

GCU-100

Automatic Engine Control and Protection Module Operators Manual



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ATTENTION

This manual contains information for operational maintenance and wiring connections, Read it carefully

INTRODUCTION

GCU-100 works with most generators; it has both universal graphical light signal warnings and 3 sets of 4 digit LED displays, which feature 3 phase voltage, current, frequency, battery volt, and running hours.

The GCU-100 can be programmed from the front panel without using a laptop or complicated instructions, and all new settings are saved on an internal (EEPROM).

Simply select one of three push buttons on the front panel to choose either automatic (AUTO), manual (MANU) and (OFF) operations.

The GCU-100's main features are:

- Digital modular design
- 3 sets of 4 easy to read large digits display
- Multiple restart capabilities
- Governor Idle timer used for engine warm-up
- Engine cool-down settings
- Service and maintenance reminders
- Complete generator monitoring and protection

LED Display

- 3-phase AC voltage
- 3-phase AC current
- AC Hertz
- Timer countdown display
- DC (Battery) voltage reading
- Clear universal warning signal signals
- Easy to check system settings

The front panel can be preset to display fixed values or to cycle the display, allowing the operator to read all the generator values as they automatically cycle through. In addition, if a failure occurs during operation, the module displays a graphical warning or a failure signal(s) on the front panel.

If you install an additional communications module, the control can display an exact copy of the controls panel on a remote computer screen using either the Ethernet, USB or RS48 communications.

Monitoring and Protection:

- Engine start failure
- Emergency stop
- High coolant temperature
- Low oil pressure
- Engine over speed
- Engine under speed
- AC over voltage
- AC under voltage
- Current load monitoring
- Low fuel level
- Battery charging alternator failure (D+)
- Battery over and under voltage
- Magnetic Pick-up (MPU) failure
- Engine service and maintenance reminders

