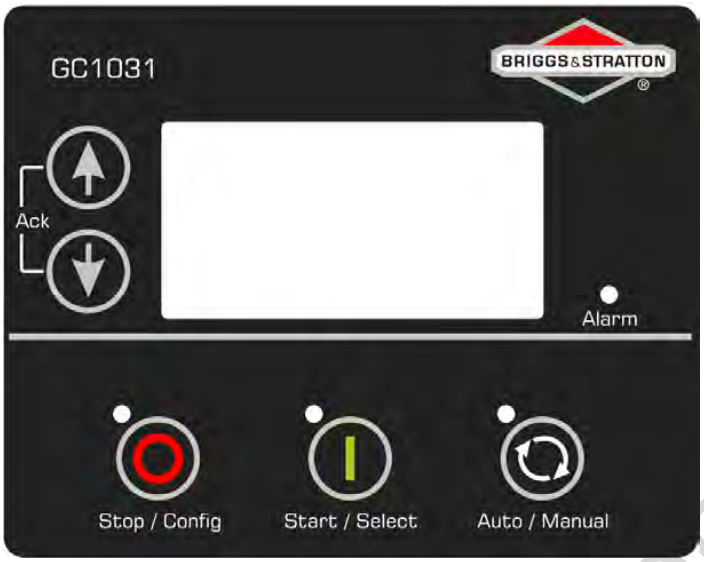


# Operation Instructions
# GC1031
# GENSET Controller





80086364
Revision A

## Safety Definitions

For your safety, the safety of others, and to protect the performance of equipment, obey the warnings in the manual before operation, during operation, and during maintenance procedures.

 indicates a potential personal injury hazard.

 **DANGER**

indicates a hazardous situation which, if not avoided, will result in death or serious injury.

 **WARNING**

indicates a hazardous situation which, if not avoided, could result in death or serious injury.

 **CAUTION**

indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTICE**

indicates a situation which can cause damage to the equipment, personal property and/or the environment, or cause the equipment to operate incorrectly.

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 **WARNING**

Failure to read, understand and obey the instructions in this manual could result in death or serious injury. Read, understand and obey the instructions in this manual before operating this product.

## List of Abbreviations and Acronyms

This list contains the abbreviations and acronyms used in this document. Refer to this list for their respective description.

| Acronym | Description |
|---|---|
| AC | Alternating Current |
| ACK | Acknowledge |
| ALT | Alternator |
| AMF | Auto Mains Failure |
| AUX | Auxiliary |
| AVR | Automatic Voltage Regulator |
| CHG | Charging |
| CKT | Circuit |
| CT | Current Transformer |
| DC | Direct Current |
| DIG IN | Digital Input |
| EGov | Electronic Governor |
| ENG TEMP | Engine Temperature |
| GCU | Genset Control Unit |
| Genset | Generator Set |
| GND | Ground |
| GST | Gain Schedule Trigger |
| HMI | Human Machine Interface |
| HSD | High Side Driver |
| HWT | High Water Temperature |
| ID | Identifier |
| LCD | Liquid Crystal Display |
| LED | Light Emitting Diode |
| LIM | Low Idle Mode |
| LLOP | Low Lube Oil Pressure |
| LOP | Lube Oil Pressure |
| LVL | Level |
| MCP | Manual Control Panel |
| MPU | Magnetic Pickup Unit |
| OV | Over Voltage |
| PF | Power Factor |
| PID | Proportional Integral Derivative |
| PWM | Pulse Width Modulation |
| RMS | Root Mean Square |
| RPM | Revolutions Per Minute |
| RTC | Real Time Clock |
| R-Y-B | Red-Yellow-Blue |
| SCP | Sensor Common Point |
| SMD | State Machine Diagram |
| TEMP | Temperature |
| USB | Universal Serial Bus |
| UV | Under Voltage |
| PF | Power Factor |
| AVR | Automatic Voltage Regulator |

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## Key Highlights of the Product

- Auto, Manual and Remote Start /Stop Modes for 1-phase & 3-phase gensets
- Electronic governor controller integration
- RPM sensing using frequency and MPU
- Supports Auto Exercise Modes
- Real time clock-based event logs
- PC connectivity via USB port, RS485, CAN J1939 protocol
- Backlit and full graphics display with power saving feature

# 1 Installation

## 1.1 Terminal Description

The figure that follows shows the rear view of the controller.

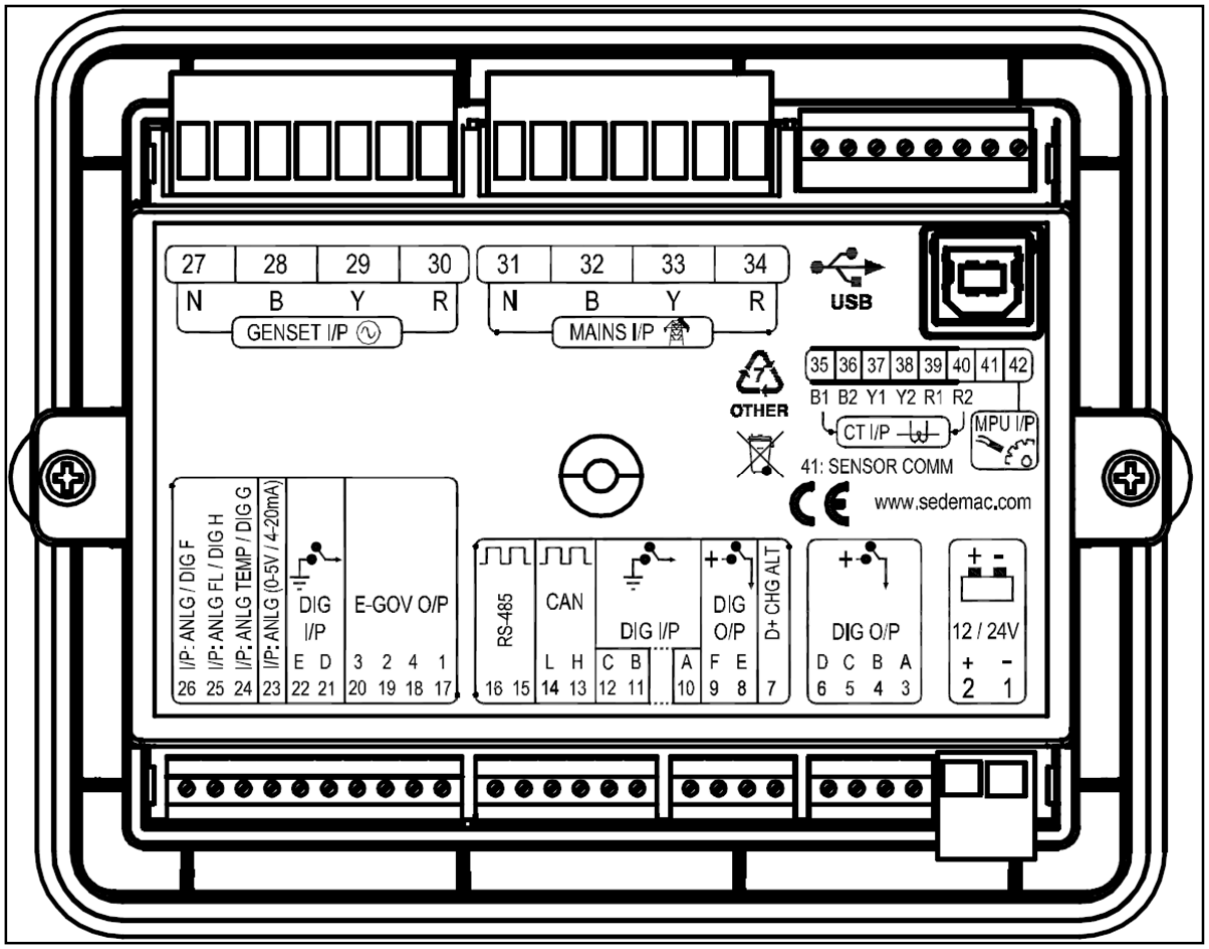


*Figure 1: GC1031 Genset controller from the backside*

*Table 1: Voltage input terminology*

| Sr. No. | System | Terminology 1 | Terminology 2 |
|---|---|---|---|
| 1 | 1 Phase 2 wire | R-N | L1-N |
| 2 | 1 Phase 3 wire | R-Y-N | L1-L2-N |
| 3 | 3 Phase 4 wire | R-Y-B-N | L1-L2-L3-N |

