

## Clarification of notation used within this manual:



**WARNING**

**WARNING:**

A **WARNING** indicates a potentially hazardous situation which, if not avoided, could result in death, serious personal injury or property damage.



**CAUTION**

**CAUTION:**

A **CAUTION** indicates a potentially hazardous situation which, if not avoided, could result in damage to equipment or property.



**NOTE:**

A **NOTE** provides other helpful information that does not fall under the warning or caution categories.



**WARNING**

## **WARNING:**

Read this entire manual pertaining to the work to be performed before installing, operating, or servicing this controller. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine or other type of prime mover should be equipped with an overspeed shutdown device to protect against runaway or damage to the prime mover with possible personal injury, loss of life, or property damage.

The overspeed shutdown device must be totally independent of the prime mover control system. An over temperature or low pressure shutdown device may also be needed for safety, as appropriate.



**CAUTION**

## **CAUTION—BATTERY CHARGING**

To prevent damage to a controller that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Controllers contain static-sensitive parts. Observe the following precautions to prevent damage to these parts:

Do not disassemble the rear back of controller or touch the components and conductors on the printed circuit board.

## **Contents**

|  |           |
|--|-----------|
| <b>1. Description .....</b>                                      | <b>4</b>  |
| <b>2. Outline Dimension Drawings and Controller Wiring .....</b> | <b>5</b>  |
| <b>3. Panel Operation .....</b>                                  | <b>8</b>  |
| <b>4. Installation Guide.....</b>                                | <b>10</b> |
| <b>5. Control and Operation Instruction.....</b>                 | <b>10</b> |
| <b>6. Measure and Display Data .....</b>                         | <b>16</b> |
| <b>7. Pre-alarm and Shutdown Alarm .....</b>                     | <b>16</b> |
| <b>8. Parameter Settings .....</b>                               | <b>20</b> |
| <b>9. LCD Display and Menu System.....</b>                       | <b>27</b> |
| <b>10. Preparation before Starting the Controller .....</b>      | <b>31</b> |
| <b>11. Technical Specification.....</b>                          | <b>31</b> |

## 1. Description

The GU601A is an Auto Control and Safety Protect Module for Genset. Either AUTO or MAN mode can be chosen through the panel push button. When the controller is running in MANUAL mode, the Start and Stop push buttons control the starting of the Genset. In AUTO mode, the preset “remote start signal” controls the Genset. The module displays operational status and parameters on the front panel LCD. Its main characteristics as below:

- Adopts MPU as core.
- The protective parameters can be configured neatly through the panel push button and LCD.
- Measure and display parameters, such as frequency and voltage of generator, battery voltage, oil pressure, coolant temperature and running hour of the engine.
- Set fuel mode (N.C. or N.O.) via procedure.
- 5 relay control outputs, except for fuel and start (crank) relay output, the rest are configurable.
- 5 digital inputs, except for oil pressure and engine temperature, the rest are configurable.
- With optional modes of built-in P/T-sensor for user.
- Equipped with built-in communication interface to configure parameters by PC.
- All connections of controller are connected by pin locked up terminals, easier and more convenient to connect, move, maintain and replace the device.

**This manual is only suitable for GU601A Intelligent Controller, user must carefully read this manual first.**

## 2. Outline Dimension Drawings and Controller Wiring

### 2.1 Following Details:

|                   |                            |
|-------------------|----------------------------|
| Module Dimensions | W88mm×H75mm                |
| Panel Cutout      | W78mm×H65mm                |
| Thickness         | D48mm (without connection) |



## 2.2 Terminal Connections:

| Pin no. | Function Description                | Signal                                     | Dim              |
|---------|-------------------------------------|--|------------------|
| 1       | Phase voltage input                 | 0-300Vac                                   | 1mm <sup>2</sup> |
| 2       | Neutral                             |  | 1mm <sup>2</sup> |
| 3       | LOP sensor or switch signal         | LOP sensor (<2KΩ)                          | 1mm <sup>2</sup> |
| 4       | HET sensor or switch signal         | HET sensor (<2KΩ)                          | 1mm <sup>2</sup> |
| 5       | Configurable digital input signal 1 | low level is active                        | 1mm <sup>2</sup> |
| 6       | Configurable digital input signal 2 | low level is active                        | 1mm <sup>2</sup> |
| 7       | Configurable digital input signal 3 | low level is active                        | 1mm <sup>2</sup> |
| 8       | Fuel solenoid relay output          | N.O. contact,<br>3A/30Vdc                  | 1mm <sup>2</sup> |
| 9       | Start (Crank) relay output          | N.O. contact,<br>3A/30Vdc                  | 1mm <sup>2</sup> |
| 10      | Configurable output relay 1         | N.O. contact,<br>3A/30Vdc                  | 1mm <sup>2</sup> |
| 11      | Configurable output relay 2         | N.O. contact,<br>3A/30Vdc                  | 1mm <sup>2</sup> |
| 12      | Configurable output relay 3         | N.O. contact,<br>3A/30Vdc                  | 1mm <sup>2</sup> |
| 13      | Charge excitation power output      | if not used, do not<br>connect to negative | 1mm <sup>2</sup> |
| 14      | Battery supply {+}                  | 12V/24V (8-35Vdc<br>continuous)            | 1mm <sup>2</sup> |
| 15      | Battery supply {-}                  |  | 1mm <sup>2</sup> |



### NOTE:

- Pin no. "3" and "4" is for "LOP sensor or switch signal" and "HET sensor or switch signal" input respectively. Either switch or sensor can be chosen. When sensor is used, according to the actual situation, increase the cross section area of cable to reduce the cable resistance from controller to engine, to ensure the accuracy of measured values for both oil pressure and engine temperature.

