (sensing across phases A and B.)

Bus Connection

Bus connection types consist of single- and three-phase. Single-phase bus voltage is sensed across phases A and B.

Phase Rotation

The Phase Rotation setting allows selection of ABC or CBA rotation according to the phase rotation connection of the machine. The DGC-2020ES calculates the power angle as the angle between the Phase AB voltage and phase B current. An angle compensation factor, determined by the phase rotation setting, is then applied. If the actual phase rotation connection of the machine does not match the phase rotation setting, calculation of the power angle will be incorrect, which may result in a miscalculation of kW, kvar, and power factor.

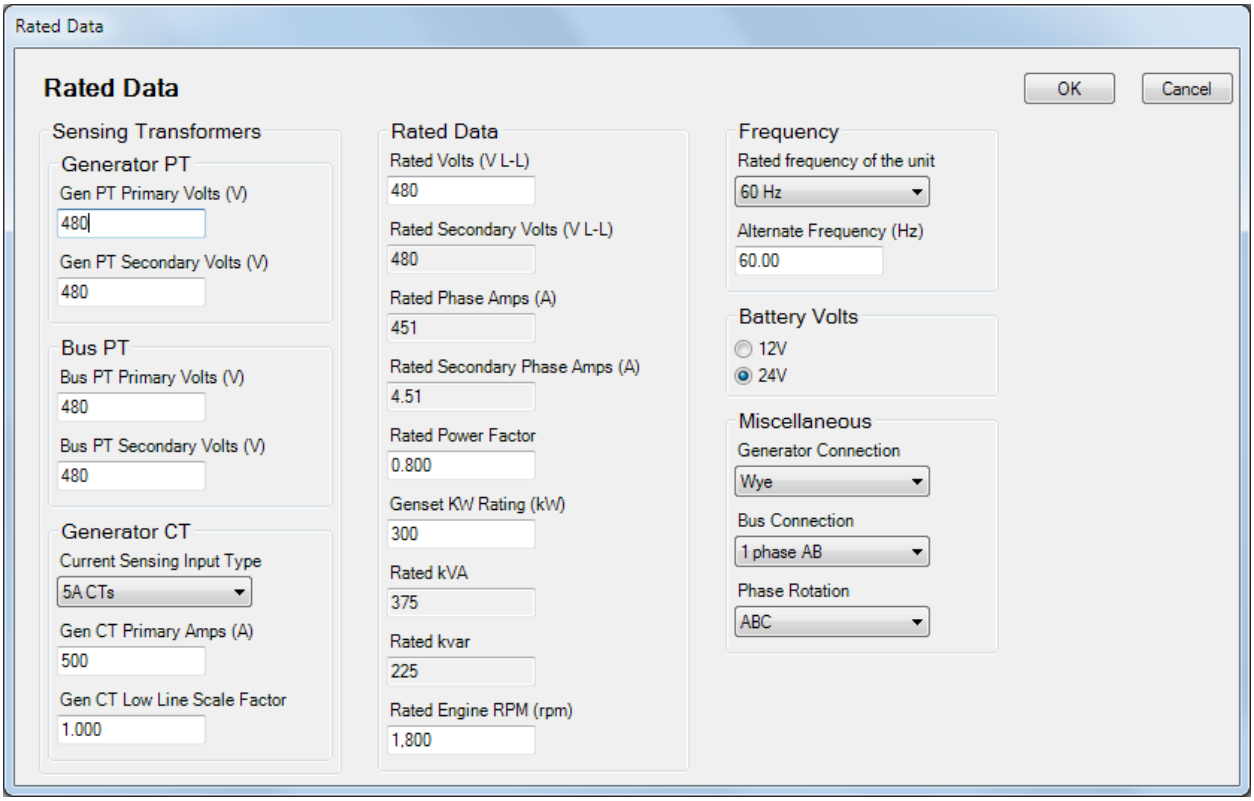


Figure 5-2. Settings Explorer, System Parameters, Rated Data Screen

Remote Module Setup

When the optional CEM-2020 is enabled, a J1939 address must be entered. Select the appropriate number of outputs available on the CEM-2020. The low current module (CEM-2020) provides 24 contact outputs and the high current module (CEM-2020H) provides 18 contact outputs.

The Remote Module Setup screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Remote Module Setup.

The BESTCOMS*Plus* Remote Module Setup screen is illustrated in Figure 5-3.

Figure 5-3. Settings Explorer, System Parameters, Remote Module Setup Screen

Crank Settings

The Crank Settings consist of pre-start, restart, cranking, crank disconnect, and cool down. These settings are described in the paragraphs below.

The Crank Settings screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Crank Settings.

The BESTCOMS*Plus* Crank Settings screen is illustrated in Figure 5-4.

Pre-Start

If desired, cycle or continuous cranking can be delayed after initiating engine startup. During this delay, the Pre-Start output closes to energize glow plugs or pre-start the lubrication pump. The Pre-crank Delay setting accepts values from 0 to 30, in increments of 1 second.

The Pre-Start output can be configured to open upon the conclusion of engine cranking or remain closed as long as the engine is running.

The Pre-Start output can be configured during the resting state. If Preheat Before Crank is selected, the Pre-Start output is closed for the duration of the Pre-crank Delay time prior to entering the first cranking state or any subsequent cranking state. If the Pre-crank Delay setting is longer than the rest interval, the Pre-Start output is closed for the entire duration of the rest time.

For example, suppose Crank Cycle Time and Rest Time are 30 seconds, Pre-crank Delay time is 15 seconds, and Preheat Before Crank is selected. Then, when it is desired to start the engine, the following would occur:

- Pre-Crank Delay of 15 seconds
- Crank for 30 seconds
- Rest for 15 seconds
- Rest and Pre-Crank Delay for 15 seconds
- Crank for 30 seconds
- Rest and Pre-Crank Delay for 15 seconds
- Crank for 30 seconds
- Repeating until the engine starts or the maximum number of crank cycles has occurred.

For another example, suppose Crank Cycle Time and Rest Time are 30 seconds, Pre-crank Delay time is 60 seconds, and Preheat Before Crank is selected. Then, when it is desired to start the engine, the following would occur:

- Pre-Crank Delay of 60 seconds
- Crank for 30 seconds
- Rest and Pre-Crank Delay for 30 seconds (the Rest Time setting controls the duration of this state)
- Crank for 30 seconds,

- Rest and Pre-Crank Delay for 30 seconds (the Rest Time setting controls the duration of this state)
- Crank for 30 seconds,

Repeating until the engine starts or the maximum number of crank cycles has occurred.

Restart

Attempting to start an engine after a normal shutdown but before the engine RPM has settled to zero can stress an engine in certain situations. The Restart Delay inhibits attempts to start the engine immediately after a normal shutdown for the duration of the Restart Delay timer. This delay should allow an engine to properly spin down before attempting to restart. This setting accepts values from 0 to 120, in increments of 1 second.

Cranking

The DGC-2020ES can be programmed for either cycle or continuous cranking.

Cycle cranking provides multiple engine starting attempts. Each starting attempt consists of a fixed interval of engine cranking followed by a rest interval. The Number of Crank Cycles setting accepts values from 1 to 7, in increments of 1. The Cycle Crank Time setting accepts values from 5 to 15, in increments of 1 second.

Continuous cranking provides a single, extended engine-starting attempt. The Continuous Crank Time setting accepts values from 5 to 60, in increments of 1 second.

A Minimum Crank Time setting can help prevent premature crank disconnections by ignoring engine rpm broadcast data until the minimum crank time has elapsed.

Crank Disconnect

Under normal operation, engine rpm is used to determine crank disconnect. The Crank Disconnect Limit setting establishes the engine rpm percentage at which the starter is disconnected. This setting accepts values from 10 to 100, in increments of 1 percent.

The Oil Pressure Crank Disconnect provides a secondary indication that the engine is running. This ensures that the starter is disconnected, even if no engine rpm sources are functioning. When enabled, oil pressure is used to determine if the engine is running. If the engine oil pressure is above the threshold, the starter is disconnected from the engine. The Crank Disconnect Pressure threshold setting accepts values from 2.9 to 150 psi, 0.2 to 10.3 bar, and 20 to 1,034.5 kPa, in increments of 0.1.

Cool Down

After the load is removed from a genset, the DGC-2020ES implements a smart cool-down function. This function ensures that the engine and turbocharger properly cool down by maintaining engine operation for a user-defined duration.

This cool-down function is initiated for any one of the following conditions:

- Genset load is removed and engine shutdown is permitted while in AUTO mode
- Auto Transfer switch (ATS) opens while operating in AUTO mode
- Remote shutdown is initiated while in AUTO mode
- Off Mode Cool down is initiated
- The Cool-down Request logic element is initiated
- The Cool and Stop Request logic element is initiated

Settings

Off Mode Cool Down: Upon receiving a cool-down request with this setting enabled, the unit will enter a cool down cycle when in Off mode.

Cool-Down Configuration: Upon receiving a cool-down request with Only When Loaded selected, the unit will enter a cool-down cycle only if a load is currently applied. With Always selected, the unit will enter a cool-down cycle upon request with or without a load applied.

No Load Cool-Down Time: This setting establishes the duration of the cool-down cycle after load has been removed.

Smart Cool-down Function

The smart cool-down function reduces unnecessary fuel expenditure by considering overall cool-down time through multiple requests. For example, a new cool-down request is initiated after a previous cool-down sequence has already started. The cool-down timer is not simply reset with each new request. Instead, the amount of time that the engine has spent cooling down is factored into the new request. This saves time and fuel by running the engine no longer than necessary to achieve proper cool down.

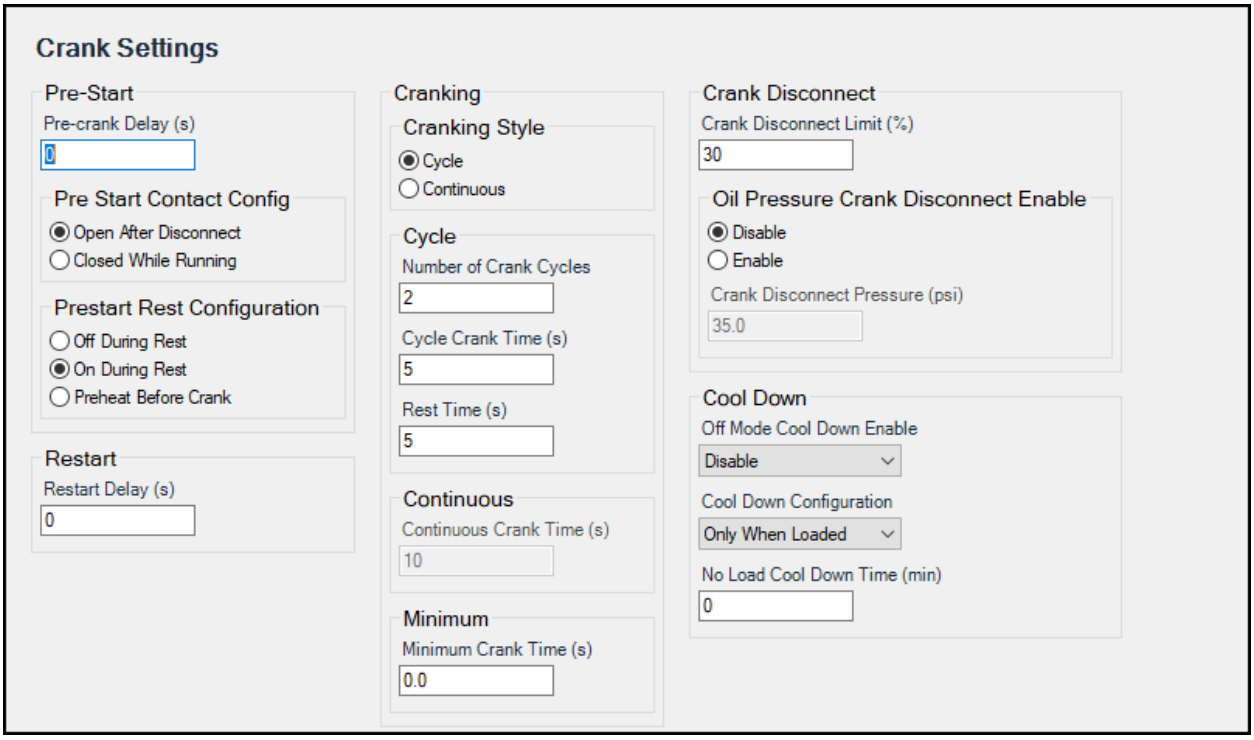


Figure 5-4. Settings Explorer, System Parameters, Crank Settings Screen

Automatic Restart

When enabled, the Automatic Restart clears all alarms automatically if the DGC-2020ES shuts down due to an alarm condition. An attempt to restart the engine is made, after a predetermined time delay, if the ATS contact input is closed. If an ATS contact is not present, the unit remains in the READY state with alarms cleared. A restart is not attempted if a low fuel alarm or emergency stop is present. The number of restart attempts is programmable. Automatic restart attempts are recorded in the event log.

The Auto Restart Interval setting accepts values from 0.5 to 30, in increments of 0.5 minutes. The Auto Restart Attempts setting accepts values from 1 to 10, in increments of 1.

The Automatic Restart screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Automatic Restart.

The BESTCOMS*Plus* Automatic Restart screen is illustrated in Figure 5-5.

Figure 5-5. Settings Explorer, System Parameters, Automatic Restart Screen

Exercise Timer

The exercise timer function starts and runs the genset at specified intervals. Exercise timer settings are described in the following paragraphs.

Modes

The Mode setting determines how often the generator is exercised. Each mode has supporting settings that establish the start time, date, and duration of each session. When a mode is selected, only the appropriate supporting settings for that mode are available while other settings are grayed out. Start Hour, Start Minute, Run Period Hours, Run Period Minutes, and Run with Load settings are available for all modes. The exercise timer modes are described below.
Daily: The generator will run every day.

Monthly: The generator will run on the same day every month using the numeric date. For example, the fifth of every month. See Start Day of Month under *Supporting Settings* below.

N Week Intervals: On or after the specified start date, the generator will run on the same day every N weeks, where N is a value from 1 through 52. For example, every two weeks on Sundays, starting on January 1, 2020. See Start Day of Week, Week Interval, and Begin Date (Month, Day, Year) under *Supporting Settings* below.

Weekday of Month: The generator will run on the same day of the week every month. For example, the third Tuesday of every month. See Start Day of Week and Week of Month under *Supporting Settings* below.

Weekly: The generator will run on the same day every week. See Start Day of Week under *Supporting Settings* below.

Supporting Settings

Begin Date (Month, Day, Year): These three settings establish the date on which the exercise timer will start when Mode is set to N Week Intervals.
Start Day of Month: Accepts values 1 through 31. Enabled when Mode is set to Monthly.
Start Day of Week: Select Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, or Saturday. Enabled when Mode is set to Weekly, Weekday of Month, or N Week Intervals.

Start Time and Run Period: The generator will start at the time established by the Start Hour and Start Minute settings and will run for the duration established by the Run Period Hours and Run Period Minutes settings. These settings are available for all modes.

Run with Load: When enabled, the DGC-2020ES closes the generator breaker during the run time.

Week Interval: Accepts values 1 through 52. Enabled when Mode is set to N Week Intervals.

Week of Month: Select First, Second, Third, Fourth, or Last. Enabled when Mode is set to Weekday of Month.

Contact inputs and outputs can be assigned to this function. Refer to the *BESTlogicPlus* chapter for more information.

The Exercise Timer screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Exercise Timer.

The BESTCOMS*Plus* Exercise Timer screen is illustrated in Figure 5-6.

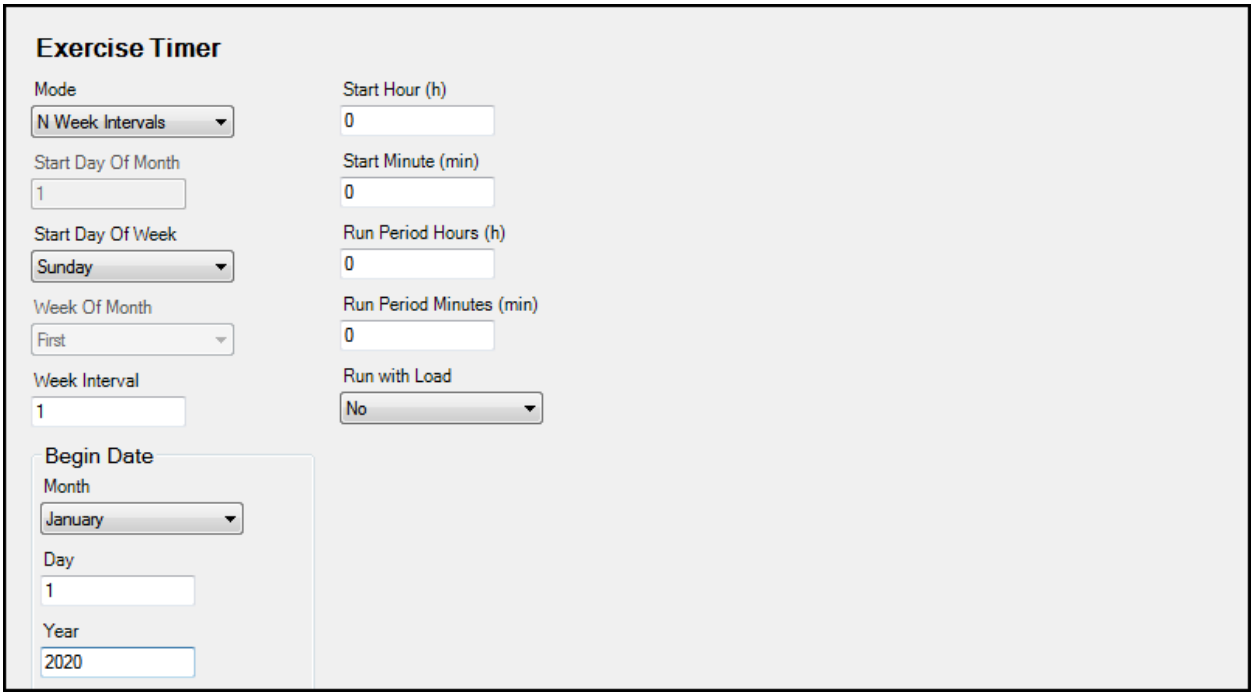


Figure 5-6. Settings Explorer, System Parameters, Exercise Timer Screen

Sensing Transformers

Three sets of transformer settings configure the DGC-2020ES for operation with a specific system. These settings, along with the generator voltage, generator current, and bus voltage detected by the DGC-2020ES, enable it to accurately meter system values and offer generator protection.

The Sensing Transformers screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Sensing Transformers.

When adjusting these settings using BESTCOMS*Plus*, click the *Rated Data* button. See *Rated Data,* above, for more information.

Generator PT

The generator PT settings establish the nominal primary (generator side) and secondary (DGC-2020ES side) voltage levels at the generator voltage-sensing transformer. The Generator PT Primary setting accepts values from 1 to 999,999, in increments of 1. The Generator PT Secondary setting accepts values from 1 to 480, in increments of 1.

Bus PT

Primary and secondary bus transformer ratings are used by the optional automatic transfer switch function. This function monitors a three-phase bus input to detect mains failure. The primary setting establishes the nominal voltage present at phases A, B, and, C of the bus. This setting accepts values

from 1 to 99,999, in increments of 1. The secondary setting establishes the nominal voltage detected at the bus voltage input of the DGC-2020ES. This setting accepts values from 1 to 480, in increments of 1.

Generator CT

The generator CT setting establishes the nominal, primary (generator side) current level at the generator current sensing transformer. This setting accepts values from 1 to 9,999, in increments of 1. The secondary value of the generator CT is dictated by the style number of the controller. A DGC-2020ES with a style number of 1xx uses a nominal CT secondary rating of 1 Aac. A DGC-2020ES with a style number of 5xx uses a nominal CT secondary rating of 5 Aac.

The Gen CT Low Line Scale Factor setting is used to automatically adjust the Gen CT Primary Amps setting in applications that may utilize more than one type of genset connection. This setting accepts a value from 0.001 to 3, in increments of 0.001. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate scaling of the settings. The value of the scale factor setting serves as a multiplier for the Gen CT Primary Amps setting. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the Gen CT Primary Amps setting is doubled (2.000 x Gen CT Primary Amps).

Relay Control

The default operational setting for the Start, Run, and Pre-start relays is *Predefined* or standard. Any of these relays can be logic driven by selecting the *Programmable* setting. Logic driven (programmable relays must be set up using BESTlogic*Plus*.

The Relay Control screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Relay Control.

The BESTCOMS*Plus* Relay Control screen is illustrated in Figure 5-7.

Figure 5-7. Settings Explorer, System Parameters, Relay Control Screen

System Configuration Detection

When enabled, this feature allows the DGC-2020ES to automatically detect its sensing configuration in relation to the generator. Upon starting the genset, the configuration of the generator is automatically detected. The Single Phase Override and Low Line Override programmable function settings are then adjusted accordingly.

There is a one-second delay in the detection to prevent the DGC-2020ES from alternating between detected configurations. When the DGC-2020ES is in the *Off* mode or the engine is not running, the Automatic Configuration Detection function is disabled. The DGC-2020ES is assumed to be in the last valid automatically detected configuration.

It is recommended that the Single Phase Override and Low Line Override programmable functions are not assigned to contact inputs when Automatic Configuration Detection is enabled.

Single Phase Detect Threshold

If the difference between the maximum and minimum line-to-line voltage exceeds this threshold, the unit is determined to be in single-phase configuration. If determined to be in single-phase configuration, the

Single Phase Override programmable function forces the DGC-2020ES into single-phase mode. The single-phase mode connection is determined by the *Single Phase Detect Generator Connection*, below.

If the Single Phase Override function is assigned to a contact output, the state of the contact output and the detected configuration are ORed. This means, if one or both are true, then the system is determined to be configured for single phase.

Low Line Detect Threshold

If the average of the valid line-to-line voltages for the detected configuration is above this threshold, the unit is determined to be in a high-line configuration. If the average is below this threshold, it is determined to be in a low-line configuration. If determined to be in low-line configuration, the Low-Line Override function forces the DGC-2020ES into the low-line configuration.

If the Low-Line Override function is assigned to a contact output, the state of the contact output and the detected configuration are ORed. This means, if one or both are true, then the system is determined to be configured for low-line.

Single Phase Detect Generator Connection

This setting specifies which single-phase connection to use when the system is determined to be single-phase. Single-phase AB or Single-phase AC can be selected.

The *Auto Config Detection* screen is found in the BESTCOMS*Plus* Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Auto Config Detect. The BESTCOMS*Plus* Auto Config Detection screen is illustrated in Figure 5-8.

Figure 5-8. Settings Explorer, System Parameters, Auto Config Detection Screen

6 • Timekeeping

The DGC-2020ES provides a real-time clock with capacitor backup that is capable of operating the clock for up to 24 hours after power is removed from the controller. As the capacitor nears depletion, an internal backup battery takes over and maintains timekeeping. The battery will maintain the clock for approximately ten years depending on conditions. The battery is not replaceable.

The clock is used by the events recorder function to time-stamp events and the exercise timer to start and stop the genset when the exercise feature is utilized.

Clock Setup

Clock settings are made through the communication ports using BESTCOMS*Plus*® or through the front-panel interface. Write access to ports is required to program the clock. An alarm is provided to detect when the DGC-2020ES has powered up and the clock has not been set.

The clock settings are made through BESTCOMS*Plus* by selecting *Clock Setup* under *General Settings.* If using the front panel, navigate to Settings > General Settings > Configure Date/Time.

The BESTCOMS*Plus Clock Setup* screen is illustrated in Figure 6-1. Settings are listed in Table 6-1.

The local time zone is configured on this screen. The Time Zone Offset is the local offset to UTC (Coordinated Universal Time). The Time Zone Offset is required when the Start/End Time Reference is set to UTC (Coordinated Universal Time). The Start/End Time Reference is set to UTC time if required by local daylight savings time rules. The Start/End Hour/Minute settings determine the time when the DST will go into effect. The Bias setting is the amount of time that the clock moves forward or backward. The user is notified when the clock is not set when the Clock Not Set Warning is enabled.

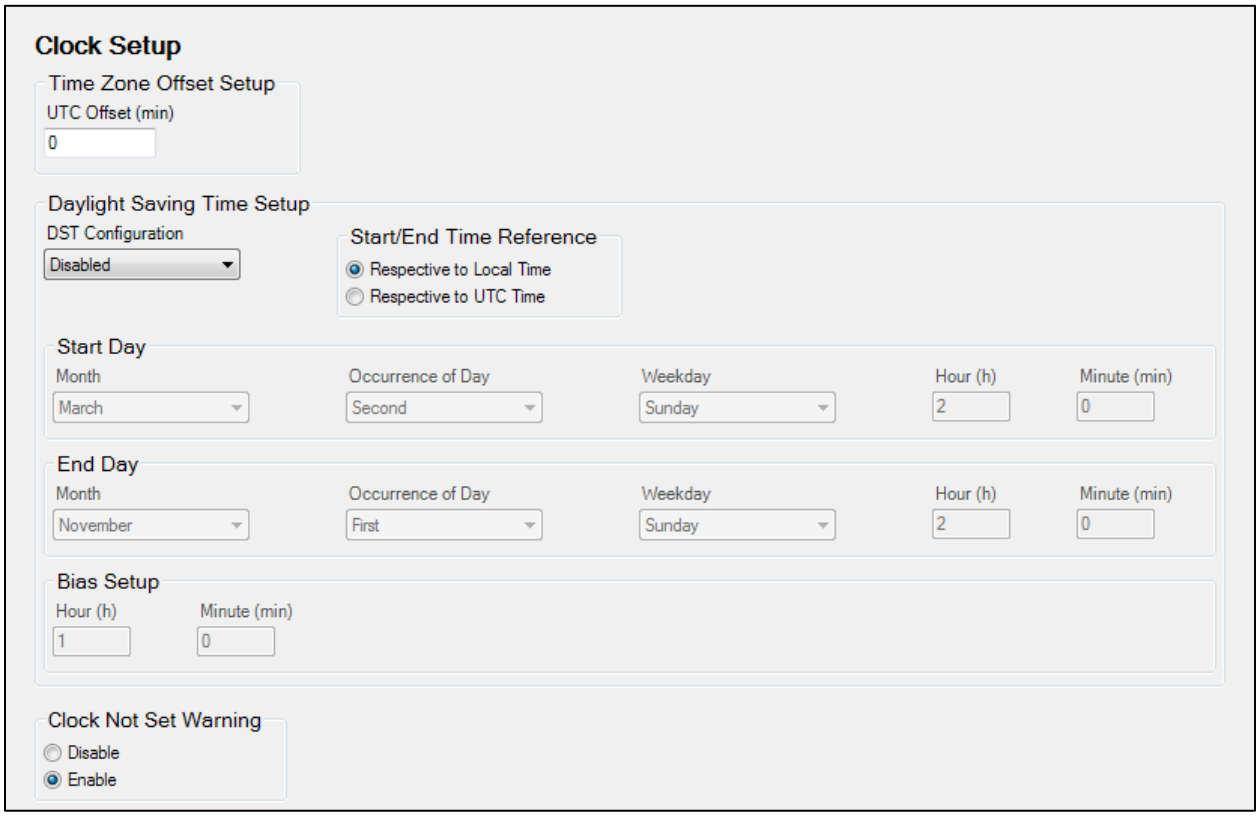


Figure 6-1. Settings Explorer, General Settings, Clock Setup Screen

Table 6-1. Settings for Clock

Setting	Range	Increment	Unit	Default
UTC Offset	–1,440 to 1,440	1	minutes	–6
DST Configuration	Floating Dates or Fixed Dates	n/a	n/a	Disabled
Start/End Time Reference	Respective to Local Time or Respective to UTC Time	n/a	n/a	Respective to Local Time
Bias Setup (Hour)	–12 to 12	1	hours	Disabled
Bias Setup (Minute)	–59 to 59	1	minutes	0
Clock Not Set Warning	Disable or Enable	n/a	n/a	Disable

Setting the Time and Date

Time and date settings are made through BESTCOMS*Plus* on the Real Time Clock screen (Figure 6-2) of the Metering Explorer. Settings can also be made through the front panel.

Figure 6-2. Metering Explorer, Real Time Clock Screen

7 • Engine Sender Inputs

The DGC-2020ES has sender inputs dedicated to monitoring the engine fuel level, oil pressure, and coolant temperature. These inputs are programmable to give the user flexibility in selecting the sender to be used in an application. Information about programming sender inputs is provided later in this chapter.

Compatible Senders

Oil pressure senders that are compatible with the DGC-2020ES include Datcon model 02505-00, Isspro model R8919, Stewart-Warner models 279BF, 279C, 411K and 411M, and VDO models 360025 and 360811. Compatible Fuel Level senders include the Isspro model R8925. Compatible Coolant Temperature senders include Datcon model 02019-00, Faria model TS4042, Isspro model, R8959, and Stewart-Warner model 334P. Other senders may also be used.

Operation

A current is provided to each sender. The developed voltage is measured and scaled for use by the internal circuitry. An open circuit or short circuit across the sender terminals will cause the DGC-2020ES to indicate a failed sender.

Sender Programmability

BESTCOMS*Plus*® software allows for the programming of sender characteristics. See *Sender Characteristic Curves* for more information.

Sender Characteristic Curves

The sender inputs of the DGC-2020ES can be customized to obtain maximum accuracy from the coolant temperature, oil pressure, and fuel level senders.

The characteristic curve of each sender input can be configured with up to 11 points. Each point can be assigned a resistance input value and a corresponding temperature (coolant temperature sender), pressure (oil pressure sender), or percentage (fuel level sender) value. A sender slope setting automatically orders the values in the resistance column according to whether the sender requires a negative or positive slope. Sender curve points are automatically plotted on a curve in BESTCOMS*Plus*, which can be printed.

Sender curve points configured in BESTCOMS*Plus* can be saved in the configuration file. The data for all three senders is automatically saved with the DGC-2020ES configuration file.

Any changes made in BESTCOMS*Plus* to the sender points, can be reverted to the factory-default values. A new settings file can also be created.

Curve Configuration

If the DGC-2020ES receives engine information from an ECU, the programmable sender parameters for coolant temperature and oil pressure do not require configuration because they have no effect. Configuration of sender parameters is appropriate for resistive senders only.

Fuel Level

Figure 7-1 illustrates the *Fuel Level* screen found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Senders* category. To program the fuel level sender, perform the following procedure:

1. The percent fuel level sender is configured by selecting one of the sender types that come as a part of the BESTCOMS*Plus* sender library. Click on *Load Fuel Settings File* and select the appropriate sender.

2. If no sender file matches the sender being used, the individual points that map resistance points to fuel level may be modified by setting numeric values in the table, or dragging the points of the graph to the desired characteristic. Information on sender characteristics should be obtained from the sender manufacturer.
3. Select *Positive* or *Negative* sender slope as required for the desired sender graph.
4. Click *Save Fuel Data* to save the data in the current settings file.
5. If you want to save newly entered sender data as a sender library file, click *Create Fuel Settings File* and enter a file name and location to save the file.
6. Click the *Send Settings* button in BESTCOMS*Plus* to send the sender settings to the DGC-2020ES.

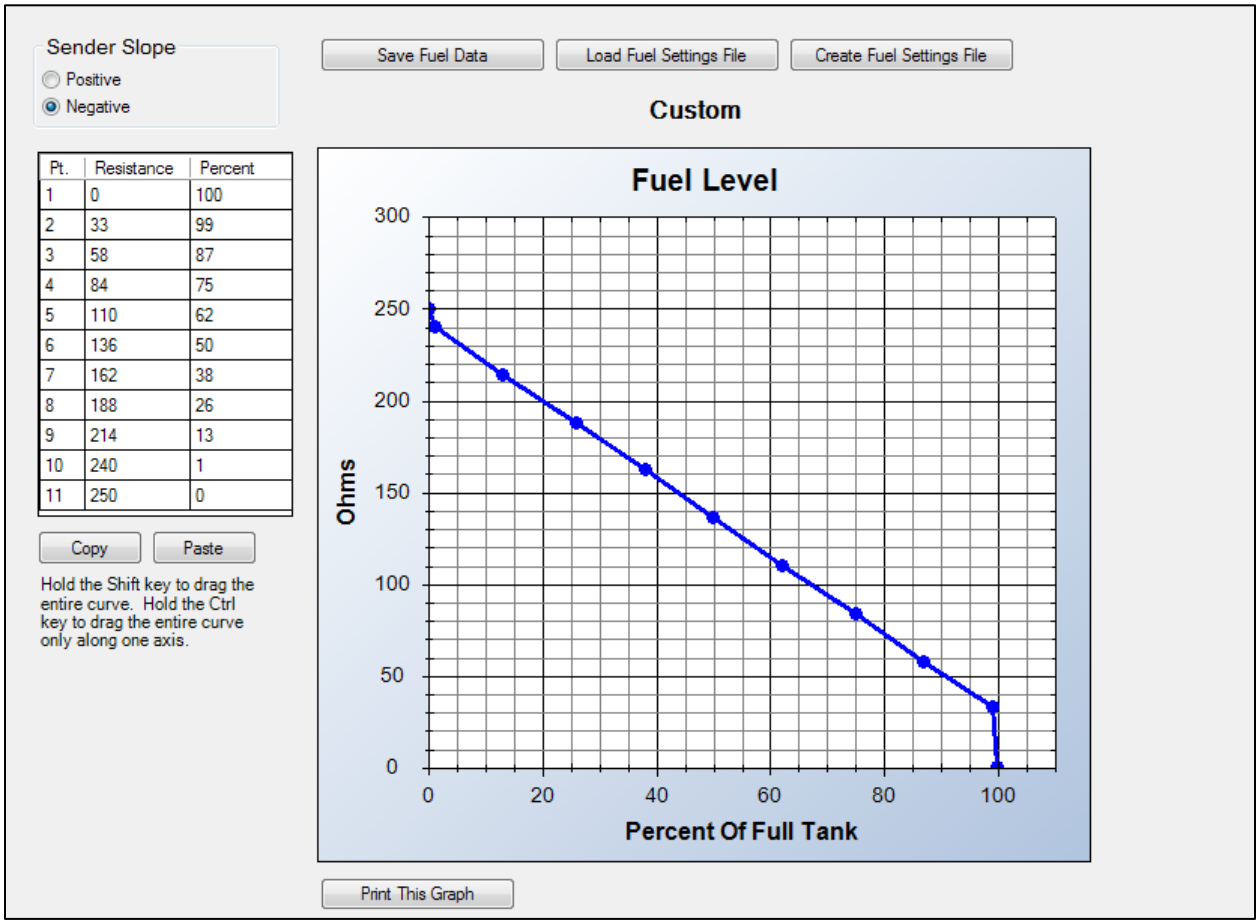


Figure 7-1. Settings Explorer, Programmable Senders, Fuel Level Screen

Oil Pressure

Figure 7-2 illustrates the *Oil Pressure* screen found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Senders* category. To program the oil pressure sender, perform the following procedure:

1. The oil pressure sender can be configured by selecting one of the sender types that come as a part of the BESTCOMS*Plus* sender library. Click on *Load Oil Settings File* and select the appropriate sender.
2. If no sender file matches the sender being used, the individual points that map resistance points to oil pressure may be modified by setting numeric values in the table, or dragging the points of the graph to the desired characteristic. Information on sender characteristics should be obtained from the sender manufacturer.
3. Select *Positive* or *Negative* sender slope as required for the desired sender graph.
4. Click *Save Oil Data* to save the data in the current settings file.