The GCU-100 also has 2 extra user programmable inputs

1. FRONT PANEL LAYOUT

1.1 Front Panel Layout

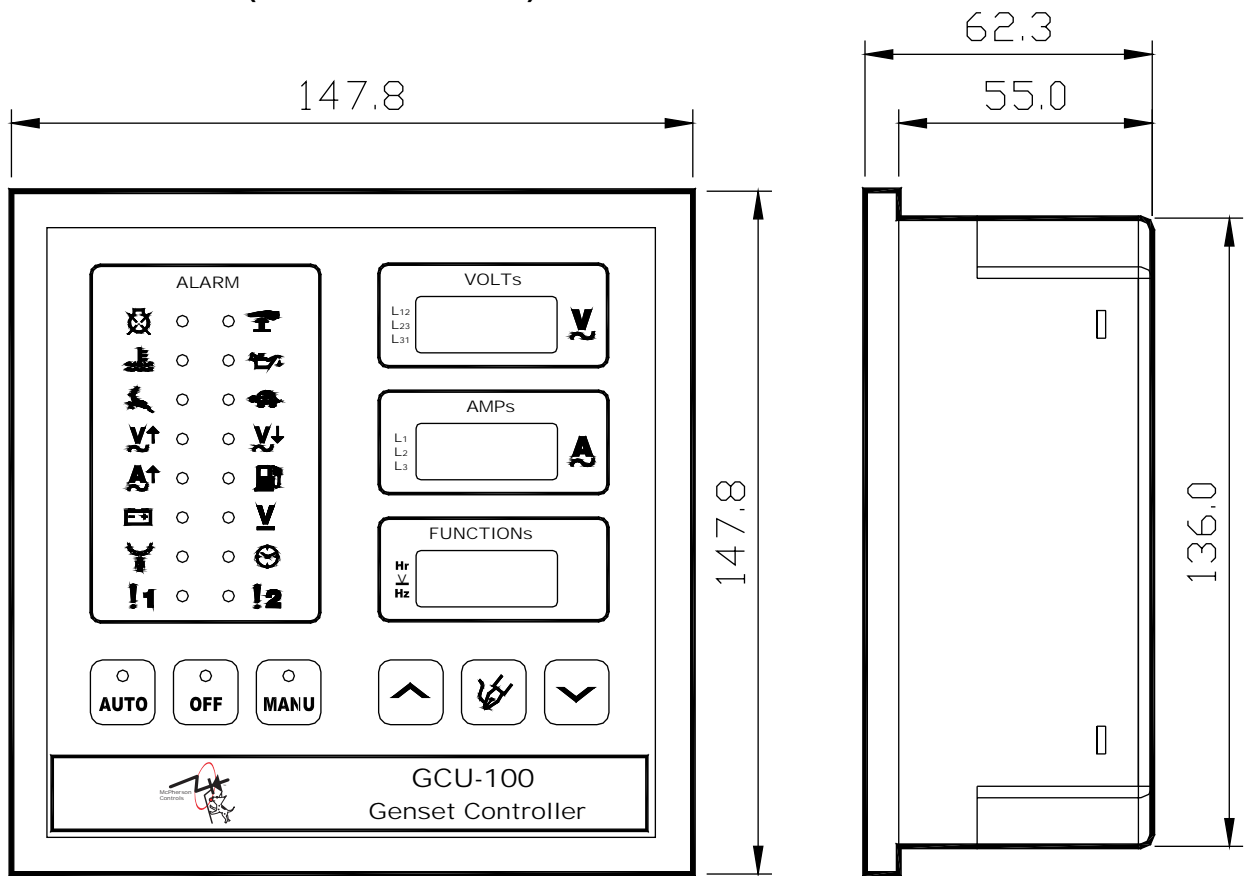


ICON	DESCRIPTION	ATTENTION
	Auto	Press to put the control in AUTO – Activated by using a remote start
	Off	Press turn the control OFF
	Manual	Press to do a MANUAL START from the front panel
	Increase & Selection	When in programming mode, pushing this button Increases the set point In normal operational mode, press to select and display the next phase voltage reading
	Program & Selection	Press and hold for 4 sec. to enter programming or to select the next line. Normally used to change to the next phase when reading current
	Decrease & Selection	When in programming mode pushing this button decreases the set point In normal operation, press to sequentially display AC frequency, battery volt or engine running hours

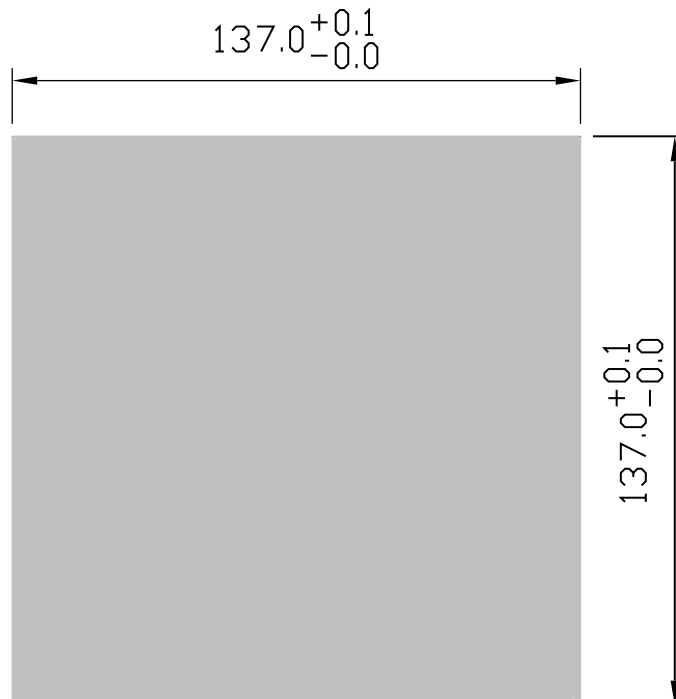
1.2 Rear panel layout



1.3 Unit Dimensions (Measurement : mm)



1.4 Panel Cut-out (Measurement : mm)



2. OPERATION

2.1 Summary

GCU-100 Operation

1. AUTO: In AUTO Start Mode (Remote Start)
2. MANU: Manual Start Mode
3. OFF: Engine Stop / Reset

Select only one button at a time. The buttons have double functions, depending if you are programming the control or in normal operation.