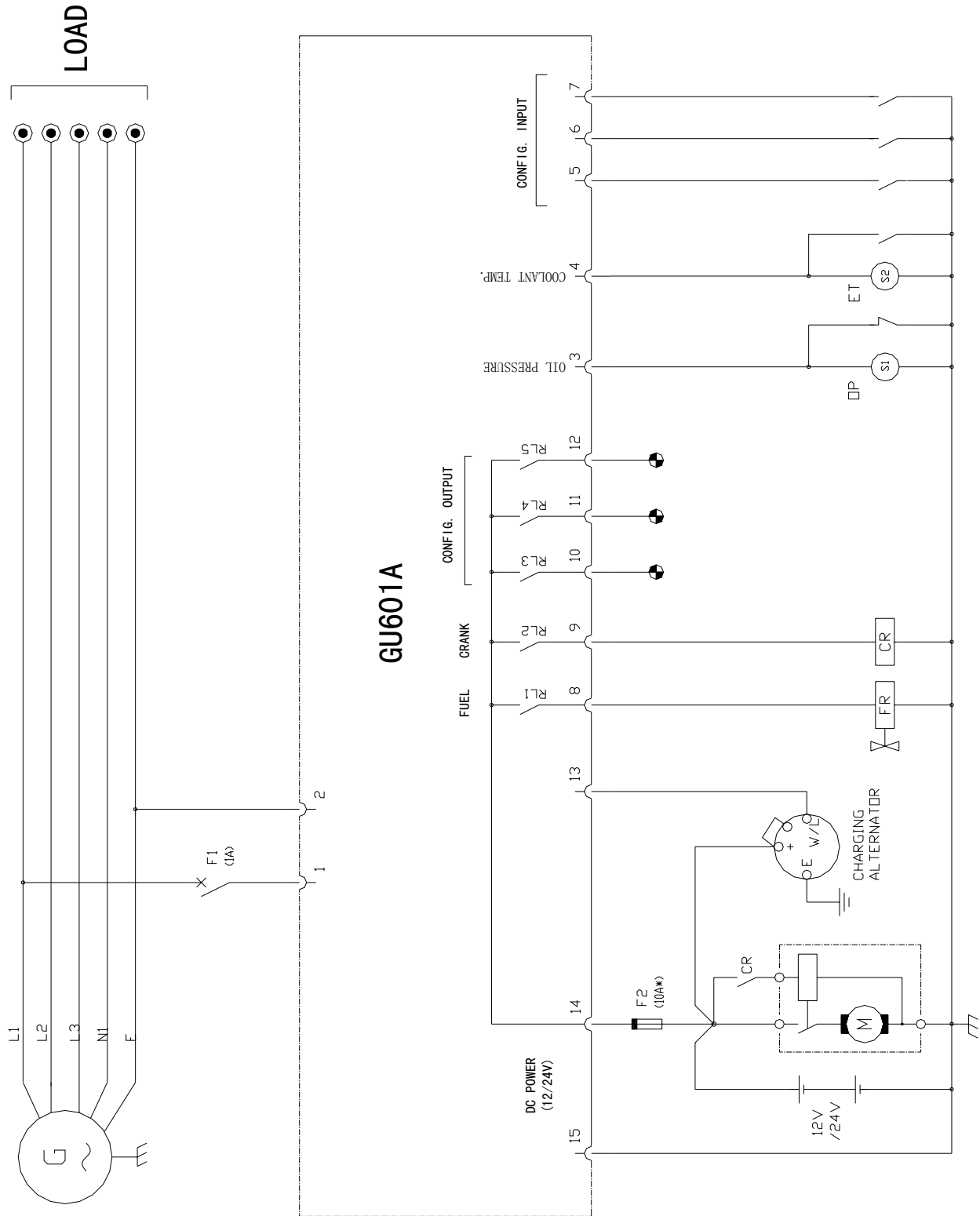


**CAUTION**

### CAUTION:

- If pin no. "13" is not used, DO NOT connect to negative.

## 2.3 Typical Wiring Diagram







## 3. Panel Operation

The operation panel consists of 3 sections: LCD display measuring parameters, LED indicator for common failure, and push buttons for Genset and selection of control modes.



The LCD circularly displays different measuring parameters. When failure occurs, LCD displays the corresponding fault icon. LCD also has a backlight so that the operator can clearly read information day or night. After pressing any button the backlight will automatically turn off in a certain time.

The LCD display and its control push buttons provide a friendly operation interface for the operator to conveniently read information and set running parameters.

### 3.1 Control buttons and LED

| Function Description   | Tag   |
|--|---|
| <p><b>Scroll Push Button</b><br/>Enter into submenu / Modify / confirm modification / scroll menu to display.</p>  |    |
| <p><b>AUTO Push Button / LED</b><br/>The push button is used for selecting "AUTO mode". When the controller is running in AUTO mode, the LED above the push button illuminates. The activation and deactivation of the "remote start signal input" controls the starting and stopping of the Genset.</p> |  |
| <p><b>MAN Push Button / LED</b><br/>The push button is used for selecting "MAN mode". When the controller is running in MAN mode, the LED above the push button illuminates. The Start and Stop push buttons control the starting and stopping of the Genset.</p>  |  |
| <p><b>START / VALUE INCREASE "+" Push Button</b><br/>The push button is used for MANUALLY start the Genset .When the controller is in MAN mode, press this push button will start the generator.<br/><br/>When in parameter setting mode, this push button is used to increase values.</p>               |  |



|  |   |
|--|---|
| <p><b>STOP / RESET / VALUE DECREASE “-” Push Button</b><br/>The push button is used to MANUALLY stop the Genset. When the controller is in MAN mode, press and hold this button more than 2sec to stop the Genset.</p> <p>If failure occurs, press this push button, the shutdown alarm lockout will be cleared.</p> <p>When in parameter setting mode, this push button is used to decrease values.</p> |  |
| <p><b>COMMON FAILURE LED</b><br/>LED will flash when pre-alarm (Warning) occurs.<br/>LED will illuminate permanently when shutdown alarm occurs.</p>   |  |

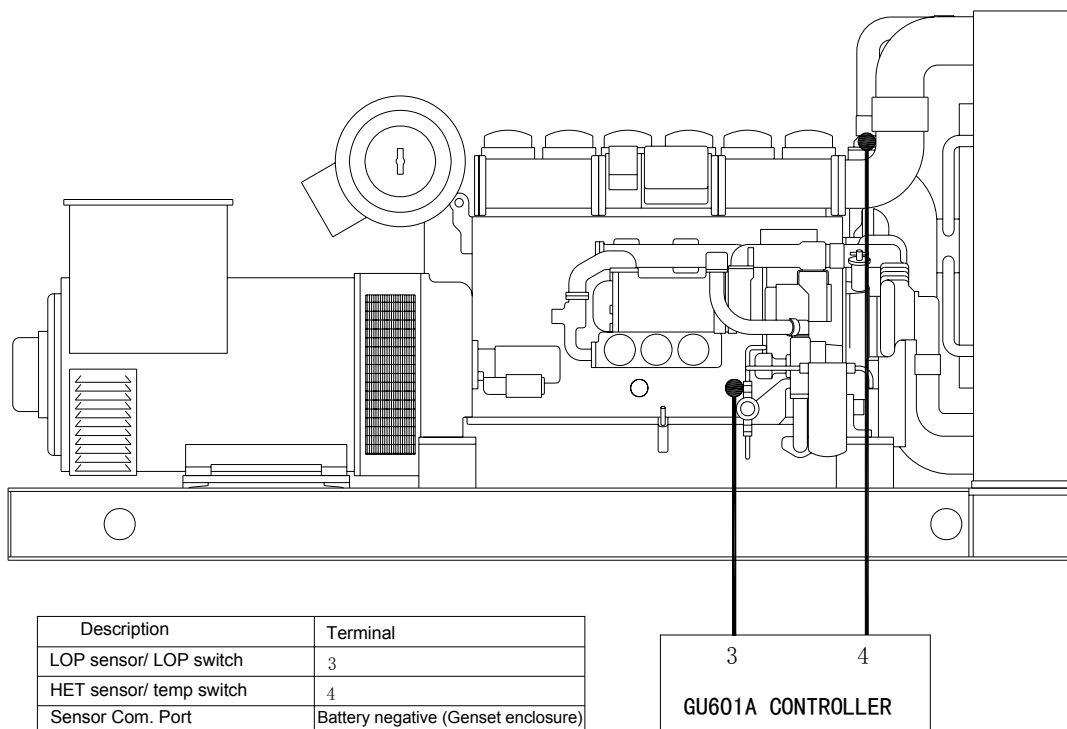
## 4. Installation Guide

### 4.1 The cutout dimensional drawing installed on panel as above attached.

The controller is secured by 2 special fittings. The shock-proof equipment must be installed if the enclosure that installed on controller is directly installed on Genet body or other heavy vibrant device.