5. If you want to save newly entered sender data as a sender library file, click *Create Oil Settings File* and enter a file name and location to save the file.
6. Click the *Send Settings* button in BESTCOMS*Plus* to send the sender settings to the DGC-2020ES.

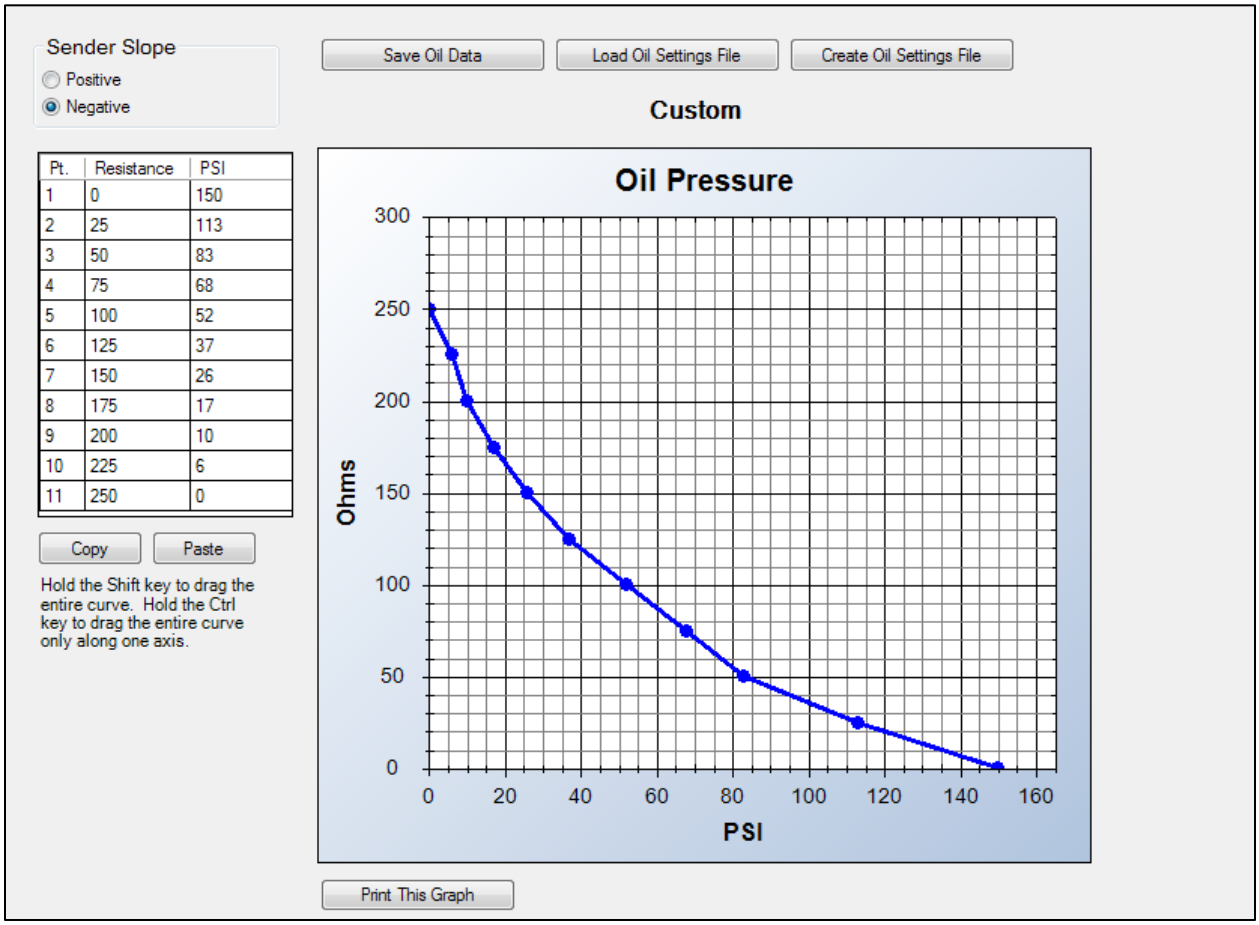


Figure 7-2. Settings Explorer, Programmable Senders, Oil Pressure Screen

Coolant Temperature

Figure 7-3 illustrates the *Coolant Temperature* screen found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Senders* category. To program the fuel level sender, perform the following procedure:

1. The coolant temperature sender can be configured by selecting one of the sender types that come as a part of the BESTCOMS*Plus* sender library. Click on *Load Cool Settings File* and select the appropriate sender.
2. If no sender file matches the sender being used, the individual points that map resistance points to coolant temperature may be modified by setting numeric values in the table, or by dragging the points of the graph to the desired characteristic. Information on sender characteristics should be obtained from the sender manufacturer.
3. Select *Positive* or *Negative* sender slope as required for the desired sender graph.
4. Click *Save Cool Data* to save the data in the current settings file.
5. If you want to save newly entered sender data as a sender library file, click *Create Cool Settings File* and enter a file name and location to save the file.
6. Click the *Send Settings* button in BESTCOMS*Plus* to send the sender settings to the DGC-2020ES.

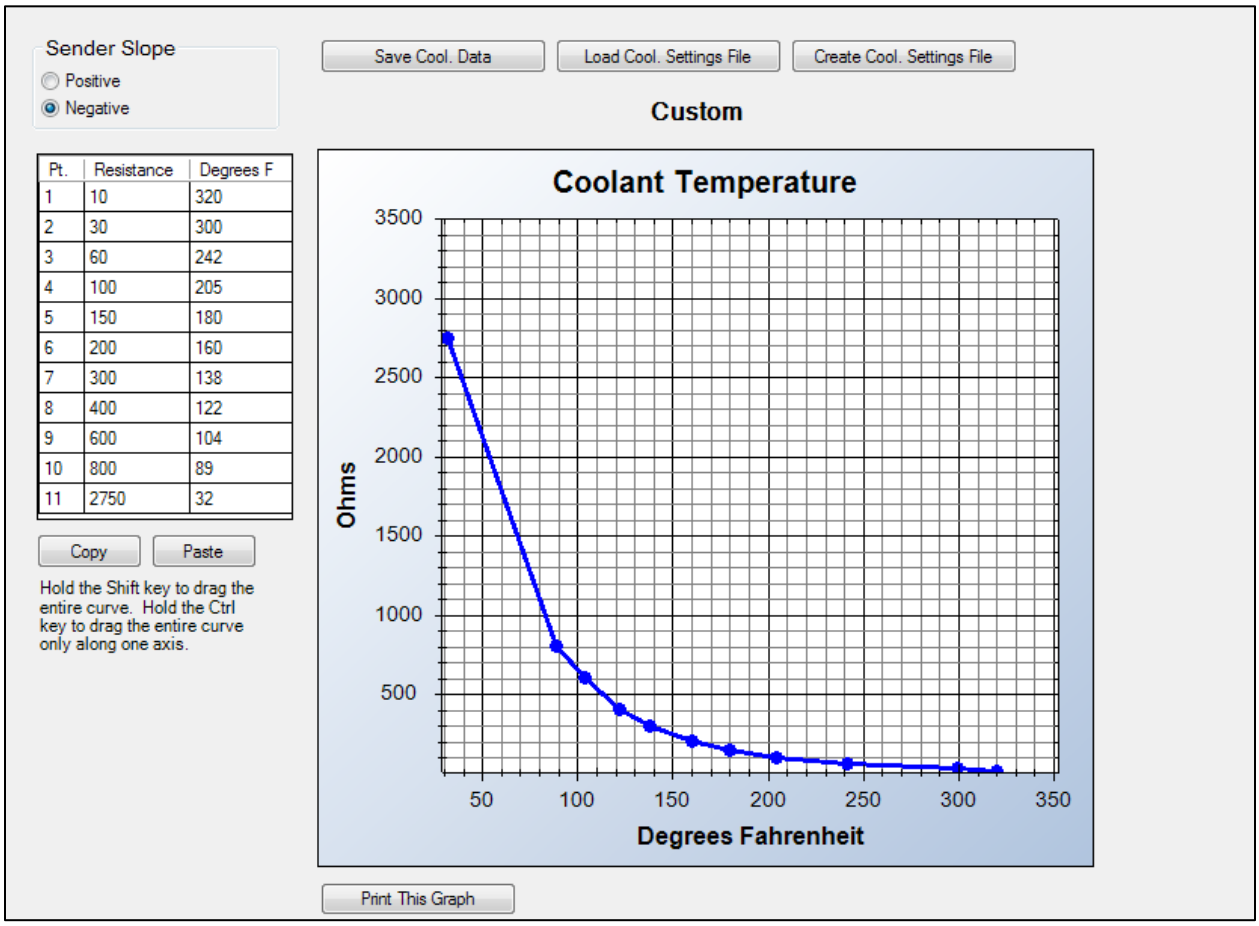


Figure 7-3. Settings Explorer, Programmable Senders, Coolant Temperature Screen

Sender Failure Detection

The DGC-2020ES can be configured to annunciate a pre-alarm or alarm when a loss of signal is detected at the coolant temperature, oil pressure, or fuel level sender input. Contact recognition can be set to Always or While Engine Running Only. Minimum and Maximum resistance values can be set. When the SF Display setting is set to Enable, “SF” is displayed instead of the measured parameter when the resistance value is outside the range specified by the Minimum and Maximum Resistance values. A loss of generator sensing voltage (when the DGC-2020ES is operating in Run or Auto mode with the ATS closed) can also be configured to trigger a pre-alarm or alarm. The speed sender fail alarm is always enabled. A user-adjustable time delay is provided for each sender/sensing alarm/pre-alarm.

Alarm and pre-alarm annunciations for loss of engine speed signals are not user-programmable and operate as follows. If the MPU (magnetic pickup) or generator frequency is programmed as the sole engine speed source and that signal source fails, an alarm (and shutdown) is triggered. If the engine speed source is configured as MPU and generator frequency and a loss of one of the signal sources occurs, a pre-alarm is annunciated. An alarm (and shutdown) is triggered if both speed signals are lost.

The BESTCOMS*Plus* Sender Fail screen is illustrated in Figure 7-4 and is found in the *Settings Explorer* under *Alarm Configuration*. If using the front panel, navigate to Settings > Alarm Configuration > Sender Fail.

Voltage Sensing Fail

The voltage sensing fail function monitors the generator line-to-neutral voltages. If any of the line-to-neutral voltages decreases below 2% of the CT secondary voltage for the duration of the Activation Delay, the DGC-2020ES detects a Voltage Sensing Fail condition and annunciates an alarm based on the Alarm Configuration setting.

In a Grounded Delta configuration where one phase (A, B, or C) of the delta connection is grounded, it is likely a Voltage Sensing Fail condition will occur.

In Delta connected systems where the DGC-2020ES neutral input is not connected, it is uncertain which line-to-neutral voltages will be monitored by the DGC-2020ES. Spurious Voltage Sensing Fail annunciations could occur.

It is recommended that Phase Imbalance detection be used to detect sensing issues in Delta and Grounded Delta configurations.

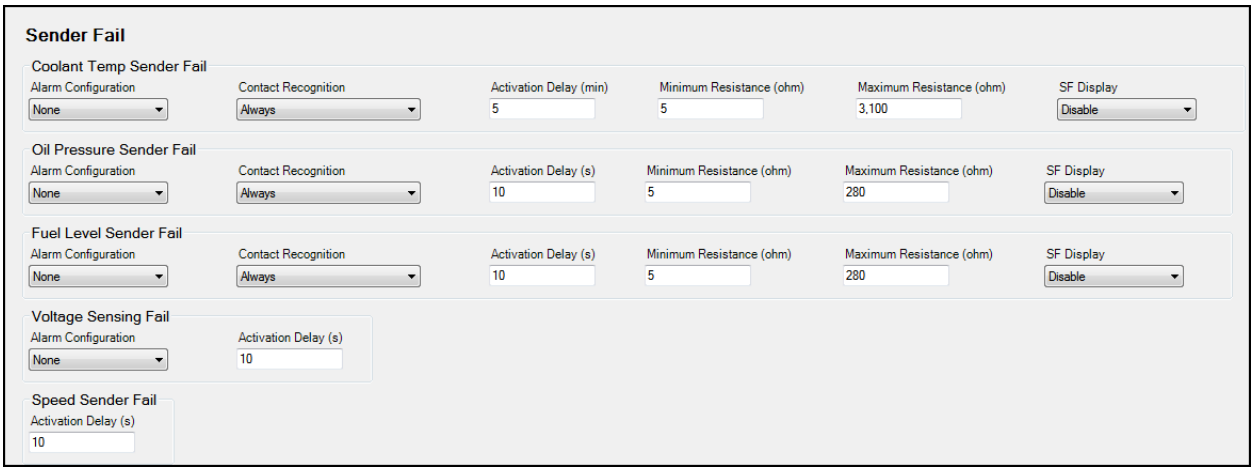


Figure 7-4. Settings Explorer, Alarm Configuration, Sender Fail Screen

8 • Contact Inputs

Contact inputs are available to initiate DGC-2020ES actions. The DGC-2020ES has seven programmable contact sensing inputs. Additional contact inputs can be accommodated with an optional CEM-2020 (Contact Expansion Module). Contact Basler Electric for availability and ordering information.

Each programmable input (Input 1 through Input 7) can be independently configured to perform the following functions. By default, each programmable input is disabled.

- Auto Transfer Switch
- Battery Charger Fail
- Battle Override
- Emergency Stop
- Fuel Leak Detect
- Grounded Delta Override
- Low Coolant Level
- Low Fuel Level
- Low Line Override
- Single-Phase Override

The programmable inputs accept dry contacts. A contact is connected between a programmable input and the negative side of the battery. Through BESTCOMS*Plus*®, each programmable contact input can be assigned a name (16 alphanumeric characters, maximum) and configured as an alarm input, a pre-alarm input, or none. The default names for the inputs are INPUT_x (where x = 1 to 7). When a programmable contact input is closed, the front panel display shows the name of the closed input if it was programmed as an alarm or pre-alarm input. Alarm inputs are annunciated through the Normal display mode screens of the front panel. Pre-alarm inputs are annunciated through the pre-alarm metering screen of the front panel. If neither alarm nor pre-alarm is programmed, no indication is given. Programming an input as *None* is useful when a programmable input is used as an input to programmable logic.

Connections for the programmable inputs are provided at terminals 3 (Input 1) through 9 (Input 7). The negative side of the battery voltage (terminal 17) serves as the return connection for the programmable inputs.

Contact Input Configuration

Figure 8-1 illustrates the *Contact Inputs* screen found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Inputs* category. If using the front panel, navigate to Settings > Programmable Inputs > Configurable Inputs.

For each contact input, configure the following parameters:

1. Alarm Configuration - Select *None, Alarm,* or *Pre-Alarm*. When an alarm occurs, the horn output closes and the engine shuts down. When a pre-alarm occurs, the horn output toggles between open and closed while the engine remains running. If *None* is selected, the input is status only. The status is available to BESTlogic™*Plus* Programmable Logic regardless of *Alarm Configuration* setting.
2. Activation Delay - This parameter defines the duration that the input remains on before any annunciation occurs.
3. Label Text - Enter descriptive text that signifies the use of the input. This text appears next to the input in BESTlogic™*Plus* Programmable Logic and in the event log if the input is configured as an alarm or pre-alarm.
4. Contact Recognition - Select whether the contact input should be recognized always, or only while the engine is running. For example, a switch closes when oil pressure is low. Such a switch would be closed when the engine is not running but a low oil pressure alarm or pre-alarm should not be annunciated unless the switch is closed while the engine is running. A selection of *While Engine Running Only* prevents spurious annunciation when the engine is not running.

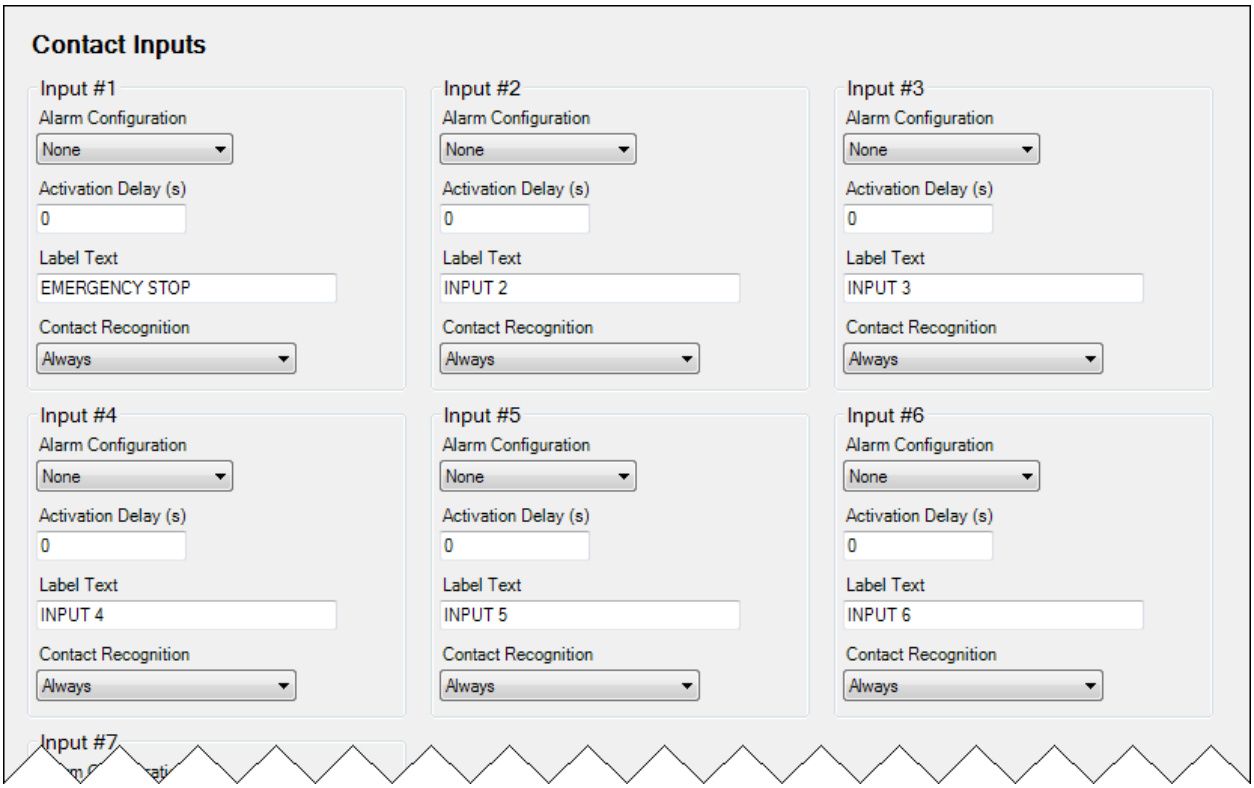


Figure 8-1. Settings Explorer, Programmable Inputs, Contact Inputs Screen

Programmable Functions

Any of the seven contact inputs can be programmed to recognize any one of 10 function types:

- Automatic Transfer Switch (ATS) - Start and run the generator while the ATS input is true and the DGC-2020ES is in Auto mode. When Input Mode is set to Complementary, a Normally Open Input and a Normally Closed Input must be selected. While the Normally Open Input is closed, the Normally Closed Input is open, and the DGC-2020ES is in Auto mode, the ATS function starts and runs the generator. If the Normally Open Input and the Normally Closed Inputs are not in opposite states for the duration of the Circuit Error Delay, an ATS Circuit Error Pre-alarm will occur. The Circuit Error Action setting dictates whether the generator should start or *not* start when an ATS Circuit Error Occurs.
- Grounded Delta Override - Uses Grounded Delta sensing if the generator connection is set for Delta.
- Battle Override - The alarms programmed to shut down the unit will be overridden and ignored. When a Battle Override condition is true the DGC annunciates a Battle Override Pre-alarm that is recorded in the event log. If an alarm occurs while a Battle Override condition is true, the alarm annunciates on the DGC front panel and is recorded in the event log, but the engine will not stop. The DGC-2020ES monitors engine rpm during battle override. If the engine rpm drops to zero while an alarm is active during a Battle Override condition, the DGC-2020ES proceeds to issue a normal shutdown to prevent fuel flow while the engine is not running. The Emergency Stop Alarm has priority over Battle Override. The engine will stop if the Emergency Stop is activated regardless of Battle Override status.
- The DGC monitors engine RPM during battle override. If the engine RPM drops to zero while an alarm is active during a Battle Override condition, the DGC will proceed to issue a normal shutdown to prevent fuel flow while the engine is not running.
- Low-Line Override - The 51, 27, and 59 settings are scaled by the low-line scale factor setting.
- Single-Phase Override - The unit switches to single-phase sensing configuration and uses the 1 Phase Override Sensing setting (A-B or A-C).

- Emergency Stop – When an input is assigned to the Emergency Stop Programmable Function, the input functions in a normally-closed manner. When the input is closed, no alarm is annunciated. When the input is open, the DGC-2020ES will open the Start, Run, and Prestart relays and annunciate an Emergency Stop Alarm.

  Once an input is assigned to this programmable input, navigate to Settings Explorer > Programmable Inputs > Contact Inputs and configure the following settings:

  - Alarm Configuration: Status Only
  - Activation Delay: 0
  - Label Text: Any text is acceptable.
  - Contact Recognition: Always
- Battery Charger Fail - When the selected input is invoked, a user selectable pre-alarm or alarm is annunciated after the activation delay.
- Low Coolant Level - When the selected input is invoked, a Low Coolant Level pre-alarm or alarm is annunciated after the activation delay.
- Low Fuel Level - When the selected input is invoked, a Low Fuel Level pre-alarm or alarm is annunciated after the activation delay.
- Fuel Leak Detect - When the selected input is invoked, a Fuel Leak pre-alarm or alarm is annunciated after the activation delay.

An Alarm Configuration setting of “None” prevents a function from being triggered by a contact input. Programmable function status is available in BESTlogic™*Plus* Programmable Logic when the “None” alarm configuration setting is selected.

The *Programmable Functions* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Inputs* category. If using the front panel, navigate to Settings > Programmable Inputs > Programmable Functions.

The BESTCOMS*Plus* Programmable Functions screen is illustrated in Figure 8-2.

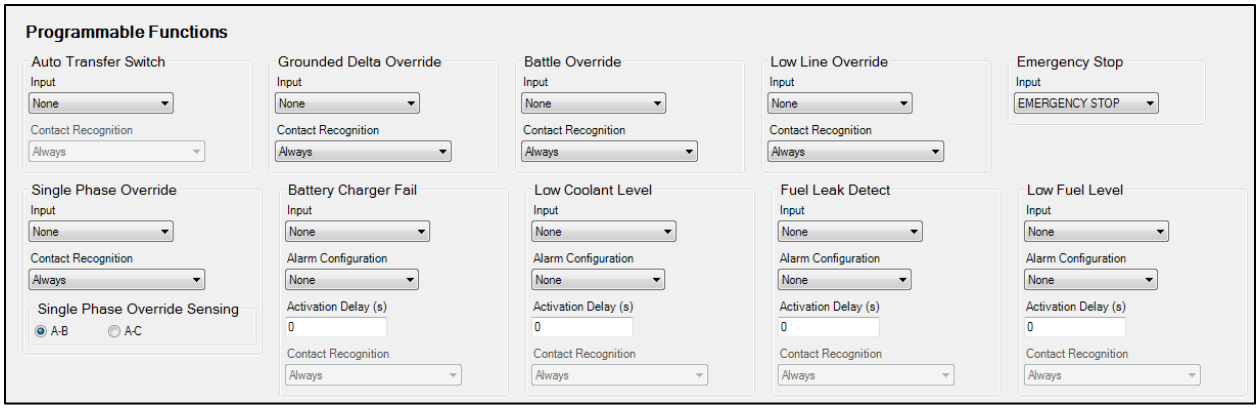


Figure 8-2. Settings Explorer, Programmable Inputs, Programmable Functions

9 • Contact Outputs

Output contact operation is controlled by the operating mode of the DGC-2020ES. The state of the Emergency Stop contact input also affects output contact operation. When the Emergency Stop contact input is open (emergency stop condition), the PRESTART, START, and RUN outputs open and an emergency stop alarm is annunciated. When the Emergency Stop input is closed, all output contacts operate normally.

DGC-2020ES output contacts include PRESTART, START, RUN, and four programmable outputs. Additional output contacts can be accommodated with an optional CEM-2020 (Contact Expansion Module).

Prestart

This output closes to energize the engine glow plugs or run pre-lubrication pumps. The PRESTART output can be programmed to close up to 30 seconds prior to engine cranking. The PRESTART output can also be programmed to open upon engine startup or remain closed as long as the engine is operating.

During the resting state, the PRESTART output can be set to Off, On, or Preheat Before Crank. If Preheat Before Crank is selected, the PRESTART output will be closed for a time equal to the Pre-crank delay time prior to re-entering the cranking state. If the Pre-crank delay setting is longer than the rest interval, the PRESTART output will be closed for the entire rest time.

PRESTART output connections are made through terminals located on the PRESTART relay.

Start

This output closes when engine cranking is initiated by the DGC-2020ES and opens when the magnetic pickup (MPU) or generator frequency indicates that the engine has started. Prior to engine starting, the duration of cranking is determined by the cranking style (cycle or continuous) selected. Cycle cranking permits up to seven crank cycles with crank cycle duration of 5 to 15 seconds. The continuous crank time is adjustable from 5 to 60 seconds.

START output connections are made through terminals located on the START relay.

Run

This output closes when engine cranking is initiated by the DGC-2020ES. The RUN output remains closed until it receives a command to stop the engine.

RUN output connections are made through terminals located on the RUN relay.

Relay Control

In some applications, it may be beneficial to modify the standard operation of the DGC-2020ES Run, Pre-Start, or Start relays. If desired, these relays can be configured to operate outside their predefined functionality. For example, if your genset does not require starting assistance from glow plugs, the Pre-Start relay may be assigned for another purpose. Configuring these relays as programmable makes them available in BESTlogic™*Plus* programmable logic to be used in the same manner as the other programmable relay outputs. Predefined or programmable operation of the Run, Pre-Start, and Start relays is selected on the Relay Control screen (Figure 9-1). See the BESTlogic*Plus* chapter for more information about DGC-2020ES programmable logic.
The Relay Control screen is found in the BESTCOMS*Plus*® Settings Explorer under the System Parameters category. If using the front panel, navigate to Settings > System Parameters > Relay Control.

Figure 9-1. Settings Explorer, System Parameters, Relay Control Screen

For each relay (Start, Run, and Pre-Start), select whether it should use its predefined functionality or be made programmable.

When *Programmable* is selected for a relay, it becomes available to BESTlogic*Plus* Programmable Logic as a logic element. The elements are titled *Start Output, Prestart Out,* and *Run Output*. The predefined functionality is available as an input to the logic. If *Programmable* is selected as the relay control mode, connecting the corresponding predefined input function to the relay causes it to function as if *Predefined* were selected as its relay control type. However, other logic can be combined with it to create operation that is more versatile. If *Programmable* is selected for a relay, but it is not used in the logic, that relay will never close.

An example logic scheme connecting the predefined inputs directly to the “programmable” relay outputs for all three relays is shown in Figure 9-2.

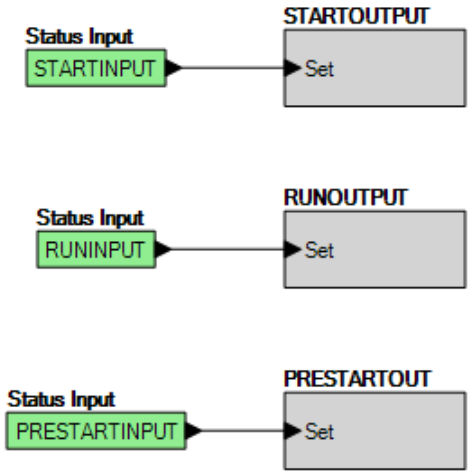


Figure 9-2. Example Logic Scheme of Programmable Relays

Programmable

DGC-2020ES controllers have four programmable output contacts (OUT 1 through 4). An additional 24 contact outputs are provided with an optional CEM-2020 (Contact Expansion Module). An optional CEM-2020H (Contact Expansion Module - High Current) provides 18 contact outputs.

Programmable Output Configuration

Figure 9-3 illustrates the *Contact Outputs* screen found in the BESTCOMS*Plus Settings Explorer* under the *Programmable Outputs* category. If using the front panel, navigate to Settings > Programmable Outputs > Contact Outputs.

Each output can be programmed with a text label describing its use. This label appears in BESTlogic*Plus* Programmable Logic where the output is used to aid in program clarity and ease of programming.

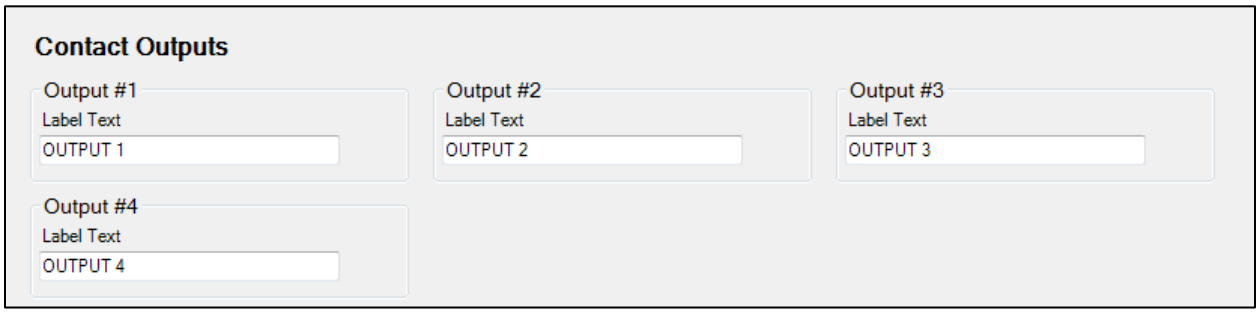


Figure 9-3. Settings Explorer, Programmable Outputs, Contact Outputs

Configurable Elements

Configurable elements are connected to the logic scheme as outputs. The configurable elements are incorporated into a BESTlogic*Plus* programmable logic scheme by selecting them from the *Elements* group in BESTlogic*Plus*. For more details, refer to the BESTlogic*Plus* chapter. Each of the eight elements can be independently configured to annunciate an alarm or pre-alarm. A user-adjustable time delay can be set to delay recognition of an element. By default, all elements are configured so that they do not trigger an alarm or pre-alarm. To make identifying an element easier, each of the elements can be given a user-assigned name. If used for an alarm or pre-alarm, the user-assigned name appears in the alarm or pre-alarm annunciation and in the DGC-2020ES event log. Elements can be recognized always or only while the engine is running. A user-adjustable arming delay disables the configurable element during engine startup. If the arming delay is set to zero, the configurable element is active at all times, including when the engine is not running. If the arming delay is set to a non-zero value, the configurable element is inactive when the engine is not running, and does not become active until after the engine is started and the arming delay has elapsed. Configurable element status is available in BESTlogic*Plus* Programmable Logic when “None” is selected for Alarm Configuration. Configurable element status can be used as logic inputs to drive other logic in the program, similar to logic control relays.

The BESTCOMS*Plus Configurable Elements* screen is illustrated in Figure 9-4 and found in the *Settings Explorer* under the *Programmable Outputs* category. If using the front panel, navigate to Settings > Programmable Outputs > Configurable Elements.