- Engine oil pressure is up (oil pressure switch activated).
- AC voltage
- AC frequency 18Hz and above
- MPU detects 20% the rated RPM

2.2 In AUTO

In **AUTO**, the module governs the start and stop of the **gen-set**. The flashing LED on the AUTO button indicates the control is in AUTO and waiting for a start signal, the moment this signal is received by grounding terminals J1-17, the LED stops flashing, and the generator initiates its auto start sequence,

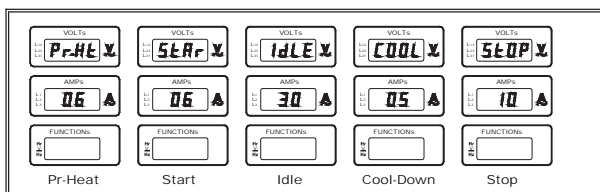
The GCU-100 also has ENGINE IDLE, and once the engine has started, and operating “**IDLE**” is displayed on the “VOLTS” screen with its corresponding countdown on the “AMPS” screen: You can disable ENGINE IDLE when programming.

This sequence starts by first Pre-heating the engine. The control now displays the word “**Pr.Ht**” on the “VOLTS” screen and the countdown on the “AMPS” screen.

Finally, the GCU-100 activates a 30 second grace period to let all parameters build up and stabilize. If it fails to do so in 30 seconds, the module stops the engine displaying the failures and warnings.

Next, the module begins to crank the engine, in the same way displaying the word “**Star**” on the “VOLTS” screen and the countdown on the “AMPS” screen. If the engine does not start the module, it repeatedly returns to Pre-Heat to execute another start sequence. If the engine fails to start, the module then displays “**FAIL**” on the screen, and simultaneously lights up the engine start failure LED on the panel, activating the failure warning alarm signal output terminal J1-4.

When the remote start signal disappears, the module goes into Engine Cool-down displaying “**COOL**” on the “VOLTS” screen and its corresponding countdown timer on the “AMPS” screen. However, if the remote start signal is reactivated during engine Cool-down, the module cancels the countdown, returns to normal operation, and continues providing power.



However, if the GCU-100 determines the gen-set started and is operating correctly, the module immediately stops the starter to prevent damage, if it senses:

After Cool-down times out, the module will implement an engine stop, either energize to stop or energize to start. When executing engine stop, “Stop” will be displayed on the “VOLTS” display screen and countdown timer on the “AMPS” display screen.

ATTENTION

When the generator is on engine Cool-down, the GCU-100 remains in effect; and if, any failure occurs, the module bypasses the countdown and shuts down the generator immediately.

2.3 MANU Mode

In **MANUAL**, you can start and stop the **gen-set** manually. If you press the OFF button, the **gen-set** will make the normal programmed shutdown...

In AUTO and MANUAL the engine start and stop program are almost identical but in **MANUAL**, engine Cool-down is not used. Reference chapter 2.2.

2.4 OFF Mode

Press the OFF button to shut down the **gen-set** or also for fault failure **RESET**. If the OFF button is pushed during normal operation, the program omits engine Cool-down execute engine shut down immediately.

If a major malfunction is detected during operation, the module immediately shuts down the **gen-set** to prevent further damage to the equipment or operating personnel. The display shows all failures at the same time on the front panel so maintenance service can carry out necessary repairs. To reset the warning(s) and failures, press the "OFF" button.

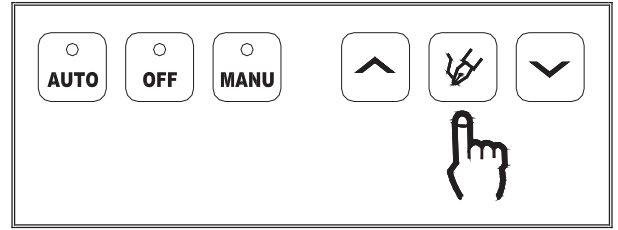
3. SYSTEM SETTING & OPERATION

ATTENTION

Before proceeding to system setting, make sure all wiring and batteries are connected.

3.1 System Setting

There are total of 53 programmable setting in the GCU-100, you can program the module according to different **gen-set** operation controls and protection preferences by pressing the setting key / buttons on the front panel. To start, press OFF and then press and hold the program (pen) button for 4 seconds.