*Table 2: Details of the GC1031 terminals*

| Sr. No. | Name | Description |
|---|---|---|
| 1 | BATT - | Battery negative |
| 2 | BATT + | Battery positive |
| 3 | OUT A | High side driver output – A |
| 4 | OUT B | High side driver output – B |
| 5 | OUT C | High side driver output – C |
| 6 | OUT D | High side driver output – D |
| 7 | D+ CHG ALT | Reserved |
| 8 | OUT E | High side driver output – E |
| 9 | OUT F | High side driver output – F |
| 10 | DIG_IN A | Input from switch – A |
| 11 | DIG_IN B | Input from switch – B |
| 12 | DIG_IN C | Input from switch – C |
| 13 | CAN H | CAN high |
| 14 | CAN L | CAN low |
| 15 | RS485_B | RS485 – B |
| 16 | RS485_A | RS485 – A |
| 17 | GOV_ACT – OUT1 | Output for the Actuator – 1 |
| 18 | GOV_ACT – OUT4 | Output for the Actuator – 4 |
| 19 | GOV_ACT – OUT2 | Output for the Actuator – 2 |
| 20 | GOV_ACT – OUT3 | Output for the Actuator – 3 |
| 21 | DIG_IN D | Input from switch – D |
| 22 | DIG_IN E | Input from switch – E |
| 23 | ANLG_V IN | Analog input 4-20mA for LOP or 2.5 ± 2V |
| 24 | ANLG_IN ENG_TEMP | Analog input from Engine Temperature Sensor |
| 25 | ANLG_IN Fuel Level | Analog input from Fuel Level Sensor |
| 26 | ANLG_IN LOP | Analog input from Lube Oil Pressure Sensor |
| 27 | GEN_V IN NTRL | Voltage input from Gen Neutral |
| 28 | GEN_V IN B | Voltage input from Gen B / L3 |
| 29 | GEN_V IN Y | Voltage input from Gen Y / L2 |
| 30 | GEN_V IN R | Voltage input from Gen R / L1 |
| 31 | MAINS_V IN NTRL | Voltage input from Mains Neutral |
| 32 | MAINS_V IN B | Voltage input from Mains Phase B / L3 |
| 33 | MAINS_V IN Y | Voltage input from Mains Phase Y / L2 |
| 34 | MAINS_V IN R | Voltage input from Mains Phase R / L1 |

| Sr. No. | Name | Description |
|---|---|---|
| 35 | CT – IN B1 | CT input 1 from Phase B / L3 |
| 36 | CT – IN B2 | CT input 2 from Phase B / L3 |
| 37 | CT – IN Y1 | CT input 1 from Phase Y / L2 |
| 38 | CT – IN Y2 | CT input 2 from Phase Y / L2 |
| 39 | CT – IN R1 | CT input 1 from Phase R / L1 |
| 40 | CT – IN R2 | CT input 2 from Phase R / L1 |
| 41 | SENSOR COMM | Sensor common point |
| 42 | MPU I/P (Speed Sensor) | Input from engine speed sensor (Inductive) |

# 2 Description of Control Keys

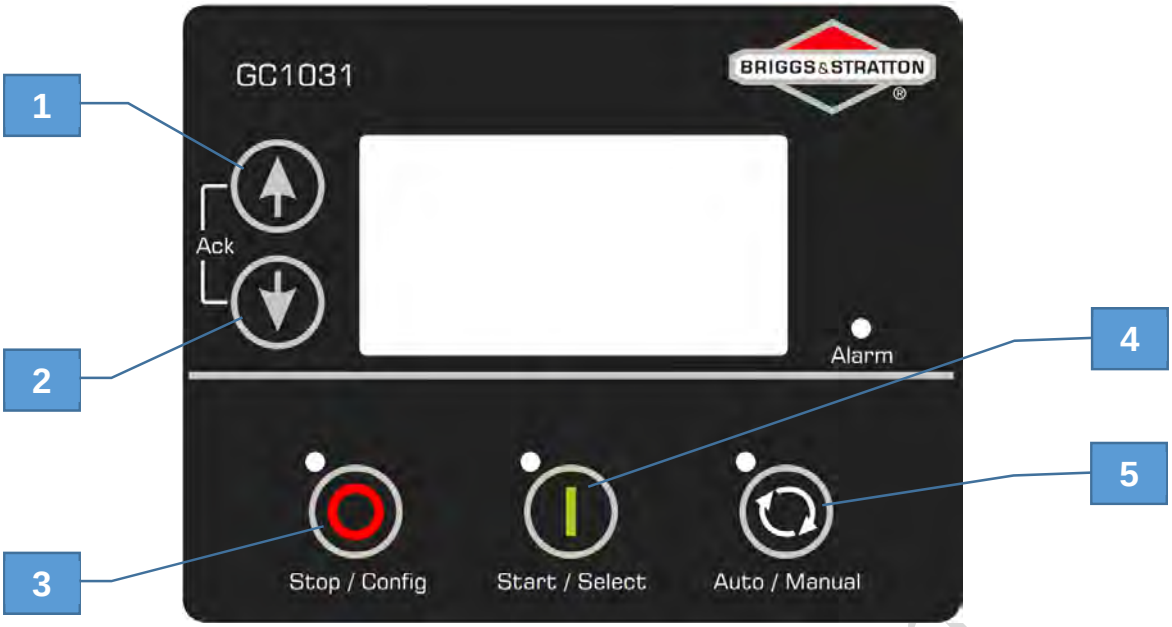


*Figure 2: Control key function*

1. Menu Navigation Up key
2. Menu Navigation Down key
3. Stop/Config key
4. Start/Select key
5. Auto/Manual Mode selection key

## 2.1 Functions of Control Keys

The table that follows gives a brief overview of different functions of control keys in different modes.

*Table 3: Control keys in different modes*

| # | Mode | Key input | Function |
|---|---|---|---|
| 1 | Manual | Start | Starts the engine in LIM |
| | | Start+Start | Exits LIM and operates at normal speed |
| 2 | Manual | Auto | Enters Auto Mode |
| | | Stop | Stops the engine when engine is running |
| | | Stop (long pressed) | Enters Configuration Mode |
| | | Stop + Down (long pressed) | Enters Programming Mode |
| 3 | Auto | Stop | Stops the engine and enters Manual Mode |
| 4 | Manual/Auto/ Configuration | Up/Down | Scrolls the screens/parameter |
| 5 | Manual/Auto | Up + Down | Acknowledges and clears the alarm |
| 6 | Configuration | Start | Selects/saves the parameter |
| 7 | | Up + Down (long pressed) | Enters on event log page |
| 8 | | Stop (long pressed) | Back to Manual Mode |
| 9 | Event log | Up + Down (long pressed) | Back to Configuration Mode |
| 10 | Programming | Up + Down (long pressed) | Controller enters in Application Mode |

# 3 Configuration of GCU

To configure the controller, please do the instructions that follow:

- To enter the configuration mode, push and hold the “STOP” key for at least 3 seconds. The following screen will appear on the GCU:

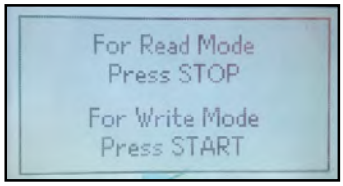


*Figure 3: Configuration mode screen*

- If you want to only view the configuration, push the “STOP” key on the GCU. If you wish to change the configuration, push the “START” key on the GCU.