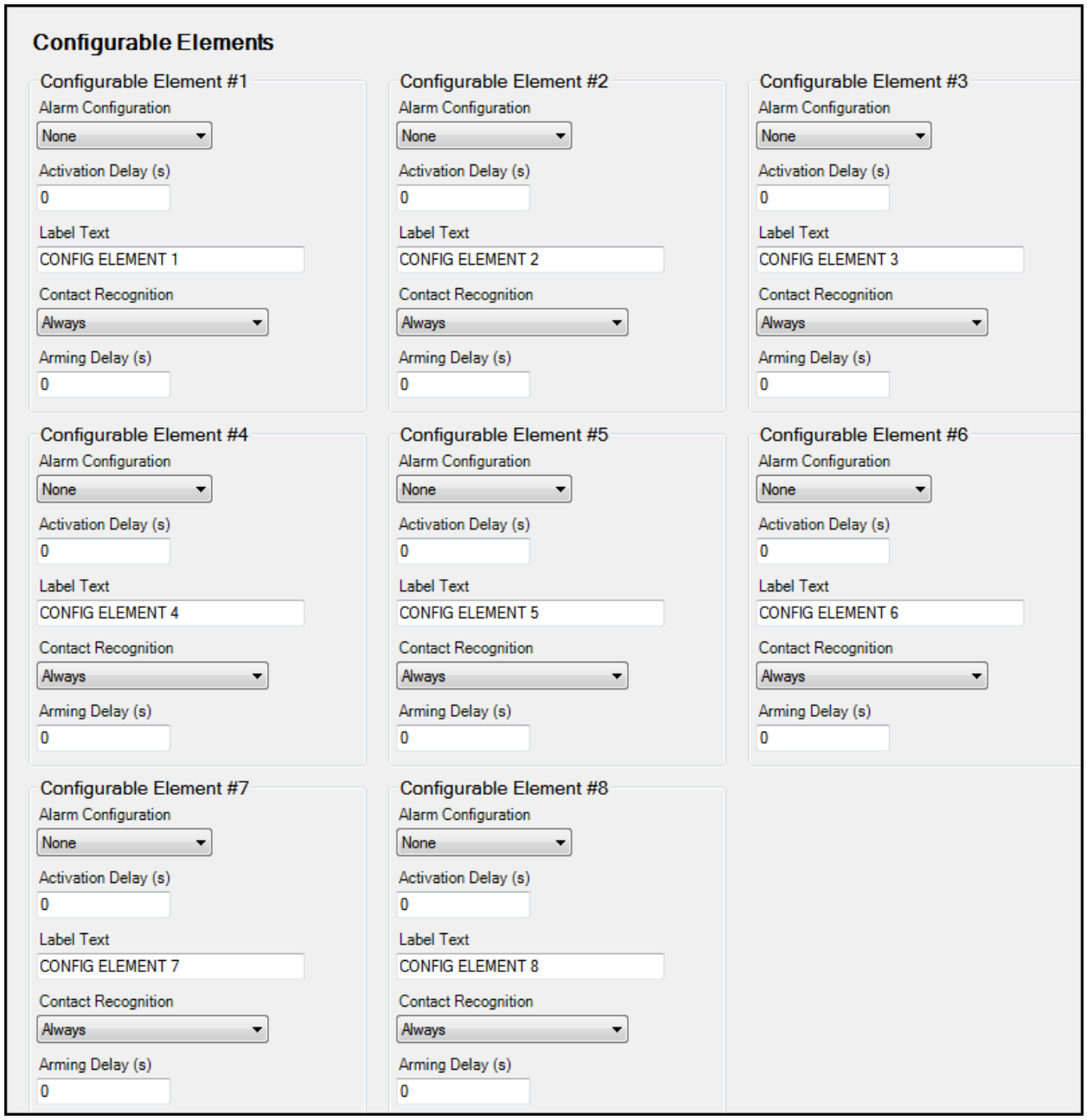


Figure 9-4. Settings Explorer, Programmable Outputs, Configurable Elements

10 • Breaker Management

The DGC-2020ES is capable of controlling the generator breaker and the mains breaker. Once it is determined that a valid breaker request is available, the DGC-2020ES will attempt to operate the breaker if possible. The user can choose to control only the generator breaker, the generator and mains breakers, or none. BESTCOMS*Plus*® is used to configure breaker management. Refer to the BESTCOMS*Plus* chapter for setting information.

Breaker Status

The status of the breakers is determined by using BESTlogic™*Plus* programmable logic and sent to the GENBRK and MAINSBRK logic blocks. These logic blocks have outputs that can be configured to energize an output contact and control a breaker as well as inputs for breaker control and status. See *Breaker Configuration*, below, for details on configuring the logic.

Breaker Operation

The DGC-2020ES will attempt to close a breaker only after verifying that it can be closed. If the breaker cannot be closed, the close request will be ignored. Only one breaker can be closed at a time. Closure to a dead bus can be performed after meeting dead bus threshold and timing requirements set by the user.

Breaker Operation Requests

Types of breaker operation requests include:

- Local Request - initiated by internal functions and based on operating modes.
- Com Request - initiated through a communication port using BESTCOMS*Plus* or the front panel.
- Logic Request - initiated from BESTlogic*Plus*.

The type of response given for a local request depends on the operating mode of the DGC-2020ES.

RUN Mode

When in RUN mode, the generator and mains breakers can be closed manually using contact inputs or the breaker operation settings on the BESTCOMS*Plus Control* screen.

OFF or AUTO Mode (Not Running)

If operating in the OFF mode or AUTO and not running, the generator breaker can be closed if the bus is determined to be dead.

AUTO Mode (Running)

When in AUTO mode and running, the mains fail transfer feature will automatically control the mains breaker and the generator breaker. Or, the external ATS (automatic transfer switch) will start the generator and control the breakers itself. In addition, the generator breaker can be automatically controlled by the exercise timer function or a RUNWLOAD (run with load) start through BESTlogic*Plus*. The generator breaker can be manually controlled using contact inputs and outputs or the breaker operation settings on the BESTCOMS*Plus Control* screen.

Breaker Closure Conditions

The conditions under which the DGC-2020ES will close a breaker are described in the following paragraphs.

Breaker Status and Voltage Stability

Before the generator breaker can be closed, it must be configured in BESTCOMS*Plus*. If only the generator breaker is configured (mains breaker not configured) the DGC-2020ES reads user settings to determine if the generator side of the breaker is stable or dead and the bus side is dead. If both the generator and the mains breakers are configured and open, the DGC-2020ES closes the generator

breaker if the generator side of the breaker is stable or dead. If both breakers are configured and the mains breaker is closed, the DGC-2020ES will not close the generator breaker.

Before the mains breaker can be closed, it must be configured in BESTCOMS*Plus*. If both the mains and the generator breakers are configured and open, the DGC-2020ES will close the mains breaker if the mains side of the breaker is stable. If both breakers are configured and the generator breaker is closed, the DGC-2020ES will not close the mains breaker.

Command Agreement

A breaker will not change state if it receives conflicting commands. In other words, if an input is indicating an open command at the same time another input is indicating a close command, the breaker will not change state.

Breaker Configuration

The following paragraphs describe how to properly configure a DGC-2020ES for generator breaker control.

Initial System Setup

Connect the DGC-2020ES according to the appropriate figure in the *Typical Connections* chapter in the *Installation* manual for the type of generator connection desired (wye, delta, etc.). Set up the basic system parameters that will govern engine operation and alarm and pre-alarm annunciation. Details can be found in the *Device Configuration* and *Alarm Configuration* chapters.

Breaker Hardware

Configure the generator breaker parameters on the BESTCOMS*Plus Settings Explorer, Breaker Management, Breaker Hardware* screen. If using the front panel, navigate to Settings > Breaker Management > Breaker Hardware. Figure 10-1 illustrates the BESTCOMS*Plus* Breaker Hardware screen.

1. *Mains Fail*: When two breakers are configured (enabled), the DGC-2020ES can be enabled to automatically transfer load power from the mains to the genset during a mains failure. This feature also enables the DGC-2020ES to transfer the load back to the mains once mains power is restored. Settings include a transfer delay, return delay, max transfer time, and max return time.
    a. When enabled, Reverse Rotation Inhibit prevents automatic load transfer due to a mains failure when the machine is determined to have reverse phase rotation.
    b. If the in-phase monitor is enabled and the Mains Fail Return Delay time has expired, the generator waits until it detects that the phases are aligned between the generator and the mains before performing the open transition from the generator back to the utility.
2. *Breaker Close Wait Time*: This is a time interval in which it is expected that the breaker will transition from open to closed or closed to open. If the generator breaker does not change state within that time, either a Gen Breaker Close Fail alarm or Gen Breaker Open Fail alarm is annunciated. If the mains breaker does not change state within that time, either a Mains Breaker Close Fail alarm or Mains Breaker Open Fail alarm is annunciated.
3. *Generator Breaker*
    a. Set the *Contact Type* and *Open/Close Pulse Times* if pulsed contacts are used.
    b. Set the *Breaker Closing Time*.
4. *Mains Breaker*
    a. Set the Mains Breaker as Configured if it is used, otherwise do not configure these settings.
    b. If the mains breaker is configured, set the contact type and pulse times if pulsed contacts are used.
    c. If the mains breaker is configured, set the breaker close time.

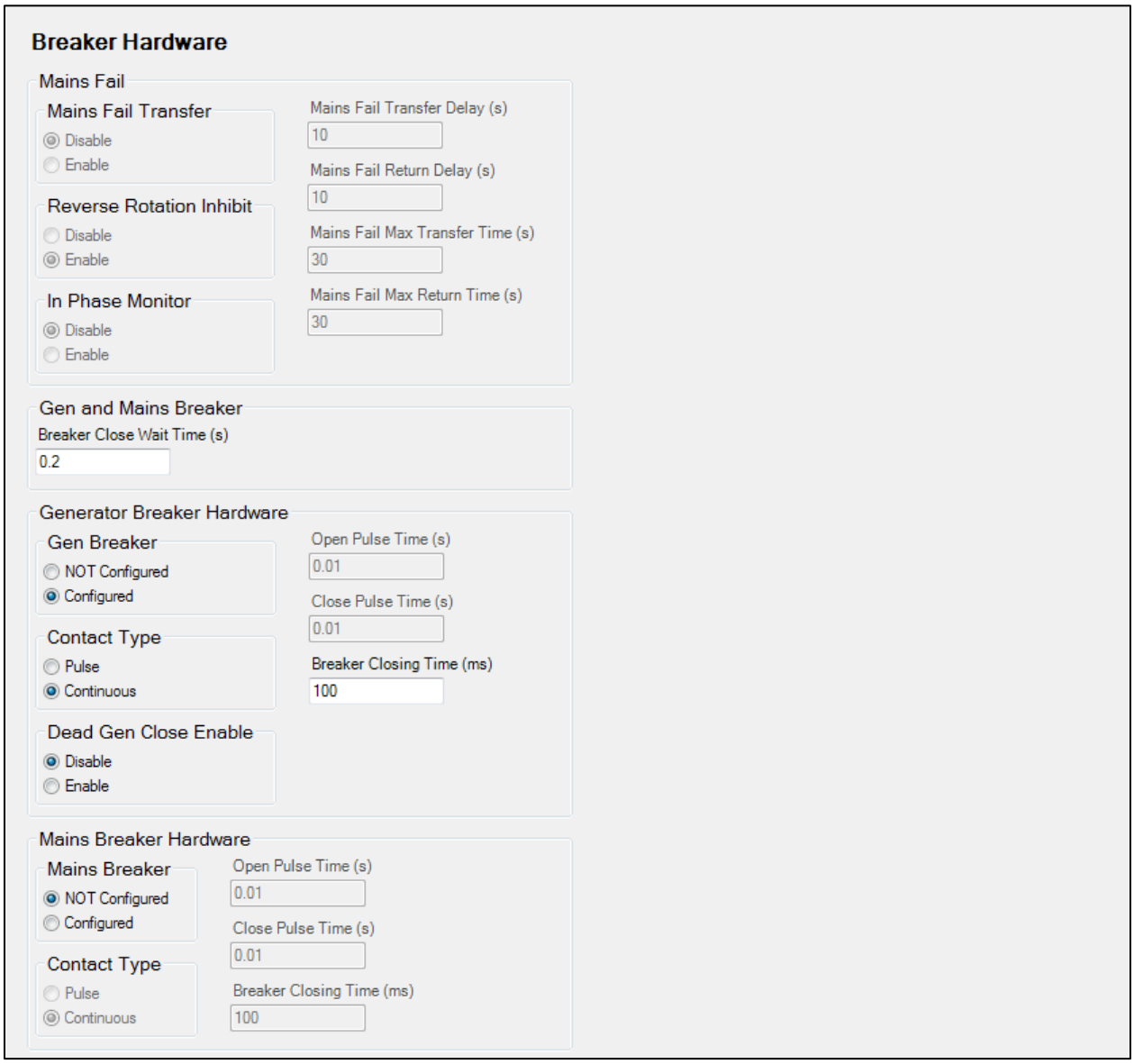


Figure 10-1. Settings Explorer, Breaker Management, Breaker Hardware Screen

Breaker Setup in BESTlogic™*Plus*

Set up the Gen Breaker in BESTlogic*Plus* Programmable Logic under the BESTCOMS*Plus Settings Explorer,* BESTlogic*Plus Programmable Logic* screen. BESTlogic*Plus* is not available through the front panel interface. Figure 10-2 illustrates the Gen breaker logic scheme in BESTlogic*Plus*.

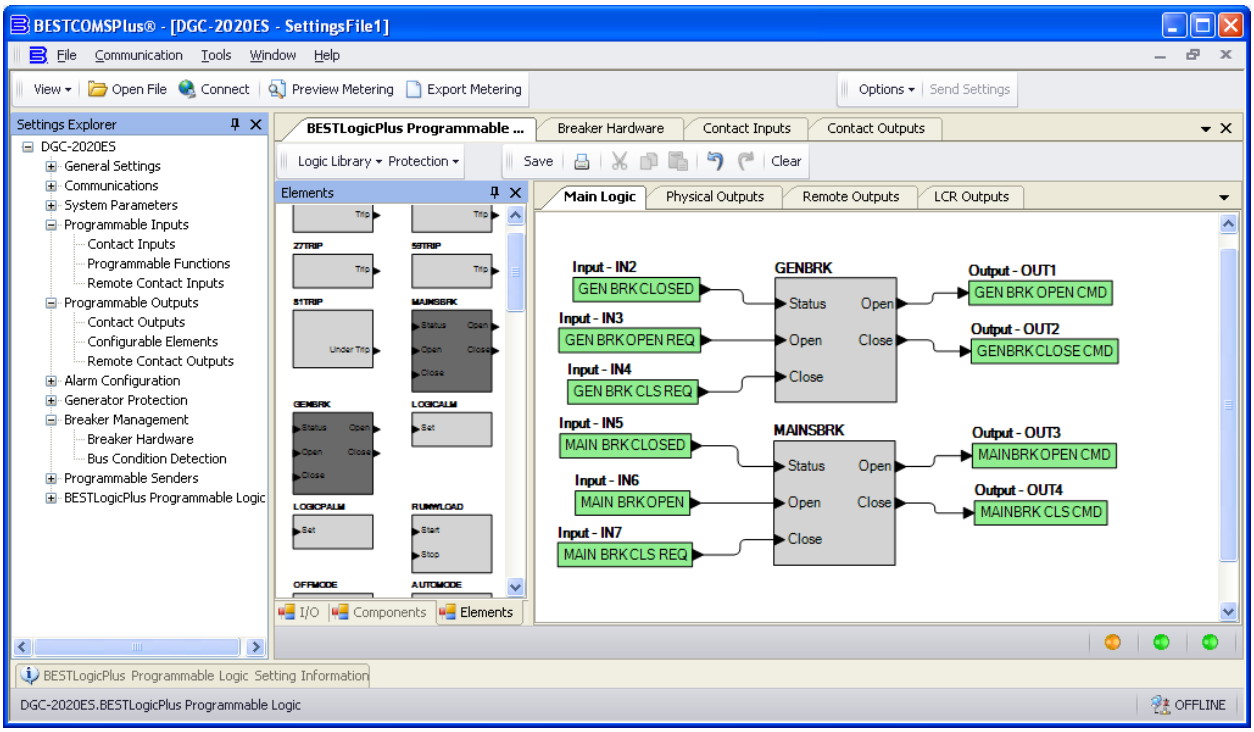


Figure 10-2. Settings Explorer, BESTlogic*Plus* Programmable Logic Screen

1. Generator Breaker
    a. Drag the Gen Breaker element into the logic diagram.
    b. Connect the breaker element open and close outputs to the contact outputs that will drive the breaker.
    c. Connect the physical input or remote input that has the breaker status (closed if breaker is closed, open when the breaker is open) to the *Status* input of the breaker element. This is the only way to indicate breaker status to the DGC-2020ES.
    d. If it is desired to have physical inputs that can request breaker open and close commands, connect the desired inputs to the open and close command inputs of the breaker element. These inputs should be pulsed. If both inputs close at the same time, the breaker will not change state. If it is not desired to have inputs for breaker commands, connect a “Logic 0” input object to the open and close command inputs of the breaker block.
2. Mains Breaker (if configured)
    a. Drag the Mains Breaker element into the logic diagram.
    b. Connect the breaker element open and close outputs to the contact outputs that will drive the breaker.
    c. Connect the physical input or remote input that has the breaker status (closed if breaker is closed, open if the breaker is open) to the *Status* input of the breaker element. This is the only way to indicate breaker status to the DGC-2020ES.
    d. If it is desired to have physical inputs that can request breaker open and close commands, connect the desired inputs to the open and close command inputs of the breaker element. These inputs should be pulsed. If both inputs close at the same time, the breaker will not change state. If it is not desired to have inputs for breaker commands, connect a “Logic 0” input object to the open and close command inputs of the breaker block.
3. Click the *Save* button when the logic setup is complete.
4. From the Communication pull-down menu, select *Upload Logic to Device* to load the logic into the DGC-2020ES if connected, or save the settings file if working off line.

Bus Condition Detection

(These thresholds determine when the generator and bus are considered to be stable or dead.)

Set the parameters for detecting stable and failed bus and generator under the BESTCOMS*Plus Settings Explorer, Breaker Management, Bus Condition Detection*. If using the front panel, navigate to Settings > Breaker Management > Bus Condition Detection.

Figure 10-3 illustrates the BESTCOMS*Plus Bus Condition Detection* screen.

1. Generator Sensing
    a. Dead Bus Voltage Threshold and Activation Delay. When the generator voltage is below this threshold for the duration of the activation delay, the generator is deemed “Dead”.
    b. Gen Stable Overvoltage and Undervoltage thresholds and Overfrequency and Underfrequency thresholds and the Bus Stable and Bus Failed Activation Delay times. When the generator voltage frequency is within the specified range for the duration of the Bus Stable Activation Delay, the generator is deemed “Stable”. Otherwise, it is deemed “Failed”.
2. Bus Sensing
    a. Dead Bus Voltage Threshold and Activation Delay. When the voltage of the bus is below this threshold for the duration of the activation delay, the bus is deemed “Dead”.
    b. Bus Stable Overvoltage and Undervoltage thresholds and Overfrequency and Underfrequency thresholds and the Bus Stable and Bus Failed Activation Delay times. When the bus voltage and frequencies are within the specified ranges for the duration of the Bus Stable Activation Delay, the bus is deemed “Stable”. Otherwise, it is deemed “Failed”.

Caution

The bus condition parameters are critical because they determine when a breaker can be closed. The generator breaker can be closed when any one of the following is true:

- The generator is stable, the bus is dead, and both breakers are open.
- The generator is dead, the bus is dead, and both breakers are open.

The mains breaker can be closed only when the bus is stable and both breakers are open.

Place the unit in AUTO. The unit is now configured for generator breaker control. It can be tested by driving the RUN WITH LOAD logic element true, setting up the exercise timer for a loaded test, or by starting the unit in RUN or AUTO mode and giving it CLOSE and OPEN commands from the physical inputs if they are available for breaker control.

Refer to the *Troubleshooting* chapter if the breaker does not seem to operate properly.

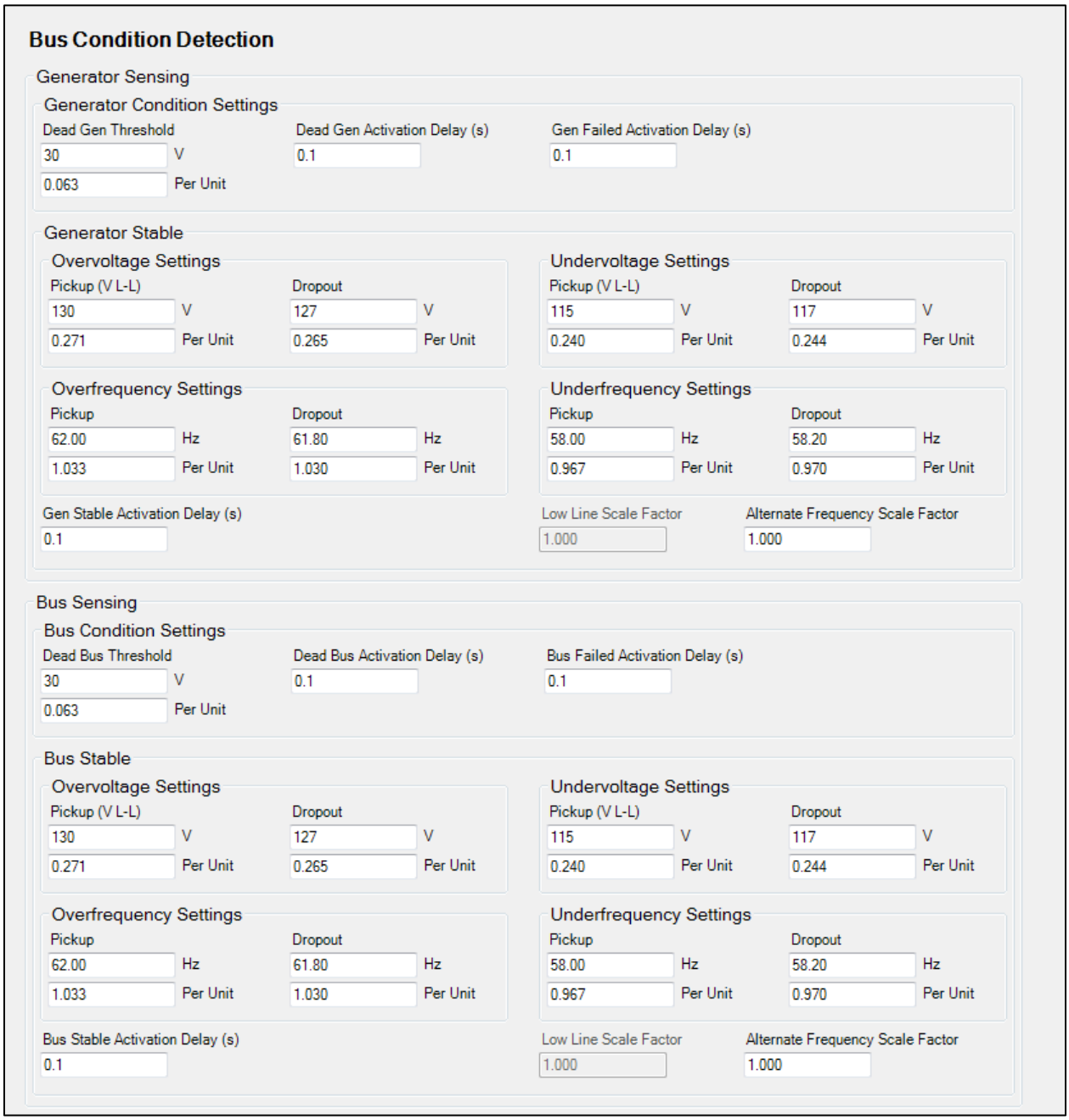


Figure 10-3. Settings Explorer, Breaker Management, Bus Condition Detection

11 • Alarm Configuration

Configuration of DGC-2020ES alarms, pre-alarms, sender failure alarms, and the audible horn is described in the following paragraphs.

Alarms

To configure alarms using BESTCOMS*Plus*, open the *Alarm* screen (Figure 11-1). This screen is found in the *Settings Explorer* under the *Alarm Configuration* category. If using the front panel, navigate to Settings > Alarm Configuration > Alarms.

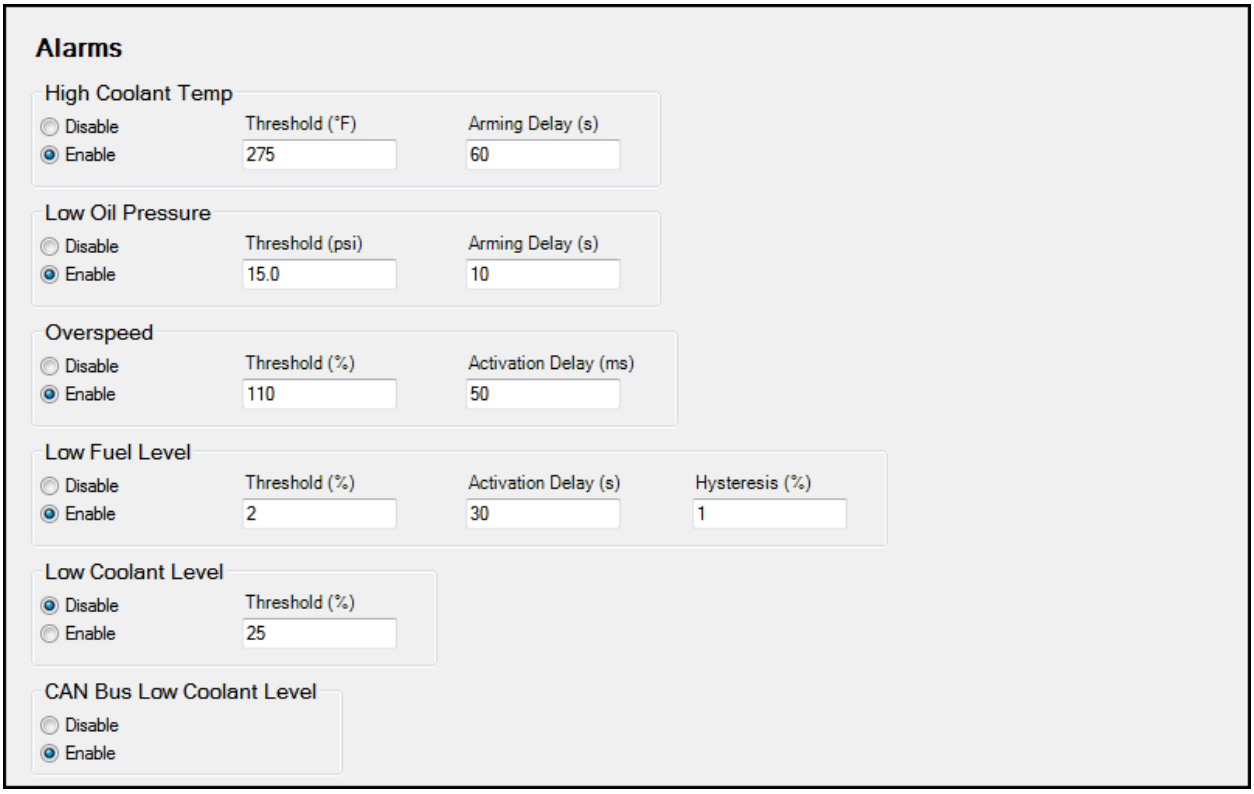


Figure 11-1. Settings Explorer, Alarm Configuration, Alarms Screen

The alarm settings are described below.

High Coolant Temp

High coolant temperature alarm settings consist of an enable/disable setting, a threshold setting, and an arming delay. If enabled, a high coolant temperature alarm is triggered after a four second delay when the engine coolant temperature exceeds the threshold setting. The arming delay disables the high coolant temperature alarm function for a user-adjustable period after engine startup. System units are configured on the System Settings screen.

Low Oil Pressure

Low oil pressure alarm settings consist of an enable/disable setting, a threshold setting, and an arming delay. If enabled, a low oil pressure alarm is triggered after a two second delay when the engine oil pressure decreases below the threshold setting. The arming delay disables the low oil pressure alarm function for a user-adjustable period after engine startup. System units and metric pressure units are configured on the System Settings screen.

Overspeed

Overspeed alarm settings include an enable/disable setting, a threshold setting, and an activation delay. If enabled, an overspeed alarm occurs when the engine speed (in rpm) exceeds the threshold setting for the duration of the activation time delay.

Low Fuel Level

Low fuel level alarm settings consist of an enable/disable setting, a threshold setting, an activation delay setting, and a hysteresis setting. If enabled, a low fuel level alarm is triggered when the metered fuel level drops below the threshold setting for the duration of the activation time delay. The hysteresis setting functions as an alarm dropout by preventing rapid switching of the alarm annunciation. Once the Low Fuel Level alarm has activated, it will not turn off until the fuel is increased to a level equal to the threshold plus the hysteresis setting.

Low Coolant Level

Low coolant level alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a low coolant level alarm is triggered when the metered coolant level drops below the threshold setting. ECU Support must be enabled on the *Communications, CAN Bus, CAN Bus Setup* screen before this alarm can be configured.

CAN Bus Low Coolant Level

When enabled, any Low Coolant Level indication received over the J1939 CAN Bus it treated as an alarm. When disabled, Low Coolant Level indications received over the J1939 CAN Bus are treated as pre-alarms.

Pre-alarms

To configure pre-alarms using BESTCOMS*Plus*, open the *Pre-Alarms* screen (Figure 11-2). This screen is found in the *Settings Explorer* under the *Alarm Configuration* category. If using the front panel, navigate to Settings > Alarm Configuration > Pre-alarms.

The pre-alarm settings are described below.

High Fuel Level

High fuel level pre-alarm settings consist of an enable/disable setting, a threshold setting, an activation delay setting, and a hysteresis setting. If enabled, a high fuel level pre-alarm is triggered when the metered fuel level increases above the threshold setting for the duration of the activation delay. The hysteresis setting functions as a pre-alarm dropout by preventing rapid switching of the alarm annunciation. Once the High Fuel Level pre-alarm has activated, it will not turn off until the fuel is decreased to a level equal to the threshold minus the hysteresis setting.

Low Fuel Level

Low fuel level pre-alarm settings consist of an enable/disable setting, a threshold setting, and a hysteresis setting. If enabled, a low fuel level pre-alarm is triggered when the metered fuel level decreases below the threshold setting. The hysteresis setting functions as a pre-alarm dropout by preventing rapid switching of the alarm annunciation. Once the Low Fuel Level pre-alarm has activated, it will not turn off until the fuel is increased to a level equal to the threshold plus the hysteresis setting.

Low Battery Voltage

Low battery voltage pre-alarm settings consist of an enable/disable setting, a threshold setting, and an activation delay. If enabled, a low battery voltage pre-alarm is triggered when the battery voltage decreases below the threshold setting for the duration of the activation time delay. The threshold can be entered in actual volts or a per-unit value. The per-unit threshold value is based on the nominal battery voltage setting found on the *System Parameters, Rated Data* screen.

High Coolant Temp

High coolant temperature pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a high coolant temperature pre-alarm is annunciated when the engine coolant temperature exceeds the threshold setting for a fixed duration of four seconds. The arming delay disables the High Coolant Temp pre-alarm function for a user-adjustable time during engine startup. Delay duration is determined by the High Coolant Temp Alarm Arming Delay setting. System units are configured on the System Settings screen.

Weak Battery Voltage

Weak battery voltage pre-alarm settings consist of an enable/disable setting, a threshold setting, and an activation time delay. If enabled, a weak battery voltage pre-alarm latches during engine cranking when the battery voltage decreases below the threshold setting for the duration of the activation delay. The threshold can be entered in actual volts or a per-unit value. The per-unit threshold value is based on the nominal battery voltage setting found on the *System Parameters, Rated Data* screen.

Low Coolant Temp

Low coolant temperature pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a low coolant temperature pre-alarm occurs when the engine coolant temperature decreases below the threshold setting. System units are configured on the System Settings screen.

Battery Overvoltage

Battery overvoltage pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a battery overvoltage pre-alarm occurs when the battery voltage increases above the threshold setting. The threshold can be entered in actual volts or a per-unit value. The per-unit threshold value is based on the nominal battery voltage setting found on the *System Parameters, Rated Data* screen.

ECU Coms Fail

ECU communication failure pre-alarm settings consist of a single enable/disable setting. If enabled, this pre-alarm is triggered when the DGC-2020ES detects a problem in its J1939 CAN connection to the ECU.

Coolant Level

Low coolant level pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a low coolant level pre-alarm is triggered when the metered coolant level decreases below the threshold setting.

Maintenance Interval

Maintenance interval pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a maintenance interval pre-alarm is annunciated when the DGC-2020ES maintenance timer counts down to zero from the threshold time setting.

Active DTC

Active DTC (diagnostic trouble code) pre-alarm settings consist of a single enable/disable setting. If J1939 CAN and DTC support are both enabled, an “active DTC” pre-alarm can be enabled. This pre-alarm is triggered when a DTC is sent from the ECU to the DGC-2020ES.

Low Oil Pressure

Low oil pressure pre-alarm settings consist of an enable/disable setting and a threshold setting. If enabled, a low oil pressure pre-alarm is triggered after a two second delay when the engine oil pressure decreases below the threshold setting. The arming delay disables the low oil pressure pre-alarm function for a user-adjustable time during engine startup. Delay duration is determined by the Low Oil Pressure Alarm Arming Delay setting. System units and metric pressure units are configured on the *System Settings* screen.