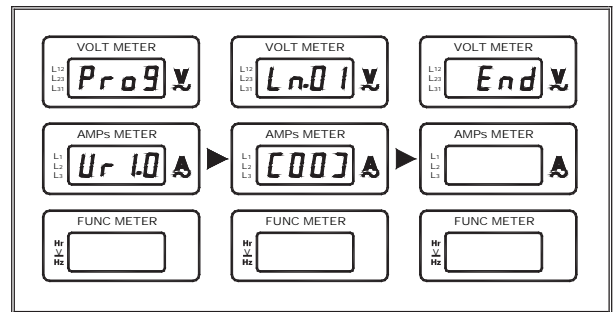
The display screen will now display "Prog" & "Vr1.0" for 4 seconds, "Vr1.0" is the program version. Next "Ln.01" will appear on the display screen,

representing the program setting entry, (00) the system setting parameter.

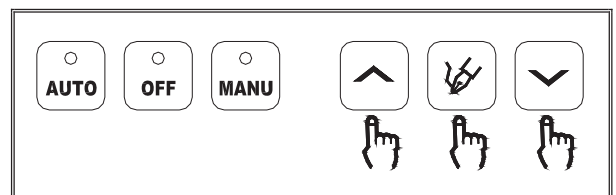
You can change the setting using the increase (up arrow) and decrease (down arrow) button. Each time your presses the (pen) button the system advances to next entry, pressing the (OFF) button returns to the previous entry.

After programming, the last entry or if the panel is left inactive for 10 seconds, the screen displays the word "End" and the system automatically records all new entries and settings

You can terminate system programming at anytime by pressing the (PEN) button for 4 seconds until the word "End" appears on the display. (For setting information, see reference 3.13 system setting reference)



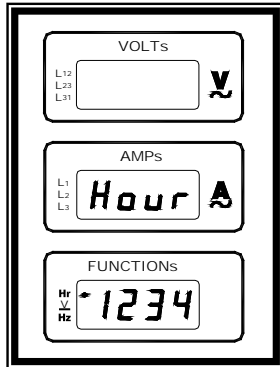
The GCU-100 comes pre-programmed with factory settings. You can reset to factory setting at any time by pressing the (UP and Down arrow) buttons together for 4 seconds until "Au.PO" appears on the screen.



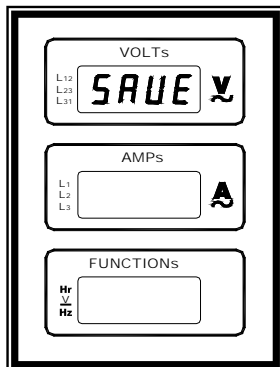
3.2 Setting the Hour meter

Removing the battery does not affect the hour meters accumulative memory and does not reset itself even with no power.

To reset the hour meter go into program mode and immediately before the Prog Vr1.0 message disappears from the screen press the (OFF) button for 4 seconds until the screen displays "Hour" the 1234 / Value) in the screen represents the total accumulated operation hours.



Press the UP and DOWN buttons to change the hours. By pressing and holding, you can speed up the process. When the setting is completed, press the (PEN) button for 4 seconds until (SAVE) appears on the screen.



If the buttons are left untouched for 10 seconds, the operation terminates showing (END) on the screen and the control turning OFF and any modification made to the hour meter will not be recorded.

3.3 Setting the Magnetic Pick-up (MPU)

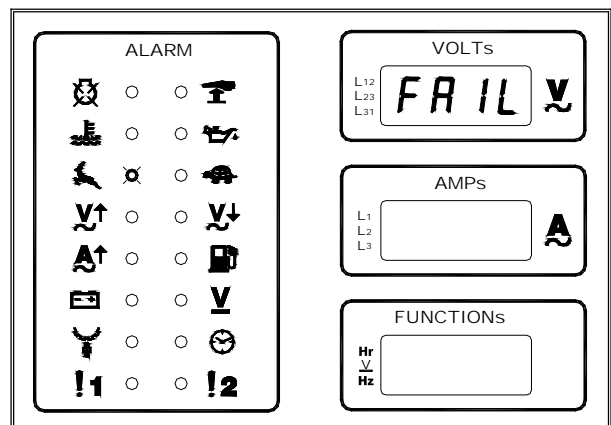
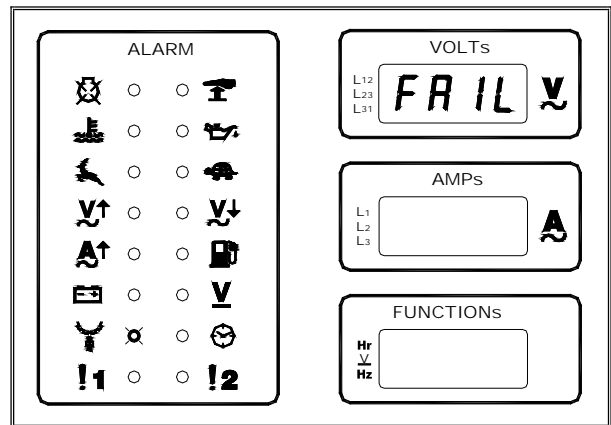
The MPU (Magnetic Pick-up) detects the engine revolution according to the frequency measured on the engine flywheel teeth. Most generators with electronics speed controllers/governors have them installed.