### 4.2 Please read above Typical Wiring Diagram fig 2.3 for wiring connections.

### 4.3 Installation of engine LOP and HET sensors:





#### CAUTION:

- Pin no. “3” and “4” is for “LOP sensor or switch signal” and “HET sensor or switch signal” input respectively. Either switch or sensor can be chosen. When sensor is used, according to the actual situation, increase the cross section area of cable to reduce the cable resistance from controller to engine, which ensures the accuracy of measured values for both oil pressure and engine temperature.
- If both switches and sensors are required for oil pressure and engine temperature, connect Pin no. “3” and “4” as above, and connect 2 configurable inputs to the switches of oil pressure and temperature, then configure parameters by setting.

## 5. Control and Operation Instruction

The controller has 2 modes: AUTO and MAN.

### 5.1 Operation Mode Setting:

| Operation  | Description   |
|--|---|
| Press "AUTO" button (continuous 2sec)<br>When controller is running in "AUTO" mode, LED above push button illuminates. |  |
| Press "MAN" button (continuous 2sec) When controller is running in "MAN" mode, LED above push button illuminates.      |  |

**NOTE: Only one mode of above 2 modes can be selected.**

### 5.2 AUTO control Sequence:

Controller is in "AUTO" mode.

First of all, define one of the configurable inputs as **Remote Start Signal**.

When the remote start signal is active, the controller implements following procedure:

The Start delay timer begins to count, when it times out the Preheat relay output is energized (if preheat function is selected), the timer starts. When it times out, the fuel relay output is energized, and operates the fuel solenoid of the engine. After 300ms delay, the start (crank) relay output is energized; the start motor engages and begins to crank. When the engine speed reaches the crank cutout RPM, the start relay output is de-energized and the safety-on delay starts. When the safety-on times out, if the controller detects that the parameters of the Genset such as voltage, frequency, oil pressure, coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset measuring parameters.



**NOTE:**

- When the remote start signal is active, the start delay timer starts. During this period, if remote start signal is deactivated, the start delay timer is immediately terminated; the controller will recover to its original standby status.
- During the period of crank or idle, if remote start signal is deactivated, controller stops the start procedure and recovers to original standby status.
- One configurable input must be set as "Remote Start Signal", or it will not implement the start procedure in "AUTO" mode.



### NOTE:

- While cranking, engine ignites. The start motor will power off when the output frequency of generator reaches the preset value (configurable crank cutout value), or if there are one of the following conditions occur:
  - A. Generator's voltage reaches 80% of rated voltage;
  - B. Cranking time's up,
  - C. LOP switch is opened and the delay time's up.
- Controller can not implement crank procedure if the frequency of generator reaches the preset value (configurable cranking cutout value) or LOP switch is opened.



### CAUTION:

To avoid damage to the start motor please make sure the generator's voltage is higher than 15V (measurable voltage of the controller) while cranking, since the crank cutout signal is sensed from the generator voltage and frequency.

If you have selected idle function, the idle relay will be closed at the same time as the crank relay is closed. The timers of idle and safety-on delay will begin counting down at the same time, and in priority to display the shorter one on the LCD, and the following procedure is the same as above.

During the crank period, if the engine can not ignite and controller will not output start signal during crank rest, Fail to Start icon on LCD flashes at this time. Once crank rest timer times out the start relay energizes once again and will attempt to start engine again.

The procedure above will be repeated until engine successfully ignites or reaches the preset number of crank attempt. However, if any failure occurs during crank, controller will stop cranking immediately and only can be reused after clearing failure and reset.

**Fail to Start:** when the above procedure repeats again and again and reaches the preset number of crank attempt, the crank relay output is then de-energized. The common failure LED illuminates and the LCD displays **Fail to Start** icon.



### CAUTION:

If Fail to Start occurs, operator must check the whole Genset system to find reason for failure, only after clearing the failure can press "STOP/RESET" button to relieve fault lock out status, and restart the Genset.

## Generator shutdown sequence:

When the remote start signal is de-activated, the cool down delay timer begins to count. When it times out, the fuel relay output de-energizes, open the fuel solenoid immediately, generator stops and goes to standby status.

**Fail to stop:** When cool down times out, the fuel relay output de-energizes, stop delay timer begins. When it times out, if controller detects that the voltage and frequency of generator or oil pressure of engine are greater than the preset values, the **Fail to stop** LED illuminates and the LCD displays Fail to stop icon.



### NOTE:

After stop failure, the controller will not energize the crank relay output if the failure hasn't been removed and the controller reset.

## 5.3 MANUAL control sequence:

Controller is in "MAN" mode.

### Generator starting sequence:

Press "START" push button, the fuel relay output is energized, and operates the fuel solenoid of the engine. After 300ms delay, the start relay output is energized, the start motor engages and begins to crank. When the engine speed reaches the crank cutout RPM, the start relay output is de-energized and the safety-on delay starts. When it times out, if the controller detects that the parameters of the Genset such as voltage, frequency, oil pressure and coolant temperature are normal, and no other failure is detected this indicates the Genset has successfully started and running normally. The LCD displays the Genset measuring parameters.

## 5.4 The start and stop sequence of engine whose fuel solenoid is N. O. type (energize to stop):

### Start control sequence:

During the starting sequence, the fuel output relay of controller will not energize, fuel solenoid is no power, so no signal is required for fuel solenoid to activate.

### Stop control sequence:

During the stopping sequence, the fuel relay output energizes, the fuel solenoid is on power and energizes, and the engine begins to stop. After a delay (same as stop delay) fuel relay de-energizes, cutting off the supply for the fuel solenoid.

**Other control sequence is same as engine whose fuel solenoid is N. C. type (energize to run).**

### 5.5 Idle function:

For **idle** function configure one of the configurable outputs as **idle**.

Refer to the flow chart **5.7** for start and stop for **idle** control flows.

### 5.6 Preheat function:

For **Preheat** function, configure one of the configurable outputs as **Preheat**. The controller has 3 selectable preheat control modes as below:

Mode 1 — during preheat time, preheat relay output energizes.

Mode2 — during preheat time, preheat relay output energizes until the successful ignition.

Mode 3 — during preheat time, preheat relay output energizes until safety-on delay times out.