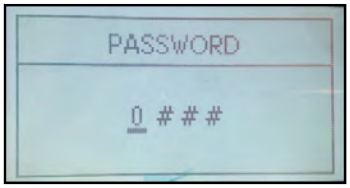


*Figure 4: Configuration mode authentication page screen*

- The GCU will ask for a password (0000). Enter the password by using the up & down arrow key for changing the digit and the “START” key for selecting the digit. The 4 digits will start blinking individually as each one is selected. Press the “START” button as mentioned earlier to enter the correct digit.
- After completion of the parameter configuration, push and hold the “STOP” key to exit from configuration mode. Before exiting from the configuration mode the controller will show the following screen:

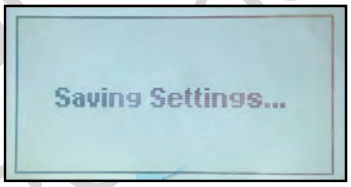


*Figure 5: Saving settings screen*



## 3.1 List of Parameters

The table that follows gives a brief overview of configurable parameters in GC1031 controller.

*Table 4: Parameters*

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| **Module (MODULE)** | General (GENERAL) | ***** Power On Mode (POWER ON MODE) | Manual/Auto |
| | | ***** Power On Lamp Test (POWER ON LAMP TEST) | Disable/Enable |
| | | Load Histogram (LOAD HISTOGRAM) | Disable/Enable |
| | | Auto-Clear Warning Alarm (WARNING AUTO CLEAR) | Disable/Enable |
| | | Language (LANGUAGE) | English |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | Display (DISPLAY) | Contrast (CONTRAST) | 0 – 100 % |
| | | Power Save Mode (POWER SAVE MODE) | Disable/Enable |
| | Communication (COMMUNICATION) | Communication Mode (COMM MODE) | None/MODBUS |
| | | * Slave ID (MODBUS SLAVE ID) | 1 – 247 |
| | | * Baudrate (MODBUS BAUDRATE) | 1200/2400/4800/9600/19200/ 38400/57600/115200 bps |
| | | * Parity Bit (PARITY BIT) | None/Even/Odd |
| | Auto Exercise (AUTO EXERCISE) | Exercise Option (EXER OPTN) | No Exercise/Standard Exercise |
| | | Cycle (EXER CYCLR) | No run/0.1/5/10/15/20 min run |
| | | Event Occurence (EXER EVENT OCCR) | Weekly/Monthly |
| | | Event Day (EXER EVENT DAY) | Weekdays/1 – 28 days |
| | | Start Time (EXER START TIME) | 00:00 – 23:59 hour |
| | | Exercise Skip Enable (EXER SKIP ENABLE) | Yes/No |
| | 45 min Burn Off (45 MIN BURN OFF) | 45 min Burn Off (45 MIN BURN OFF) | Disable/Enable |
| | | Event Month (EVENT MONTH 1) | March/April/May/None |
| | | Event Day (EVENT DAY 1) | 1 - 28 |
| | | Start Time (EVENT START TIME 1) | 00:00 – 23:59 hour |
| | | Event Month (EVENT MONTH 2) | August/September/ October/None |
| | | Event Day (EVENT DAY 2) | 1 - 28 |
| | | Start Time (EVENT START TIME 2) | 00:00 – 23:59 hour |
| **Digital Inputs (INPUTS)** | Digital Input X (DIG IN X) X= A/B/C/D/E | * Source (SOURCE) | |
| | | * Polarity (POLARITY) | Close to Activate/Open to Activate |
| | | * Action (ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Activation (ACTIVATION) | Never/From Engine Start/ From Monitoring On/Always |
| | | * Activation Delay * (ACTIVATION DELAY) | 1 – 60 sec |
| **Analog Inputs** | Analog Input 1 | * Use Input As | Not used/Digital Input G/Anlg |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | (AMB TEMP/DIG G) | (USE INPUT AS) | In Amb Temp |
| | | * Circuit Fault Action (CKT FAULT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Ambient Temperature Sensor Calibration Table | |
| | Analog Input 2 (FUEL LVL/DIG H) | * Use Input As (USE INPUT AS) | Not used/Digital Input H/Anlg In Fuel LVL |
| | | * (Digital) Source ((DIG) SOURCE) | |
| | | * (Digital) Polarity ((DIG) POLARITY) | Close to Activate/Open to Activate |
| | | * (Digital) Action ((DIG) ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * (Digital) Activation ((DIG) ACTIVATION) | Never/From Engine Start/ From Monitoring On/Always |
| | | * (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 – 60 sec |
| | | * Low Fuel Level Shutdown (SHUTDOWN) | Disable/Enable |
| | | * Low Fuel Level Shutdown Threshold (SHUTDOWN THRESHOLD) | 0 – 78 % |
| | | * Low Fuel Level Notification (NOTIFICATION) | Disable/Enable |
| | | * Low Fuel Level Notification Threshold (NOTIFICATION THRESH) | 2 – 80 % |
| | | * Fuel Tank Capacity (FUEL TANK CAPACITY) | 2 – 1000 litre |
| | | * Fuel Theft Warning (FUEL THEFT ALARM) | Disable/Enable |
| | | * Fuel Theft Alarm Threshold (FUEL THEFT THRESHOLD) | 1 – 100 % per hour |
| | | * Circuit Fault Action (CKT FAULT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Fuel Sensor Reference (FUEL SENSOR REFERENCE) | Engine Body/Battery Negative |
| | | * Fuel Level Sensor Calibration Table | |
| | Analog Input 3 (LOP RES/ DIG F) | * Use Input As (SENSOR SELECTION) | Not used/Digital Input F/Anlg In LOP |
| | | * (Digital) Source ((DIG) SOURCE) | |
| | | * (Digital) Polarity ((DIG) POLARITY) | Close to Activate/Open to Activate |
| | | * (Digital) Action ((DIG) ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * (Digital) Activation ((DIG) ACTIVATION) | Never/From Engine Start/ From Monitoring On/ Always |
| | | * (Digital) Activation Delay | 1 – 60 sec |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | ((DIG) ACTIVATION DELAY) | |
| | | * Low Level Shutdown (SHUTDOWN) | Disable/Enable |
| | | * Low Level Shutdown Threshold (SHUTDOWN THRESHOLD) | 0.0 – 9.8 bar |
| | | * Low Level Warning (WARNING) | Disable/Enable |
| | | * Low Level Warning Threshold (WARNING THRESHOLD) | 0.2 – 10.0 bar |
| | | * Circuit Fault Action (CKT FAULT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Lube Oil Pressure Sensor Calibration Table | |
| | Analog Input 4 (LOP CURR/ DIG I) | * Use Input As (SENSOR SELECTION) | Not used/Digital Input I/Anlg In LOP(4 – 20mA) |
| | | * (Digital) Source ((DIG) SOURCE) | |
| | | * (Digital) Polarity ((DIG) POLARITY) | Close to Activate/Open to Activate |
| | | * (Digital) Action ((DIG) ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * (Digital) Activation ((DIG) ACTIVATION) | Never/From Engine Start/ From Monitoring On/ Always |
| | | * (Digital) Activation Delay ((DIG) ACTIVATION DELAY) | 1 – 60 sec |
| | | * Shutdown (SHUTDOWN) | Disable/Enable |
| | | * Shutdown Threshold (SHUTDOWN THRESHOLD) | 0.0 – 9.8 (0.0 – 9.8 Bar) |
| | | * Warning (WARNING) | Disable/Enable |
| | | * Warning Threshold (WARNING THRESHOLD) | 0.2 – 10.0 (0.2 – 10.0 Bar) |
| | | * Circuit Fault Action (CKT FAULT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Lube Oil Pressure Sensor Calibration Table | |
| **Outputs (OUTPUTS)** | Output X (OUT X) X= A/B/C/D/E/F | * Source (SOURCE) | |
| | | * On Activation (ON ACTIVATION) | Energize/De-energize |
| **Timers (TIMERS)** | Cranking (CRANKING TIMER) | * Crank Hold Time (CRANK HOLD TIME) | 3 – 15 sec |
| | | * Crank Rest Time (CRANK REST TIME) | 2 – 60 sec |
| | | * Manual Start Delay (MANUAL START DELAY) | 0 – 30 sec |
| | | * Auto Start Delay (AUTO START DELAY) | 0 – 43200 sec |
| | General Timer | * Safety Monitoring Delay | 10 – 60 sec |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | (GENERAL TIMER) | (SAFETY MONITOR DELAY) | |
| | | Mains Detect Delay (MAINS DETECT DELAY) | 1 – 300 sec |
| | | * Alternator Detect Delay (ALT DETECT DELAY) | 1 – 60 sec |
| | | Warm-Up Delay (WARM UP DELAY) | 0 – 60 sec |
| | | Return To Mains Delay (RETN-TO-MAINS DELAY) | 0 – 600 sec |
| | | * Engine Cooling Time (ENG COOL TIME) | 0 – 300 sec |
| | | * Stop Action Time (STOP ACTION TIME) | 10 – 120 sec |
| | | * Additional Stopping Time (ADDN STOPPING TIME) | 0 – 120 sec |
| | | Load Transfer Delay (LOAD TRANSFER DELAY) | 0 – 60 sec |
| | | Power Save Mode Delay (PWR SAVE MODE DELAY) | 5 – 1800 sec |
| | | Sounder Alarm Time (SOUNDER ALARM TIMER) | 1 – 300 sec |
| | | Auto Exit Config Mode (AUTO EXIT CNFG TMR) | 10 – 1800 sec |
| **Generator (GENERATOR)** | Alternator Configuration (ALT CONFIG) | * Alternator Present (ALT PRESENT) | No/Yes |
| | | * Number Of Poles (NUMBER OF POLES) | 2/4/6/8 |
| | | * AC system (ALT AC SYSTEM) | Single Phase 2 Wire/ Single Phase 3 Wire/ Three Phase 4 Wire (1Ph 2 wire/1Ph 3 wire/3Ph 4 wire) |