CEM Comm Failure

CEM-2020 communication failure pre-alarm settings consist of a single enable/disable setting. If enabled, this pre-alarm is triggered when communication between the optional CEM-2020 and DGC-2020ES is lost.

Checksum Failure

When one of the internal checksum calculations, used for data integrity purposes, has failed, the checksum failure pre-alarm is triggered. This indicates that some of the user settings or firmware code has been corrupted.

After upgrading firmware through BESTCOMS*Plus*, the checksum failure pre-alarm may trigger. This pre-alarm is not indicative of an error in this case. It can be cleared by cycling power to the DGC-2020ES. If the pre-alarm reoccurs, then it is indicative of an error and corrective action should be taken. See *Resetting Alarms, Checksum Failure*, below, for more information.

Breaker Close Failure

If enabled, this pre-alarm is triggered when the DGC-2020ES has issued a "breaker close" output and has not received "breaker closed" feedback from the breaker within the allowed closing time. The Monitor setting determines whether this condition is monitored only during transitions or always.

Breaker Open Failure

If enabled, this pre-alarm is triggered when the DGC-2020ES has issued a "breaker open" output and has not received "breaker opened" feedback from the breaker within the allowed closing time. The Monitor setting determines whether this condition is monitored only during transitions or always.

Reverse Rotation

If enabled, this pre-alarm is triggered when the Generator or Bus rotation is opposite of the Phase Rotation setting defined on the Rated Data screen.

DEF Pre-Alarms Enable

The DEF Pre-Alarms Enable setting allows the user to disable any DEF related pre-alarms in the DGC-2020ES. There have been occurrences where some engines that do not have DEF-based exhaust treatment systems send information over the J1939 CAN Bus that causes the DGC-2020ES to annunciate DEF related pre-alarms. Since these pre-alarms are not applicable on this type of system, they can be disabled with this setting.

Engine kW Overload

By comparing the genset power output with the rated genset output, the level of engine loading can be determined. Three engine overload pre-alarms are available that monitor three-phase real power when three-phase sensing is active or single-phase real power if single-phase sensing is active. Settings for each pre-alarm consist of an enable/disable setting, three-phase threshold setting, three-phase hysteresis setting, single-phase threshold setting, single-phase hysteresis setting, and low-line scale factor setting. If enabled, an engine overload pre-alarm occurs when the metered power level exceeds the threshold setting. The threshold setting is expressed as a percentage of the genset kW rating on the BESTCOMS*Plus* Rated Data screen (DGC-2020ES, System Parameters, Rated Data). The hysteresis setting functions as a pre-alarm dropout by preventing rapid switching of the alarm annunciation. When the low-line override is active, the thresholds for three-phase and single-phase detection are multiplied by the low-line scale factor. The effect is that low-line threshold = three-phase or single-phase threshold setting x low-line scale factor.

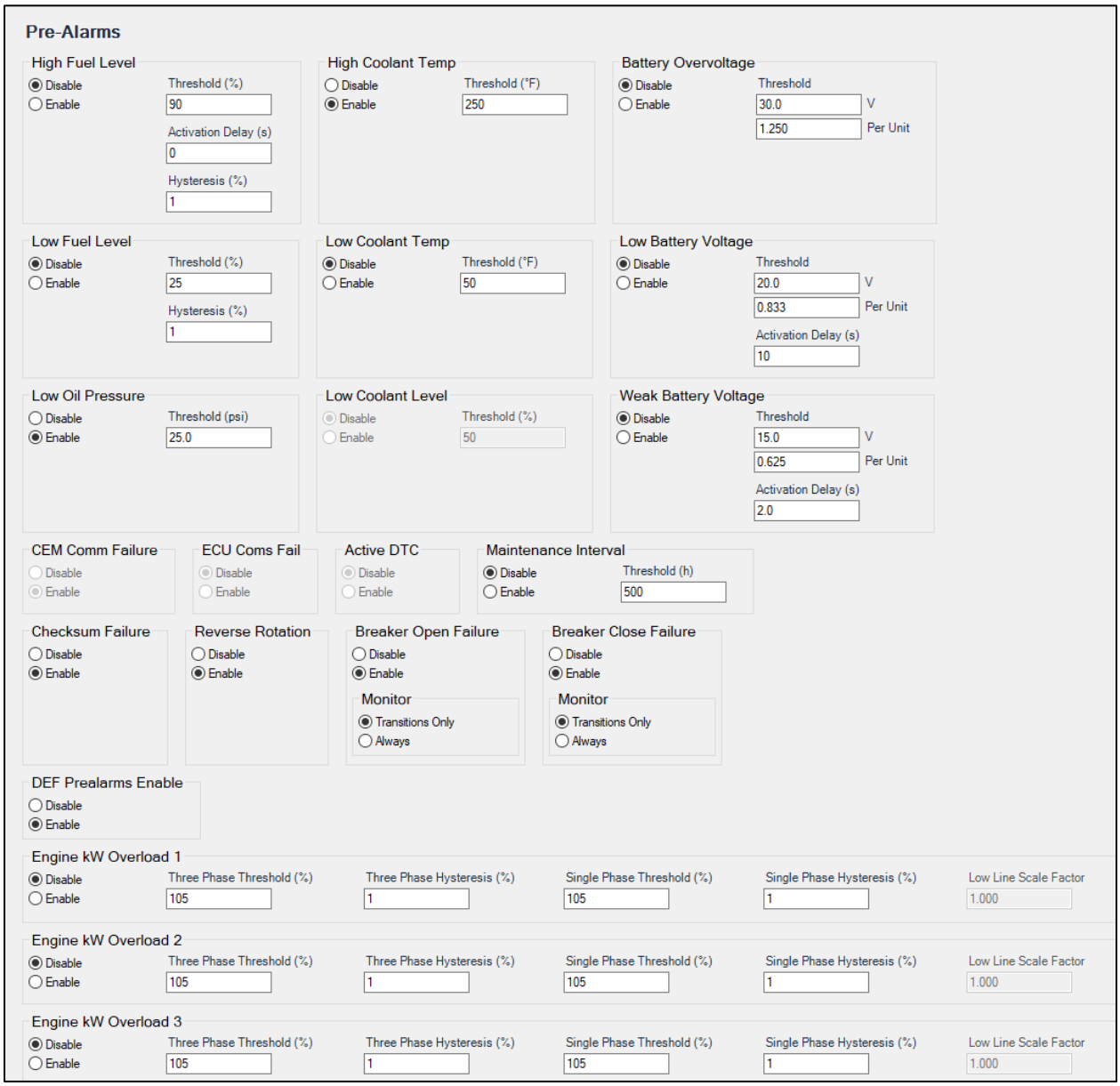


Figure 11-2. Settings Explorer, Alarm Configuration, Pre-Alarms Screen

Horn Configuration

To configure the audible horn using BESTCOMS*Plus*, open the *Horn Configuration* screen (Figure 11-3). This screen is found in the *Settings Explorer* under the *Alarm Configuration* category. If using the front panel, navigate to Settings > Alarm Configuration > Horn Configuration.

An output contact is configured through programmable logic to energize an audible horn when an alarm or pre-alarm condition exists. The horn settings consist of an enable/disable setting and a Not in Auto enable/disable setting. If enabled, the contact output is closed when an alarm condition exists. The contact output is toggled between open and closed when a pre-alarm condition exists. If the Not in Auto setting is enabled, the horn is disabled when the DGC-2020ES is not operating in Auto mode.

Figure 11-3. Settings Explorer, Alarm Configuration, Horn Configuration Screen

Sender Failure

To configure sender failure alarms using BESTCOMS*Plus*, open the *Sender Fail* screen (Figure 11-4). This screen is found in the *Settings Explorer* under the *Alarm Configuration* category. If using the front panel, navigate to Settings > Alarm Configuration > Sender Fail.

Coolant temperature, oil pressure, fuel level, and voltage sensing sender failure settings consist of an alarm configuration setting and an activation delay. The alarm configuration setting allows selection of the type of alarm to be annunciated when a sender fail condition exists. None, Alarm, and Pre-alarm can be selected. The selected alarm type is triggered when a sender failure exists for the duration of the activation time delay.

Speed sender failure settings consist of a single activation delay. An alarm is triggered when a speed sender failure exists for the duration of the activation time delay.

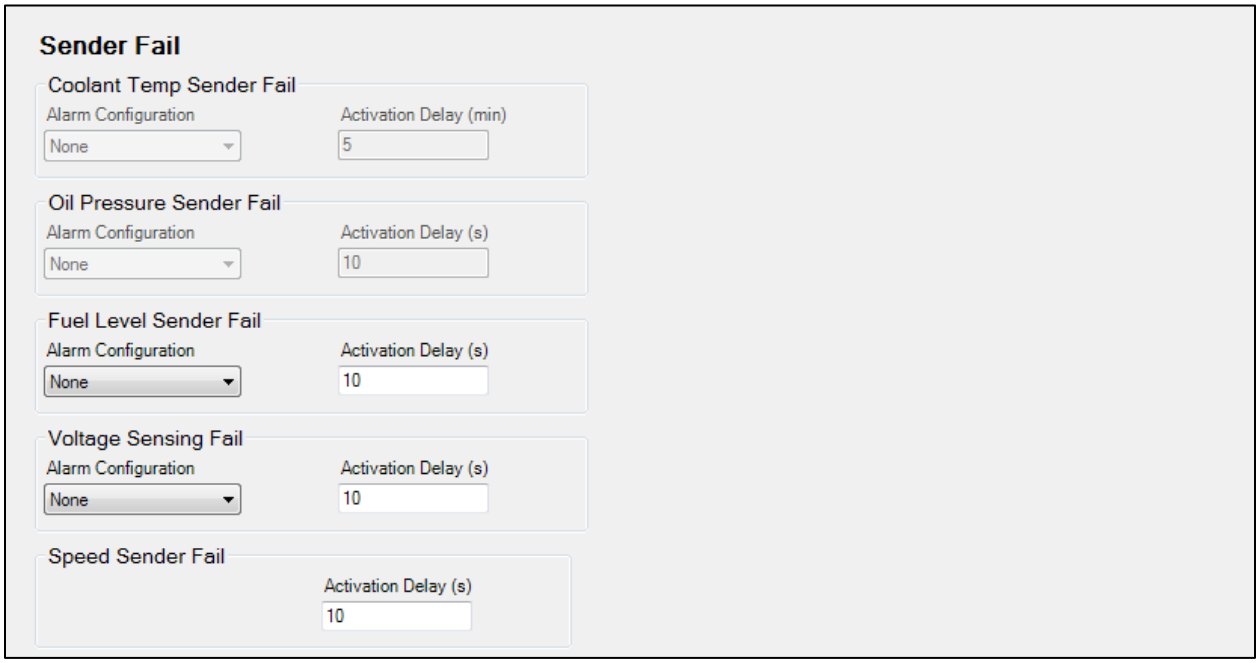


Figure 11-4. Settings Explorer, Alarm Configuration, Sender Fail Screen

12 • Generator Protection

DGC-2020ES controllers offer standard protection consisting of undervoltage (27), overvoltage (59), overcurrent (50), overfrequency (81O), underfrequency (81U), and phase-imbalance voltage (47) elements.

The description of generator protection is organized as follows:

- Voltage (27, 59, 47)
- Frequency (81)
- Overcurrent (50)

Voltage

Voltage protection consists of an undervoltage element, an overvoltage element, and a phase-sequence voltage element.

Undervoltage (27)

Two sets of undervoltage settings are provided for this element: one for three-phase generator connections and one for single-phase generator connections. The pickup setting entered is based on the PT secondary side. When a single-phase override contact input is received, the DGC-2020ES automatically switches from the three-phase undervoltage settings to the single-phase undervoltage settings.

An undervoltage condition is annunciated when the average of the three-phase (three-phase mode) or the line-to-line voltage (single-phase mode) decreases below the corresponding 27 pickup setting for the duration of the corresponding 27 activation delay. An undervoltage annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). An undervoltage annunciation can also be user-configured to close a programmable output.

The hysteresis setting functions as an undervoltage dropout by preventing rapid switching of the pickup output.

A frequency-based inhibit setting prevents a 27 trip from occurring during an undervoltage condition associated with system startup.

A low-line scale factor setting is used to automatically adjust the undervoltage pickup settings in applications that may utilize more than one type of genset connection. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate low-line override. This triggers scaling of the protection settings. The value of the scale factor setting serves as a multiplier for the pickup settings. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the pickup setting will be doubled (2.000 × PU).

The element is disabled when Alarm Configuration is set to “None”. Element status is available in BESTlogic™*Plus* Programmable Logic when “Status Only” is selected.

Settings which are related to machine ratings can be set in either actual units of voltage or in per unit values. When a native unit is edited, BESTCOMS*Plus*® automatically recalculates the per unit value based on the native unit setting and the rated data parameter (on the *System Parameters, Rated Data* screen) associated with it. When a per unit value is edited, BESTCOMS*Plus* automatically recalculates the native value based on the per unit setting and the rated data parameter associated with it.

Once all per unit values are assigned, if the rated data parameters are changed, BESTCOMS*Plus* automatically recalculates all native unit settings based on the modified rated data parameters.

The following settings have native units of *Secondary Volts*, and the rated data associated with them is *Rated Secondary Volts* (on the *System Parameters, Rated Data* screen).

- Undervoltage 27 Three-Phase Pickup
- Undervoltage 27 Single-Phase Pickup

The *Undervoltage* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Generator Protection, Voltage* category. If using the front panel, navigate to Settings > Generator Protection > 27 Undervoltage. The BESTCOMS*Plus* Undervoltage screen is illustrated in Figure 12-1.

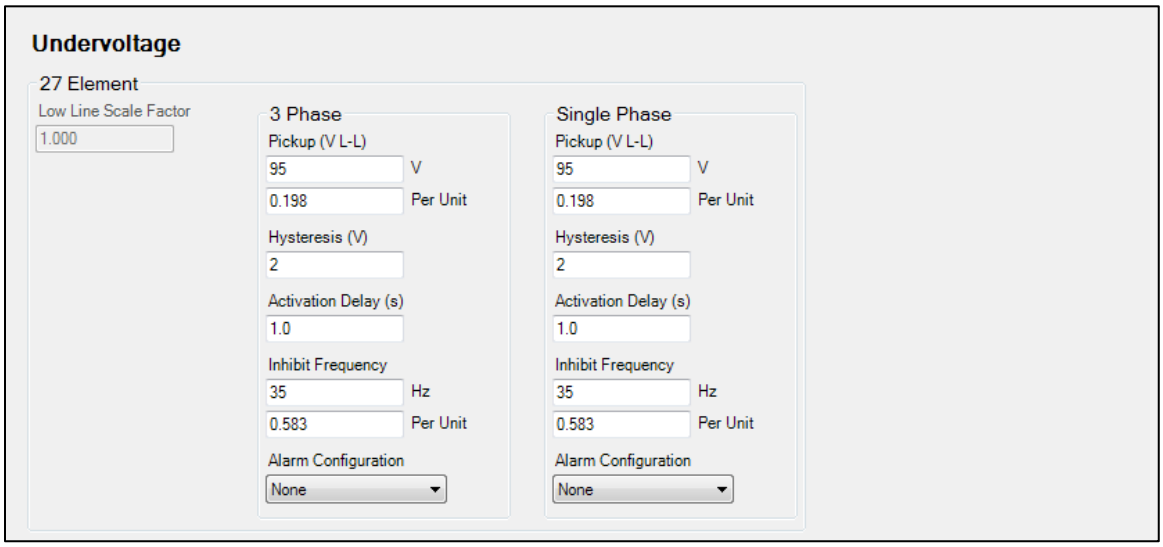


Figure 12-1. Settings Explorer, Generator Protection, Voltage, Undervoltage (27) Screen

Overvoltage (59)

Two sets of overvoltage settings are provided for this element: one for three-phase generator connections and one for single-phase generator connections. The pickup setting entered is based on the PT secondary side (DGC-2020ES). When a single-phase override contact input is received, the DGC-2020ES automatically switches from the three-phase overvoltage settings to the single-phase overvoltage settings.

An overvoltage condition is annunciated when the average of the three-phase (three-phase mode) or the line-to-line voltage (single-phase mode) increases above the corresponding 59 pickup setting for the duration of the corresponding 59 activation delay. An overvoltage annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). An overvoltage annunciation can also be user-configured to close a programmable output.

The hysteresis setting functions as an undervoltage dropout by preventing rapid switching of the pickup output.

A low-line scale factor setting is used to automatically adjust the overvoltage pickup settings in applications that may utilize more than one type of genset connection. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate low-line override. This triggers scaling of the protection settings. The value of the scale factor setting serves as a multiplier for the pickup settings. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the pickup setting will be doubled (2.000 × PU).

The element is disabled when Alarm Configuration is set to “None”. Element status is available in BESTlogic*Plus* Programmable Logic when “Status Only” is selected.

Settings which are related to machine ratings can be set in either actual units of voltage or in per unit values. When a native unit is edited, BESTCOMS*Plus* automatically recalculates the per unit value based on the native unit setting and the rated data parameter (on the *System Parameters, Rated Data* screen) associated with it. When a per unit value is edited, BESTCOMS*Plus* automatically recalculates the native value based on the per unit setting and the rated data parameter associated with it.

Once all per unit values are assigned, if the rated data parameters are changed, BESTCOMS*Plus* automatically recalculates all native unit settings based on the modified rated data parameters.

The following settings have native units of *Secondary Volts*, and the rated data associated with them is *Rated Secondary Volts* (on the *System Parameters, Rated Data* screen).

- Overvoltage 59 Three-Phase Pickup

- Overvoltage 59 Single-Phase Pickup

The *Overvoltage* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Generator Protection, Voltage* category. If using the front panel, navigate to Settings > Generator Protection > 59 Overvoltage. The BESTCOMS*Plus* Overvoltage screen is illustrated in Figure 12-2.

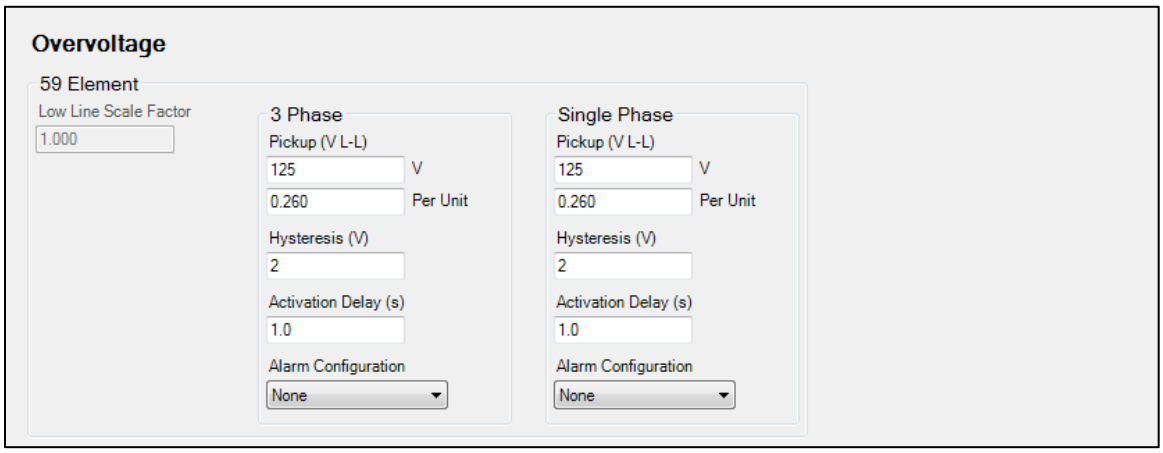


Figure 12-2. Settings Explorer, Generator Protection, Voltage, Overvoltage (59) Screen

Phase Imbalance (47)

DGC-2020ES controllers are capable of protecting against voltage imbalances between any of the three phases. The pickup setting entered is based on the PT secondary side. A phase imbalance condition is annunciated when the difference between any of the three phases of generator voltage increases above the 47 pickup setting for the duration of the 47 activation delay setting. A phase imbalance annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). A phase imbalance annunciation can also be user-configured to close a programmable output.

The hysteresis setting functions as a phase imbalance dropout by preventing rapid switching of the pickup output.

A low-line scale factor setting is used to automatically adjust the phase imbalance pickup setting in applications that may utilize more than one type of genset connection. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate the low-line override. This triggers scaling of the protection settings. The value of the scale factor setting serves as a multiplier for the pickup setting. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the pickup setting will be doubled (2.000 × PU).

The element is disabled when Alarm Configuration is set to “None”. Element status is available in BESTlogic*Plus* Programmable Logic when “Status Only” is selected.

Settings which are related to machine ratings can be set in either actual units of voltage or in per unit values. When a native unit is edited, BESTCOMS*Plus* automatically recalculates the per unit value based on the native unit setting and the rated data parameter (on the *System Parameters, Rated Data* screen) associated with it. When a per unit value is edited, BESTCOMS*Plus* automatically recalculates the native value based on the per unit setting and the rated data parameter associated with it.

Once all per unit values are assigned, if the rated data parameters are changed, BESTCOMS*Plus* automatically recalculates all native unit settings based on the modified rated data parameters.

The following setting has native units of *Secondary Volts*, and the rated data associated with it is *Rated Secondary Volts* (on the *System Parameters, Rated Data* screen).

- Phase Imbalance 47 Pickup

The *Phase Imbalance* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Generator Protection, Voltage* category. If using the front panel, navigate to Settings > Generator Protection > 47 Phase Imbalance. The BESTCOMS*Plus* Phase Imbalance screen is illustrated in Figure 12-3.

Figure 12-3. Settings Explorer, Generator Protection, Voltage, Phase Imbalance (47) Screen

Frequency

Two sets of frequency protection settings are provided: one for underfrequency (81U) and one for overfrequency (81O).

Underfrequency (81U)

An underfrequency condition is annunciated when the generator frequency decreases below the 81U pickup setting for the duration of the 81U activation delay setting. An underfrequency annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). An underfrequency annunciation can also be user-configured to close a programmable output.

A voltage-based inhibit setting prevents an 81U trip from occurring during an underfrequency condition associated with system startup.

The hysteresis setting functions as an underfrequency dropout by preventing rapid switching of the pickup output.

Overfrequency (81O)

When the generator frequency increases above the 81O pickup setting for the duration of the 81O activation delay setting, an overfrequency condition is annunciated. An overfrequency annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). An overfrequency condition can also be user configured to close a programmable output.

The hysteresis setting functions as an overfrequency dropout by preventing rapid switching of the pickup output.

The element is disabled when Alarm Configuration is set to “None”. Element status is available in BESTlogic*Plus* Programmable Logic when “Status Only” is selected.

Alternate Frequency Scale Factor

An alternate frequency scale factor setting is used for automatic adjustment of the frequency pickup settings in applications that may utilize more than one operating frequency. For example, a machine that is configurable between 50 or 60 Hz operation. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input that is connected to the Alternate Frequency Override logic element in BESTlogic*Plus* Programmable Logic. When the Alternate Frequency Override is true, the scale factor setting serves as a multiplier for the pickup settings. For example, if an alternate frequency scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the pickup setting is doubled (2.000 x PU).

Per Unit

Settings which are related to machine ratings can be set in either actual units of hertz or in per unit values. Per unit settings are available for Pickup (81O/81U) and Inhibit Volts (81U). When a native unit is edited, BESTCOMS*Plus* automatically recalculates the per unit value based on the native unit setting and the rated data parameter (on the *System Parameters, Rated Data* screen) associated with it. When a per unit value is edited, BESTCOMS*Plus* automatically recalculates the native value based on the per unit setting and the rated data parameter associated with it.

Once all per unit values are assigned, if the rated data parameters are changed, BESTCOMS*Plus* automatically recalculates all native unit settings based on the modified rated data parameters.

The following settings have native units of *Frequency in Hz*, and the rated data associated with them is *Rated Frequency* (on the *System Parameters, Rated Data* screen).

- 81 U Pickup
- 81 O Pickup

The following setting has native units of *Secondary Volts*, and the rated data associated with it is *Rated Secondary Volts* (on the *System Parameters, Rated Data* screen).

- 81 U Inhibit Voltage

The *Frequency* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Generator Protection, Frequency* category. If using the front panel, navigate to Settings > Generator Protection > 81 O/U Frequency. The BESTCOMS*Plus* Frequency screen is illustrated in Figure 12-4.

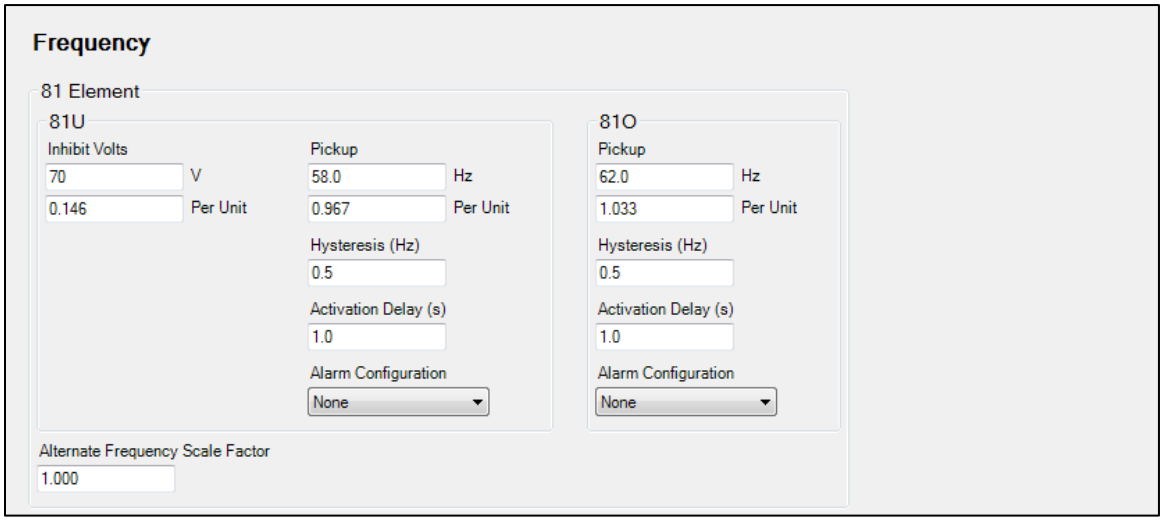


Figure 12-4. Settings Explorer, Generator Protection, Frequency, Frequency (81) Screen

Overcurrent

Two sets of overcurrent settings are provided for this element: one for three-phase generator connections and one for single-phase generator connections. The pickup setting entered is based on the CT secondary side. When a single-phase override contact input is received by the DGC-2020ES, the overcurrent protection settings automatically switch from the three-phase settings to the single-phase overcurrent protection settings.

When any of the phase currents increase above the pickup setting for the duration of the overcurrent time delay, an overcurrent condition is annunciated. An overcurrent annunciation can be user-selected to trigger a pre-alarm (warning) or alarm (shutdown). An overcurrent annunciation can also be user-configured to close a programmable output.

A low-line scale factor setting is used for automatic adjustment of the overcurrent pickup settings in applications that may utilize more than one type of genset connection. The scale factor setting is implemented when the DGC-2020ES senses a contact closure at a contact input programmed to activate low-line override. This triggers scaling of the protection settings. The value of the scale factor setting

serves as a multiplier for the pickup settings. For example, if a scale factor contact input is received by the DGC-2020ES and the scale factor setting is 2.000, the pickup setting will be doubled (2.000 × PU).

The element is disabled when Alarm Configuration is set to “None”. Element status is available in BESTlogic*Plus* Programmable Logic when “Status Only” is selected.

Settings which are related to machine ratings can be set in either actual units of current or in per unit values. When a native unit is edited, BESTCOMS*Plus* automatically recalculates the per unit value based on the native unit setting and the rated data parameter (on the *System Parameters, Rated Data* screen) associated with it. When a per unit value is edited, BESTCOMS*Plus* automatically recalculates the native value based on the per unit setting and the rated data parameter associated with it.

Once all per unit values are assigned, if the rated data parameters are changed, BESTCOMS*Plus* automatically recalculates all native unit settings based on the modified rated data parameters.

The following settings have native units of *Secondary Amps*, and the rated data associated with them is *Rated Secondary Phase Amps* (on the *System Parameters, Rated Data* screen).

- Overcurrent 50 Three-Phase Pickup
- Overcurrent 50 Single-Phase Pickup

The *Overcurrent* screen is found in the BESTCOMS*Plus Settings Explorer* under the *Generator Protection, Current* category. If using the front panel, navigate to Settings > Generator Protection > 50 Overcurrent. The BESTCOMS*Plus* Overcurrent screen is illustrated in Figure 12-5.

Figure 12-5. Settings Explorer, Generator Protection, Current, Overcurrent

13 • 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. Each DGC-2020ES has multiple, self-contained logic blocks that have all of the inputs and outputs of its discrete component counterpart. Each independent logic block interacts with control inputs and hardware outputs based on logic variables defined in equation form with BESTlogic*Plus*. BESTlogic*Plus* equations entered and saved in the DGC-2020ES system's nonvolatile memory integrate (electronically wire) the selected or enabled protection and control blocks with control inputs and hardware outputs. A group of logic equations defining the logic of the DGC-2020ES is called a logic scheme.

One default active logic scheme is preloaded into the DGC-2020ES. This scheme is configured for a typical protection and control application and virtually eliminates the need for "start-from-scratch" programming. BESTCOMS*Plus*® can be used to open a logic scheme that was previously saved as a file and upload it to the DGC-2020ES. The default logic scheme can also be customized to suit your application. Detailed information about logic schemes is provided later in this section.

BESTlogic*Plus* is not used to define the operating settings (modes, pickup thresholds, and time delays) of the individual protection and control functions. Operating settings and logic settings are interdependent but separately programmed functions. Changing logic settings is similar to rewiring a panel and is separate and distinct from making the operating settings that control the pickup thresholds and time delays of a DGC-2020ES. Detailed information about operating settings is provided in the *BESTCOMSPlus* chapter.

Caution

This product contains one or more *nonvolatile memory* devices. Nonvolatile memory is used to store information (such as settings) that needs to be preserved when the product is power-cycled or otherwise restarted. Established nonvolatile memory technologies have a physical limit on the number of times they can be erased and written. In this product, the limit is 100,000 erase/write cycles. During product application, consideration should be given to communications, logic, and other factors that may cause frequent/repeated writes of settings or other information that is retained by the product. Applications that result in such frequent/repeated writes may reduce the useable product life and result in loss of information and/or product inoperability.

Overview of BESTlogic™Plus

Use BESTCOMS*Plus* to change BESTlogic*Plus* settings. Use the Settings Explorer to open the *BESTlogicPlus Programmable Logic* tree branch as shown in Figure 13-1.

The *BESTlogicPlus Programmable Logic* screen contains a logic library for opening and saving logic files, tools for creating and editing logic documents, and protection settings.

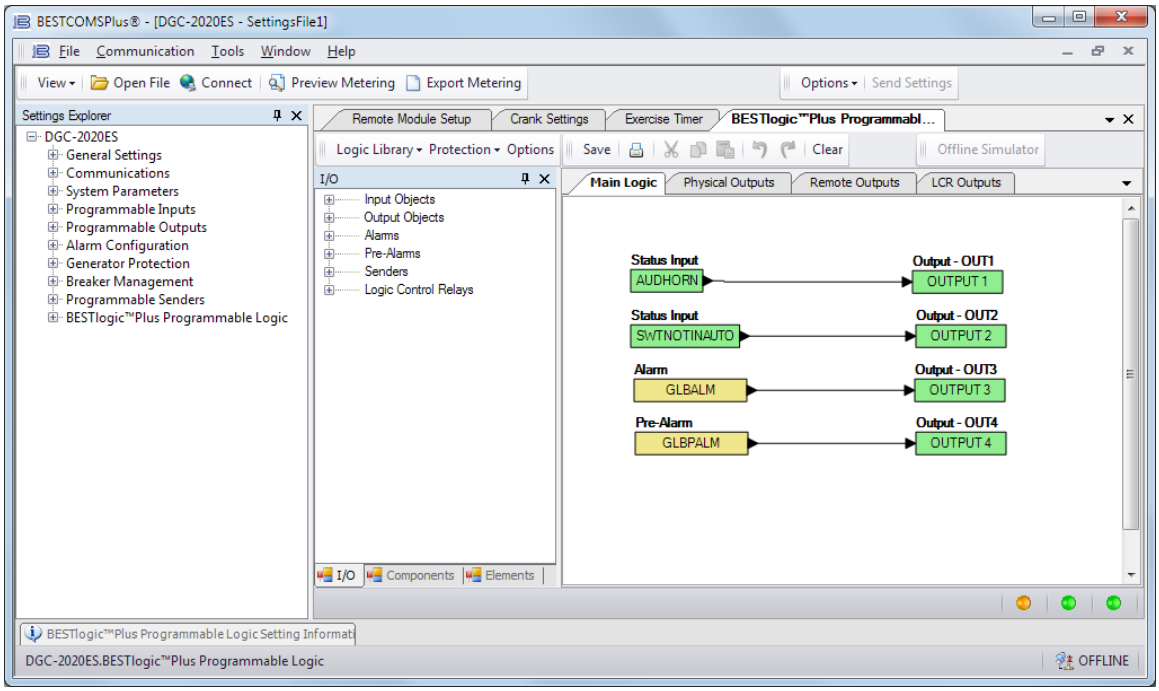


Figure 13-1. Settings Explorer, BESTlogic*Plus* Programmable Logic Screen

BESTlogic™Plus Composition

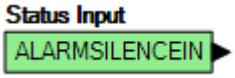
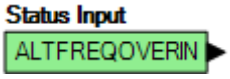
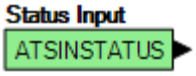
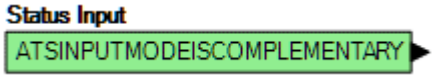
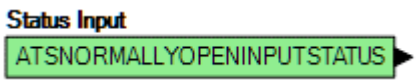
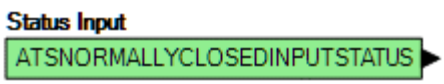
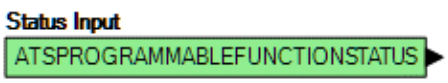
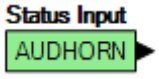
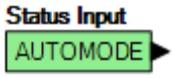
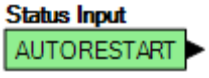
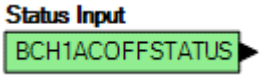
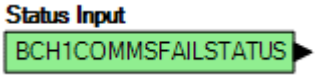
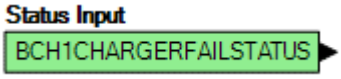
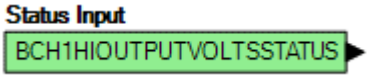
There are three main groups of objects used for programming BESTlogic*Plus*. These groups are *I/O, Components,* and *Elements.* For details on how these objects are used to program BESTlogic*Plus*, see the paragraphs on *Programming BESTlogicPlus,* later in this chapter.