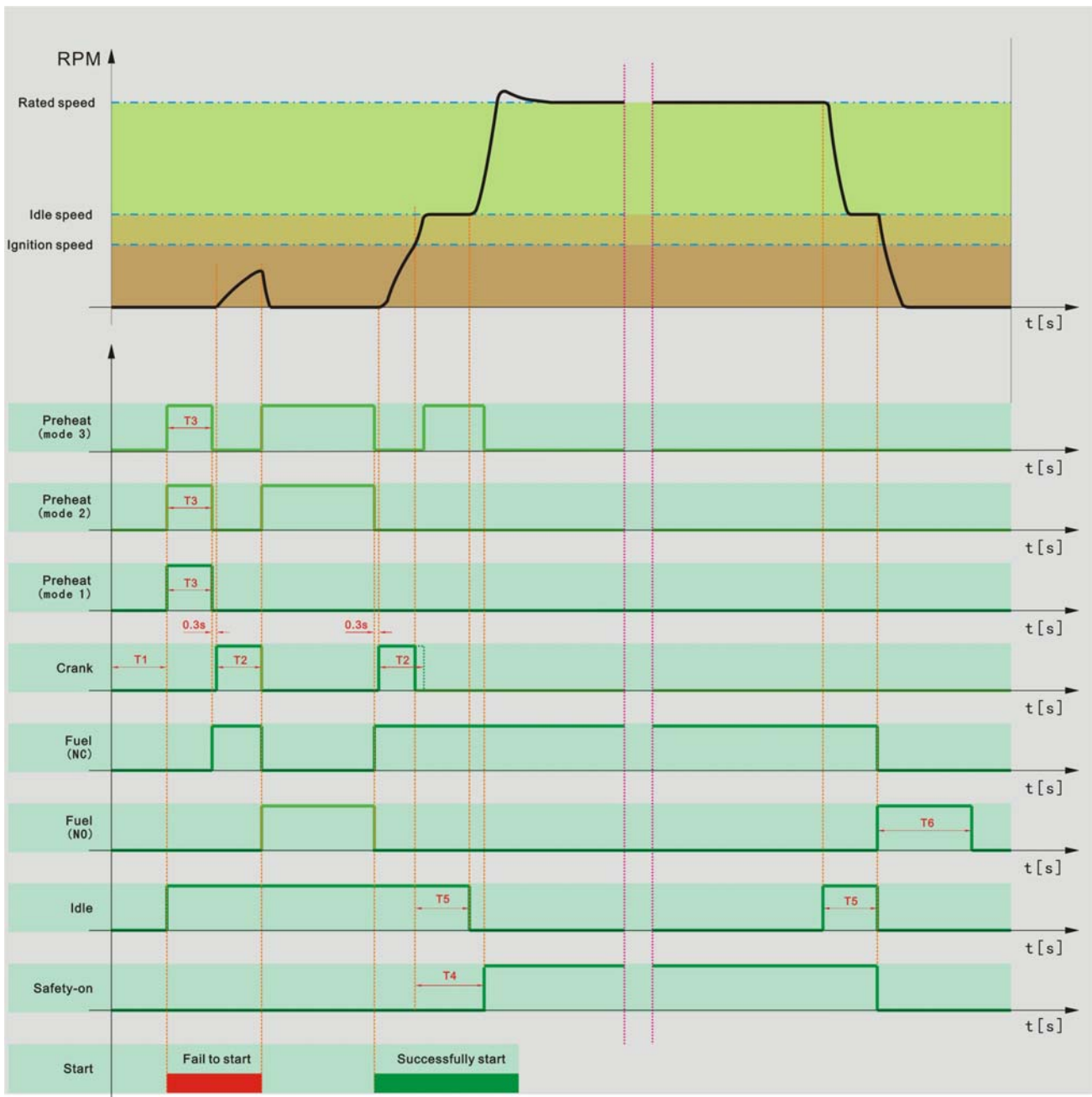
During crank period, the Preheat relay output will not energize in any of above modes.

Refer to the flow chart **5.7** for start and stop for **Preheat** control flows.

When the Preheat relay output energizes, LCD displays the icon of preheat operating status:



## 5.7 Flow chart for start and stop



T1 — start delay

T2 — crank time

T3 — pre-heat time

T4 — safety-on delay

T5 — idle time

T6 — stop delay



**NOTE:**

If T4 is longer than T5, low oil pressure protection is ignored during T5.

If T4 is shorter than T5, low oil pressure protection becomes effective after T4 in T5.

## 6. Measure and Display Data

Gen AC phase voltage **Vac**

Generator frequency **Hz**

Engine speed **RPM** (derived from generator frequency)

Battery voltage **Vdc**

Running hours **h**


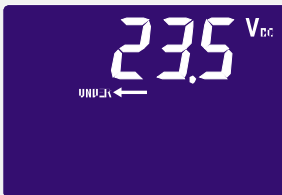

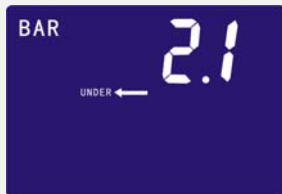
Engine coolant temperature °C/°F (signal from engine HET sensor)

Engine oil pressure **BAR / PSI** (signal from engine LOP sensor)

## 7. Pre-alarm and Shutdown Alarm







### 7.1 Pre-alarm (Warning)

**NOTE:** (Pre-alarms (Warnings) are non-critical failure conditions and do not affect the operation of the generator system, they serve for drawing the operators' attention to an undesirable condition so they can remove it to ensure continuous running of the system. When Pre-alarms occur, the LED indicator flashes, but failure will not be locked out and the unit will not shutdown. Once the Pre-alarm failure is removed the Pre-alarm LED will automatically turn off.)

| Pre-alarm / Description  | LCD Display   |
|--|---|
| <p><b>Fail to Charge:</b> After safety-on times up, if the charging voltage from the excitation contact of alternator is lower than the “charge V Pre-alarm”, the common failure LED indicator ( ) flashes, the LCD displays charge failure icon:</p>  |  |
| <p><b>Battery Low Voltage:</b> if controller detects that battery voltage has fallen below the “low batt. pre-alarm”, common failure LED indicator flashes. For example, “low batt. pre-alarm” preset as: 23.6V, when battery voltage falls below this value, LCD flashing low value icon:</p>   |  |
| <p><b>Battery High Voltage:</b> if controller detects that battery voltage has exceeded the “high batt. pre-alarm”, common failure LED indicator flashes. For example, “high batt. pre-alarm” preset as: 28.2V, when battery voltage exceeds this value, LCD flashing high value icon:</p>   |  |
| <p><b>Low Oil Pressure:</b> if controller detects that the engine oil pressure has fallen below the “low oil-press pre-alarm” after the safety-on timer expired, common failure LED indicator flashes. For example, “low oil-press pre-alarm” preset as: 2.2BAR, when engine oil pressure falls below this value, LCD flashing low value icon:</p> |  |



## GU601A Controller Operation Manual

|   |   |
|---|---|
| <p><b>High Temperature:</b> if controller detects that engine coolant temperature has exceeded the “high temp pre-alarm”, common failure LED indicator flashes. For example, “high temp pre-alarm” preset as: 95°C, when engine coolant temperature exceeds this value, LCD flashing high value icon:</p>   |    |
| <p><b>Over speed:</b> if engine speed exceeds the “over speed pre-alarm”, common failure LED indicator flashes. For example, “over speed pre-alarm” preset as: 1600RPM, when engine speed exceeds this value, LCD flashing high value icon:</p>   |    |
| <p><b>Under speed:</b> if engine speed falls below the “under speed pre-alarm” after the safety-on timer has expired, common failure LED indicator flashes. For example, “under speed pre-alarm” preset as: 1440RPM, when engine speed falls below this value, LCD flashing low value icon:</p>   |    |
| <p><b>High Voltage:</b> if controller detects that the output voltage of generator has exceeded the “Vac high pre-alarm” after the safety-on timer has expired, common failure LED indicator flashes. For example, “Vac high pre-alarm” preset as: 253V, when the output voltage of generator exceeds this value, LCD flashing high value icon:</p>     |   |
| <p><b>Low Voltage:</b> if controller detects that the output voltage of generator has fallen below the “Vac low pre-alarm” after the safety-on timer has expired, common failure LED indicator flashes. For example, “Vac low pre-alarm” preset as: 198V, when the output voltage of generator falls below this value, LCD flashing low value icon:</p> |  |
| <p><b>Auxiliary Pre-alarm:</b> if a configurable input is defined as pre-alarm, when the input signal is active, common failure LED indicator flashes. LCD displaying Aux. pre-alarm icon:</p>  |  |



**NOTE:**

To make “low oil pressure” and “high temperature” pre-alarm active, you must use LOP sensor and HET sensor, if you only use LOP and HET switches, both pre-alarms are inactive.