| | | * Min Healthy Voltage (MIN HEALTHY VOLT) | 50 – 350 Volt Ph-N |
| | | * Min Healthy Frequency (MIN HEALTHY FREQ) | 10 – 75 Hz |
| | | * Phase Reversal Detection (PHASE REVERSE DETECT) | Disable/Enable |
| | | * Phase Reversal Action (PHASE REVERSE ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Auto Load Transfer (AUTO LOAD TRANSFER) | Disable/Enable |
| | | * Genset Nominal Voltage (NOMINAL VOLTAGE (L-L)) | 100 – 650 Volt L-L |
| | | * Genset Nominal Frequency (NOMINAL FREQUENCY) | 10.0 – 75.0 Hz |
| | Voltage Monitoring (VOLT MONITOR) | * Under-voltage Shutdown (UNDER VOLT SHUTDOWN) | Disable/Enable |
| | | * Under-voltage Shutdown Threshold (UV SHUTDWN THRESHLD) | 50 – 295 Volt Ph-N |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | * Under-voltage Warning (UNDER VOLT WARNING) | Disable/Enable |
| | | * Under-voltage Warning Threshold (UV WARNING THRESHOLD) | 55 – 300 Volt Ph-N |
| | | * Over-voltage Shutdown (OVER VOLT SHUTDOWN) | Disable/Enable |
| | | * Over-voltage Shutdown Threshold (OV SHUTDWN THRESHLD) | 105 – 350 Volt Ph-N |
| | | * Over-voltage Warning (OVER VOLT WARNING) | Disable/Enable |
| | | * Over-voltage Warning Threshold (OV WARNING THERSHOLD) | 100 – 345 Volt Ph-N |
| | Frequency Monitoring (FREQ MONITOR) | * Under-frequency Shutdown (UNDER FREQ SHUTDOWN) | Disable/Enable |
| | | * Under-frequency Shutdown Threshold (UF SHUTDWN THRESHLD) | 10.0 – 59.0 Hz |
| | | * Under-frequency Warning (UNDER FREQ WARNING) | Disable/Enable |
| | | * Under-frequency Warning Threshold (UF WARNING THRESHOLD) | 11.0 – 60.0 Hz |
| | | * Over-frequency Shutdown (OVER FREQ SHUTDOWN) | Disable/Enable |
| | | * Over-frequency Shutdown Threshold (OF SHUTDWN THRESHLD) | 26.0 – 75.0 Hz |
| | | * Over-frequency Warning (OVER FREQ WARNING) | Disable/Enable |
| | | * Over-frequency Warning Threshold (OF WARNING THRESHOLD) | 25.0 – 74.0 Hz |
| | Current Monitoring (CURRENT MONITOR) | * CT Ratio (CT RATIO) | 0 – 8000 / 5 |
| | | * Over-current Action (OVER CURR ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Over-current Threshold (OVER CURR THRESHOLD) | 5 – 10000 Amp |
| | | * Over-current Delay (OVER CURR DELAY) | 1 – 600 sec |
| | | * CT Location (CT LOCATION) | On Load Cable/On Alt Output Cable |
| | Load Monitoring (LOAD MONITOR) | * Generator Rating (GEN RATING) | 0 – 8000 kW |
| | | * Over-load Action (OVERLOAD ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Over-load Threshold (OVERLOAD THRESHOLD) | 50 – 150 % |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | * Over-load Monitoring Delay (OVERLOAD MON DELAY) | 1 – 600 sec |
| | | * Unbalanced Load Action (UNBAL LOAD ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Unbalanced Load Threshold (UNBAL LOAD THRESHOLD) | 5 – 200 % |
| | | * Unbalanced Load Delay (UNBAL LOAD DELAY) | 1 – 600 sec |
| | | * Extended Over-load Trip (EXT OL TRIP) | Disable/Enable |
| | | * Extended Over-load Trip Threshold (EXT OL THRESHOLD) | 50 – 150 % |
| **Mains (MAINS)** | Configuration (MAINS CONFIG) | Mains Monitoring (MAINS MONITORING) | Disable/Enable |
| | | * Mains AC system (MAINS AC SYSTEM) | Single Phase 2 Wire/Single Phase 3 Wire/Three Phase 4 Wire (1Ph 2 wire/1Ph 3 wire /3Ph 4 wire) |
| | | * Phase Reversal Detection (PHASE REVERSE DETECT) | Disable/Enable |
| | | * Phase Reversal Action (PHASE REVERSE ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | Under-voltage Monitoring (UNDER VOLT MON) | * Under-voltage (ENABLE) | Disable/Enable |
| | | * Trip (TRIP) | 50 – 298 Volt Ph-N |
| | | * Return (RETURN) | 52 – 300 Volt Ph-N |
| | Over-voltage Monitoring (OVER VOLT MON) | * Over-voltage (ENABLE) | Disable/Enable |
| | | * Trip (TRIP) | 102 – 350 Volt Ph-N |
| | | * Return (RETURN) | 100 – 348 Volt Ph-N |
| | Under-frequency Monitoring (UNDER FREQ MON) | * Under-frequency (ENABLE) | Disable/Enable |
| | | * Trip (TRIP) | 10.0 – 59.0 Hz |
| | | * Return (RETURN) | 11.0 – 60.0 Hz |
| | Over-frequency Monitoring (OVER FREQ MON) | * Over-frequency (ENABLE) | Disable/Enable |
| | | * Trip (TRIP) | 26.0 – 75.0 Hz |
| | | * Return (RETURN) | 25.0 – 74.0 Hz |
| **Engine (ENGINE)** | Crank Disconnect (CRANK DISCON) | * Start Attempts (START ATTEMPTS) | 1 – 9 |
| | | * Disconnect On Oil Pressure | Disable/Enable |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | Sensor (DISCONN ON LOP SENS) | |
| | | * Pressure Sensor Monitoring Threshold (DISCONN LOP THRESH) | 0.5 – 10.0 bar |
| | | * Monitor Pressure Switch Before Crank (MON LLOP BEFR CRANK) | Disable/Enable |
| | | * Monitor Pressure Sensor Before Crank (MON LOP BEFR CRANK) | Disable/Enable |
| | | * Disconnect On Oil Pressure Switch (DISCONN ON LLOP SW) | Disable/Enable |
| | | * Pressure Switch Transient Time (LLOP SW TRANS TIME) | 0.0 – 3.0 sec |
| | | * Crank Disconnect At Alt Frequency (DISCONN AT ALT FREQ) | 10 – 70 Hz |
| | | * Crank Disconnect At Engine Speed (DISCONN AT ENG SPEED) | 150 – 4000 rpm |
| | Speed Monitoring (SPEED MONITOR) | * Engine Speed Sense Source (SPEED SENSE SOURCE) | Sensor input only/ Alternator output only/ Primary Sensor/Secondary Alternator/ Primary Alternator/Secondary Sensor |
| | | * Flywheel Teeth (FLYWHEEL TEETH) | 1 – 300 |
| | | * Under-speed Shutdown (UNDER SPEED SHUTDOWN) | Disable/Enable |
| | | * Under-speed Threshold (UNDER SPD THRESHOLD) | 0 – 3600 rpm |
| | | * Under-speed Delay (UNDER SPD DELAY) | 1 – 60 sec |
| | | * Over-speed Threshold (OVER SPD THRESHOLD) | 700 – 4500 rpm |
| | | * Over-speed Delay (OVER SPEED DELAY) | 0.1 – 20 sec |
| | | * Gross Over-speed Threshold (GROSS OS THRESHOLD) | 100 – 200 % |
| | Battery Monitoring (BATTERY MONITOR) | * Low Battery Voltage Action (LOW VOLT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |
| | | * Low Battery Voltage Threshold (LOW VOLT THRESHOLD) | 8.0 – 31.0 volt |
| | | * Low Battery Voltage Delay (LOW VOLT DELAY) | 5 – 1800 sec |
| | | * High Battery Voltage Action (HIGH VOLT ACTION) | None/Notification/Warning/ Electrical Trip/Shutdown |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | * High Battery Voltage Threshold (HIGH VOLT THRESHOLD) | 9.0 – 32.0 volt |
| | | * High Battery Voltage Delay (HIGH VOLT DELAY) | 5 – 1800 sec |
| **Maintenance (MAINTENANCE)** | Maintenance Alarm (MAINT ALARM) | Alarm Action (ACTION) | Notification/Warning |
| | | Due At Engine Hours (DUE AT ENGINE HOURS) | 10 – 65000 Hrs |
| | Alarm Due Date (ALARM DUE DATE) | Alarm Due Date | DD/MM/YYYY |
| **Rotary Actuator (ROTARY ACTUATOR)** | General (GENERAL) | * Actuator Application (ACTUATOR APPLN) | As E-Governor/As Start / Stop Device |
| | | * Actuator Speed (ACTUATOR SPEED) | 1 – 10 x 25 Hz |
| | | * Actuator Direction (ACTUATOR DIRECTION) | (Clockwise/Anti–Clockwise) to Stop |
| | Engine Start Strategy (ENG START STRGY) | * Cranking Steps (CRANKING STEPS) | 5 – 5000 |
| | | * Initial Low Speed Delay (INIT LOW SPEED DELAY) | 0 – 180 sec |
| | | * Initial Low Speed (INIT LOW SPEED) | 500 – 1800 RPM |
| | | * PID Trigger Speed (PID TRIGGER SPEED) | 20 – 2800 RPM |
| | | * Ramp Up Time (RAMP UP TIME) | 1 – 180 sec |
| | | * PID on Time (PID ON TIME) | 1 – 180 sec |
| | | * LIM P Gain (LIM P GAIN) | 0 – 1000 |
| | | * LIM I Gain (LIM I GAIN) | 0 – 2000 |
| | | * LIM D Gain (LIM D GAIN) | 0 – 1000 |
| | | * Cold Sweep Enable (COLD SWEEP ENABLE) | Yes/No |
| | | * Cold Sweep Angle (COLD SWEEP ANGLE) | 0 – 180 Deg |
| | Generator EGov Configuration (GEN EGOV CNFG) | * Set Speed Selection (SET SPEED SELECTION) | Fixed Speed(0% Droop)/ Speed Bias Input (0-5 V)/ Load Based Droop |
| | | * Droop (DROOP) | 0 – 4 % |
| | | * Target Speed (TARGET SPEED) | 500 – 4000 RPM |
| | | * Proportional Gain (Kp) (PROPORTIONAL GAIN) | 0 – 1000 |
| | | * Integral Gain (Ki) | 0 – 2000 |