MPU frequency range : 100Hz ~ 10K Hz

To set the MPU frequency, start the engine in **MANUAL** and manually set the engine to 50Hz or 60Hz, then quickly press PEN, UP and DOWN arrow simultaneously for 4 seconds until the word (SAVE) appears on the display screen.

If the control sees a erroneous frequency reading from the MPU that is below 100 or above 10K Hz, the control deduces it as an MPU failure and will

display (FAIL) on the screen and at the same time light up the warning LED. Check the MPU for incorrect wiring or bad connections, and after correcting the problem, repeat the previous steps to finish setting up the MPU. Any the previous frequency settings are unaffected.



Some electronics speed controllers “Governors” do not share the MPU with other devices, so you may have to install another (MPU) or use a dual coil MPU with the GCU-100. When the control cannot read the frequency correctly, the GCU-100 shuts down the engine and the MPU failure icon lights up on the panel.

For MPU settings refer to programming , lines (2), (16), (17), (18), (19), (21), (22), and (23).

3.4 Setting the AC Voltage and Current Display

In normal operation, you can read full phase voltage and current directly off the screen. This reading is factory calibrated. However, if the **gen set** encounters capacitive or inductive loads, waveform distortion causes minor voltage differences with a calibrated voltmeter.

If you want an identical reading, you need to re-calibrate the control AC voltage and current settings. Once the new calibration is completed, the voltage reading is identical to the display. The over, under voltage and load current protection will use these new values as the system’s reference voltage,

For AC voltage and current display, settings go to system setting and programming lines (3), (4), (10), and (11).

3.5 Setting AC Voltage Protection

The module comes preprogrammed for AC over and under voltage protection. However if defective AC Voltage is detected, it activates a permissive timer to give the generator time to recover. However if it does not recover on time, the module activates the AC voltage protection shutdown showing the abnormal voltage on the display and lighting up the high or low AC Voltage LED on the control panel. If the voltage recovers within the permissive count down, the control automatically omits the abnormality.

The GCU-100 has two types of protections; a simple warning and a total engine shutdown.

- **ENGINE SHUTDOWN:** perform an immediate engine power failure, displaying the abnormal reading on the screen, and lighting up the appropriate a LED indicator
- **GENERATOR WARNING:** display the abnormal reading on the screen and lighting up the appropriate a universal indicator without stopping the generator.

For AC voltage protection and settings refer to system programming lines (5), (6), (7), (8), and (9).

3.6 Engine Over-load Protection Settings

To prevent inappropriate load usage and causing **gen-set** failure and damage, the module is equipped with engine over-load protection function. User needs to setup appropriate over load protection setting according to the **gen-set** maximum output.

If the system detects engine overload, it automatically starts engine over-load timer countdown. If rated load usage does not recover within the countdown, the system automatically executes engine over-load protection and displays a failure signal on the panel and at the same time provides corresponding failure signal output. If rated load usage is resumed within the countdown timer, then it automatically omits the overload warning.

The GCU-100 provides two kinds of warning and protection mode for engine over-load protection.

- Engine stop mode : When engine over-loads, the module will execute engine stop and display a failure signal on the panel, at the same time it will provide corresponding failure signal output.
- Warning mode : display failure signal on the panel, while at the same time provide corresponding failure signal output. User can use the signal output to disconnect the load and let **gen-set** operate without load to cool down.