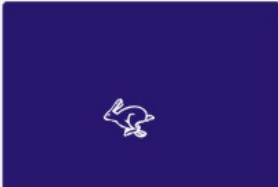

**CAUTION**

**CAUTION:**


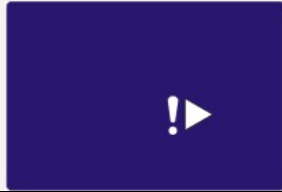
Under the period of safety-on delay, some pre-alarms are inactive, the safety-on delay must be carefully and properly set to make Genset have full protection.

## 7.2 Shutdown Alarm

**NOTE:** (shutdown alarm failures immediately lock out the system and stop the Genset. The failure must be removed and the controller be reset before restarting the Genset.)

| Shutdown Alarm / Description   | LCD Display   |
|--|---|
| <p><b>Fail to Start:</b> if engine does not fire after the preset number of crank attempt has been made, common failure LED illuminates. LCD displays “fail to start” icon:</p>  |    |
| <p><b>Fail to Stop:</b> if engine does not stop after the stop delay expired, common failure LED illuminates. LCD displays fail to stop icon:</p>  |    |
| <p><b>Emergency Stop:</b> define a configurable input as emergency stop, when the input signal is active, controller immediately stops all relay control outputs except alarm, engine stops immediately. Common failure LED illuminates, LCD displays emergency stop icon:</p> |   |
| <p><b>Low Oil Pressure:</b> if controller detects that the oil pressure still falls below “low oil-press alarm” or LOP switch closes after the safety-on timer has expired, engine stops immediately, common failure LED illuminates. LCD displays low oil pressure icon:</p>  |  |
| <p><b>High Temperature:</b> if controller detects that engine coolant temperature has exceeded the “high temp alarm” or HET switch closes, engine stops immediately, common failure LED illuminates. LCD displays high temperature icon:</p>                                   |  |
| <p><b>Over speed:</b> if controller detects that engine speed exceeds “over speed alarm”, engine stops immediately, common failure LED illuminates. LCD displays over speed icon:</p>  |  |
| <p><b>High Voltage:</b> After safety-on delay times up, if controller detects that the output voltage exceeds the “Vac high alarm”, the engine will be shut down immediately, common failure LED illuminates.</p>  |  |

# GU601A Controller Operation Manual

|   |   |
|---|---|
| <p><b>Low Voltage:</b> After safety-on delay times up, if controller detects that the output voltage of controller is lower than the “Vac low alarm”, the engine will be shut down immediately, common failure LED illuminates.</p> |  |
| <p><b>Auxiliary Failure:</b> If a configurable input has been defined as Shutdown Alarm, when the input signal is active, common failure LED illuminates. LCD displays Aux. shutdown alarm icon:</p>                                |  |

## Code Table for Failure:

| Name             | Code |
|------------------|------|
| CHARGE FAILURE   | 8888 |
| BATT. UNDER VOLT | 8888 |
| BATT. OVER VOLT  | 8888 |
| START FAILURE    | 8888 |
| STOP FAILURE     | 8888 |
| EMERGENCY STOP   | 8888 |
| LOW OIL PRESS    | 8888 |

| Name             | Code |
|------------------|------|
| ENGINE HIGH TEMP | 8888 |
| OVER SPEED       | 8888 |
| UNDER SPEED      | 8888 |
| GEN. OVER VOLT   | 8888 |
| GEN. UNDER VOLT  | 8888 |
| P-SENSOR OPEN    | 8888 |
|                  |      |



### NOTE:

- Engine speed signal is derived from the frequency of generator output voltage, it is used for control and failure protection parameters, for the convenience of user, some data is expressed by RPM,  $RPM = Hz * 60 / \text{pair of poles}$ .
- While the Genset is running, if there are high coolant temperature, low oil pressure or over speed failure occurs, the controller will shutdown it immediately without delay. During the cool down period, if there is low oil pressure failure, the alarm will be active no matter if there is idle function.



### CAUTION:

During the period of safety-on delay, low oil pressure protection is inactive. To avoid starting an engine with no oil, you must make sure the oil levels are normal and the safety-on delay shall be carefully and properly set for the first commissioning.

## 8. Parameters Setting

### 8.1 System Parameters:

| NO. | Items                 |      | Preset | Value Range              |
|-----|-----------------------|------|--------|--------------------------|
| 1.1 | VT ratio              | 8888 | 1.0    | 1.0-100.0                |
| 1.2 | Rated voltage         | 8888 | 220    | 45-9999Vac               |
| 1.3 | Startup mode          | 8888 | 0      | 0-1 / 0 (MAN) / 1 (AUTO) |
| 1.4 | Oil pressure unit     | 8888 | 0      | 0-1 / 0 (BAR) / 1 (PSI)  |
| 1.5 | Temperature unit      | 8888 | 0      | 0-1 / 0 (°C) / 1 (°F)    |
| 1.6 | Communication address | 8888 | 1      | 1-247                    |
| 1.7 | Default settings      | 8888 |        |                          |
| 1.8 | On-line update        | 8888 |        |                          |
| 1.9 | Page scroll time      | 8888 | 0S     | 0-10 S / 0 (not used)    |

#### NOTE:



- **For 1.3 Startup Mode**, if you select “1”, the controller will be in AUTO mode when it is powered on; if you select “0”, the controller will be in MAN mode when it is powered on.
- After the oil pressure and temperature units changed, the corresponding failure alarm value must be reset according to actual situation.
- Engine speed is calculated by the number of “pair of poles”.  $RPM = Hz * 60 / \text{pair of poles}$ , when rated frequency is 50 Hz, if pair of poles set as “2”, then running speed is 1500 RPM, if pair of poles set as “1”, then running speed is 3000 RPM.