| Level 0 | Level 1 (On screen) | Level 2 (On screen) | Parameters (On screen) |
|---|---|---|---|
| | | (INTEGRAL GAIN) | |
| | | * Derivative Gain (Kd) (DERIVATIVE GAIN) | 0 – 1000 |
| | | * Friction Setoff (FRICTION SETOFF) | 0 – 1000 |
| | | * Gain Schedule Trigger (GAIN SCHEDULE TRIGGER) | 0.0 – 100.0 % |
| | | * Loading Factor (LOADING FACTOR) | 0 – 1000 |
| | | * Unloading Factor (UNLOADING FACTOR) | 0 – 1000 |
| | Start/Stop Configuration (STR/STP DEV CNFG) | * Running Steps (RUNNING STEPS) | 0 – 500 |
| (MISC SETTINGS) | PASSWORD 1 | * #### | 0 – 9 for each digit |
| | PASSWORD 2 | #### | 0 – 9 for each digit |
| | PASSWORD 3 | #### | 0 – 9 for each digit |
| (RESET COUNTERS) | (GENSET) | * (RUN TIME) | (In hours) |
| | | (NO. OF STARTS) | (In numbers) |
| | | (NO. OF TRIPS) | (In numbers) |
| (SELECT PROFILE) | (SELECT PROFILE) | (Profile Name) | A – Z, 0 – 9 |
| (DATE AND TIME) | (DATE) | (DD / MM / YYYY) | 0 – 9 for each digit |
| | (TIME) | (Hours) | (In hours) |
| (ACTUATOR TEST) | (ACTUATOR TEST) | (ENABLE) | Yes/No |
| | | (TEST DURATION) | 0 – 10 sec |

*** Note:** Certain parameters can only be changed by the dealer while others can only be changed by the manufacturer (designated by an *). Some default parameters are subject to change during firmware updates per the manufacturer. The dealer password is available on the Briggs and Stratton® Power Portal.



# 4 Operating Modes

There are two modes of operation:

- Auto Mode
- Manual Mode

## 4.1 Auto Mode

To enter Auto Mode, push the “AUTO” key. While in Auto Mode, the generator will start and run under any one of these conditions:

- Auto Mains Failure (AMF)
- Remote Start/Stop (2 Wire)
- Auto Exercise

### 4.1.1 Auto Mains Failure (AMF)

When the Mains Monitoring is enabled (default setting) in the Mains configuration and the controller is in the Auto Mode, AMF mode gets activated.

In this mode, if the Mains is healthy, the genset remains in the OFF condition. When the Mains voltage drops below a certain threshold, the controller gives a start command. Once the genset is started and its loading parameters reach the threshold values, the genset contactor is latched and the load is

transferred to  the genset. If the Mains voltage returns to normal, the controller will sense this and return the load back to the Mains, further it will stop the genset after a cool down period.