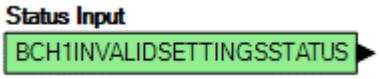
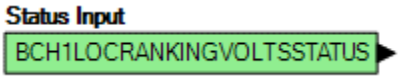
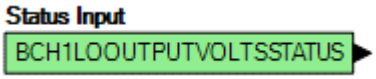
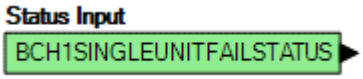
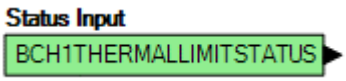
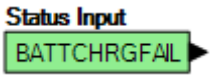
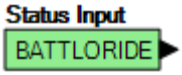
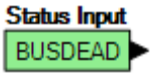
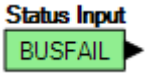
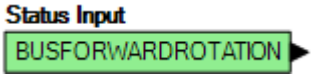
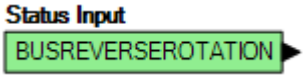
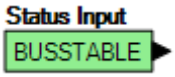
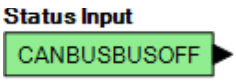
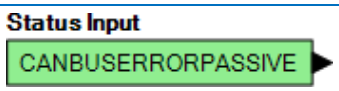
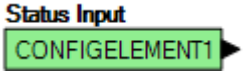
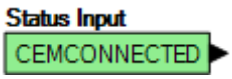
I/O

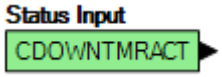
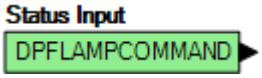
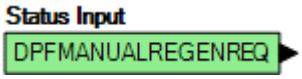
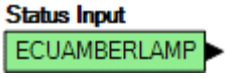
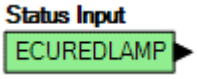
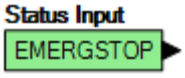
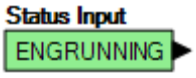
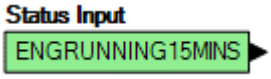
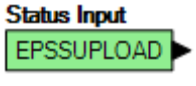
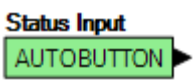
This group contains Input Objects, Output Objects, Alarms, Pre-Alarms, Senders, and Logic Control Relays. Table 13-1 lists the names and descriptions of the objects in the *I/O* group.

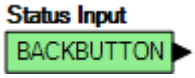
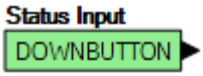
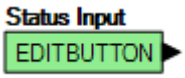
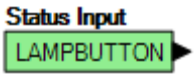
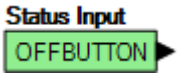
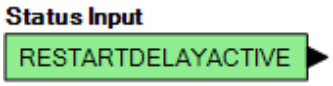
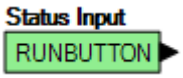
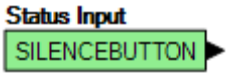
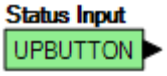
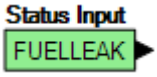
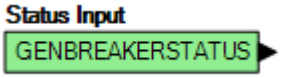
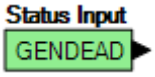
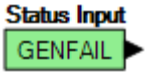
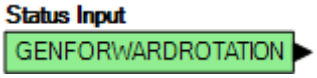
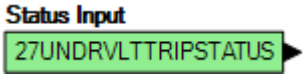
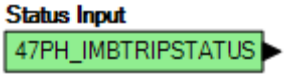
Table 13-1. I/O Group, Names and Descriptions

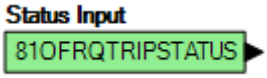
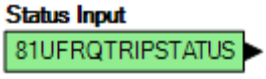
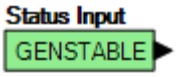
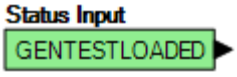
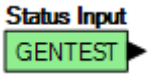
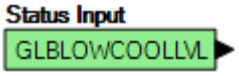
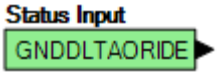
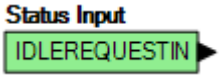
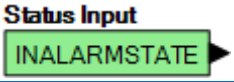
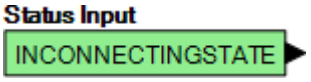
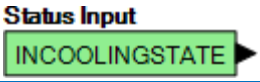
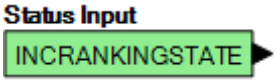
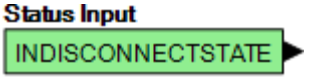
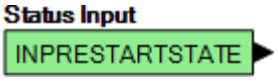
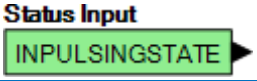
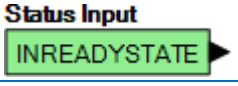
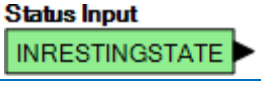
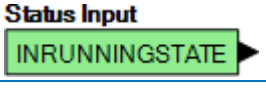
Name	Description	Symbol
Input Objects		
Logic 0	Always false (Low).	Fixed 0
Logic 1	Always true (High).	Fixed 1
Physical Inputs IN1 – IN7	True when Physical Input x is active.	Input - IN1 INPUT 1
Remote Inputs IN8 – IN17	True when Remote Input x is active. (Available when an optional CEM-2020 is connected.)	Input - IN8 INPUT 8
Virtual Inputs VIN1 – VIN4	True when Virtual Input x is active.	Input - VIN1 VIN1
Status Input Active DTC's Present	True when Diagnostic Trouble Codes are present.	Status Input ACTIVEDTCSPRESENT

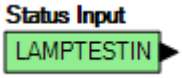
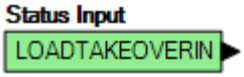
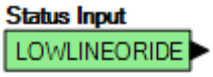
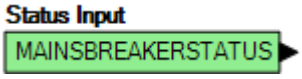
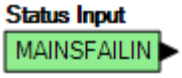
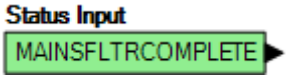
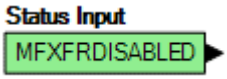
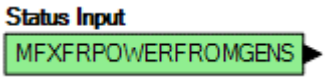
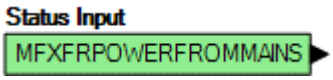
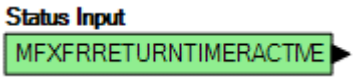
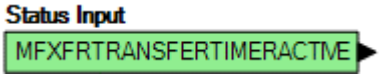
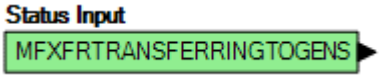
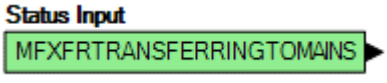
Name	Description	Symbol
Status Input Alarm Silence	True when the Alarm Silence logic element is true or the Alarm Silence button is pressed on the front panel.	
Status Input Alternate Frequency Override	True when the Alternate Frequency Override logic element is true.	
Status Input ATS Input	True when the ATS (Auto Transfer Switch) input is true or the ATS logic element is true.	
Status Input ATS Input Mode is Complementary	True when the Auto Transfer Switch Programmable Function Input Mode is set for Complementary. False when it is set for Single.	
Status Input ATS Normally Open Input	True when the input mapped to the ATS N.O. input is true.	
Status Input ATS Normally Closed Input	True when the input mapped to the ATS N.C. input is true.	
Status Input ATS Status	True when the ATS Programmable Function detects a true status. When the ATS Input Mode is set for Single, it is true when the input mapped to the ATS N.O. input is true. When the ATS Input Mode is set for Complementary, it is true when the input mapped to the ATS N.O. input is true and the input mapped to the ATS N.C. input is false.	
Status Input Audible Horn	True when the Audible Horn is active.	
Status Input Auto Mode	True when the DGC-2020ES is in Auto Mode or the Auto Mode logic element is true.	
Status Input Auto Restart	True when the Automatic Restart function is active.	
Status Input Battery Charger AC Off	True when the ac power to the battery charger is off. (Battery Charger 1 shown.)	
Status Input Battery Charger Battery Failure	True when the battery charger has detected that the battery has failed. (Battery Charger 1 shown.)	
Status Input Battery Charger Comms Fail	True when the battery charger has detected a J1939 communications failure. (Battery Charger 1 shown.)	
Status Input Battery Charger Fail	True when the battery charger has failed. (Battery Charger 1 shown.)	
Status Input Battery Charger High Output Volts	True when the battery charger output voltage is too high. (Battery Charger 1 shown.)	

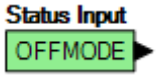
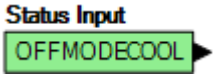
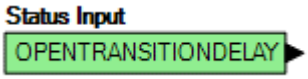
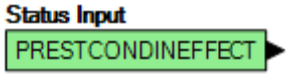
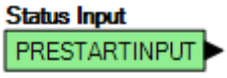
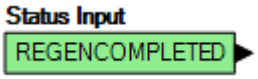
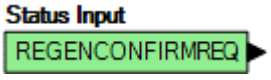
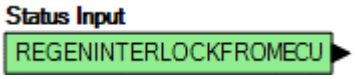
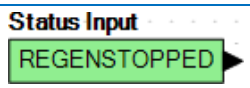
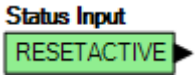
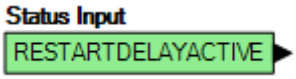
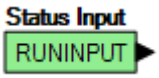
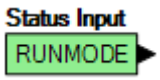
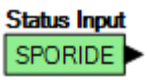
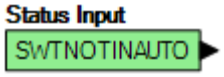
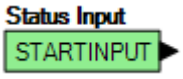
Name	Description	Symbol
Status Input Battery Charger Invalid Settings	True when the battery charger has detected settings that are not valid. (Battery Charger 1 shown.)	
Status Input Battery Charger Low Cranking Volts	True when the battery charger has detected that the voltage while the engine is cranking has dipped too low. (Battery Charger 1 shown.)	
Status Input Battery Charger Low Output Volts	True when the battery charger output voltage is too low. (Battery Charger 1 shown.)	
Status Input Battery Charger Single Unit Fail	True when the battery charger has detected one or more charging output stages in a charger with multiple charging output stages has failed. (Battery Charger 1 shown.)	
Status Input Battery Charger Thermal Limit	True when the battery charger temperature is beyond the thermal limit. (Battery Charger 1 shown.)	
Status Input Battery Charger Fail	True when the Battery Charger Fail input is true.	
Status Input Battle Override	True when the Battle Override input is true.	
Status Input Bus Dead	True when the Bus Dead condition settings have been exceeded.	
Status Input Bus Fail	True when the Bus Fail condition settings have been exceeded.	
Status Input Bus Forward Rotation	True when the bus rotation matches the Phase Rotation setting.	
Status Input Bus Reverse Rotation	True when the bus rotation is opposite of the Phase Rotation setting.	
Status Input Bus Stable	True when the Bus Stable condition settings have been exceeded.	
Status Input *CAN Bus - Bus Off*	True when the CAN Bus - bus is off.	
Status Input *CAN Bus Error Passive*	True when a passive error is annunciated by the CAN Bus.	
Status Input Configurable Elements 1-8	True when the Configurable Element x logic element is true.	
Status Input Contact Expansion Module	Contact Expansion Module Connected. True when an optional CEM-2020 is connected to the DGC-2020ES.	

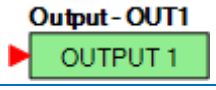
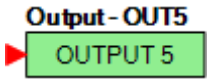
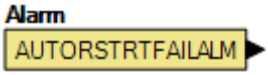
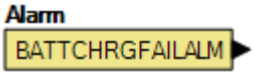
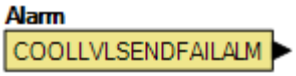
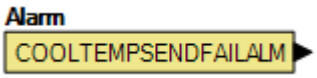
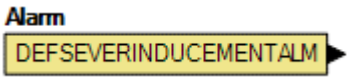
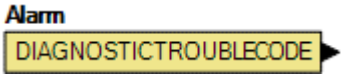
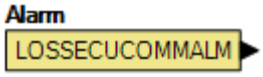
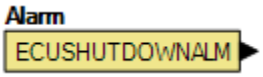
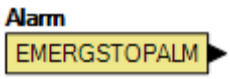
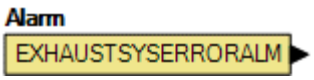
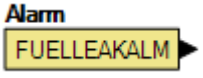
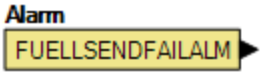
Name	Description	Symbol
Status Input Cool Down Timer Active	True when the Cool Down Timer is timing out. The Cool Down Timer is true under two circumstances: 1. The unit is in auto and ATS is removed, causing the DGC-2020ES to go into a cooldown state. 2. The engine is running (in RUN or AUTO mode with ATS applied) and the load has been removed (i.e. the EPSSUPLOAD status input is false due to small load). If the load is reapplied, the Cool Down Timer stops and resets, and it will restart when the load is removed the next time.	
Status Input DPF Lamp Command	True when DPF lamp is lit. This status input mimics the state of the DPF lamp. It remains true when the DPF lamp is constantly lit and toggles true and false at a rate of 1 Hz when DPF lamp is blinking.	
Status Input DPF Manual Regen Request	True when a Diesel Particulate Filter (DPF) manual regen request has been initiated through the front panel, BESTCOMS*Plus*, or the Manual Regen Request logic element.	
Status Input DPF Regen Inhibit Request	True when the Diesel Particulate Filter (DPF) regeneration inhibit setting is turned on through the front panel, BESTCOMS*Plus*, or logic.	
Status Input ECU Amber Lamp	True when the engine ECU sends ECU Amber Lamp (Warning Lamp) status as part of J1939 Diagnostic Trouble Code (DTC) communications. It may be off, on, or flashing. If the installation requires annunciation of engine warning and fault lamps, this may be connected to an output in logic to drive an amber lamp.	
Status Input ECU Red Lamp	True when the engine ECU sends ECU Red Lamp (Fault Lamp) status as part of J1939 Diagnostic Trouble Code (DTC) communications. It may be off, on, or flashing. If the installation requires annunciation of engine warning and fault lamps, this may be connected to an output in logic to drive a red lamp.	
Status Input Emergency Stop	True when the Emergency Stop button has been pressed.	
Status Input Engine Running	True while the Engine is Running.	
Status Input Engine Running 15 Minutes	True when the engine is presently running and has been running 15 minutes or more since the most recent start.	
Status Input EPS Supplying Load	True while the EPS is supplying load.	
Status Input Front Panel Buttons	True while the *Auto* front panel button is pressed.	

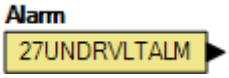
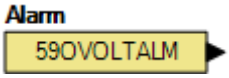
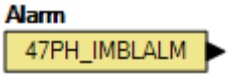
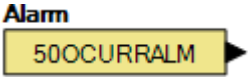
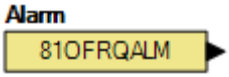
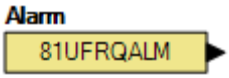
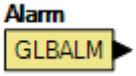
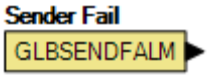
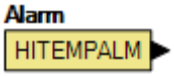
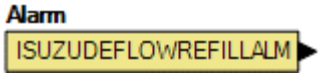
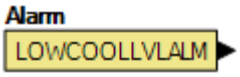
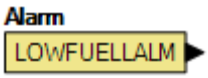
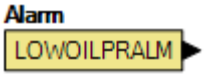
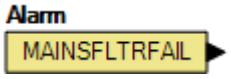
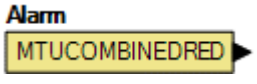
Name	Description	Symbol
Status Input Front Panel Buttons	True while the *Back* front panel button is pressed.	
Status Input Front Panel Buttons	True while the *Down* front panel button is pressed.	
Status Input Front Panel Buttons	True while the *Edit* front panel button is pressed.	
Status Input Front Panel Buttons	True while the *Up and Down* front panel buttons are simultaneously pressed.	
Status Input Front Panel Buttons	True while the *Off* front panel button is pressed.	
Status Input Restart Delay Active	True when the restart delay is currently active.	
Status Input Front Panel Buttons	True while the *Run* front panel button is pressed.	
Status Input Front Panel Buttons	True while the *Back and Edit* front panel buttons are simultaneously pressed.	
Status Input Front Panel Buttons	True while the *Up* front panel button is pressed.	
Status Input Fuel Leak	True when the Fuel Leak Detect input is true.	
Status Input Generator Breaker Status	True when the generator breaker is closed.	
Status Input Generator Dead	True when the Gen Dead condition settings have been exceeded.	
Status Input Generator Fail	True when the Gen Fail condition settings have been exceeded.	
Status Input Generator Forward Rotation	True when the generator rotation matches the Phase Rotation setting.	
Status Input Generator Protection	True when the 27 element is tripped.	
Status Input Generator Protection	True when the 59 element is tripped.	
Status Input Generator Protection	True when the 47 element is tripped.	
Status Input Generator Protection	True when the 50 element is tripped.	

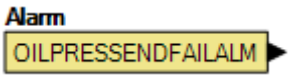
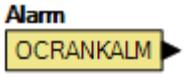
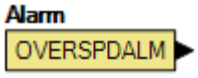
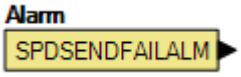
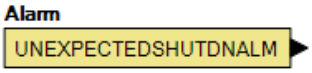
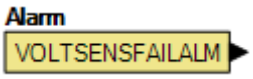
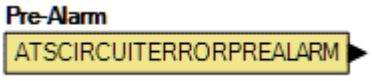
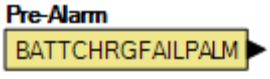
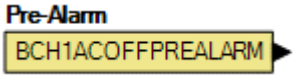
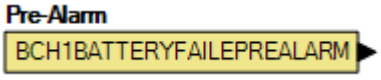
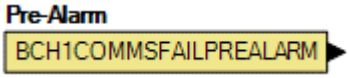
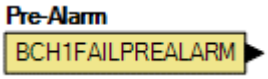
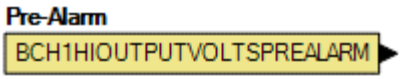
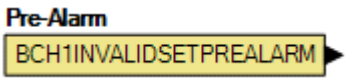
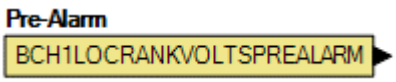
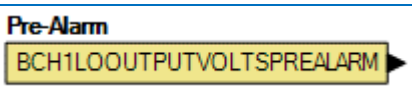
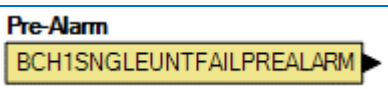
Name	Description	Symbol
Status Input Generator Protection	True when the 81 Over element is tripped.	
Status Input Generator Protection	True when the 81 Under element is tripped.	
Status Input Generator Reverse Rotation	True when the generator rotation is opposite of the Phase Rotation setting.	
Status Input Generator Stable	True when the Gen Stable condition settings have been exceeded.	
Status Input Generator Test Loaded	True when the Exercise Timer has started the generator and run with load is selected.	
Status Input Generator Test	True when the Exercise Timer has started the generator.	
Status Input Global Low Coolant Level	True when the Low Coolant Level input is true.	
Status Input Ground Delta Override	True when the Grounded Delta Override input is true.	
Status Input Idle Request	True when the Idle Request logic element is true.	
Status Input In Alarm State	True when the DGC-2020ES is in the alarm state.	
Status Input In Connecting State	True when the DGC-2020ES is in the connecting state.	
Status Input In Cooling State	True when the DGC-2020ES is in the cooling state.	
Status Input In Cranking State	True when the DGC-2020ES is in the cranking state.	
Status Input In Disconnect State	True when the DGC-2020ES is in the disconnect state.	
Status Input In Prestart State	True when the DGC-2020ES is in the pre-start state.	
Status Input In Pulsing State	True when the DGC-2020ES is in the pulsing state.	
Status Input In Ready State	True when the DGC-2020ES is in the ready state.	
Status Input In Resting State	True when the DGC-2020ES is in the resting state.	
Status Input In Running State	True when the DGC-2020ES is in the running state.	

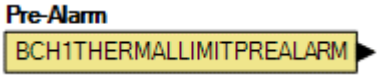
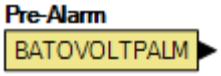
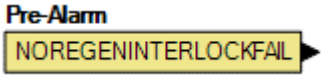
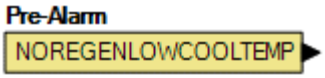
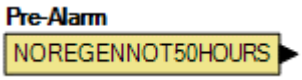
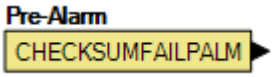
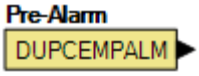
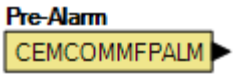
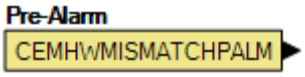
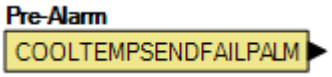
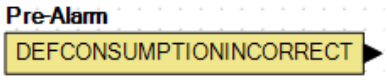
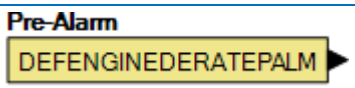
Name	Description	Symbol
Status Input Lamp Test	True when the Lamp Test logic element is true or the Lamp Test button is pressed on the front panel.	
Status Input Load Take Over	True when the Load Take Over logic element is true.	
Status Input Low Line Override	True when the Low Line Override input is true.	
Status Input Mains Breaker Status	True when the mains breaker is closed.	
Status Input Mains Fail Test	True when the Mains Fail Test logic element is true.	
Status Input Mains Fail Transfer Complete	True when the DGC-2020ES is configured for mains fail transfers and has successfully transferred to the generator from the utility. It remains true until the utility power is deemed good and the DGC-2020ES transfers the load back to utility power.	
Status Input Mains Fail Transfer Disabled	True when the Mains Fail Transfer Functionality is not enabled or when the DGC-2020ES is operating in the Off or Run modes or in the alarm state.	
Status Input Mains Fail Transfer Power from Gens	True when mains fail transfer function detects the load is powered from the generator bus.	
Status Input Mains Fail Transfer Power from Mains	True when mains fail transfer function detects the load is powered from the mains bus.	
Status Input Mains Fail Transfer Return Timer Active	True when mains fail transfer return delay timer is actively counting.	
Status Input Mains Fail Transfer Transfer Timer Active	True when the mains fail transfer delay timer is actively counting.	
Status Input Mains Fail Transfer Transferring to Gens	True when mains fail transfer is transferring load to the generator bus.	
Status Input Mains Fail Transfer Transferring to Mains	True when mains fail transfer is transferring load to the mains bus.	

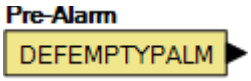
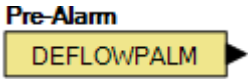
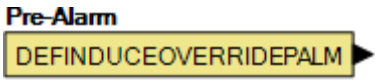
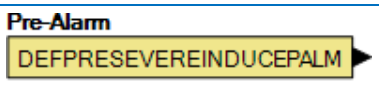
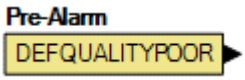
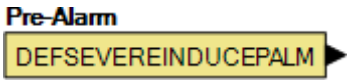
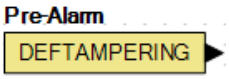
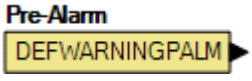
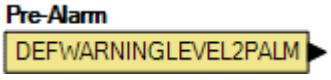
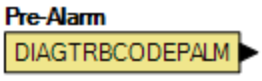
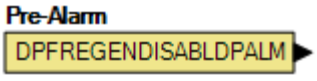
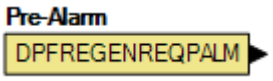
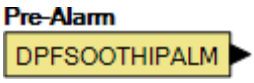
Name	Description	Symbol
Status Input Off Mode	True when the DGC-2020ES is in Off Mode or the Off Mode logic element is true.	
Status Input Off Mode Cooldown	True when the DGC-2020ES is in Off Mode and cooling down.	
Status Input Open Transition Delay	True when the open transition delay is actively counting.	
Status Input Pre Start Condition in Effect	True while in the Pre Start state.	
Status Input Pre Start Input	True when the DGC-2020ES is indicating that the Pre Start relay should be closed.	
Status Input Regen Completed	True for 30 seconds after a Yanmar ECU goes back into passive mode when the status of the DPF Active Regeneration Forced Status is “Regen Successful”.	
Status Input Regen Confirmation Requested	True after a manual exhaust regeneration has been requested on a Yanmar ECU. Once in this state, another regen request must be issued to confirm manual regeneration.	
Status Input Regen Interlock from ECU	True when John Deere proprietary parameters are broadcast over the J1939 CAN Bus.	
Status Input Regen Stopped	True for 30 seconds after a Yanmar ECU goes back into passive mode when the status of the DPF Active Regeneration Forced Status is “Regen Not Successful”.	
Status Input Reset Active	True when the Reset logic element is true or when the Reset key on the front panel is pressed.	
Status Input Restart Delay Active	True when the Restart Delay timer is timing out.	
Status Input Run Input	True when the DGC-2020ES is indicating that the Run relay should be closed.	
Status Input Run Mode	True when the DGC-2020ES is in Run Mode or the Run Mode logic element is true.	
Status Input Single Phase Connection Override	True when the Single Phase Override input is true.	
Status Input Switch not in Auto	True when the DGC-2020ES is not in Auto Mode.	
Status Input Start Input	True when the DGC-2020ES is indicating that the Start relay should be closed to start the engine.	
Output Objects		

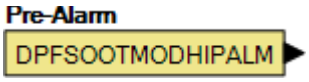
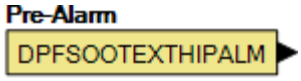
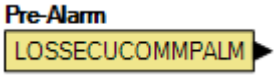
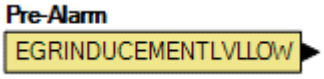
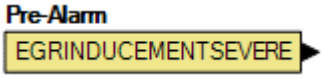
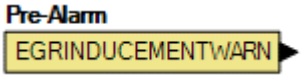
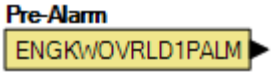
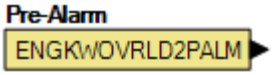
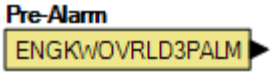
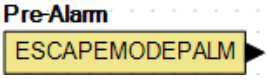
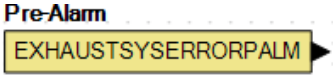
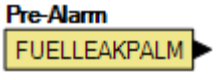
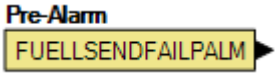
Name	Description	Symbol
Physical Outputs OUT1 – OUT4	Physical Outputs 1 through 4.	
Remote Outputs OUT5 – OUT28	Remote Outputs 5 through 28. (Available when an optional CEM-2020 is connected.)	
Alarms		
Auto Restart Fail	True after the Automatic Restart function fails to restart the generator.	
Battery Charger Fail	True when the Battery Charger Fail function is configured as an alarm and the activation delay has expired.	
Coolant Level Sender Fail	True when a low coolant level error status code is received from the ECU. CAN Bus must be enabled.	
Coolant Temp Sender Fail	True when the Coolant Temp Sender Fail is configured as an alarm and the activation delay has expired.	
DEF Severe Inducement	This alarm indicates the highest level of inducement not to operate the engine due to low or poor quality Diesel Exhaust Fluid (DEF), or a malfunction in the Exhaust After Treatment System (EATS). The engine may operate in a reduced power mode, or for a limited time, or may be prevented from starting by the ECU until the problem is corrected. A service tool may be required to restart the engine.	
Diagnostic Trouble Code	True when a Diagnostic Trouble Code alarm exists.	
ECU Comm Loss	True when communication to ECU has been lost.	
ECU Shutdown	True when ECU has shut down the engine.	
Emergency Stop	True when the Emergency Stop button has been pressed.	
Exhaust System Error	This alarm annunciates when the DEF Inducement Level is greater than or equal to 3, the Isuzu Exhaust System lamp is on, and the Isuzu No Power lamp is on. The Exhaust System Error alarm appears in conjunction with a DEF Severe Inducement alarm to indicate why the machine has entered the severe inducement state due to SCR system malfunction.	
Fuel Leak	True when the Fuel Leak Detect function is configured as an alarm and the activation delay has expired.	
Fuel Level Sender Fail	True when the Fuel Level Sender Fail is configured as an alarm and the activation delay has expired.	

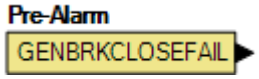
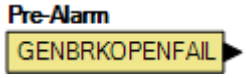
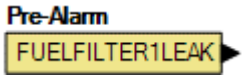
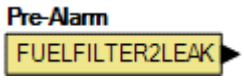
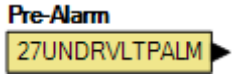
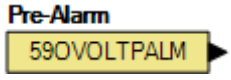
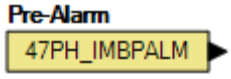
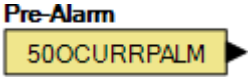
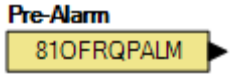
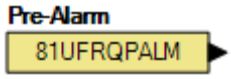
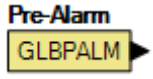
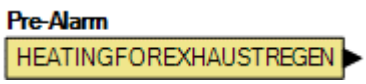
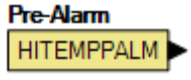
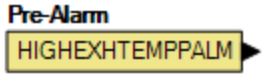
Name	Description	Symbol
Generator Protection 27	True when the 27 element is configured as an alarm and has tripped.	
Generator Protection 59	True when the 59 element is configured as an alarm and has tripped.	
Generator Protection 47	True when the 47 element is configured as an alarm and has tripped.	
Generator Protection 50	True when the 50 element is configured as an alarm and has tripped.	
Generator Protection 81 Over	True when the 81 Over element is configured as an alarm and has tripped.	
Generator Protection 81 Under	True when the 81 Under element is configured as an alarm and has tripped.	
Global Alarm	True when one or more alarms are set.	
Global Sender Fail	True when one or more of the Sender Fails are configured as alarms and are true.	
Hi Coolant Temp	True when the High Coolant Temp Alarm settings have been exceeded.	
Isuzu DEF Low Refill DEF	True when an Isuzu engine ECU has detected low DEF level and indicated the DEF symbol should be displayed, and the Isuzu No Power Lamp is active indicating that the engine has been shut down.	
Low Coolant Level	True when the Low Coolant Level function is configured as an alarm and the activation delay has expired. In addition, true when CAN Bus is enabled and the Low Coolant Level Alarm threshold has been exceeded.	
Low Fuel Level	True when the Low Fuel Level Alarm settings have been exceeded.	
Low Oil Pressure	True when the Low Oil Pressure Alarm settings have been exceeded.	
Mains Fail Transfer Failed	True when a mains fail transfer fail pre-alarm occurs. The pre-alarm occurs when the DGC-2020ES is configured for mains fail transfers, but has not transferred to the generator from the utility before the Mains Fail Max Transfer Time has expired. It remains true until the pre-alarm is cleared by pressing the *Reset* button on the front panel.	
mtu Combined Red	This is an indication from the *mtu* Engine ECU that a Red Alarm has occurred. If any Red Alarm occurs, a Combined Red Alarm occurs.	