### 8.2 Generator Parameters:

| NO. | Items              |      | Preset | Value Range              |
|-----|--------------------|------|--------|--------------------------|
| 2.1 | Vac low alarm      | 8888 | 0      | 20-200% / 0 (not set)    |
| 2.2 | Vac low pre-alarm  | 8888 | 90%    | 20-200% / 0 (not set)    |
| 2.3 | Vac high pre-alarm | 8888 | 115%   | 20-200% / 9999 (not set) |
| 2.4 | Vac high alarm     | 8888 | 9999   | 20-200% / 9999 (not set) |
| 2.5 | Alarm delay        | 8888 | 10S    | 0-600 S                  |

# GU601A Controller Operation Manual

## 8.3 Engine Parameters:

| NO.  | Items                   |    | Preset  | Value Range                 |
|------|-------------------------|---|---------|-----------------------------|
| 3.1  | Pair of poles           |    | 2       | 1-4                         |
| 3.2  | Fly wheel teeth         |    | 120     | 2-300                       |
| 3.3  | Fuel mode               |    | 0       | 0-1 / 0(NC) / 1 (NO)        |
| 3.4  | T-sensor mode           |    | 3       | 0-15 / 0 (not used)         |
| 3.5  | P-sensor mode           |    | 4       | 0-15 / 0 (not used)         |
| 3.6  | Start delay             |    | 10S     | 0-300 S                     |
| 3.7  | Crank attempt           |    | 3 times | 1-10 times                  |
| 3.8  | Crank time              |    | 8S      | 0-30 S                      |
| 3.9  | Crank rest              |    | 15S     | 0-300 S                     |
| 3.10 | Crank cutout RPM        |    | 300RPM  | 1-9999 RPM                  |
| 3.11 | Preheat delay           |   | 3S      | 0-300 S                     |
| 3.12 | Preheat mode            |  | 1       | 1-3                         |
| 3.13 | Idle delay              |  | 0       | 0-9999 S                    |
| 3.14 | Safety-on delay         |  | 60S     | 0-600 S                     |
| 3.15 | Cool down delay         |  | 300S    | 0-600 S                     |
| 3.16 | Stop delay              |  | 20S     | 0-60 S                      |
| 3.17 | Under speed alarm       |  | 0RPM    | 0-9999 RPM / 0 (not set)    |
| 3.18 | Under speed Pre-alarm   |  | 1440RPM | 0-9999 RPM / 0 (not set)    |
| 3.19 | Over speed Pre-alarm    |  | 1600RPM | 1-9999 RPM / 9999 (not set) |
| 3.20 | Over speed alarm        |  | 1710RPM | 1-9999 RPM / 9999 (not set) |
| 3.21 | Low oil-press alarm     |  | 1.4BAR  | 0-45.0 BAR                  |
| 3.22 | Low oil-press pre-alarm |  | 2.2BAR  | 0-45.0 BAR                  |
| 3.23 | High temp pre-alarm     |  | 95°C    | 70-320°C / 9999 (not set)   |
| 3.24 | High temp alarm         |  | 105°C   | 70-320°C / 9999 (not set)   |

## GU601A Controller Operation Manual

|      |                      |      |       |                            |
|------|----------------------|------|-------|----------------------------|
| 3.25 | Low batt. pre-alarm  | 8888 | 8.0V  | 1.0-25.0V / 0 (not set)    |
| 3.26 | High batt. pre-alarm | 8888 | 28.0V | 1.0-35.0V / 99.9 (not set) |
| 3.27 | Charge V Pre-alarm   | 8888 | 8.0V  | 1.0-25.0V / 0 (not set)    |

### 8.4 Input and Output Setting:

| NO. | Items                |      | Preset | Value Range               |
|-----|----------------------|------|--------|---------------------------|
| 4.1 | Configurable input 1 | 8888 | 8      | 0-12 (define code as 8.7) |
| 4.2 | Configurable input 2 | 8888 | 7      | 0-12 (define code as 8.7) |
| 4.3 | Configurable input 3 | 8888 | 12     | 0-12 (define code as 8.7) |
| 4.4 | Input 1 delay        | 8888 | 2S     | 0-60 S                    |
| 4.5 | Input 2 delay        | 8888 | 2S     | 0-60 S                    |
| 4.6 | Input 3 delay        | 8888 | 2S     | 0-60 S                    |
| 4.7 | Configurable relay 1 | 8888 | 2      | 0-80 (define code as 8.8) |
| 4.8 | Configurable relay 2 | 8888 | 3      | 0-80 (define code as 8.8) |
| 4.9 | Configurable relay 3 | 8888 | 5      | 0-80 (define code as 8.8) |

**NOTE:** configurable input delay is only for 1 to 4 codes in 8.7.

### 8.5 Calibration Menu:

| NO. | Items               |      | Preset | Value Range |
|-----|---------------------|------|--------|-------------|
| 5.1 | Gen voltage V1      | 8888 | 0      | ± 10.0%     |
| 5.2 | Oil pressure        | 8888 | 0      | ± 10.0%     |
| 5.3 | Coolant temperature | 8888 | 0      | ± 10.0%     |
| 5.4 | Battery voltage     | 8888 | 0      | ± 10.0%     |

## 8.6 The optional items for P/T-sensor:

| Code | The brand model of LOP sensor | The brand model of HET sensor |
|------|-------------------------------|-------------------------------|
| 0    | not used                      | not used                      |
| 1    | close for low oil pressure    | close for high temperature    |
| 2    | open for low oil pressure     | open for high temperature     |
| 3    | VDO 5 bar                     | VDO 120 °C                    |
| 4    | VDO 10 bar                    | VDO 150 °C                    |
| 5    | Datcon 7 bar                  | Datcon                        |
| 6    | Murphy 7 bar                  | Murphy                        |
| 7    | Pre-set 1                     | PT100                         |
| 8    | Pre-set 2                     | Pre-set 1                     |
| 9    | Pre-set 3                     | Pre-set 2                     |
| 10   | Pre-set 4                     | Pre-set 3                     |
| 11   | configured by user            | Pre-set 4                     |
| 12   |                               | configured by user            |



### NOTE:

When the controller leaves factory, the optional types and functions of LOP sensor and HET sensor have been preset as the above table. If the using sensor is not listed in this table, the user can select “configurable”, and write sensor parameters to controller via software.

- LOP sensor parameter addendum:

### VDO 5 bar:

|        |     |     |      |      |      |      |      |      |      |      |      |
|--------|-----|-----|------|------|------|------|------|------|------|------|------|
| P(Bar) | 0.0 | 0.5 | 1.0  | 1.5  | 2.0  | 2.5  | 3.0  | 3.5  | 4.0  | 4.5  | 5    |
| P(PSI) | 0   | 7.3 | 14.5 | 21.8 | 29.0 | 36.3 | 43.5 | 50.8 | 58.0 | 65.3 | 72.5 |
| R(Ω)   | 11  | 29  | 47   | 65   | 82   | 100  | 117  | 134  | 151  | 167  | 184  |

### VDO 10 bar:

|        |     |      |      |      |      |      |      |       |       |       |       |
|--------|-----|------|------|------|------|------|------|-------|-------|-------|-------|
| P(Bar) | 0.0 | 1.0  | 2.0  | 3.0  | 4.0  | 5.0  | 6.0  | 7.0   | 8.0   | 9.0   | 10.0  |
| P(PSI) | 0   | 14.5 | 29.0 | 43.5 | 58.0 | 72.5 | 87.0 | 101.5 | 116.0 | 130.5 | 145.0 |
| R(Ω)   | 10  | 31   | 52   | 71   | 90   | 106  | 124  | 140   | 155   | 170   | 184   |

# GU601A Controller Operation Manual

## Datcon 7 bar:

|                |     |      |      |      |      |      |      |      |      |      |       |
|----------------|-----|------|------|------|------|------|------|------|------|------|-------|
| P (Bar)        | 0.0 | 0.7  | 1.4  | 2.1  | 2.8  | 3.4  | 4.1  | 4.8  | 5.5  | 6.2  | 6.9   |
| P (PSI)        | 0   | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 | 70.0 | 80.0 | 90.0 | 100.0 |
| R ( $\Omega$ ) | 240 | 200  | 165  | 135  | 115  | 95   | 78   | 63   | 48   | 35   | 25    |