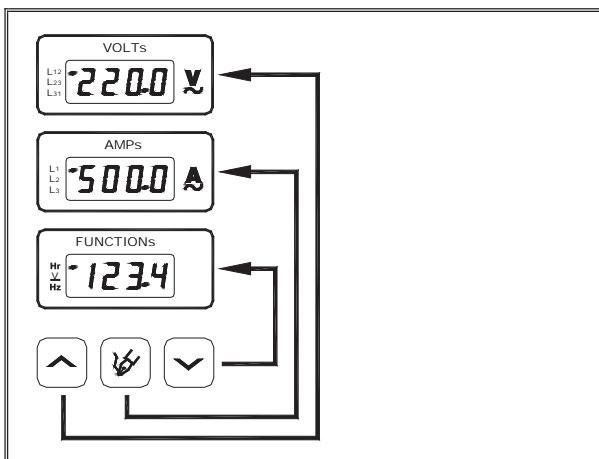
For engine over-load protection related settings refer to system setting reference entries (12), (13), (14), and (15).

3.7 Panel Display Setting

There are two types of display settings, fixed and cycle display. The default setting is cycle display when you view each parameter for 2 seconds.

To monitor particular parameter, press the corresponding button to freeze the desired parameter and press again to return to cycle display.

- Press the up and down arrows to change between different phases readings
- Press the up and down arrows to change between different phase current readings
- Press decrease / selection button to interchange between AC frequency, Battery voltage and operation Timer.



3.8 Technicians shutdown-bypass setting

An important and practical item on this control is the technician shutdown bypass setting on line 53. When activated, a technician can perform adjustments and correction on the generator without the control stopping it constantly. Now you can simply **start** the generator by pushing the **MANUAL** button and **stopping** it by pushing the **AUTO** button. Finally pushing the **OFF** button takes you back to normal operation and protections.

Before going into bypass mode make sure the GCU-100 is connected properly, in bypass mode the all the AUTO / OFF / MANU LED will turn-on as a reminder that the control is in bypass mode. In bypass mode, the module will continue to provide all warning LED signals but cancel engine shutdown

⊗
AUTO

⊗
OFF

⊗
MANU

^

✋

v

ATTENTION

Under bypass Manual Start and Stop Operation, all of the engines protections are cancelled. If a major failure occurs during this operation, the module will not execute and engine shutdown and the user will need to activate engine shutdown manually. Only use this setting for initial configuration and calibration of the generator and not for providing load for long period to prevent possible damage to the gen-set.

3.9 Setting the Programmable inputs Alarm1 and Alarm2

This module has 2 extra alarm outputs that are user programmable that can either provide a warning or a shutdown

To set up the two alarms refer to programming lines (45), (46), (47), (48), (49), and (50).

3.10 Service and Maintenance reminders

This controller can activate a generator service reminder by lighting up a service LED in the shape of a clock face on the front panel. Program the service timer in 10-hour units. For example if 20 is entered then the scheduled timer is set to 200 hrs intervals (20 *10 hrs = 200 hrs). Reset the timer after activation

For service and maintenance reminders, go to system setting, programming lines (51), (52).

3.11 Engine Idle

A generator normally goes to full load speed on startup; this may shutdown a cold engine. To avoid this problem, the GCU-100 has an engine idle warm-up timer allowing the engine to warm-up before loading. You can activate or deactivate this function depending on the type of engine and governor in use. Or if the engine already has a block heater.

To set the engine idle warm-up timers go to system programming line (33).

3.12 Charge Alternator Excitation D+

GCU-100 provides excitation to the battery charging alternator D+ terminal during engine start and later monitors the D+ terminal to check if the alternator is working properly. If the alternator fails, the control turns on the charge alternator failure LED.

For battery charging alternator excitation setting, go to system programming lines (39), (40), and (41).

3.13 Setting Communication Modules GCU-100 to PC (KCU-XX)

You can monitor and control the gen-set on a remote PC using the optional USB / RS485 / Ethernet remote communication modules; all three-interface modules are easy to install.

KCU-01 – USB communication module

KCU-02 – RS-485 communications module

KCU-03 – Ethernet communications module

For remote communication, settings refer to system setting reference lines (54), (55) and (56).

Setline (54) is set to 00, and then the user can read all the real time information from the controller only.

But when it set to 01, it allow remote control from PC also.

The items (55) and (56) is for KCU-02 RS485 interface module used only, others do not care.

For detail, information refers to the KCU-XX user manual.