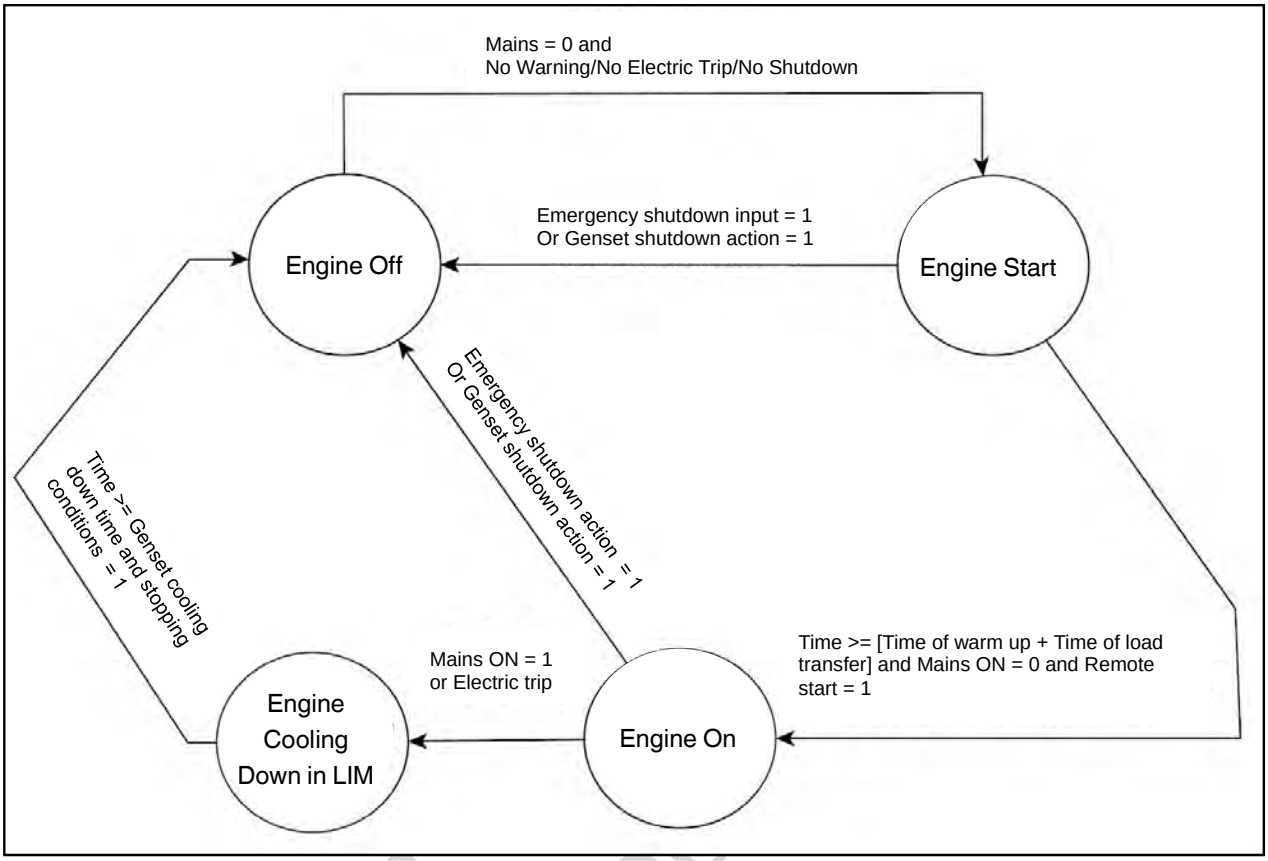


*Figure 6: SMD for AMF mode*

### 4.1.2 **Remote Start/Stop (2 Wire)**

To use the Remote Start/Stop Mode of the controller, the Mains monitoring should be disabled **first** before using the Remote Start/Stop feature.

In this mode, the genset can be commanded to start and stop by activating/deactivating the preconfigured Remote Start/Stop input (active low) in a continuous state. The controller will latch the genset contactor when the controller confirms that the engine and genset are healthy. When the preconfigured input is deactivated the controller will open the genset contactor and stop the genset with a pre-defined sequence.

### 4.1.3 **Auto Exercise Mode**

The controller contains a built-in exerciser that is capable of automatically starting and stopping the genset for periodic maintenance runs. The standard exercise option will be selected by default and it will have 6 runtime options. It will have a default 0.1min (6s) cycle enabled with an option to choose from 5min /10min /15min /20min / None runtimes. The selected runtime can be scheduled to run once weekly / monthly. The run is dependent on the ambient temperature of the genset. If the ambient temperature is below 40ºF then the exercise will be skipped. The skipping of the exercise based on ambient temperature is selectable through a parameter which is by default enabled. The optional settings for the 45min burn-off are:

- Event1: March / April / May / None
- Event2: August / September / October / None

The 45min burn-off cycle will override the check for the value of ambient temperature and will have precedence over the other scheduled exercise cycles. Exercise will occur when the controller is in Auto Mode with no shutdown or warning alarms. Load transfer will not be allowed in the Auto-Exercise Mode of operation. In case the ambient temperature sensor is not configured, the controller will skip the temperature check and continue the standard scheduled exercise cycle as it is.