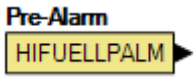
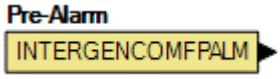
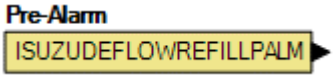
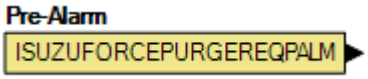
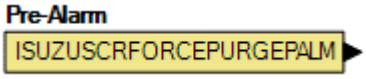
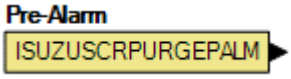
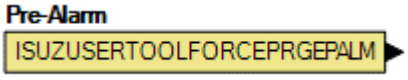
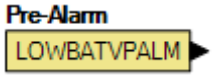
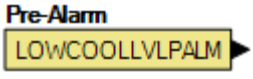
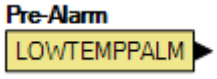
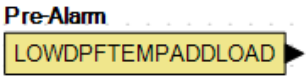
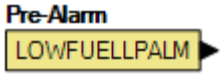
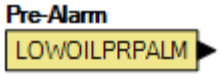
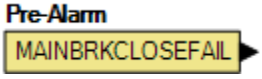
Name	Description	Symbol
Oil Pressure Sender Fail	True when the Oil Pressure Sender Fail is configured as an alarm and the activation delay has expired.	
Overcrank	True when an Overcrank condition exists.	
Overspeed	True when the Overspeed Alarm settings have been exceeded.	
Speed Sender Fail	True when the Speed Sender Fail activation delay has expired.	
Unexpected Shutdown Alarm	True when the metered engine speed (RPM) unexpectedly drops to 0 while the engine is running.	
Voltage Sensing Fail	True when the Voltage Sensing Fail is configured as an alarm and the activation delay has expired.	
Pre-Alarms		
ATS Circuit Error	True when the input mapped to the ATS N.O. input and the input mapped to the ATS N.C. input are not opposite for a time longer than the ATS Circuit Error Delay setting.	
Battery Charger Fail	True when the Battery Charger Fail function is configured as a pre-alarm and the activation delay has expired.	
Battery Charger AC Off	True when the ac power to the battery charger is off. (Battery Charger 1 shown.)	
Battery Charger Battery Failure	True when the battery charger has detected that the battery has failed. (Battery Charger 1 shown.)	
Battery Charger Comms Fail	True when the battery charger has detected a J1939 communications failure. (Battery Charger 1 shown.)	
Battery Charger Fail	True when the battery charger has failed. (Battery Charger 1 shown.)	
Battery Charger High Output Volts	True when the battery charger output voltage is too high. (Battery Charger 1 shown.)	
Battery Charger Invalid Settings	True when the battery charger has detected invalid settings. (Battery Charger 1 shown.)	
Battery Charger Low Cranking Volts	True when the battery charger has detected that the voltage while the engine is cranking has dipped too low. (Battery Charger 1 shown.)	
Battery Charger Low Output Volts	True when the battery charger output voltage is too low. (Battery Charger 1 shown.)	
Battery Charger Single Unit Fail	True when the battery charger has detected one or more charging output stages in a charger with multiple charging output stages has failed. (Battery Charger 1 shown.)	

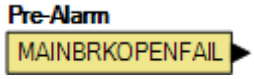
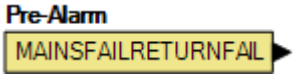
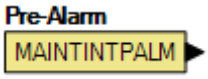
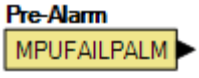
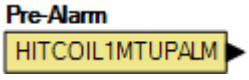
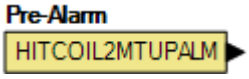
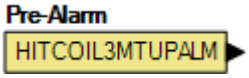
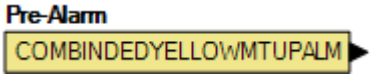
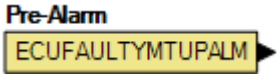
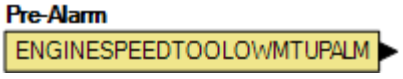
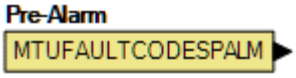
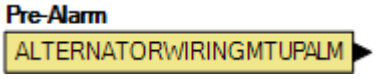
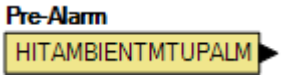
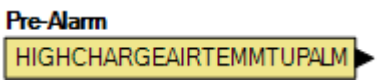
Name	Description	Symbol
Battery Charger Thermal Limit	True when the battery charger temperature is beyond the thermal limit. (Battery Charger 1 shown.)	
Battery Overvoltage	True when the Battery Overvoltage pre-alarm threshold has been exceeded.	
Cannot Regen - Interlock Fail	True when the regeneration interlock has failed on a Yanmar ECU. Manual regeneration is blocked.	
Cannot Regen - Low Coolant Temp	True when the coolant temp is low on a Yanmar ECU. Manual regeneration is blocked.	
Cannot Regen - Not 50 Hours Since Last Regen	True when 50 hours has not elapsed since last regeneration on a Yanmar ECU. Manual regeneration is blocked.	
Checksum Failure	True when some of the user settings or firmware code has been corrupted. Refer to the *Reporting and Alarms* chapter for more details.	
Contact Expansion Module Multiple Contact Expansion Modules Connected	True when more than one CEM-2020 is connected.	
Contact Expansion Module Contact Expansion Module Comm Fail	True when communication from the CEM-2020 to the DGC-2020ES has been lost.	
Contact Expansion Module Contact Expansion Modules Hardware Mismatch	True when the connected CEM-2020 does not have the same number of outputs as defined on the *System Parameters, Remote Module Setup* screen in BESTCOMS*Plus*.	
Coolant Temp Sender Fail	True when the Coolant Temp Sender Fail is configured as a pre-alarm and the activation delay has expired.	
DEF Consumption Incorrect	True when the engine ECU reports via CAN bus that a DEF Consumption Error has occurred.	
DEF Inducement	This is the lowest level of inducement not to operate the engine when Diesel Exhaust Fluid (DEF) is low or of poor quality or there is a problem with the Exhaust After Treatment System (EATS). The engine is operating in a reduced power mode. Eventually the level of inducement will be increased unless the problem with the DEF or malfunction in the EATS is corrected.	

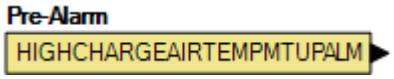
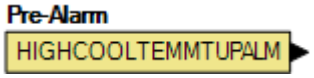
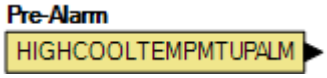
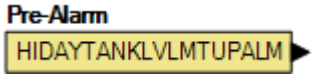
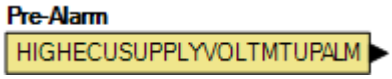
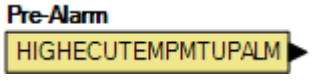
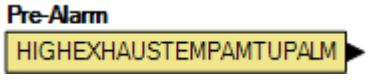
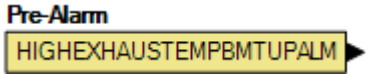
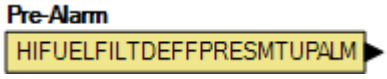
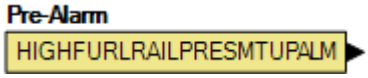
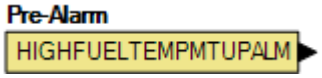
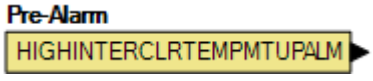
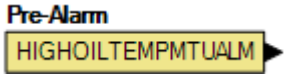
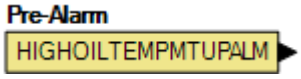
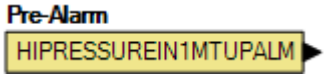
Name	Description	Symbol
DEF Low Severe	True when the engine ECU reports via CAN Bus that Diesel Exhaust Fluid (DEF) is at a level below 8%.	
DEF Fluid Low	True when the engine ECU reports via CAN Bus that the Diesel Exhaust Fluid (DEF) is at a level between 8 and 23%.	
DEF Inducement Override	This pre-alarm indicates a temporary override of inducement not to operate the engine. This is set by the ECU and is not a user setting.	
DEF Pre-severe Inducement	This pre-alarm indicates a high level of inducement not to operate the engine due to low or poor quality Diesel Exhaust Fluid (DEF), or a malfunction in the Exhaust After Treatment System (EATS). The engine may operate in a reduced power mode, or for a limited time, after which it will enter a state of severe inducement unless the problem with the DEF or malfunction in the EATS is corrected.	
DEF Quality Poor	True when the engine ECU reports “DEF Quality Poor” via CAN Bus.	
DEF Severe Inducement	This pre-alarm indicates the highest level of inducement not to operate the engine due to low or poor quality Diesel Exhaust Fluid (DEF), or a malfunction in the Exhaust After Treatment System (EATS). The engine may operate in a reduced power mode, or for a limited time, or may be prevented from starting by the ECU until the problem is corrected. A service tool may be required to restart the engine.	
DEF Tampering	True when the engine ECU reports “DEF Tampering” via CAN Bus.	
DEF Warning	This pre-alarm indicates the first level of warning when EATS is not functioning properly or DEF quality or level is not sufficient for proper operation.	
DEF Warning Level 2	This pre-alarm indicates the second level of warning when EATS is not functioning properly or DEF quality or level is not sufficient for proper operation.	
Diag Trouble Code	True when a Diagnostic Trouble Code exists.	
DPF Regenerate Disabled	True when the Diesel Particulate Filter (DPF) lamp status broadcast over CAN Bus indicates that DPF regeneration is inhibited.	
DPF Regenerate Required	True when the Diesel Particulate Filter (DPF) lamp status broadcast over CAN Bus indicates that DPF regeneration is required.	
DPF Soot Level High	True when the engine ECU reports via CAN Bus that Diesel Particulate Filter (DPF) soot level is high.	

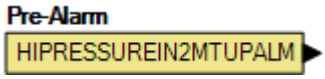
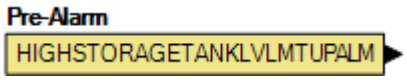
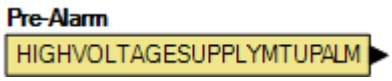
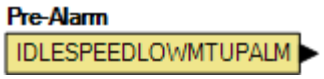
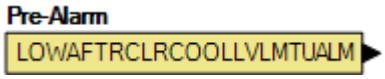
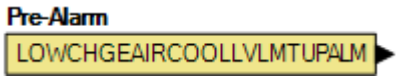
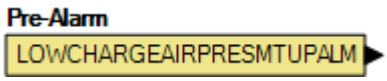
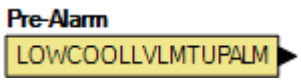
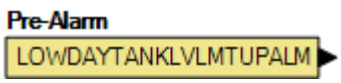
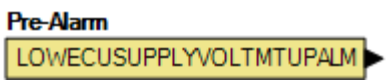
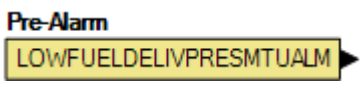
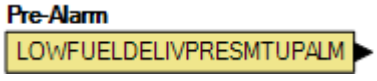
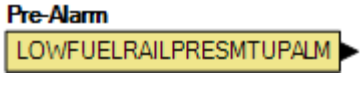
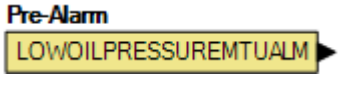
Name	Description	Symbol
DPF Soot Level Moderately High	True when Diesel Particulate Filter (DPF) lamp status (yellow warning) broadcast over CAN Bus indicates that the soot level is moderately high.	
DPF Soot Level Severely High	True when Diesel Particulate Filter (DPF) lamp status (red warning) broadcast over CAN Bus indicates that the soot level is severely high.	
ECU Comm Loss	True when communication to ECU has been lost.	
EGR Inducement Level Low	True when an issue has been detected in the Exhaust Gas Recirculation (EGR) system. This is the second level of inducement to correct the issue. There should also be Diagnostic Trouble Codes providing additional information about the issue.	
EGR Inducement Severe	True when an issue has been detected in the Exhaust Gas Recirculation (EGR) system. This is the third level of inducement to correct the issue. If not corrected, engine power derating or shutdown may occur. There should also be Diagnostic Trouble Codes providing additional information about the issue.	
EGR Inducement Warning	True when an issue has been detected in the Exhaust Gas Recirculation (EGR) system. This is the first level of inducement to correct the issue. There should also be Diagnostic Trouble Codes providing additional information about the issue.	
Engine kW Over Load 1	True when the Engine kW Overload 1 Pre-Alarm settings have been exceeded.	
Engine kW Over Load 2	True when the Engine kW Overload 2 Pre-Alarm settings have been exceeded.	
Engine kW Over Load 3	True when the Engine kW Overload 3 Pre-Alarm settings have been exceeded.	
Escape Mode	This pre-alarm indicates a temporary override of inducement not to operate the engine. This is set by the ECU and is not a user setting.	
Exhaust System Error	Pre-alarm indicating an Exhaust System Error has been detected. A number of conditions cause this; examples include DEF Tank Low indication, Purge in Progress, Exhaust System Error, Exhaust System Inducement Indications, etc. This is derived based on ECU Lamp conditions communicated from the Engine ECU to the DGC-2020ES via J1939 CAN Bus communications.	
Fuel Leak	True when the Fuel Leak Detect function is configured as a pre-alarm and the activation delay has expired.	
Fuel Level Sender Fail	True when the Fuel Level Sender Fail is configured as a pre-alarm and the activation delay has expired.	

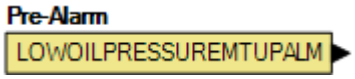
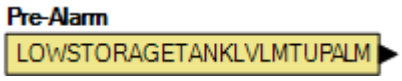
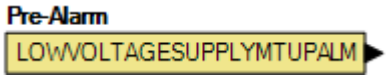
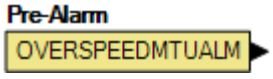
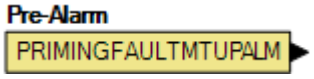
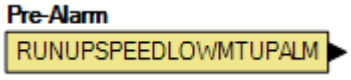
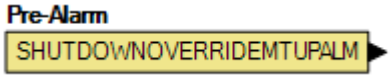
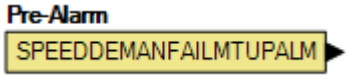
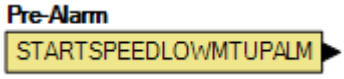
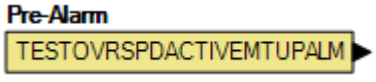
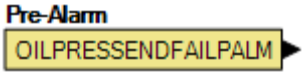
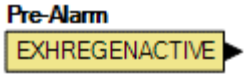
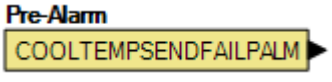
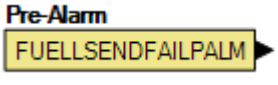
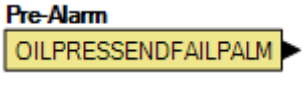
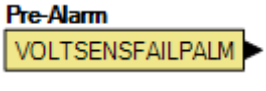
Name	Description	Symbol
Generator Breaker Close Fail	True when a generator breaker close fail pre-alarm occurs. The pre-alarm occurs when the DGC-2020ES has issued a generator breaker close output but does not receive a generator breaker status input that indicates the breaker has closed before the breaker close wait time has expired.	
Generator Breaker Open Fail	True when a generator breaker open fail pre-alarm occurs. The pre-alarm occurs when the DGC-2020ES has issued a generator breaker open output but does not receive a generator breaker status input that indicates the breaker has opened before the breaker close wait time has expired.	
Fuel Filter 1 Leak	This logic status input indicates that the engine ECU has detected a leak in fuel filter 1, and has communicated this to the DGC-2020ES over CAN Bus.	
Fuel Filter 2 Leak	This logic status input indicates that the engine ECU has detected a leak in fuel filter 2, and has communicated this to the DGC-2020ES over CAN Bus.	
Generator Protection 27	True when the 27 element is configured as a pre-alarm and has tripped.	
Generator Protection 59	True when the 59 element is configured as a pre-alarm and has tripped.	
Generator Protection 47	True when the 47 element is configured as a pre-alarm and has tripped.	
Generator Protection 50	True when the 50 element is configured as a pre-alarm and has tripped.	
Generator Protection 81 Over	True when the 81 Over element is configured as a pre-alarm and has tripped.	
Generator Protection 81 Under	True when the 81 Under element is configured as a pre-alarm and has tripped.	
Global Pre-Alarm	True when one or more pre-alarms are set.	
Heating for Exhaust Regen	A manual or automatic exhaust regeneration request has occurred, but the exhaust system is not hot enough for regeneration to occur. The ECU feeds fuel into the exhaust stream to increase the temperature to accomplish regeneration.	
Hi Coolant Temp	True when the High Coolant Temp Pre-Alarm threshold has been exceeded.	
High Exhaust Temperature	True when Diesel Particulate Filter (DPF) lamp status broadcast over CAN Bus indicates high exhaust temperature.	

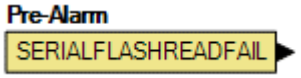
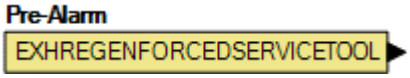
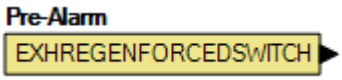
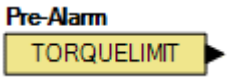
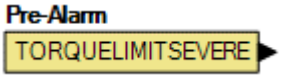
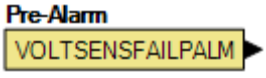
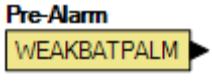
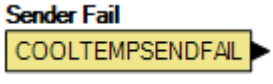
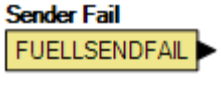
Name	Description	Symbol
High Fuel Level	True when the High Fuel Level Pre-Alarm settings have been exceeded.	
Inter Generator Comm Fail	True when the DGC-2020ES detects that an individual generator previously connected to a generator network has lost connection.	
Isuzu DEF Low Refill DEF	True when an Isuzu engine ECU has detected low DEF level and has indicated the DEF symbol should be displayed.	
Isuzu Forced Purge Request	True when a forced purge has been requested by momentarily pressing the Manual Regeneration button or setting the DPF Regen setting on the front panel, or setting the DPF Manual Regenerate button in BESTCOMS*Plus*.	
Isuzu SCR Forced Purge	True when a forced purge is in progress after having been requested.	
Isuzu SCR Purge	True when a normal SCR Purge is in progress. Normal purges occur during normal operation if the engine load is sufficient to allow purge to occur.	
Isuzu Service Tool Forced Purge Request	True when a forced purge has been requested through the Isuzu Service Tool. This will remain true until the forced purge cycle begins.	
Low Battery Voltage	True when the Low Battery Voltage Pre-Alarm settings have been exceeded.	
Low Coolant Level	True when the Low Coolant Level function is configured as a pre-alarm and the activation delay has expired. In addition, true when CAN Bus is enabled and the Low Coolant Level Pre-Alarm threshold has been exceeded.	
Low Coolant Temp	True when the Low Coolant Temp Pre-Alarm threshold has been exceeded.	
Low DPF Temp Add Load	True when a Yanmar engine ECU has received a regeneration request, but has detected that DPF temperature is too low to perform regeneration. Adding load to engine is recommended to increase temperature.	
Low Fuel Level	True when the Low Fuel Level Pre-Alarm threshold has been exceeded.	
Low Oil Pressure	True when the Low Oil Pressure Pre-Alarm threshold has been exceeded.	
Mains Breaker Close Fail	True when a mains breaker close fail pre-alarm occurs. The pre-alarm occurs when the DGC-2020ES has issued a mains breaker close output but does not receive a mains breaker status input that indicates the breaker has closed before the breaker close wait time has expired.	

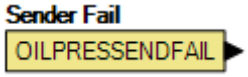
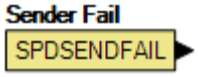
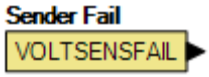
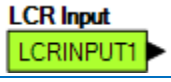
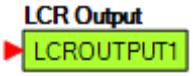
Name	Description	Symbol
Mains Breaker Open Fail	True when a mains breaker open fail pre-alarm occurs. The pre-alarm occurs when the DGC-2020ES has issued a mains breaker open output but does not receive a mains breaker status input that indicates the breaker has opened before the breaker close wait time has expired.	
Mains Fail Return Failed	True when a mains fail return fail pre-alarm has occurred. The pre-alarm occurs when the DGC-2020 is attempting to transfer from generator power to mains power after mains returns, but has not returned to the mains from the generator before the Mains Fail Return Delay has expired.	
Maintenance Interval	True when the Maintenance Interval Pre-Alarm threshold has been exceeded.	
MPU Fail	True when the MPU has failed.	
mtu Pre-Alarms Coil 1 High Temperature	True when a High Coil Temperature 1 Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Coil 2 High Temperature	True when a High Coil Temperature 2 Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Coil 3 High Temperature	True when a High Coil Temperature 3 Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Combined Yellow	True when a Combined Yellow Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms ECU Faulty	True when an ECU Fault Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Engine Speed Too Low	True when a Low Engine Speed Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Fault Codes	True whenever the presence of *mtu* Fault Codes is detected.	
mtu Pre-Alarms High Alternator Winding Temperature	True when a High Temperature In the Alternator Windings Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Ambient Temperature	True when a High Ambient Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Charge Air Temp *mtu* Alarm	True when a High Charge Air Temperature Alarm has been received from an *mtu* Engine ECU.	

Name	Description	Symbol
mtu Pre-Alarms High Charge Air Temp *mtu* Pre-Alarm	True when a High Charge Air Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Coolant Temp *mtu* Alarm	True when a High Coolant Temperature Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Coolant Temp *mtu* Pre-Alarm	True when a High Coolant Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Day Tank Level	True when a High Fuel Level in the Day Tank Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High ECU Supply Voltage	True when a High ECU Supply Voltage Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High ECU Temp	True when a High ECU Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Exhaust Temp A	True when a High Exhaust Temperature in Exhaust System True when aPre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Exhaust Temp B	True when a High Exhaust Temperature in Exhaust System B Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Fuel Filter Diff Pressure	True when a High Fuel Filter Differential Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Fuel Rail Pressure	True when a High Fuel Rail Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Fuel Temp	True when a High Fuel Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Intercooler Temperature	True when a High Intercooler Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Oil Temp *mtu* Alarm	True when a High Oil Temperature Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Oil Temp *mtu* Pre-Alarm	True when a High Oil Temperature Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Pressure In 1	True when a High Pressure Level in Pressure Input 1 Pre-Alarm has been received from an *mtu* Engine ECU.	

Name	Description	Symbol
mtu Pre-Alarms High Pressure In 2	True when a High Pressure Level in Pressure Input 2 Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Storage Tank Level	True when a High Fuel Level in the Storage Tank Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms High Voltage Supply	True when a High System Power Supply Voltage Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Idle Speed Low	True when a Low Idle Speed Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low After Cooler Coolant Level	True when a Low Aftercooler Coolant level Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Charge Air Coolant Level	True when a Low Charge Air Coolant Level Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Charge Air Pressure	True when a Low Charge Air Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Coolant Level *mtu* Pre-Alarm	True when a Low Coolant Level Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Day Tank Level	True when a Low Fuel Level in the Day Tank Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low ECU Supply Voltage	True when a Low ECU Supply Voltage Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Fuel Delivery Pressure *mtu* Alarm	True when a Low Fuel Delivery Pressure Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Fuel Delivery Pressure *mtu* Pre-Alarm	True when a Low Fuel Delivery Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Fuel Rail Pressure	True when a Low Fuel Rail Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Oil Pressure *mtu* Alarm	True when a Low Oil Pressure Alarm has been received from an *mtu* Engine ECU.	

Name	Description	Symbol
mtu Pre-Alarms Low Oil Pressure *mtu* Pre-Alarm	True when a Low Oil Pressure Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Storage Tank Level	True when a Low Fuel Level in the Storage Tank Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Low Voltage Supply	True when a Low System Power Supply Voltage Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Overspeed	True when an Overspeed Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Priming Fault	True when a Fault in the Engine Priming System Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Run-Up Speed Low	True when a Low Runup Speed Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Shutdown Override	True when a Shutdown Override Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Speed Demand Fail	True when a Speed Demand Fail Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Start Speed Low	True when a Low Start Speed Pre-Alarm has been received from an *mtu* Engine ECU.	
mtu Pre-Alarms Test Overspeed Active	True when an Overspeed Test Active Pre-Alarm has been received from an *mtu* Engine ECU.	
Oil Pressure Sender Fail	True when the Oil Pressure Sender Fail is configured as a pre-alarm and the activation delay has expired.	
Regenerate Active	True when an exhaust system regeneration is in progress.	
Sender Fail Coolant Temp Sender Fail	True when the Coolant Temp Sender Fail is configured as a pre-alarm and the activation delay has expired.	
Sender Fail Fuel Level Sender Fail	True when the Fuel Level Sender Fail is configured as a pre-alarm and the activation delay has expired.	
Sender Fail Oil Pressure Sender Fail	True when the Oil Pressure Sender Fail is configured as a pre-alarm and the activation delay has expired.	
Sender Fail Voltage Sensing Fail	True when the Voltage Sensing Fail is configured as a pre-alarm and the activation delay has expired.	

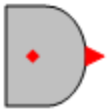
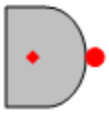
Name	Description	Symbol
Serial Flash Read Fail	When the DGC-2020ES reads data from the serial flash, the data is read twice and then compared to verify that the data matches. If it does not match, the read cycle is repeated. After the second attempt, if the data does not match, the DGC-2020ES annunciates a serial flash read failure pre-alarm. This status input to logic indicates that the DGC-2020ES has detected a serial flash read failure.	
Service Tool Forced Regenerate	A manual or forced regeneration is in progress and was initiated from a manufacturer's service tool. This indication is received from the engine ECU over J1939 CAN Bus as SPN 4175 Diesel Particulate Filter Active Regeneration Forced Status or SPN 6934 SCR System Cleaning Forced Status. When the value is 2, a Service Tool Forced Regenerate pre-alarm is annunciated.	
Switch Forced Regenerate	A manual or forced regeneration is in progress and was initiated from a manual regeneration switch. This indication is received from the engine ECU over J1939 CAN Bus as SPN 4175 Diesel Particulate Filter Active Regeneration Forced Status or SPN 6934 SCR System Cleaning Forced Status. When the value is 1, a Switch Forced Regenerate pre-alarm is annunciated.	
Torque Limit	True while the engine is running in a reduced torque mode due to exhaust system issues such as Low DEF, Purge Required, Exhaust System Error, etc. This reflects the status of the exhaust system Torque Limit lamp, which is communicated from the Engine ECU to the DGC-2020ES via J1939 CAN Bus communications.	
Torque Limit Severe	True while the engine is running in a severely reduced torque mode due to exhaust system issues such as Low DEF, Purge Required, Exhaust System Error, etc. This reflects the status of the exhaust system Torque Limit lamp, which is communicated from the Engine ECU to the DGC-2020ES via J1939 CAN Bus communications.	
Voltage Sensing Fail	True when the Voltage Sensing Fail is configured as a pre-alarm and the activation delay has expired.	
Weak Battery	True when the Weak Battery Voltage Pre-Alarm settings have been exceeded.	
Senders		
Coolant Temp Sender Fail	True when the Coolant Temp Sender Fail is configured as either a pre-alarm or alarm and the activation delay has expired.	
Fuel Level Sender Fail	True when the Fuel Level Sender Fail is configured as either a pre-alarm or alarm and the activation delay has expired.	

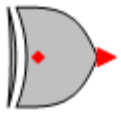
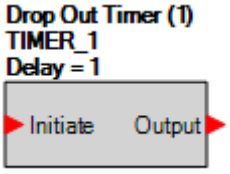
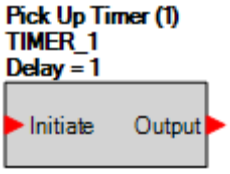
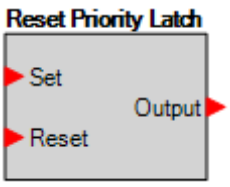
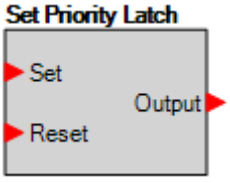
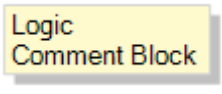
Name	Description	Symbol
Oil Pressure Sender Fail	True when the Oil Pressure Sender Fail is configured as either a pre-alarm or alarm and the activation delay has expired.	
Speed Sender Fail	True when the Speed Sender Fail activation delay has expired.	
Voltage Sensing Fail	True when the Voltage Sensing Fail is configured as either a pre-alarm or alarm and the activation delay has expired.	
Logic Control Relays		
The logic control relays (LCR) consist of LCR outputs and LCR inputs. The output can be used to terminate the "output" end of a logic network, and then use the corresponding input as an input to logic elsewhere in the logic scheme. When a given LCR output is true the corresponding LCR input is true. In other words, when LCR Output N (N being a number from 1 to 16) becomes true, then LCR Input N is true also. If you get a "too many logic levels" error while building a logic network, LCR outputs and inputs can be used as a solution to this problem. Place an LCR output on the end of the partial logic network and then use the corresponding LCR input to build more logic than was previously possible.		
Inputs Input 1-16	See description above.	
Outputs Output 1-16	See description above.	

Components

This group contains Logic Gates, Pickup and Dropout Timers, Latches, and Comment Blocks. Table 13-2 lists the names and descriptions of the objects in the *Components* group.

Table 13-2. Components Group, Names and Descriptions

Name	Description	Symbol
Logic Gates		
AND	Input 0 0 → Output 0 Input 0 1 → Output 0 Input 1 0 → Output 0 Input 1 1 → Output 1	
NAND	Input 0 0 → Output 1 Input 0 1 → Output 1 Input 1 0 → Output 1 Input 1 1 → Output 0	
OR	Input 0 0 → Output 0 Input 0 1 → Output 1 Input 1 0 → Output 1 Input 1 1 → Output 1	
NOR	Input 0 0 → Output 1 Input 0 1 → Output 0 Input 1 0 → Output 0 Input 1 1 → Output 0	

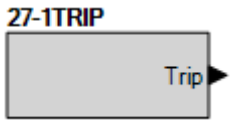
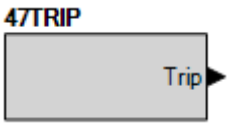
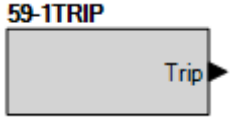
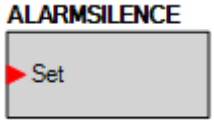
<table>
<tr><th>Name</th><th>Description</th><th>Symbol</th></tr>
<tr><td>XOR</td><td><table><tr><th colspan="2">Input</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td></tr><tr><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>1</td><td>0</td></tr></table>When an XOR gate has more than two inputs, the output is true whenever an odd number of inputs are true.</td><td>  </td></tr>
<tr><td>XNOR</td><td><table><tr><th colspan="2">Input</th><th>Output</th></tr><tr><td>0</td><td>0</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td></tr></table>When an XNOR gate has more than two inputs, the output is true whenever an even number of inputs are true. The output is also true if no inputs are true.</td><td>  </td></tr>
<tr><td>NOT (INVERTER)</td><td><table><tr><th>Input</th><th>Output</th></tr><tr><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td></tr></table></td><td>  </td></tr>
<tr><td colspan="3">Pickup and Dropout Timers</td></tr>
<tr><td>Drop Out Timer</td><td>Used to set a delay in the logic.
For more information, refer to Programming BESTlogicPlus, Pickup and Dropout Timers, later in this section.</td><td> 
</td></tr>
<tr><td>Pickup Up Timer</td><td>Used to set a delay in the logic.
For more information, refer to Programming BESTlogicPlus, Pickup and Dropout Timers, later in this section.</td><td> 
</td></tr>
<tr><td colspan="3">Latches</td></tr>
<tr><td>Reset Priority Latch</td><td>When the Set input is on and the Reset input is off, the latch will go to the SET (ON) state. When the Reset input is on and the Set input is off, the latch will go to the RESET (OFF) state. If both the Set and Reset inputs are on at the same time, a reset priority latch will go to the RESET (OFF) state.</td><td> 
</td></tr>
<tr><td>Set Priority Latch</td><td>When the Set input is on and the Reset input is off, the latch will go to the SET (ON) state. When the Reset input is on and the Set input is off, the latch will go to the RESET (OFF) state. If both the Set and Reset inputs are on at the same time, a set priority latch will go to the SET (ON) state.</td><td> 
</td></tr>
<tr><td colspan="3">Other</td></tr>
<tr><td>Comment Block</td><td>Enter user comments.</td><td> 
</td></tr>
</table>

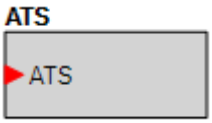
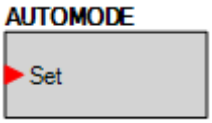
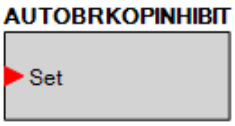
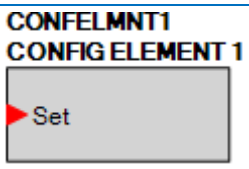
Elements

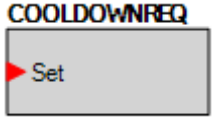
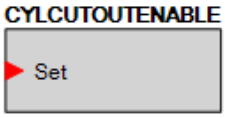
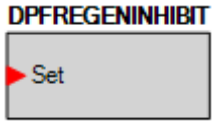
This group contains elements for the 27, 47, 50, 59, and 81. It also contains elements for Generator Breaker, Mains Breaker, Logic Alarm, Logic Pre-Alarm, Configurable Elements, AUTO Mode, OFF Mode, RUN Mode, Run with Load, Engine Run, ATS, Run Inhibit, Test Inhibit, Pre-Start Output, Start Output, Run Output, Cool Stop Request, Cool Down Request, External Start Delay, Start Delay Bypass, Alternate Frequency Override, Mains Fail Test, Load Take Over, EPS Supplying Load, *mtu* Speed Demand Switch, Reset, Alarm Silence, Lamp Test, Idle Request, Low Fuel Pre-Alarm, Diesel Particulate Filter Manual Regeneration, Diesel Particulate Filter Regeneration Inhibit, Emergency Stop, Speed Raise, Speed Lower, *mtu* Cylinder Cutout Disable, and Automatic Breaker Operation Inhibit from PLC.