NOTE

When using the KCU-02 in a closed LAN, use different controller address but keeping the same Baud rate

3.14 Setting the Oil Pressure Switch

The oil pressure-sensing terminal J1-13 can be configured three different ways. See line (24)

“00” NO Normally Open

“01” OC Normally Close

“00” Grounding signal from J1939 reader

On engines with ECU controls, the GCU-100 does not need to read oil faults directly. This job belongs to the engine ECU that provides its on safety shutdown. Therefore, you can disable the oil pressure-sensing terminal by programming it to “00”. Now the J1-13 becomes regular alarm terminal shutdown input that can be triggered by grounding.

A good example is a J-1939 code reader built with an internal fault relay that grounds terminal J1-13 if the engines ECU detect a problem.

3.15 System Setting Reference

















ITEM	DESCRIPTION	SETTING	FACTORY SETTING
1	Phase Selection (3Ø 3Wire, 1Ø 3Wore, 1Ø)	00 → 3Ø 3W 01 → 1Ø 3W 02 → 1Ø	00
2	Generator Frequency (60 or 50 Hz)	00 → 60 Hz 01 → 50 Hz	00
3	AC Voltage display reconciliation and calibration	00 → Its OK do not change 01 → add volts 02 → subtract volts	00
4	Volts to add or subtract (if needed) to panel reading	00~ 99 V	0V
5	Permissive AC voltage timer	00 ~ 99sec (00 – Option Cancelled)	15
6	Under voltage protection setting (18 = to 180 volts)	08 ~ 47	18 (180V)
7	Under voltage protection Warning or Shutdown	00 → Warning 01 → Shutdown	01
8	Over voltage protection setting (25 = to 250 volts)	11 ~ 50	25 (250V)
9	AC over voltage protection Warning or Shutdown	00 → Warning 01 → Shutdown	01
10	AC Amps display reconciliation and calibration	00 → Its OK do not change 01 → add Amps 02 → subtract amps	00
11	Amps to add or subtract (if needed) to panel reading	00~ 99 A	0 A
12	Set (CT) Current Transformer size in amps Example The default setting is (12) for use with an1000A/5A Current Transformer (If you not set the correct CT value you are going to get a erroneous current readings)	1 → 50/5 2 → 100/5 3 → 150/5 4 → 200/5 5 → 250/5 6 → 300/5 7 → 400/5 8 → 500/5 9 → 600/5 10 → 750/5 11 → 800/5 12 → 1000/5 13 → 1200/5 14 → 1500/5 15 → 1600/5 16 → 2000/5 17 → 3000/5	12
13	Engine overload timer	00 ~ 99sec (00 – no overload protection)	0
14	Engine Overload protection setting (The setting value is the percentage ratio from the primary current of Current Transformer) For example: CT=1000/5A and Overload protection setting is 80%, then the over current activation will be 1000A * 80% = 800A	30% ~ 99%	80%
15	Engine over-load protection Warning or Shutdown	00 → Warning 01 → Shutdown	01
16	Engine over-frequency setting	51 ~ 75HZ	65HZ
17	Permissive engine over-frequency timer setting	00 ~ 99 sec (00 – no under-speed protection)	05
18	Engine under-frequency setting	40 ~59HZ	55HZ
19	Engine Under-frequency permissive timer setting	00 ~ 99 sec (00 – no over-speed protection)	10
20	Engine under-speed protection Warning or Shutdown	00 → Warning 01 → Shutdown	01
21	Magnetic Pick-up (MPU) installation	00 → NO 01 → Yes	00
22	Magnetic Pick-up (MPU) used to set engine over speed	00 → NO 01 → Yes	00
23	Magnetic Pick-up (MPU) Failure Warning or Shutdown	00 → Warning 01 → Shutdown	00