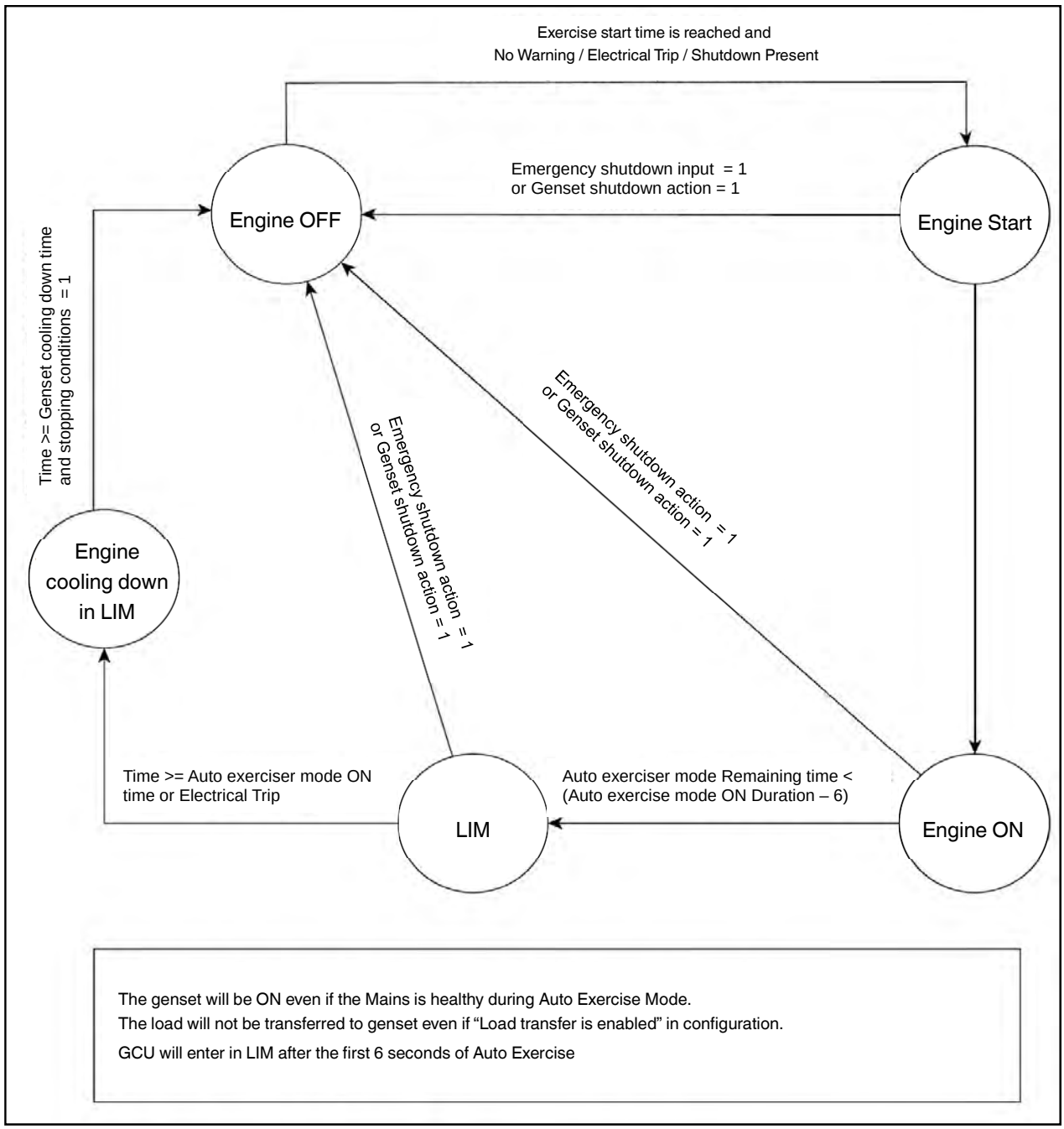


*Figure 7: SMD for auto exercise mode*

## 4.2 **Manual Mode**

In Manual mode, the genset starting and stopping must be done manually, through keypad input. The controller will accept inputs and act accordingly. However, if the controller senses that the genset is in an unhealthy state it will take appropriate action.

On first start, the engine runs in Low Idle Mode (LIM). When the “Start” key is pressed again, the engine runs at the normal set speed.

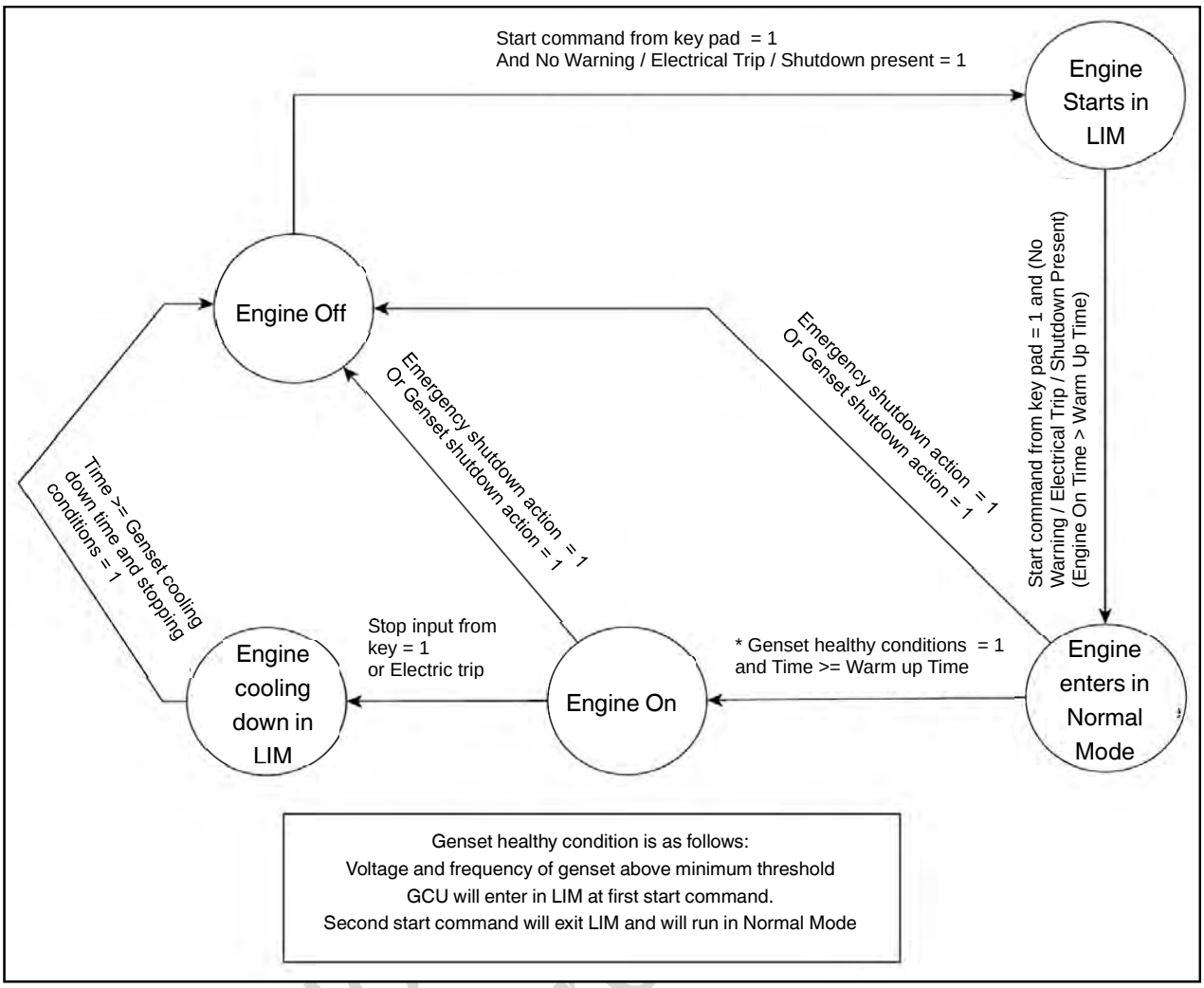


*Figure 8: SMD for manual mode*

### 4.2.1 **Low Idle Mode (LIM)**

The intent of this mode is to run the genset at lower than normal speed when the genset is not connected to external loads. This will reduce overall noise.

While operating in this mode, the controller will only take defined actions on critical faults (Over voltage, Over frequency, Over current, Over temperature, LOP) and will ignore non-critical faults.

# 5 Alarms

An alarm condition occurs when a preconfigured parameter is outside of a pre-set level. On initiation of an alarm, the Alarm LED will start blinking and the fault output pin will be activated if configured. The controller will display the name of the alarms along with a count on the ALARMS screen and the nature of alarm on the ENGINE STATUS screen. For acknowledging and clearing the alarms, press the "UP + DOWN" keys simultaneously. Alarms are ignored until the end of the Safety Monitoring Start Delay duration. The controller will not issue the start command if the Shutdown Alarm is left unacknowledged. Table 5 shows the types of alarm actions whereas Table 6 shows types of alarms. Please refer to Table 5 and Table 6.

*Table 5: Alarm actions*

| # | Alarm Actions | Description |
|---|---|---|
| 1 | Notification | Controller will display message on the display screen, and this will not affect the genset start stop operation. |
| 2 | Warning | Warning alarms serves to draw operator's attention to an undesirable condition without affecting genset's operation in genset ON condition.<br>The genset cannot be started without acknowledging the warning alarms. |
| 3 | Electrical trip | In this alarm action type the engine cool down timer begins, after which the genset is stopped. |
| 4 | Shutdown | In this alarm the genset is immediately stopped. |