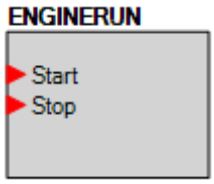
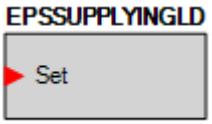
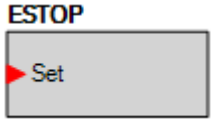
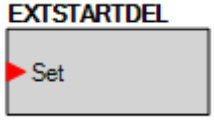
Table 13-3 lists the names and descriptions of the elements in the *Elements* group.

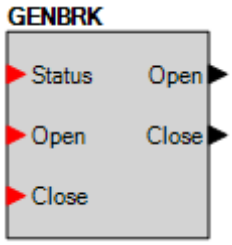
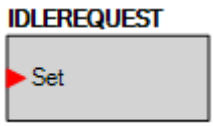
Table 13-3. Elements Group, Names and Descriptions

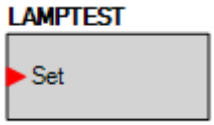
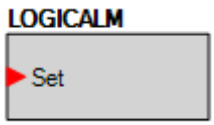
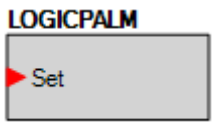
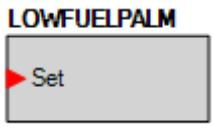
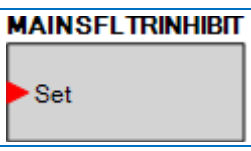
Name	Description	Symbol
Protection		
27TRIP	True when the 27-1 undervoltage is in a TRIP condition. Connect to another logic block input.	
47TRIP	True when the 47 phase imbalance is in a TRIP condition. Connect to another logic block input.	
50TRIP	True when the 50 overcurrent is in a TRIP condition. Connect to another logic block input.	
59TRIP	True when the 59-1 overvoltage is in a TRIP condition. Connect to another logic block input.	
81TRIP	True when the 81 frequency is in a TRIP condition. Connect to another logic block input.	
Other		
ALARMSILENCE	The alarm will be silenced when this element is true. The alarm can also be silenced by pressing the Alarm Silence button on the front panel of the DGC-2020ES.	
ALTFREQOVER	When this logic element is true, protection and bus condition detection is forced to operate at the Alternate Frequency instead of the Rated Frequency.	

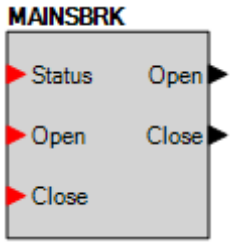
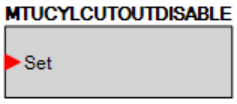
Name	Description	Symbol
ATS	When this logic element is true, and the DGC-2020ES is in AUTO mode, the generator will run. This can be used in place of the ATS programmable function if it is desired to generate the ATS signal as a combination of programmable logic rather than a simple contact input. If either the ATS logic element is true or the contact mapped to the ATS programmable function is true, and the DGC-2020ES is in AUTO mode, the generator will run. If both the ATS logic element and the ATS programmable function are false, and the DGC-2020ES is in AUTO mode, the generator will cool down and stop.	
AUTOMODE	When this input is true, and the DGC-2020ES is in OFF mode, the DGC-2020ES will switch to AUTO mode. This is a pulsed input. It does not need to be held after the desired mode switch has occurred.	
AUTOBRKOP-INHIBIT	Automatic breaker operation is inhibited when the Set input is true.	
CONFELMNTX (X = 1 to 8)	Configurable elements (CONFELMNT1-8) are connected to the logic scheme as outputs. These elements are configurable in BESTCOMS*Plus* under *Programmable Outputs, Configurable Elements.* The user can assign a string of up to 16 characters, configure whether the element should generate an alarm or pre-alarm. If used for alarm or pre-alarm, the user's text is what will appear in the alarm or pre-alarm annunciation and in the DGC-2020ES event log.	
COOLSTOPREQ	RUN Mode If the unit is in RUN mode when the Cool Stop Request is received, the unit will unload, open its breaker, and go into a cooldown cycle. While in the cooldown cycle, the unit will display “COOL & STOP REQ” in addition to displaying the cooldown timer. After the cooldown timer expires, the unit will go to OFF mode. The Cool Stop Request must be removed before the unit can be run again. If the Cool Stop Request is removed during the cooldown process, the unit will remain running. Furthermore, if a condition occurs that normally causes the unit to close its breaker in RUN mode, the unit will close its breaker and reload. AUTO Mode If the unit is in AUTO mode when the Cool Stop Request is received, all conditions that would normally cause the unit to run in AUTO mode are cleared. Since all conditions that cause the unit to run have been removed, the unit goes into a cooldown cycle. While in the cooldown cycle, the unit will display “COOL & STOP REQ” in addition to displaying the cooldown timer. After the cooldown timer expires, the unit will shut down, remaining in AUTO. The Cool Stop Request must be removed before the unit can be run again. If the Cool Stop Request is removed during the cooldown process and some condition that would normally cause the unit to run in AUTO mode is true, the unit will remain running. Furthermore, if a condition occurs that normally causes the unit to close its breaker, the unit will close its breaker and reload.	

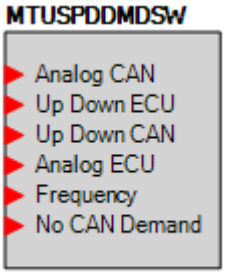
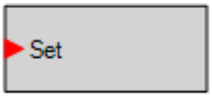
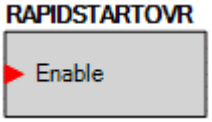
Name	Description	Symbol
COOLDOWNREQ	RUN Mode If the unit is in RUN mode when the Cool Down Request is received, the unit is forced to unload and open its breaker and then go into a cooldown cycle. While in the cool down cycle, the unit will display “COOLDOWN REQ” in addition to displaying the cooldown timer. After the cooldown timer expires, the unit will remain running in RUN mode. The Cool Down Request must be removed before the breaker can be closed again; this element blocks breaker closures. If the Cool Down Request is removed during the cool down process, the unit will remain running in RUN mode. Furthermore, if a condition occurs that normally causes the unit to close its breaker in RUN mode, the unit will close its breaker and reload. AUTO Mode If the unit is in AUTO mode and the Cool Down Request is received, the unit is forced to unload and open its breaker and go into a cooldown cycle. While in the cooldown cycle, the unit will display “COOLDOWN REQ” in addition to displaying the cooldown timer. After the cool down timer expires, the unit will remain running in AUTO mode, unless there are no conditions that cause the unit to run in AUTO mode, in which case it will shut down and remain in AUTO mode. The Cool Down Request must be removed before the breaker can be closed again; this element blocks breaker closures. If the Cool Down Request is removed during the cool down process and some condition that would normally cause the unit to run in AUTO mode is true, the unit will remain running in AUTO mode. Furthermore, if a condition occurs that normally causes the unit to close its breaker, the unit will close its breaker and reload.	
CYLCUTOUTENABLE (Cutout Enable Override)	When true, cylinder cutout is enabled. When false, cylinder cutout is disabled when any of the following are true: • Synchronization is in progress. • The machine is operating with the generator breaker closed. • The Cylinder Cutout Disable setting is true. • The Cylinder Cutout Disable logic element is true.	
DPFMANREGEN	Diesel Particulate Filter Regeneration is forced manually when the Set input is true.	
DPFREGENINHIBIT	Diesel Particulate Filter Regeneration is inhibited when the Set input is true.	
ECU Connect Override	When true, a Key On signal is applied to the ECU and CAN Bus data is updated any time except during the Disconnecting state.	

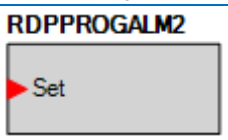
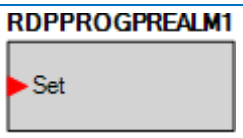
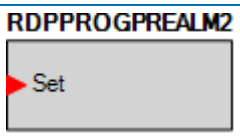
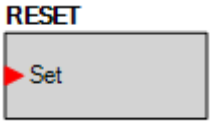
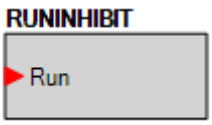
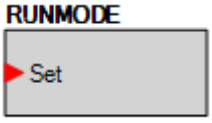
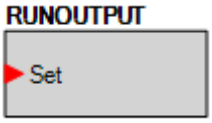
Name	Description	Symbol
ENGINERUN	The Start input starts the generator. No load is applied. The breaker remains open. The Stop input stops the generator. The DGC-2020ES only responds to this logic element when in AUTO mode.	
EPSSUPPLYINGLD	When true, the Set input forces a supplying load indication. This is useful when it is necessary for the supplying load indication to be true during test runs, but the system load is not enough to light the supplying load indication. A supplying load indication is true when the supplying load logic element is true and the generator is stable (voltage and frequency are within the limits programmed on the Gen Condition Detection screen under Breaker Management, Bus Condition Detection in the BESTCOMS*Plus* Settings Explorer). This is OR'ed with the traditional supplying load criteria that supplying load is true when the generator current is above a percentage of CT primary current (typically 3% minimum). When the supplying load indication has been driven from logic or from generator current levels, the DGC-2020ES will go through a cool down cycle when it is in AUTO mode and the ATS contact has been removed.	
ESTOP	When this element is true, an Emergency Shutdown alarm is annunciated and the Emergency Stop LED on the RDP-110 is illuminated.	
EXTSTARTDEL	If the Set input is true while the DGC-2020ES is in the Pre Start state, the DGC-2020ES will remain in the Pre Start state until the Set input is false.	

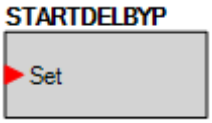
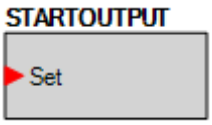
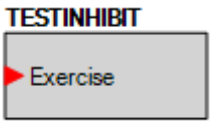
Name	Description	Symbol
GENBRK	This element is used to connect the breaker open and close output signals from the DGC-2020ES to physical output contacts to open and close the generator breaker, and map breaker status feedback to a contact input. In addition, contact inputs can be mapped to allow switches to be implemented to manually initiate breaker open and close requests. Inputs *Status:* This input allows a contact input to be mapped that will provide breaker status feedback to the DGC-2020ES. When the contact input is closed, the breaker is indicated to be closed. When the contact input is open, the breaker is indicated to be open. *Open:* This input allows a contact input to be mapped that can be used to initiate a manual breaker open request. When this input is pulsed closed while the DGC-2020ES is in RUN or AUTO mode, the breaker will open. *Close:* This input allows a contact input to be mapped that can be used to initiate a manual breaker close request. When this input is pulsed and the DGC-2020ES is in AUTO or RUN mode, and the generator is stable, a close request will be initiated. If bus is dead, the breaker will close; if the bus is not dead the generator breaker will not be closed. Outputs The outputs must be mapped to the contact outputs of the DGC-2020ES that will be used to drive the breaker. *Open:* This output is pulsed true (closes the output contact it is mapped to) when the DGC-2020ES is providing a signal to the breaker to open. It will be a pulse if the Breaker Output Contact Type is set to Pulse on the Breaker Hardware screen under Breaker Management in the Settings Explorer, and the length is determined by the Open Pulse Time. It will be a constant output if the Generator Breaker Hardware Contact Type is set to continuous. Note the pulse time must be set long enough for the breaker to actually open before the pulse is removed. *Close:* This output is pulsed true (closes the output contact it is mapped to) when the DGC-2020ES is providing a signal to the breaker to close. It will be a pulse if the Breaker Output Contact Type is set to Pulse on the Breaker Hardware screen under Breaker Management in the Settings Explorer, and the length is determined by the Open Pulse Time. It will be a constant output if the Generator Breaker Hardware Contact Type is set to continuous. Note the pulse time must be set long enough for the breaker to actually open before the pulse is removed.	
IDLEREQUEST	When this element is true, the DGC-2020ES sends an idle request to the ECU on J1939 engines that are equipped to receive such a request. The request consists of an enable bit command and an idle RPM setting. At this time, only Volvo and Cummins are implemented. ECUs that accept the idle RPM setting set the engine to the requested RPM. ECUs that accept only the enable bit command, set the engine to their internal idle speed setting, ignoring the requested idle RPM from the DGC-2020ES.	

Name	Description	Symbol
LAMPTEST	The lamp test will be performed when this element is true. The lamp test can also be accomplished by simultaneously pressing the *Up* and *Down* buttons on the front panel of the DGC-2020ES.	
LOADTAKEOVER	When this logic element is true, the generator is forced to start, assume load, and disconnect from the mains, in an open transition.	
LOGICALM	When this input is true, the DGC-2020ES goes into an alarm condition.	
LOGICPALM	When this input is true, the DGC-2020ES goes into a Pre-alarm condition.	
LOWFUELPALM	When this element is true, a Low Fuel Pre-Alarm is annunciated and the Low Fuel Level LED on the RDP-110 is illuminated.	
MAINSFAILTEST	When this element is true, the DGC-2020ES will exercise its mains fail transfer function exactly as it would if the mains were to fail on a mains fail machine. This can be used as a test of the mains fail transfer capability of the unit without having to cause a true mains failure.	
MAINSFLTRINHIBIT	The mains fail transfer function is inhibited when the Set input is true.	

Name	Description	Symbol
MAINSBRK	This element is used to connect the breaker open and close output signals from the DGC-2020ES to physical output contacts to open and close the mains breaker and map breaker status feedback to a contact input. In addition, contact inputs can be mapped to allow switches to be implemented to manually initiate breaker open and close requests. This element is only available when the Mains Breaker Hardware in configured on the *Breaker Hardware* screen via the *Breaker Management* tree branch. Inputs *Status:* This input allows a contact input to be mapped that will provide breaker status feedback to the DGC-2020ES. When the contact input is closed, the breaker is indicated to be closed. When the contact input is open, the breaker is indicated to be open. *Open:* This input allows a contact input to be mapped that can be used to initiate a manual breaker open request. When this input is pulsed closed while the DGC-2020ES is in RUN or AUTO mode, the breaker will open. *Close:* This input allows a contact input to be mapped that can be used to initiate a manual breaker close request. When this input is pulsed, the mains is stable, and both breakers are open, a close request will be initiated. Outputs The outputs must be mapped to the contact outputs of the DGC-2020ES that will be used to drive the breaker. *Open:* This output is pulsed true (closes the output contact it is mapped to) when the DGC-2020ES is providing a signal to the breaker to open. It will be a pulse if the Breaker Output Contact Type is set to Pulse on the Breaker Hardware screen under Breaker Management in the Settings Explorer, and the length is determined by the Open Pulse Time. It will be a constant output if the Mains Breaker Hardware Contact Type is set to continuous. Note the pulse time must be set long enough for the breaker to actually open before the pulse is removed. *Close:* This output is pulsed true (closes the output contact it is mapped to) when the DGC-2020ES is providing a signal to the breaker to close. It will be a pulse if the Breaker Output Contact Type is set to Pulse on the Breaker Hardware screen under Breaker Management in the Settings Explorer, and the length is determined by the Open Pulse Time. It will be a constant output if the Mains Breaker Hardware Contact Type is set to continuous. Note the pulse time must be set long enough for the breaker to actually open before the pulse is removed.	
*mtu*CYLCUTOUT-DISABLE (*mtu* Cylinder Cutout Disable)	When this logic element is true, Cylinder Cutout Disable 1 and Cylinder Cutout Disable 2 are both sent to the engine ECU with true status. When this logic element is false, Cylinder Cutout Disable 1 and Cylinder Cutout Disable 2 are sent to the engine ECU with states set by the values programmed for the Cylinder Cutout Disable 1 and Cylinder Cutout Disable 2 DGC-2020ES settings which are configured on the ECU Setup screen in BESTCOMS*Plus*.	

Name	Description	Symbol
*mtu*SPDDMDSW	This logic element can be used to specify the Speed Demand Source parameter value that is sent to an *mtu* Engine ECU. When no input is true, the value sent to the engine ECU is the value specified in the Speed Demand Source setting in the ECU configuration setting. If an input on this logic element is true, the selected Speed Demand Source will be sent rather than the value specified by the Speed Demand Source setting. If multiple inputs are true at the same time, the input that is closest to the top of the logic element symbol will specify the Speed Demand Source parameter value that is sent to the ECU. Analog CAN: This input configures the *mtu* ECU to accept speed bias requests over J1939 CAN Bus from the DGC-2020ES. Up Down ECU: This input configures the *mtu* ECU to accept speed raise/lower commands via contact inputs on the ECU. Up Down CAN: This input configures the *mtu* ECU to accept speed raise/lower commands via communications over J1939 CAN Bus. Analog ECU: This input configures the *mtu* ECU to accept speed bias via bias voltage input connections on the ECU. Frequency: This configures the *mtu* ECU to accept speed commands via a frequency signal input on the ECU. The mapping of input signal frequency to machine speed is configured in a curve within the engine ECU. No CAN Demand: This input configures the *mtu* ECU to disregard all speed requests or speed raise/lower requests from J1939 CAN Bus.	
OFFMODE	When this input is true, the DGC-2020ES will switch to OFF mode. This is a pulsed input. It does not need to be held after the desired mode switch has occurred.	
PRESTARTOUT	This element is used to drive the prestart output relay from logic when the Prestart Output Relay configuration is set to “Programmable”. When the Prestart Output Relay configuration is set to “Programmable”, the prestart relay will not close unless logic is used to drive this element. When the Prestart Output Relay configuration is set to “Predefined”, the prestart relay is closed according to the predefined prestart functionality of the DGC-2020ES. When the “Predefined” functionality is selected, the relay will not respond to this element.	
Rapid Start Override	When true, this element sets the Start mode to Rapid regardless of the Start mode setting.	
RDPPROGALM1	When true, this element illuminates the *Fuel Leak/Sender Failure* LED on the Remote Display Panel RDP-110. When this element is connected in logic, it overrides all other commands to the LED. Otherwise, the LED operates as normal.	

Name	Description	Symbol
RDPPROGALM2	When true, this element illuminates the *Sender Failure* LED on the Remote Display Panel RDP-110. When this element is connected in logic, it overrides all other commands to the LED. Otherwise, the LED operates as normal.	
RDPPROGPREALM1	When true, this element illuminates the *Battery Overvoltage* LED on the Remote Display Panel RDP-110. When this element is connected in logic, it overrides all other commands to the LED. Otherwise, the LED operates as normal.	
RDPPROGPREALM2	When true, this element illuminates the *Battery Charger Failure* LED on the Remote Display Panel RDP-110. When this element is connected in logic, it overrides all other commands to the LED. Otherwise, the LED operates as normal.	
RESET	Reset will be active when this element is true. Reset can also be accomplished by pressing the Reset button on the front panel of the DGC-2020ES.	
RUNINHIBIT	When this logic element is true, the DGC-2020ES is prevented from starting and running the generator, regardless of any condition that would normally cause the generator to run. If this element is false and there is any condition in effect which will cause the generator to run, the DGC-2020ES will start and run the generator.	
RUNMODE	When this input is true, and the DGC-2020ES is in OFF mode, the DGC-2020ES will switch to RUN mode. This is a pulsed input. It does not need to be held after the desired mode switch has occurred.	
RUNOUTPUT	This element is used to drive the run output relay from logic when the Run Output Relay configuration is set to “Programmable”. When the Run Output Relay configuration is set to “Programmable”, the run relay will not close unless logic is used to drive this element. When the Run Output Relay configuration is set to “Predefined”, the run relay is closed according to the predefined run functionality of the DGC-2020ES. When the “Predefined” functionality is selected, the relay will not respond to this element.	
RUNWLOAD	The Start input starts the generator and closes the Gen breaker. The Stop input stops the generator and opens the Gen breaker. The DGC-2020ES only responds to this logic element when in AUTO mode.	
SPEEDLOWER	This element lowers the speed setting of the DGC-2020ES by up to 2 rpm per second. After the speed has not been lowered for 30 seconds, the modified speed is saved to nonvolatile memory.	
SPEEDRAISE	This element raises the speed setting of the DGC-2020ES by up to 2 rpm per second. After the speed has not been raised for 30 seconds, the modified speed is saved to nonvolatile memory.	

Name	Description	Symbol
STARTDELBYP	This element allows the Pre Start state to be skipped based on logic. For example, a start delay may not be necessary when the engine is warm. This also allows an external device, such as an ECU, to control the pre start interval.	
STARTOUTPUT	This element is used to drive the start output relay from logic when the Start Output Relay configuration is set to “Programmable”. When the Start Output Relay configuration is set to “Programmable”, the start relay will not close unless logic is used to drive this element. When the Start Output Relay configuration is set to “Predefined”, the start relay is closed according to the predefined start functionality of the DGC-2020ES. When the “Predefined” functionality is selected, the relay will not respond to this element.	
TESTINHIBIT	When this logic element is true, the generator exercise timer cannot start the generator. If the TESTINHIBIT logic function is false during an exercise period, or transitions from true to false at any time during an exercise period, the DGC-2020ES will start and run the generator for the duration of the exercise period.	

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 *Communication* 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 *Communication* pull-down menu.

Caution

Always remove the DGC-2020ES from service prior to changing or modifying the active logic scheme. Attempting to modify a logic scheme while the DGC-2020ES is in service could generate unexpected or unwanted outputs.

Modifying a logic scheme in BESTCOMS*Plus* does not automatically make that scheme active in the DGC-2020ES. The modified scheme must be uploaded into the DGC-2020ES.

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 13-1.

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 BESTCOMS*Plus* 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 13-4 defines the colors for each indicator.

Table 13-4. Status Indicators

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

Pickup and Dropout Timers

A pickup timer produces a true output when the elapsed time is greater than or equal to the Pickup Time setting after a false to true transition occurs on the Initiate input from the connected logic. Whenever the Initiate input status transitions to false, the output transitions to false immediately.

A drop out timer produces a true output when the elapsed time is greater than or equal to the Dropout Time setting after a true to false transition occurs on the Initiate input from the connected logic. Whenever the Initiate input transitions to true, the output transitions to false immediately. Refer to Figure 13-2.

To program logic timer settings, use the Settings Explorer within BESTCOMS*Plus* to open the *BESTlogicPlus Programmable Logic/Logic Timers* tree branch. Enter a *Name* label that you want to appear on the timer logic block. The *Time Delay* value range is 0 to 250 hours in 1 hour increments, 0 to 250 minutes in 1 minute increments, or 0 to 1,800 seconds in 0.1 second increments.

Next, open the *Components* tab inside the BESTlogic*Plus* window and drag a timer onto the program grid. Right click on the timer to select the timer you want to use that was previously set on the *Logic Timers* tree branch. The *Logic Timer Properties Dialog Box* will appear. Select the timer you want to use.

Timing accuracy is ±15 milliseconds.

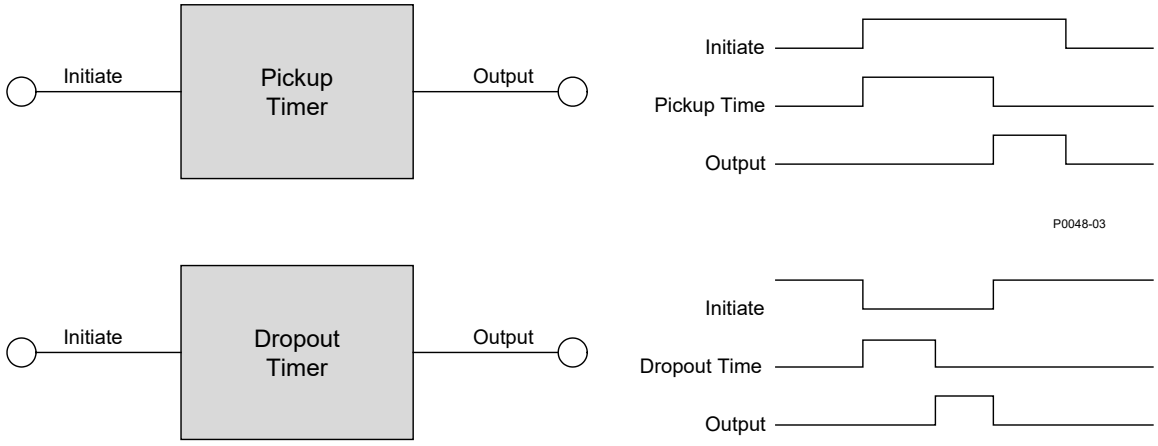


Figure 13-2. Pickup and Dropout Timer Logic Blocks

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 13-3. Output 1 is Logic 0 (red) when Virtual Switch 1 is Logic 0 (red) and Fixed 1 is Logic 1 (green).

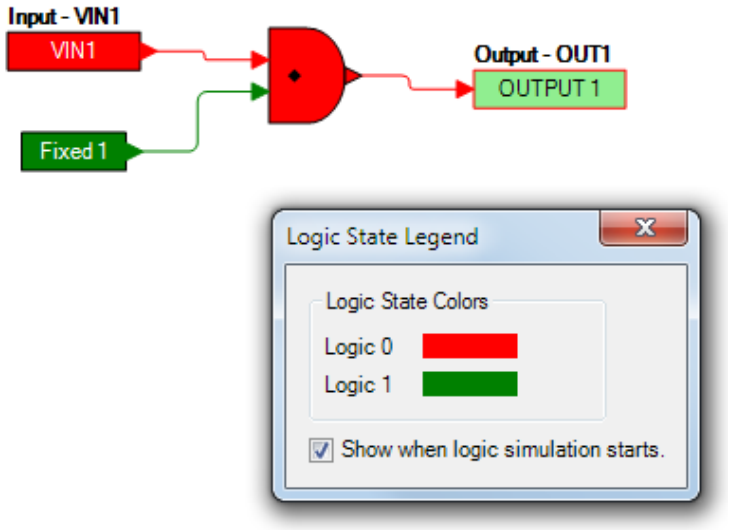


Figure 13-3. Offline Logic Simulator Example

BESTlogic™Plus File Management

To manage BESTlogic*Plus* files, use the Settings Explorer to open the *BESTlogicPlus Programmable Logic* tree branch. Use the BESTlogic*Plus* Programmable Logic toolbar to manage BESTlogic*Plus* files. Refer to Figure 13-4. For information on Settings Files management, refer to the *BESTCOMSPlus* chapter.

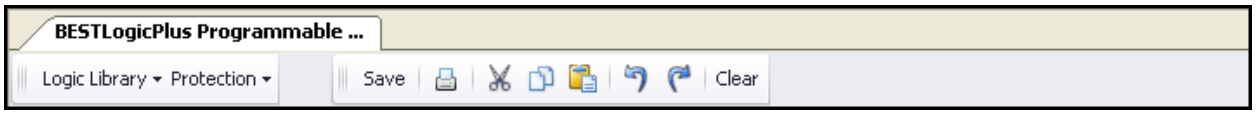


Figure 13-4. BESTlogic*Plus* Programmable Logic Toolbar

Saving a BESTlogic*Plus* File

After programming BESTlogic*Plus* settings, click on the *Save* button to save the settings to memory.

Before the new BESTlogic*Plus* settings can be uploaded to the DGC-2020ES, you must select *Save* from the *File* pull-down menu located at the top of the BESTCOMS*Plus* main shell. This step will save both the BESTlogic*Plus* settings and the operating settings to a file.

The user also has the option to save the BESTlogic*Plus* settings to a unique file that contains only BESTlogic*Plus* settings. Click on the *Logic Library* drop-down button and select *Save Logic Library File.* Use normal Windows® techniques to browse to the folder where you want to save the file and enter a filename.

Opening a BESTlogic*Plus* File

To open a saved BESTlogic*Plus* file, click on the *Logic Library* drop-down button on the BESTlogic*Plus* Programmable Logic toolbar and select *Open Logic Library File.* Use normal Windows techniques to browse to the folder where the file is located.

Protecting a BESTlogic*Plus* File

Objects in a logic diagram can be locked so that when the logic document is protected these objects cannot be changed. Locking and protecting is useful when sending logic files to other personnel to be modified. The locked object(s) cannot be changed. To view the lock status of the object(s), select *Show Lock Status* from the *Protection* drop-down menu. To lock object(s), use the mouse to select object(s) to be locked. Right click on the selected object(s) and select *Lock Object(s).* The gold colored padlock next

to the object(s) will change from an open to a locked state. To protect a logic document, select *Protect Logic Document* from the *Protection* drop-down button. A password is optional.

Uploading a BESTlogic*Plus* File

To upload a BESTlogic*Plus* file to the DGC-2020ES, you must first open the file through BESTCOMS*Plus* or create the file using BESTCOMS*Plus*. Then pull down the *Communication* menu and select *Upload Logic.*

Downloading a BESTlogic*Plus* File

To download a BESTlogic*Plus* file from the DGC-2020ES, you must pull down the *Communication* menu and select *Download Logic*. If the logic in your BESTCOMS*Plus* has changed, a dialog box will open asking you if want to save the current logic changes. You may choose *Yes* or *No*. After you have taken the required action to save or not save the current logic, the downloading is executed.

Printing a BESTlogic*Plus* File

To view a preview of the printout, click on the *Print Preview* icon located on the BESTlogic*Plus* Programmable Logic toolbar. If you wish to print to a printer, select the printer icon in the upper left corner of the *Print Preview* screen.

You may skip the print preview and go directly to print by clicking on the *Printer* icon on the BESTlogic*Plus* Programmable Logic toolbar. A dialog box, *Select Views to Print* opens allowing you to check which views you would like to print. Next, the *Print* dialog box opens with the typical Windows choice to setup the properties of printer. Execute this command, as necessary, and then select *Print*.

A *Page Setup* icon is also provided on the BESTlogic*Plus* Programmable Logic toolbar allowing you to select *Paper Size, Paper Source, Orientation,* and *Margins.*

Clearing the On-Screen Logic Diagram

Click on the *Clear* button to clear the on-screen logic diagram and start over.

BESTlogic™Plus Examples

Example 1 - GENBRK Logic Block Connections

Figure 13-5 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.

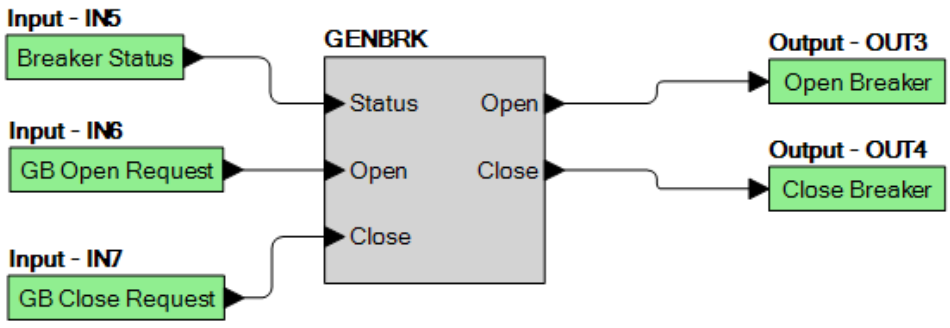


Figure 13-5. Example 1 – GENBRK Logic Block Connections

Example 2 - AND Gate Connections

Figure 13-6 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.

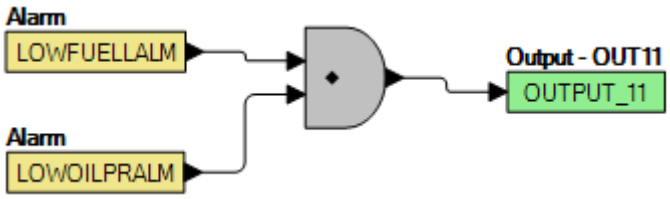


Figure 13-6. Example 2 – AND Gate Connections

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 13-7.

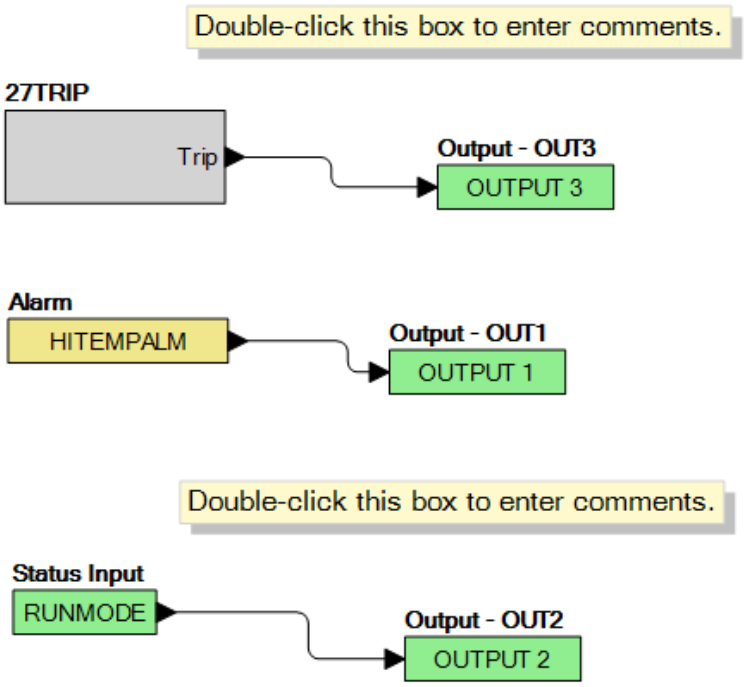


Figure 13-7. Example 3 – Multiple Logic Connections

14 • Exhaust Treatment

Diesel Particulate Filter (DPF)

In order to meet Tier 4 emission requirements, some engine manufacturers are applying Diesel Particulate Filters (DPF) to the exhaust system of the engine. A Diesel Particulate Filter traps particulate matter contained in diesel exhaust and prevents it from distributing into the air. The particulate matter is later burned off during a regeneration process.