## Murphy 7 bar:

|                |     |      |      |      |      |      |      |      |      |      |       |
|----------------|-----|------|------|------|------|------|------|------|------|------|-------|
| P (Bar)        | 0.0 | 0.7  | 1.4  | 2.1  | 2.8  | 3.4  | 4.1  | 4.8  | 5.5  | 6.2  | 6.9   |
| P (PSI)        | 0   | 10.0 | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 | 70.0 | 80.0 | 90.0 | 100.0 |
| R ( $\Omega$ ) | 240 | 205  | 171  | 143  | 123  | 103  | 88   | 74   | 60   | 47   | 33    |

## Pre-set 1:

|                |     |      |      |      |      |      |      |       |       |       |       |
|----------------|-----|------|------|------|------|------|------|-------|-------|-------|-------|
| P (Bar)        | 0.0 | 1.0  | 2.0  | 3.0  | 4.0  | 5.0  | 6.0  | 7.0   | 8.0   | 9.0   | 10.0  |
| P (PSI)        | 0   | 14.5 | 29.0 | 43.5 | 58.0 | 72.5 | 87.0 | 101.5 | 116.0 | 130.5 | 145.0 |
| R ( $\Omega$ ) | 15  | 31   | 49   | 66   | 85   | 101  | 117  | 132   | 149   | 164   | 178   |

## Pre-set 2:

|                |     |      |      |      |      |      |      |       |       |       |       |
|----------------|-----|------|------|------|------|------|------|-------|-------|-------|-------|
| P (Bar)        | 0.0 | 1.0  | 2.0  | 3.0  | 4.0  | 5.0  | 6.0  | 7.0   | 8.0   | 9.0   | 10.0  |
| P (PSI)        | 0   | 14.5 | 29.0 | 43.5 | 58.0 | 72.5 | 87.0 | 101.5 | 116.0 | 130.5 | 145.0 |
| R ( $\Omega$ ) | 30  | 41   | 65   | 88   | 110  | 115  | 145  | 150   | 172   | 185   | 190   |

## Pre-set 3:

|                |     |     |     |     |     |     |      |  |  |  |
|----------------|-----|-----|-----|-----|-----|-----|------|--|--|--|
| P (Bar)        | 0.0 | 1.7 | 3.4 | 5.2 | 6.9 | 8.6 | 10.3 |  |  |  |
| P (PSI)        | 0   | 25  | 50  | 75  | 100 | 125 | 150  |  |  |  |
| R ( $\Omega$ ) | 21  | 36  | 52  | 72  | 84  | 100 | 120  |  |  |  |

## Pre-set 4:

|                |     |      |      |      |      |      |      |      |       |       |       |
|----------------|-----|------|------|------|------|------|------|------|-------|-------|-------|
| P (Bar)        | 0.0 | 1.0  | 2.0  | 3.0  | 4.0  | 5.0  | 6.0  | 6.5  | 7.0   | 8.0   | 9.0   |
| P (PSI)        | 0   | 14.5 | 29.0 | 43.5 | 58.0 | 72.5 | 87.0 | 94.3 | 101.5 | 116.0 | 130.5 |
| R ( $\Omega$ ) | 251 | 195  | 155  | 127  | 107  | 88   | 72   | 65   | 61    | 54    | 48    |



# GU601A Controller Operation Manual

- HET sensor parameter addendum:

## VDO 120°C:

|       |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 40  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140 |
| T(°F) | 104 | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 | 266 | 284 |
| R(Ω)  | 291 | 197 | 134 | 97  | 70  | 51  | 38  | 29  | 22  | 18  | 15  |

## VDO 150°C:

|       |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140 | 150 |
| T(°F) | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 | 266 | 284 | 302 |
| R(Ω)  | 322 | 221 | 155 | 112 | 93  | 62  | 47  | 37  | 29  | 23  | 19  |

## Datcon:

|       |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 40  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140 |
| T(°F) | 104 | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 | 266 | 284 |
| R(Ω)  | 900 | 600 | 400 | 278 | 200 | 141 | 104 | 74  | 50  | 27  | 4   |

## Murphy:

|       |      |     |     |     |     |     |     |     |     |     |     |
|-------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 40   | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 | 130 | 140 |
| T(°F) | 104  | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 | 266 | 284 |
| R(Ω)  | 1029 | 680 | 460 | 321 | 227 | 164 | 120 | 89  | 74  | 52  | 40  |

## PT100:

|       |      |     |     |     |     |     |     |     |     |     |     |
|-------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | -100 | -50 | 0   | 20  | 40  | 60  | 80  | 100 | 150 | 200 | 300 |
| T(°F) | -148 | -58 | 32  | 68  | 104 | 140 | 176 | 212 | 302 | 392 | 572 |
| R(Ω)  | 60   | 81  | 100 | 108 | 116 | 123 | 131 | 139 | 157 | 176 | 212 |

## Pre-set 1:

|       |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 20  | 30  | 40  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 |
| T(°F) | 68  | 86  | 104 | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 |
| R(Ω)  | 900 | 600 | 420 | 282 | 152 | 113 | 86  | 62  | 48  | 40  | 30  |

# GU601A Controller Operation Manual

## Pre-set 2:

|       |  |  |     |     |     |     |     |     |     |     |     |
|-------|--|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) |  |  | 30  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 |
| T(°F) |  |  | 86  | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 |
| R(Ω)  |  |  | 980 | 400 | 265 | 180 | 125 | 90  | 65  | 50  | 38  |

## Pre-set 3:

|       |     |     |     |     |     |     |     |     |     |     |     |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T(°C) | 20  | 30  | 40  | 50  | 60  | 70  | 80  | 90  | 100 | 110 | 120 |
| T(°F) | 68  | 86  | 104 | 122 | 140 | 158 | 176 | 194 | 212 | 230 | 248 |
| R(Ω)  | 805 | 540 | 380 | 260 | 175 | 118 | 83  | 58  | 42  | 30  | 21  |

## Pre-set 4:

|       |     |     |     |     |     |     |     |     |     |     |  |
|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| T(°C) | 28  | 35  | 40  | 50  | 60  | 70  | 80  | 90  | 95  | 98  |  |
| T(°F) | 82  | 95  | 104 | 122 | 140 | 158 | 176 | 194 | 203 | 208 |  |
| R(Ω)  | 579 | 404 | 342 | 250 | 179 | 136 | 103 | 77  | 67  | 63  |  |

## 8.7 The optional items for configurable input:

| Code | Optional Function                             | NOTE                |
|------|---|---------------------|
| 0    | not used                                      |                     |
| 1    | Pre-alarm (active immediately)                | low level is active |
| 2    | Shutdown Alarm (active immediately)           | low level is active |
| 3    | Pre-alarm (active after safety-on delay)      | low level is active |
| 4    | Shutdown Alarm (active after safety-on delay) | low level is active |
| 5    | LOP switch                                    | low level is active |
| 6    | HET switch                                    | low level is active |
| 7    | Emergency stop                                | low level is active |
| 8    | Remote start signal                           | low level is active |
| 9    | Reserved                                      | low level is active |
| 10   | Reserved                                      | low level is active |
| 11   | Low fuel level                                | low level is active |
| 12   | Lamp test                                     | low level is active |

## 8.8 The optional items for configurable output:

| Code | Failure Type Define | Code | Failure Type Define |
|------|---------------------|------|---------------------|
| 0    | Not used            | 1    | Reserved            |
| 2    | Alarm               | 3    | Pre-alarm           |
| 4    | Idle 0 (N.C.)       | 5    | Preheat             |
| 6    | Speed up            | 7    | Reserved            |
| 8    | Fuel pump control   | 9    | Running             |
| 10   | System in AUTO mode | 11   | Reserved            |
| 12   | System in MAN mode  | 13   | Reserved            |
| 14   | Idle 1 (N.O.)       | 15   | Reserved            |
| 16   | Reserved            | 17   | Fail to start       |



### NOTE:

If define one configurable relay as **Speed up**, the relay will close after the engine has successfully started. If there is idle function, the relay will close after idle timer times out.