*Table 6: Alarms and their causes*

| Sr. No. | Alarms | Causes |
|---|---|---|
| 1 | Low Oil Pressure Sensor | Indicates that the oil pressure measured is below the pre-set threshold |
| 2 | Low Oil Pressure Switch | Indicates that the oil pressure measured is below the pre-set threshold |
| 3 | High Oil Pressure Sensor | Indicates that the oil pressure measured is above the pre-set threshold |
| 4 | High Oil Pressure Switch | Indicates that the oil pressure measured is above the pre-set threshold |
| 5 | High Engine Temperature sensor | Indicates that the engine temperature is above the pre-set threshold |
| 6 | High Engine Temperature switch | Indicates that the engine temperature is above the pre-set threshold |
| 7 | Anlg LOP (Pin 26) Ckt Open | The oil pressure sensor is detected as not being present |
| 8 | Amb Temp (Pin 24) Ckt Open | The temperature sensor is detected as not being present |
| 9 | Emergency Stop | Configured as digital input has triggered longer than pre-set duration or when the immediate shutdown is required |
| 10 | Fail To Stop | Indicates that genset has not stopped after sending Stop command |
| 11 | Fail To Start | Indicates that genset has not started after the pre-set number of Start attempts |
| 12 | R/L1 Phase Over Voltage | Indicates that genset L1(R) Phase voltage has exceeded the pre-set over voltage threshold. |
| 13 | Y/L2 Phase Over Voltage | Indicates that genset L2(Y) Phase voltage has exceeded the pre-set over voltage threshold |
| 14 | B / L3 Phase Over | Indicates that genset L3(B) Phase voltage has exceeded |

| Sr. No. | Alarms | Causes |
|---|---|---|
| | Voltage | the pre-set over voltage threshold |
| 15 | R/L1 Phase Under Voltage | Indicates that genset L1(R) Phase voltage has fallen below pre-set under voltage threshold. |
| 16 | Y/L2 Phase Under Voltage | Indicates that genset L2(Y) Phase voltage has fallen below pre-set under voltage threshold |
| 17 | B / L3 Phase Under Voltage | Indicates that genset L3(B) Phase voltage has fallen below pre-set under voltage threshold |
| 18 | Genset Phase Reversal | Alternator phase sequence is not correct |
| 19 | Over Frequency | Indicates that genset output frequency has exceeded the pre-set threshold |
| 20 | Under Frequency | Indicates that genset output frequency has fallen below the pre-set threshold |
| 21 | Over Current | Indicates that genset current has exceeded the pre-set shutdown threshold |
| 22 | Over Load | Indicates that the measured kW load rating has exceeded the pre-set threshold |
| 23 | Unbalanced Load | Load on any phase is greater or less than other phases by a threshold value |
| 24 | Over Speed | Indicates that genset speed has exceeded the pre-set over speed threshold |
| 25 | Gross over speed | Indicates that genset speed has exceeded the pre-set gross over speed threshold |
| 26 | Under Speed | The engine speed has fallen below the pre-set RPM |
| 27 | Extended Over Load Trip | Indicates that there was 100% load on the genset for one hour in the time interval of last 12 hours |
| 28 | Battery Under Voltage | The battery voltage has fallen below the pre-set threshold |
| 29 | Battery Over Voltage | The battery voltage has exceeded the pre-set threshold |
| 30 | Maintenance Due | Indicates that engine running hours has exceeded the pre-set hours limit or maintenance due date has occurred, and filter servicing is required. |
| 31 | Mains Phase Reversal | Indicates the Mains unhealthy condition |
| 32 | AVR Fault | Generic fault |
| 33 | No speed signal | If signal is not received when MPU speed signal source is selected in engine running condition. |
| 34 | Speed Sensor I/P Lost | If engine speed sensing through sensor is enabled and GCU is not getting any signal from speed sensor. |
| 35 | High Voltage Failure | If the voltage generated during the auto-exercise is too high |
| 36 | Low Voltage Warning | If the voltage generated during the auto-exercise is too low |
| 37 | Alternator Input Lost | If the alternator signal is lost |
| 38 | Low Voltage Failure | If the voltage generated during the auto-exercise is too low |
| 39 | Auto Exercise Skipped | If ambient temperature is less than 40°F and auto exercises time occurs, GCU skips exercise and gives this |

| Sr. No. | Alarms | Causes |
|---|---|---|
| | | alarm. Clears at the next successful exercise cycle |

# 6 Troubleshooting

**WARNING**

**Autostart Hazard.** With the battery connected the generator may crank and start without warning, resulting in death or serious injury. Before servicing, stop the generator and disconnect the negative (-) cable at the battery.

**WARNING**

**Electric shock hazard.** Electric shock could result in death or serious injury.

- Do not install or remove current transformer when generator is operating.
- Place generator in off position and remove controller fuse before servicing.
- Disconnect all sources of electricity before installing or servicing equipment.

*Table 7: Common faults and their remedial actions*

| Sr. No. | Faults | Remedial Actions |
|---|---|---|
| **Possible Issues in MANUAL Mode** | | |
| **1** | The controller does not power ON. | • Check the battery voltage.<br>• Check the fuse on the battery supply.<br>• Check continuity between battery positive and controller terminal # 2.<br>• Check continuity between battery negative and controller terminal # 1. |
| **2** | The controller fails to crank-start the engine. | • Check the battery voltage.<br>• Enter “Configuration Mode” in controller and verify the configuration for the “START” output. Also, check that “START” output is working correctly by measuring its output voltage.<br>• Enter “Configuration Mode” in controller and verify the configuration of “CRANK DISCONNECT” method. |
| **3** | The “Emergency Stop” alarm comes up even when the “Emergency Stop” is not pressed. | • Check if the “Emergency Stop” switch is working OK. Check its wiring also.<br>• Enter “Configuration Mode” in controller and verify the configuration of “EMERGENCY STOP” polarity. |
| **4** | The controller generates unnecessary “Shutdown Alarms” or “Warning Alarms” | • Check the respective switch/sensor and wiring.<br>• Enter “Configuration Mode” in the controller and verify the respective threshold configuration. |
| **5** | The engine runs, but the controller shows genset to be “OFF”. | • Check if the MPU signal (if used), and main alternator voltage signal (R/L1 phase) are received by the controller terminals.<br>• Check if the LOP and LLOP are working OK. Also check their wiring to the controller. |
| **6** | The controller displays incorrect PF value or kW or load current. | • Check wiring of the respective alternator phase voltage and the CT to the controller.<br>• Check the CT ratio (if kW or current reading is faulty). |
| **7** | The controller displays incorrect Mains voltage or incorrect main alternator voltage. | • Check the wiring of the respective phase to the controller. |
| **8** | Controller displays incorrect reading for any of LOP, Fuel Level, Temperature sensors. | • Check respective sensor and its wiring.<br>• Enter “configuration mode” in the controller and verify the calibration for the respective sensor in configuration. |
| **9** | The controller displays incorrect engine RPM. | • Check the MPU connection and configuration (if enabled).<br>• Check wiring of the main alternator’s R-phase and neutral to the controller. |

| | | |
|---|---|---|
| **Possible Issues in AUTO Mode** | | |
| **10** | The controller does not start the engine even when a “Remote Start” command is sent from an external device such as a telecom PIU. | • Check the wiring of the “Remote Start” signal to the controller's respective digital input terminal.<br>• Enter “Configuration Mode” in the controller and verify the configuration for the “Remote Start” digital input terminal.<br>• Check that the controller is in “Auto Mode. ”<br>• For 2 wire start verify “MAINS MONITORING” is disabled |
| **11** | Controller does not stop engine even when a “Remote Stop” command is sent from an external device such as a telecom PIU. | • Check the wiring of the “Remote Stop” signal to the controller's respective digital input terminal.<br>• Enter “Configuration Mode” in the controller and verify the configuration for the “Remote Stop” digital input terminal.<br>• Check that the controller is in “Auto Mode. ” |
| **12** | While in Auto Mode, controller issues “Start” command even if the Mains present. | • Check the wiring of the Mains R, Y and B phase to the controller's respective input terminal.<br>• Enter “Configuration Mode” in the controller and verify the configuration for the “MAINS MONITORING”. |
| **Possible Issues with Electronic Governing** | | |
| **13** | The controller does not maintain the target RPM.<br>The engine RPM is not stable or engine hunts.<br>The controller cranks the engine but does not start the engine. | • Check the wiring of the actuator to the controller's terminal.<br>• Check if the mechanical linkage assembly is OK.<br>• Enter “Configuration Mode” in the controller and verify the configuration for “GOVERNOR”. Also, check the PID control gains.<br>• Check that the Actuator moves to full throttle position when the engine is cranked. |

# Notes

**Disclaimer: Due to continuous development, the details provided in this document are subject to change without any prior notice.**