The DGC-2020ES communicates DPF control and status information to and from the engine ECU via J1939 communications in the form of various Parameter Group Numbers (PGN) and Suspect Parameter Numbers (SPN). These are summarized in the following paragraphs.

Regeneration

Regeneration is accomplished by operating the engine at elevated exhaust temperatures where the accumulated particulate is burned off. If, in normal operation, the engine can be loaded to a high enough level to achieve the elevated exhaust temperature, then regeneration can occur as a part of normal operation. This is known as *passive regeneration*.

High exhaust temperatures can also be accomplished by methods such as providing dampers in the exhaust stream or heating the exhaust through the burning of fuel. This is known as *active regeneration* since it is outside of normal engine operation.

Heavily loaded engines will seldom require active regeneration. A lightly loaded engine will likely undergo active regeneration when regeneration is required.

DPF Control

DPF control information is sent from the DGC-2020ES to the Engine ECU through PGN Number 57244 (0xE000). A manual regeneration request is sent using SPN 3695, Diesel Particulate Filter Regeneration Force Switch. Regeneration can be inhibited by SPN 3695, Diesel Particulate Filter Regeneration Inhibit Switch.

Manual Regeneration

The operator can force a regeneration cycle by turning on the Manual Regeneration setting found on the front panel under Settings > Communication > CANBus Setup > ECU Setup > DPF Regenerate Setup. The parameter will remain on for a few seconds then go off. The ECU will respond to the momentary setting by logging the request to force a manual regeneration. A continuous request is not used because this can be problematic for some engine ECUs.

Manual regeneration can also be initiated by clicking the *Manual Regeneration* button on the ECU Setup screen in BESTCOMS*Plus*®. BESTlogic™*Plus* programmable logic can also be used to initiate manual regeneration by setting the DPF Manual Regeneration (DPFMANREGEN) logic element true.

Regeneration Inhibit

The operator can inhibit regeneration by turning on the DPF Regeneration Disable setting found on the ECU Setup screen in BESTCOMS*Plus*.

Regeneration can also be disabled by turning on the Disable Regeneration setting on the ECU Setup screen in BESTCOMS*Plus*.

BESTlogic*Plus* programmable logic can also be used to inhibit regeneration by setting the DPF Regeneration Inhibit (DPFREGENINHIBIT) logic element true.

DPF Status and Pre-Alarms

The DGC-2020ES receives DPF status information which is broadcast from the engine ECU in various Parameter Group Numbers (PGN) and Suspect Parameter Numbers (SPN). The DGC-2020ES displays this information on the front panel, and in BESTCOMS*Plus*, via DPF related pre-alarms. The J1939 parameters and the resulting DGC-2020ES pre-alarms are summarized in the following paragraphs.

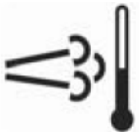
- PGN 64892 (0xFD7C) Diesel Particulate Filter Control 1
  - *SPN 3697, Diesel Particulate Filter Lamp Command*

    DPF REGEN REQUIRED Pre-Alarm: When SPN 3697 has a value of 1 or 4 indicating the DPF lamp is on, the DGC-2020ES will annunciate a pre-alarm with text of DPF REGEN REQUIRED. The DPF symbol, shown to the right, will accompany the text when the pre-alarm appears on the DGC-2020ES front panel.

  - *SPN 3698, Exhaust System High Temperature Lamp Command*

    HIGH EXHAUST TEMP Pre-Alarm: When SPN 3698 has a value of 1 indicating the high exhaust temperature lamp is on, the DGC-2020ES will annunciate a pre-alarm with text of HIGH EXHAUST TEMP. The high exhaust temperature symbol, shown to the right, will accompany the text when the pre-alarm appears on the DGC-2020ES front panel.

  - *SPN 3701 Aftertreatment Diesel Particulate Filter Status*

    SPN 3701 indicates that regeneration is required at the lowest level, moderate level, or most severe level. The DGC-2020ES uses this parameter for DPF Soot Level Pre-alarms which are described in the following paragraphs.

  - *SPN 3703 Diesel Particulate Filter Active Regeneration Inhibited Due to Inhibit Switch*

    DPF REGEN INHIBITED Pre-Alarm: When SPN 3703 has a value of 1 indicating the DPF Regeneration is inhibited due to the inhibit switch being set, the DGC-2020ES will annunciate a pre-alarm with text of DPF REGEN INHBTD. The DPF regeneration inhibited symbol, shown to the right, will accompany the text when the pre-alarm appears on the DGC-2020ES front panel.

- DPF Soot Level Annunciation

  The DGC-2020ES annunciates DPF Soot Level pre-alarms which are described in the following paragraphs.

  - SOOT LEVEL HIGH Pre-Alarm

    This pre-alarm is annunciated when one of the following occurs.

    - A DTC is received with SPN 3719 (Diesel Particulate Filter Soot Load Percent) with FMI = 15 (*Data Valid But Above Normal Operating Range Least Severe Level)*
    - SPN 3701 (Aftertreatment Diesel Particulate Filter Status) is received with a value of 001 (*regeneration is needed – lowest level)*

    The pre-alarm text is SOOT LVL HI.

    The DPF symbol, shown to the right, accompanies the text when the pre-alarm appears on the DGC-2020ES front panel.

  - SOOT LEVEL MODERATELY HIGH Pre-Alarm

    This pre-alarm is annunciated when one of the following occurs.

    - A DTC is received with SPN 3719 (Diesel Particulate Filter Soot Load Percent) with FMI = 16 (*Data Valid But Above Normal Operating Range Moderately Severe Level)*

- SPN 3701 (Aftertreatment Diesel Particulate Filter Status) is received with a value of 010 (*regeneration is needed – moderate level)*

The pre-alarm text is SOOT LVL MOD HI.

The DPF warning symbol, shown to the right, accompanies the text when the pre-alarm appears on the DGC-2020ES front panel.

- SOOT LEVEL EXTREMELY HIGH Pre-Alarm

This pre-alarm is annunciated when one of the following occurs.

- A DTC is received with SPN 3719 (Diesel Particulate Filter Soot Load Percent) with FMI = 0 (*Data Valid But Above Normal Operating Range Most Severe Level)*
- SPN 3701 (Aftertreatment Diesel Particulate Filter Status) is received with a value of 011 (*regeneration is needed – highest level)*

The pre-alarm text is SOOT LVL EXT HI.

The DPF stop symbol, shown to the right, accompanies the text when the pre-alarm appears on the DGC-2020ES front panel. If the DPF soot level reaches the most severe level, the engine ECU may shut the engine down, preventing it from running, or allow it to run, but at a reduced power level. The DGC-2020ES only indicates a pre-alarm, it does not prevent the engine from running or cause operation at a reduced power level. However, the operator should be aware that the engine ECU or after treatment system may cause such behavior.

Exhaust After-Treatment Systems (EATS)

In order to meet Tier 4 emission requirements, some engine manufacturers are adding Exhaust After Treatment Systems (EATS) which treat the engine exhaust within the exhaust system to reduce particulate matter and harmful contaminants prior to releasing the exhaust into the atmosphere. One such system uses urea-based Diesel Exhaust Fluid (DEF) catalyst which is combined with the exhaust gasses in the EATS to bring the emissions to acceptable levels.

The DGC-2020ES meters EATS information from the engine ECU via J1939 CANBus and displays the DEF level within the DEF tank(s), and also displays several pre-alarms related to the EATS system. Any DEF related pre-alarms annunciated on the front panel display the symbol used for DEF functions which is shown to the right.

Most systems will contain one DEF tank, while some may contain two tanks. The DGC-2020ES front panel displays the level of DEF in each tank under Metering > Alarms-Status > J1939 Status > DEF Tank1 LVL% and Metering > Alarms-Status > J1939 Status > DEF Tank2 LVL%. The tank 1 level is sent from the ECU via SPN 1761 in J1939 PGN 65110 - After Treatment 1 Reagent Tank 1 Information. The tank 2 level is sent from the ECU via SPN 4367 in J1939 PGN 64829 - After Treatment 1 Reagent Tank 2 Information. The tank levels are expressed in units of percent.

Pre-Alarms

The ECU sends DEF level diagnostics to the DGC as SPNs 5245 and 5246 in PGN 65110 (the AT1TI PGN). SPN 5245 communicated DEF level diagnostics, whereas SPN 5246 communicates DEF inducement level status.

There are several pre-alarms related to the EATS which annunciate DEF level diagnostics and DEF inducement level status. They are always enabled and will annunciate when received from the engine ECU. Each of them contains the symbol for DEF functions when annunciated on the front panel; however it will not be displayed in BESTCOMS*Plus*. The pre-alarms are summarized in the following paragraphs.

- DEF FLUID LOW: This pre-alarm displays when SPN 5245 has a value of 1, indicating that the DEF tank level is low. The exact DEF levels which constitute a low DEF condition vary among manufacturers.

- DEF LOW SEVERE: This pre-alarm displays when SPN 5245 has a value of 4, indicating that the DEF tank level is severely low or empty. The exact DEF levels which constitute a severely low DEF condition vary among manufacturers. When this occurs and is not remedied, the engine ECU may enter a mode of inducement not to operate the engine where some of the conditions in the pre-alarms descriptions below may occur.
- DEF WARNING: This pre-alarm displays when SPN 5246 has a value of 1. This is the lowest level of warning which indicates the EATS is not functioning properly or DEF quality or level is insufficient for proper operation.
- DEF WARNING LVL2: This pre-alarm displays when SPN 5246 has a value of 2. This is a higher level of warning which indicates the EATS is not functioning properly or DEF quality or level is insufficient for proper operation. If the problem causing this warning is not corrected, the system will eventually enter the DEF inducement states. In these states, the engine power or operating speed may be derated depending on the engine manufacturer and engine application.
- DEF INDUCEMENT: This pre-alarm displays when SPN 5246 has a value of 3, indicating the first level of inducement. The engine power or operating speed may be derated at this level of inducement depending on engine manufacturer and engine application. This is the lowest level of inducement and is caused by either the EATS not functioning properly or insufficient DEF quality or level for proper operation.
- DEF PRESEVERE INDUCEMENT: This pre-alarm displays when SPN 5246 has a value of 4, indicating the Pre-Severe Inducement level of inducement. This indicates that the engine has entered the second highest level of inducement not to operate. This is caused by either the EATS not functioning properly or insufficient DEF quality or level for proper operation. The engine power or operating speed may be derated at this level of inducement depending on engine manufacturer and engine application. The ECU will allow the engine to run for a limited time in this condition after which the engine will enter the severe inducement state.
- DEF SEVERE INDUCEMENT: This pre-alarm displays when SPN 5246 has a value of 5, indicating the Severe Inducement level of inducement. This is caused by either the EATS not functioning properly or insufficient DEF quality or level for proper operation. In this condition, the engine may either operate with reduced power or RPM or be shut down depending on manufacturer or engine application. The engine will remain at this level of inducement until the problem causing the inducement is resolved.

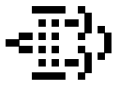
- DEF INDUCEMENT OVERRIDE: This pre-alarm displays when SPN 5246 has a value of 6, indicating the Temporary Override of inducement. This indicates DEF inducement is temporarily overridden. The engine may operate with reduced power, or for a limited time, after which time it may re-enter the SEVERE INDUCEMENT state.

Exhaust System Status Annunciation

When an exhaust system condition requires annunciation, the DGC-2020ES displays the exhaust system information across the bottom of the front panel screen. The parameters and symbols in the Exhaust System Status Display are listed below. The symbol images below are the actual bit-mapped images that are viewed on the front panel screen of the DGC-2020ES.

DEF Tank Level – The DEF Tank Level is the level of Diesel Exhaust Fluid (DEF) in the DEF Tank. When the DEF Level is getting low and DEF related conditions require annunciation, the caption of the DEF Tank level will change from “DEF” to the DEF symbol. Details of the DEF symbol are described below.

DEF Symbol – When the symbol is on solid, it indicates that DEF is low or there is an issue with the Selective Catalytic Reduction (SCR) system. When it is flashing, it indicates the DEF level is critically low or there is a critical issue with the SCR system.



DPF Symbol – When the DPF symbol is on solid, it indicates that the Diesel Particulate Filter (DPF) or exhaust system filter requires regeneration. When flashing it indicates a more urgent need for regeneration. Some manufacturers also show this symbol along with the High Exhaust Temperature Symbol when a Regeneration is in process.

Regeneration Inhibited Symbol – When this symbol is visible, it indicates that Regeneration is Inhibited. Operation with Regeneration Inhibited is not recommended. If Regeneration is not allowed when required, eventually the machine may shut down and cannot be restarted without a service call from the engine manufacturer. However, ample warning is given through various pre-alarms to allow removal of the inhibit so regeneration can occur and prevent an unwanted exhaust related shutdown condition.

Exhaust System Malfunction Symbol – When this symbol is visible, an exhaust system malfunction is in effect. Pre-alarms and/or Diagnostic Trouble Codes (DTC's) will provide additional information. It may be necessary to contact the engine manufacturer if the pre-alarms and DTC's do not provide sufficient failure information.

High Exhaust Temperature Symbol – This is visible when the exhaust system temperature has been elevated to perform a DPF Regeneration and typically indicates a DPF Regeneration is active. Some manufacturers also show this symbol when there is a mechanism to heat the exhaust stream and it is in the process of heating in preparation for a DPF Regeneration.

Check Engine Symbol – This is visible when Active Diagnostic Trouble Codes (DTCs) are present.

Torque Limit Symbol – This symbol is visible when operating in a Limited Torque mode due to exhaust system issues. When on solid, it indicates torque reduction. When flashing, it indicates increased torque reduction.

Amber Warning Lamp Symbol– This symbol indicates the engine ECU is lighting the Amber Warning Lamp. When flashing, it indicates a higher degree of severity.

Red Lamp Symbol – This symbol indicates the engine ECU is lighting the Red Warning Lamp. When flashing, it indicates a higher degree of severity. An engine shutdown may accompany this symbol.

Wait To Start Symbol – This symbol is visible when the engine is in a state of preparation for starting the engine. Examples include engine pre-heating or engine pre-lubrication.

Exit Conditions for DEF Severe Inducement

- First Restart: Return to 0% torque reduction in exit condition, until proper DEF level and quality evaluation. If low level or poor DEF quality is detected during the next monitoring cycle, the severe inducement will be active after the next restart. After the second restart, a service tool is required to exit the severe inducement.
- With Service Tool Clearing: Invoke 0% torque reduction with service tool clearing until proper DEF level and quality evaluation. If low level or poor DEF quality is detected during the next monitoring cycle, the severe inducement will be active after the next restart.

15 • 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.

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 BESTCOMS*Plus*®. 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.

Step 2: Review the section on breaker close requests in the *Breaker Management* chapter.

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 commands simultaneously. The breaker will not change state if it is being 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.

Step 2: Review the section on breaker operation requests in the *Breaker Management* chapter.

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 commands simultaneously. The breaker will not change state if it is being 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.

Generator stays in cooling state when attempting to shut down in Auto mode after Cool Down Timer counts down to zero seconds or when No Load Cool Down time is set to zero

If the unit is in AUTO mode and attempting a normal shutdown, it will always go through the cool down state. It will remain there until the cool down timer counts down to zero, and the generator breaker status is open.

If the unit stays in the cool down state after the cool down timer has expired, it is likely because it has a generator breaker status of closed. This can be checked on the front panel under METERING > ALARMS STATUS > STATUS > GEN BREAKER or in BESTCOMS*Plus* under Metering Explorer > DGC-2020ES > STATUS. The generator will not leave the cooling state until it has an open generator breaker status.

If the Generator Breaker logic element is present in logic and the Status Input is TRUE, the breaker status will be reported as closed even if that breaker block has a large yellow X through it indicating it is not configured.

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.

16 • BESTCOMS*Plus*® Settings Loader Tool

The BESTCOMS*Plus*® Settings Loader Tool is a software application, which allows the user to instantly upload settings to Basler BESTCOMS*Plus*-compatible products by scanning a pre-registered bar code, which promotes consistency, reduces potential errors, and saves time.

Setup

The BESTCOMS*Plus* Settings Loader Tool software and a bar code reader (acquired separately) must be installed on the same PC.

BESTCOMS*Plus* Settings Loader Tool Installation

System Recommendations

The BESTCOMS*Plus*® Settings Loader Tool is bundled with BESTCOMS*Plus* software. BESTCOMS*Plus* software is built on the Microsoft® .NET Framework. The setup utility that installs BESTCOMS*Plus* on your PC also installs the BESTCOMS*Plus* Settings Loader Tool and the required version of .NET Framework (if not already installed). BESTCOMS*Plus* operates with systems using Windows® 7 SP1, Windows 8.1, and Windows 10 version 1607 (Anniversary Update) or later. Microsoft Internet Explorer 5.01 or later must be installed on your PC before installing BESTCOMS*Plus*. System recommendations for the .NET Framework and BESTCOMS*Plus* are listed in Table 16-1.

Table 16-1. System Recommendations for BESTCOMS*Plus* and the .NET Framework

System Type	Component	Recommendation
32/64 bit	Processor	2.0 GHz
32/64 bit	RAM	1 GB (minimum), 2 GB (recommended)
32 bit	Hard Drive	200 MB (if .NET Framework is already installed on PC)
		4.5 GB (if .NET Framework is not already installed on PC)
64 bit	Hard Drive	200 MB (if .NET Framework is already installed on PC)
		4.5 GB (if .NET Framework is not already installed on PC)

To install and run BESTCOMS*Plus*, a Windows user must have Administrator rights.

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

Use the following procedure to download BESTCOMS*Plus* from the Basler Electric website.

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

Install BESTCOMSPlus

Run the setup file for the BESTCOMS*Plus* application. The setup utility installs BESTCOMS*Plus*, the .NET Framework (if not already installed), the USB driver, and the BESTCOMS*Plus* Settings Loader Tool on your PC.

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 the BESTCOMS*Plus* Settings Loader Tool.

Bar Code Reader and Bar Codes

The BESTCOMS*Plus*® Settings Loader Tool is compatible with bar code readers, which conform to UnifiedPOS specifications. Bar code readers and bar code labels are not provided and must be acquired separately. Refer to the bar code reader's documentation for installation instructions.

Any bar code compatible with your bar code reader may be used.

BESTCOMSPlus® Settings Loader Tool Settings

BESTCOMS*Plus* Settings Loader Tool settings are found on two main screens, the Loader Grid and Configuration screen. The Loader Grid contains management options for the product settings files and their associated bar codes. The Configuration screen contains product-specific options for the default behavior of the BESTCOMS*Plus* Settings Loader Tool. These settings are described in the following paragraphs.

Loader Grid

One entry, or row, in the Loader Grid contains all of the necessary data to associate a product settings file with a bar code. New entries can be added. Existing entries can be edited, deleted, and uploaded to a Basler product.

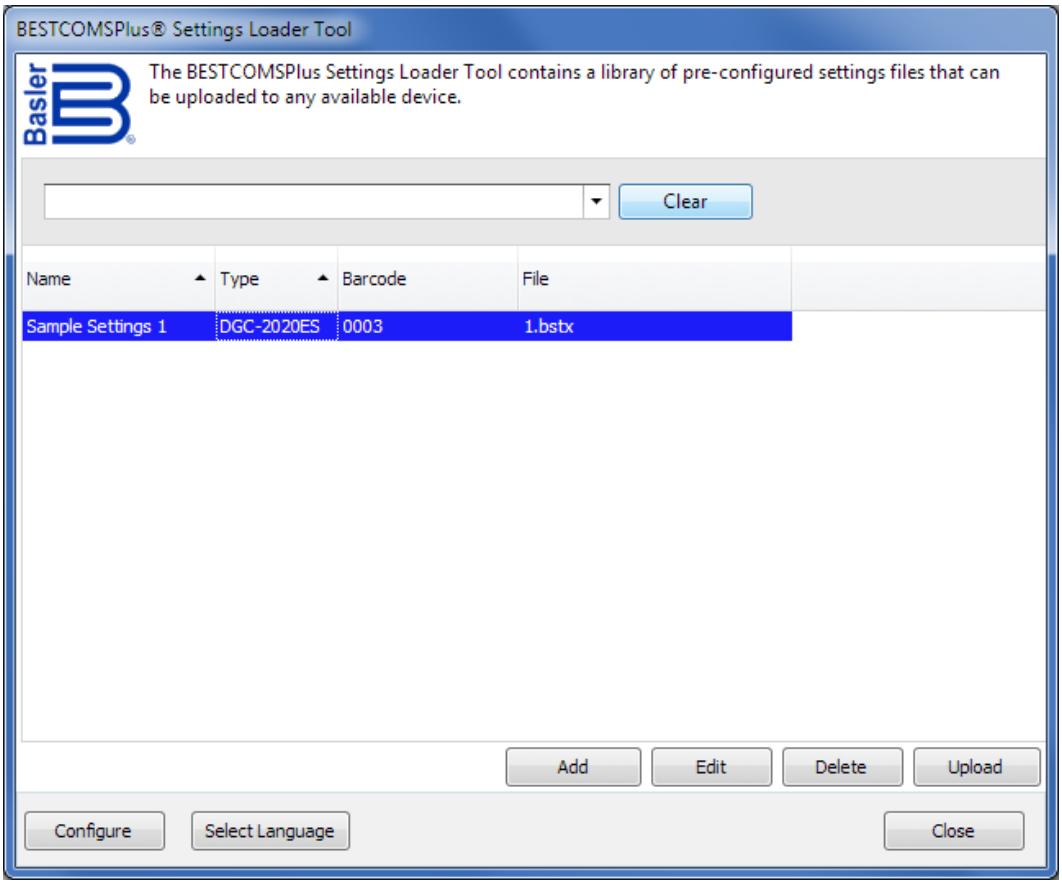


Figure 16-1. Loader Grid

Scanning Bar Codes

Place the cursor in the text field, found at the top of the Loader Grid screen, and scan a bar code. If successful, the digits which comprise the bar code appear in the text field. The BESTCOMS*Plus* Settings Loader Tool automatically searches for this bar code among the entries in the Loader Grid and displays the matching entry. Click Clear to remove the digits from the text field.

Adding an Entry

Click Add to create an entry. The BESTCOMS*Plus*® Settings Loader Tool: Add Device dialog box appears (Figure 16-2).

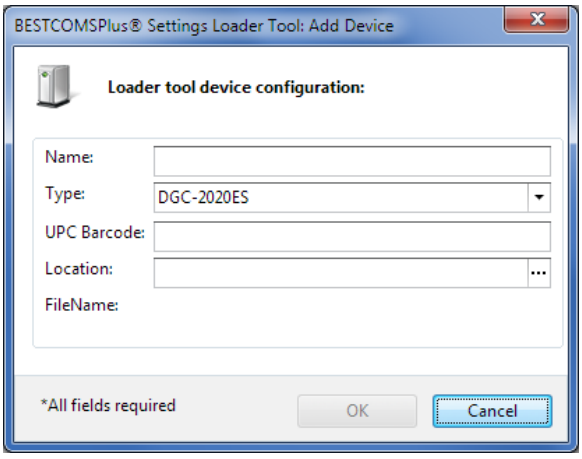


Figure 16-2. Add Device Screen

Enter the name of the entry in the Name field. This appears in the first column of the Loader Grid.

Select the product type from the Type drop-down menu. This appears in the second column of the Loader Grid.

Enter the bar code of the entry in the UPC Barcode field by placing the cursor in the UPC Barcode field and scanning the bar code.

To select the product settings file for the entry, click the browse (…) button in the Location field. Use standard Windows methods to navigate to the desired product settings file and click Open. Ensure that the selected product type in the Type field matches that of the product settings file specified in the Location field.

Click OK when finished.

Editing an Entry

To Edit an existing entry, select the entry in the Loader Grid and click Edit. The BESTCOMSPlus Settings Loader Tool: Edit Device dialog box appears. The options are identical to those of the Add Device dialog. When the desired changes have been made, click OK.

Deleting an Entry

To delete an entry from the Loader Grid, select the entry and click the Delete button. A prompt appears providing the option to confirm or cancel the deletion.

Uploading an Entry

Select an entry and click Upload. A dialog appears which provides connection options for the appropriate type of device. Refer to the Basler product instruction manual for detailed connection information. Once a connection is established, the product settings associated with the entry are uploaded.

Configuration Settings

For configuration settings, click the Configure button in the bottom left of the Loader Grid. The product tabs on the left represent the compatible Basler products. Each product tab contains tabs for Settings Files and Connection Options. The options on these tabs are described below.

Setting Files Options

Use Saved Path: When enabled, the path specified in the Loader Grid entry is used when uploading the settings file.

Single Folder: When enabled, this specifies a single folder which contains all settings files for the product. The Windows filename specified in the Location field of the Loader Grid entry is searched for in the Single Folder location. For example, all settings files for a product are located in “C:\files”. The Location field in the Loader Grid entry for a device contains “C:\documents\settings\DGC-2020ES Settings.bstx”. The BESTCOMS*Plus* Settings Loader Tool searches in “C:\files” for the file named “DGC-2020ES Settings.bstx”.

Append Bar-Code to Location: When enabled, the bar code is appended to the specified location when uploading the settings file. For example, an entry with the bar code “0002” is located in C:\files\0002 and an entry with the bar code “0003” is located in C:\files\0003.

Logon: If User Name and Password are specified, you will not be prompted for credentials when required.

Save After Upload: After uploading a settings file, the settings are downloaded from the connected device and saved to the specified location, when enabled.

Upload Security: When enabled, the security settings stored in the settings file are uploaded to the device. Credentials will be requested if not already specified.

Figure 16-3 illustrates the Setting Files tab.

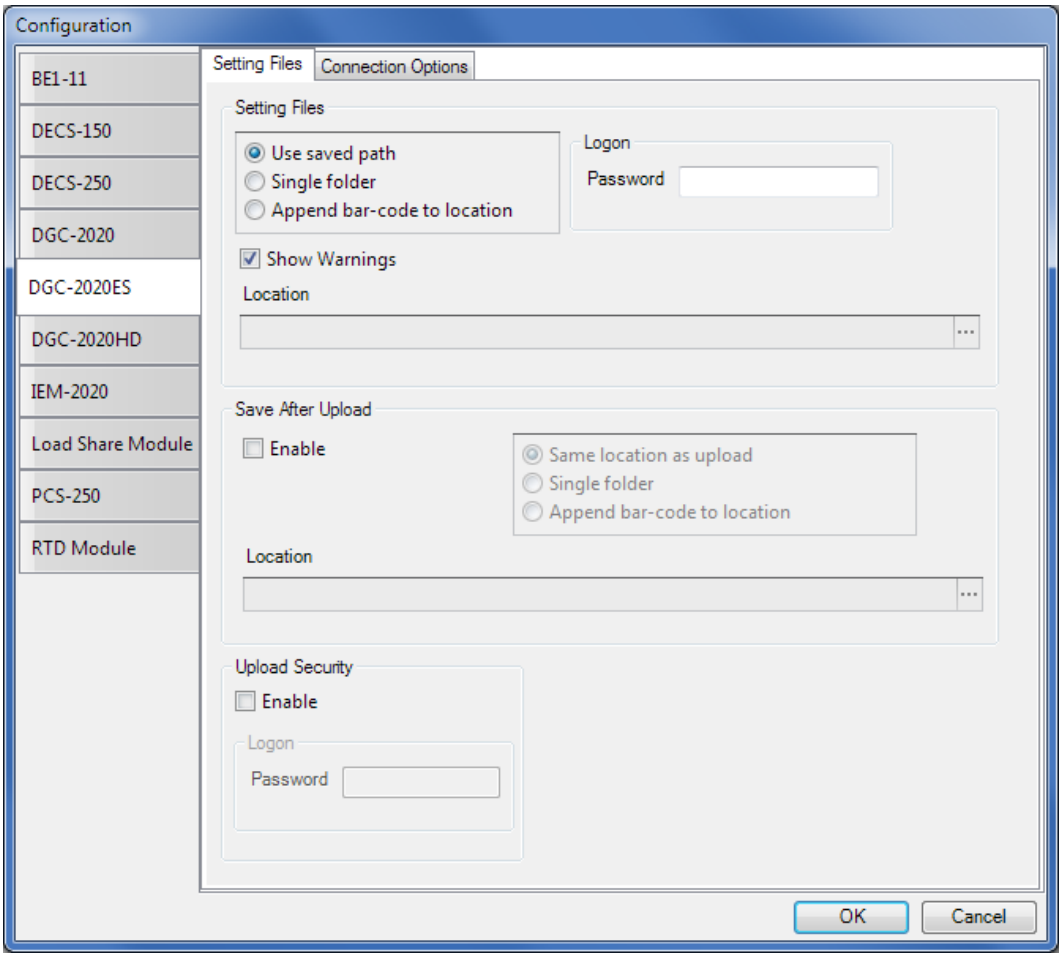


Figure 16-3. Configuration, Settings Files Tab

Connection Options

Connection options consist of the three selections described below. Refer to the Basler product instruction manual for detailed connection information.

Always Prompt for Connection: When enabled, a dialog appears which provides connection options for the appropriate type of device each time a connection attempt is made.

Ethernet Connection: When enabled, the BESTCOMS*Plus* Settings Loader Tool automatically attempts to connect to the specified IP address before uploading settings.

USB Connection: When enabled, the BESTCOMS*Plus*® Settings Loader Tool automatically attempts to connect to the device via USB port before uploading settings.

Figure 16-4 illustrates the Connection Options tab.

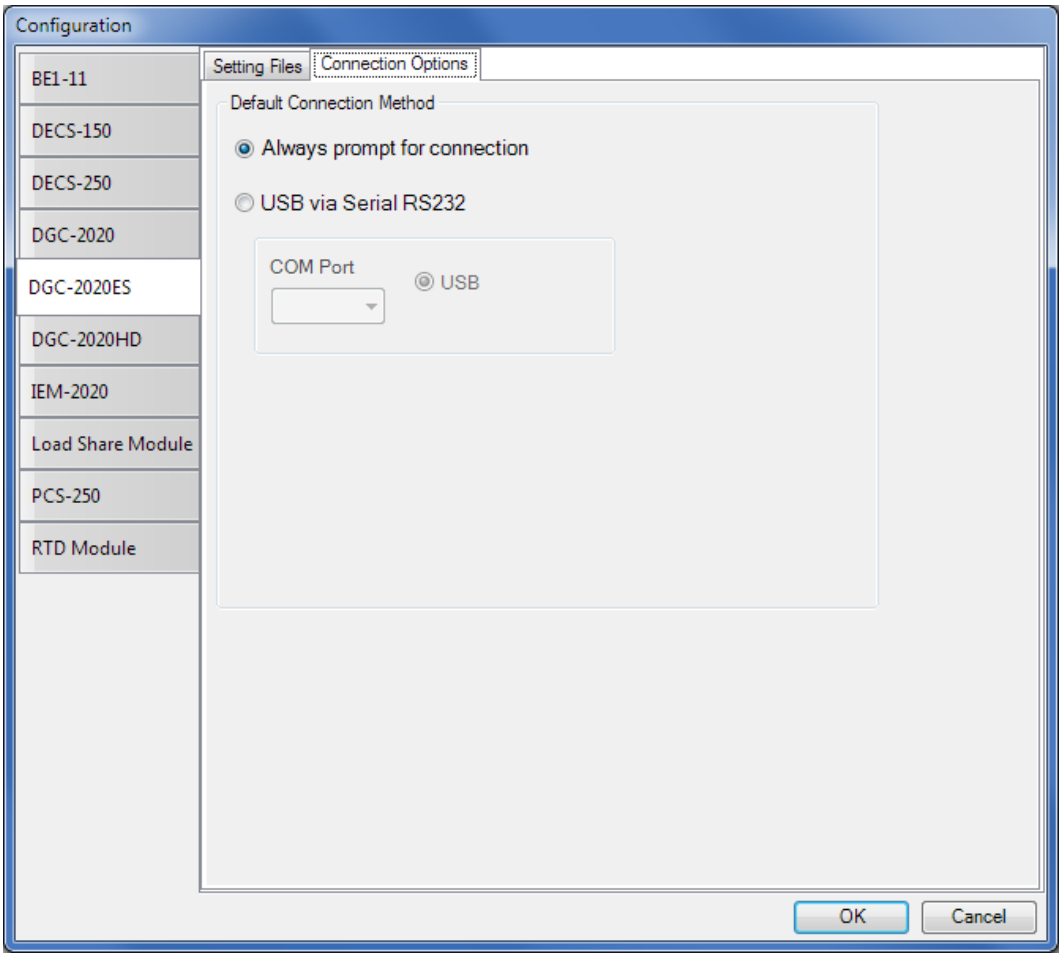


Figure 16-4. Configuration, Connection Options Tab

General Operation

The steps listed below are provided as a general guideline for how to operate the BESTCOMS*Plus* Settings Loader Tool when the initial setup is complete and the settings files are associated with bar codes.

1. Power on the device which will receive the new settings. Ensure proper communication connections have been made between the device and the PC running BESTCOMS*Plus* Settings Loader Tool.
2. Run BESTCOMS*Plus* Settings Loader Tool.
3. Place cursor in search bar.
4. Scan bar code.
5. Settings file is automatically highlighted and isolated in the grid.
6. Click Upload.
7. BESTCOMS*Plus* Settings Loader Tool automatically connects to device and uploads settings. Device connection is automatic unless “Always prompt for connection” is enabled.

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