## 9. LCD Display and Menu System

Using a backlit TN type LCD to display data and information. After pressing any push button the backlight will automatically turn off in a preset time. In normal operating status, you can set the page scroll time to circularly display each page of measuring data. Press “▶” manually scrolls to view each measuring data. When failure occurs, LCD displays the corresponding failure icon.

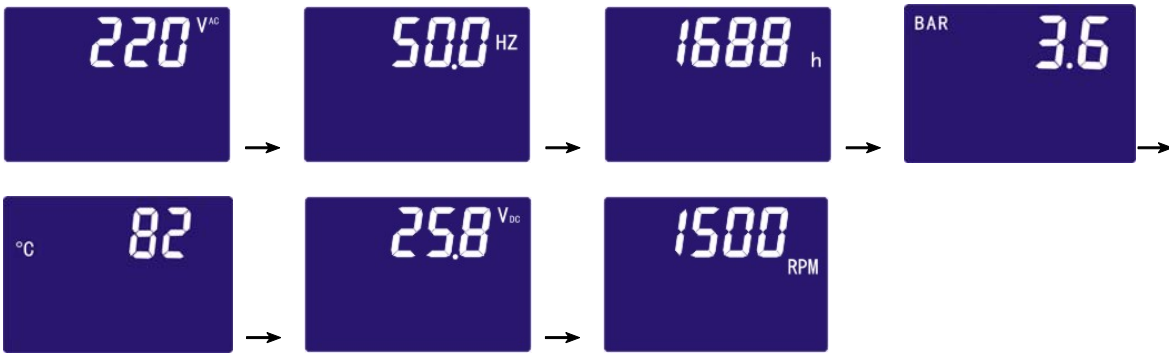
Press and hold “▶” button 2sec to enter into parameters setting menu, then use “◀” or “▶” to scroll page, press “▶” again to select the required modify item, press “◀” or “▶”, LCD displays 0 0 0 0 when prompted to enter password, then use “◀” or “▶” to modify the first digital value, press “▶” move to modify the next one, after this, the first digital value will be displayed as “H”. Press “▶” to confirm after the password is set as 2213, then you can modify parameters. Otherwise it will prompt to key in password again. Press and hold “▶” for more than 2sec to quit parameters setting mode after finishing configuration.

## 9.1 Static LCD displays

Controller is in standby status:

| Operation   | Description   |
|---|---|
| LCD displays detected battery voltage and running hour: |  |

Controller is normally running, circularly displays each measuring data:



**NOTE:**

- When T-sensor or P-sensor is set as “not used”, LCD will not display related measuring data.

## 9.2 Setting running parameters

For example: (setting VT rate at 2.0)














| Operation  | Description |
|--|-------------|
| Press and hold "▶" 2sec, to enter into parameter settings menu, then LCD displays:                 | 8888        |
| press "▶", then LCD displays:  | 888.8       |
| press "I+", then LCD displays:   | 8888        |
| Press "I+" or "I-" to key in password: (2213), press "▶", then LCD displays:                       | 888.8       |
| Press "I+" or "I-" to change parameter, change to 2.0, then LCD displays:                          | 882.8       |
| Press "▶" to confirm, then press "I-", then LCD displays:  | 8888        |
| Press "▶" again to quit, or press and hold "▶" for more than 2sec to quit parameter settings menu: | 8888        |

For example: (setting controller crank attempt at 2)













| Operation   | Description |
|---|-------------|
| Press and hold "▶" 2sec, enter into parameter settings menu, then LCD displays:   | 8888        |
| Press "I+" 20 times, then LCD displays:   | 8888        |
| Press "▶" again, then LCD displays:   | 888.8       |
| Press "I+", then LCD displays:  | 8888        |
| Press "I+" or "I-" to key in password: (2213), press "▶", then LCD displays:  | 888.8       |
| Press "I-" or "I+" change parameter, change at 2, Press "▶" confirm change, and then press and hold "▶" for more than 2sec will quit parameter settings menu. | 888.2       |

## GU601A Controller Operation Manual

For example: (resume all parameters of controller to factory default)

| Operation   | Description   |
|---|---|
| Press and hold “  ” 2s, to enter into parameter settings menu, then LCD displays:  |  |
| Press “  ” 6 times again, then LCD displays:   |  |
| press “  ”, prompted to key in password, then LCD displays:  |  |
| Press “  ” or “  ” to enter password: (2213), press “  ”, then LCD display: |  |
| Press “  ” to recover default, press and hold “  ” for more than 2sec will quit parameter settings menu.  |  |

For example: (set controller as online program mode)

| Operation   | Description   |
|---|---|
| Press and hold “  ” 2sec, to enter into parameter settings menu, then LCD displays:  |  |
| Press “  ” 7 times, then LCD displays:   |  |
| Press “  ” again, then LCD displays:   |  |
| Press “  ” or “  ” to enter password: (3132), press “  ”, then LCD displays:  |  |
| Press “  ” again to enter into online program mode, use the communication cable and the software to program, please make sure the power supply is normal during programming, the controller will reset automatically after programming. If you have entered into this mode already, but you do not program, you need to turn the controller off to exit this mode. |  |

### 10. Preparation before Starting the Controller

- 10.1 Make sure the controller is correctly installed to meet the ambient requirements.
- 10.2 Confirm all wiring connections of the controller meet the correct electric specification and corresponding to “2.3 typical wiring diagram”. Ensure the correct polarity of the DC supply source and that it has been protected by an external fuse. Otherwise damage to the controller may occur.
- 10.3 We recommend mounting an “Emergency Stop” button externally. The emergency stop input could be connected to N.O. contact of emergency stop push button, and the other contactor point be connected to the battery negative.
- 10.4 Switch on DC working power, make sure the preset parameters meet practical operating conditions, such as P-sensor mode, T-sensor mode, etc.

### 11. Technical Specification

DC working power

Voltage range: 12V/24V (8-35V continuous)

Cranking drop outs: 0V for 100mS, assuming dc supply was at least 10V before dropout and recovers to 5V

Max. operating current: @12V 150mA, @24V 75mA

Standby current: TBA

AC input voltage: phase voltage 15-300Vac RMS (AC frequency  $\geq$  40 Hz)

AC input frequency: 3-70Hz (voltage  $\geq$  15V)

Accuracy: 1%

Control relay outputs: 3A/30Vdc

Protection: IP65 (when correctly installed)

Operating ambient temperature: -20 to 70°C

Storage ambient temperature: -30 to 80°C