ITEM	DESCRIPTION	SETTING	FACTORY SETTING
24	Oil pressure switch type NO (Normal Open), NC (Normal Close) or no oil pressure switch used	00 → NO 01 → NC 02 → J1939 reader	01
25	Low oil pressure permissive delay	02 ~ 99 sec	05
26	Water temperature sensor type NO (Normal Open) or NC (Normal Close)	00 → NO 01 → NC	00
27	High water temperature permissive delay	02 ~ 99 sec	05
28	Engine pre-heat timer setting (Countdown)	02 ~ 99 sec	06
29	engine crack cycles	01 ~ 09	03
30	Starter cranking time setting	02 ~ 30 sec	06
31	Oil pressure switch used to stop engine cranking	00 → No 01 → Yes	01
32	Magnetic Pick-up (MPU) used to stop engine cranking	00 → No 01 → Yes	00
33	Engine in idle timer setting	00 ~ 99 sec	00
34	Control set to (Energize to STOP) Shutdown solenoid Activation timer	02 ~ 99 sec	10
35	Set Engine fuel solenoid to either (Energize to STOP or energize to START)	00 → Energize to stop 01 → Energize to start	00
36	Set Engine cool-down timer	00 ~ 60 min	00
37	Set Battery under voltage protection voltage	08 ~ 23 VDC	08 VDC
38	Set Battery over voltage protection voltage	13 ~ 35 VDC	32 VDC
39	Charge alternator permissive timer delay	00 ~ 99 sec (00 – Option Cancelled)	10
40	Charge alternator D+ terminal minimum voltage Setting	08~ 25 VDC	08 VDC
41	Charge alternator failure Warning or Shutdown	00 → Warning 01 → Shutdown	00
42	Fuel level Switch type NO (Normal Open) or NC (Normal Close)	00 → Not used 01 → NO 02 → NC	00
43	Low fuel level activation permissive timer delay	02 ~ 99 sec	10
44	Low fuel level warning or Shutdown	00 → Warning 01 → Shutdown	00
45	Set Alarm1 as NO (Normal Open) or NC (Normal Close) type	00 → No input signal 01 → NO 02 → NC	00
46	Alarm1 permissive timer delay	02 ~ 99 sec	10
47	Alarm1 Warning or Shutdown	00 → Warning 01 → Shutdown	00
48	Set Alarm2 as NO (Normal Open) or NC (Normal Close) type	00 → No input signal 01 → NO 02 → NC	00
49	Alarm 2 permissive timer delay	02 ~ 99 sec	10
50	Alarm2 Warning or Shutdown	00 → Warning 01 → Shutdown	00
51	Engine service and maintenance timer setting Every value represents 10 hr (2 = 20 hrs)	00 ~ 25 (00 Option Cancelled)	00
52	Erase service and maintenance warning signal and reset timer cycle	00 → NO 01 → Yes	00
53	Technician service mode - Shutdown override	00 → Normal 01 → override	00
54	Enable remote control by KCU-XX Module	00 → NO 01 → Yes	00
55	KCU-02 module address setting	00 → None 01 ~ 99	00
56	KCU-02 Baud rate setting	01 → 115200 02 → 57600 03 → 38400 04 → 19300 05 → 14400 06 → 9600 07 → 4800 08 → 2400 09 → 1200	03

4. FAILURE WARNING DESCRIPTION

4.1 Failure Signal Reference

Icon Reference

WARNING SIGNAL	DESCRIPTION	EXECUTION
	Engine Start Failure	Shutdown
	Emergency Shutdown Activated	Shutdown
	High Water Temperature	Shutdown
	Low Oil Pressure	Shutdown
	Over-speed	Shutdown
	Under-speed	Shutdown or Warning
	AC over voltage	Shutdown or Warning
	AC under voltage	Shutdown or Warning
	Gen-set Over-load	Shutdown or Warning
	Low Fuel Level	Shutdown or Warning
	Charge alternator failure	Shutdown or Warning
	Low Battery Voltage Warning	Warning
	MPU Signal Failure	Shutdown or Warning
	Service & Maintenance Reminders	Warning
	Spare Setting 1	Shutdown or Warning
	Spare Setting 2	Shutdown or Warning

4.2 Warning

If a failure occurs and the condition does not pose immediate danger to the operator or **gen-set**, the control allows the generator to keep on running and provide power and the failure warning LED light will flash, and activate the warning signal output. Once the failure is corrected and eliminated, the warning

signal will automatically reset itself and return to normal operation.

4.3 Shutdown Mode

If a major failure occurs during operation that can cause danger to personnel or equipments, the control will execute an immediate engine shut down and display the corresponding failure warning signals and at the same time will activate the warning signal output to alarm the maintenance personnel to service and fix the problem. Once the failure is serviced and eliminated, user can press (OFF) button to reset the failure warning and confirm if the failure is properly eliminated.

5. SPECIFICATION

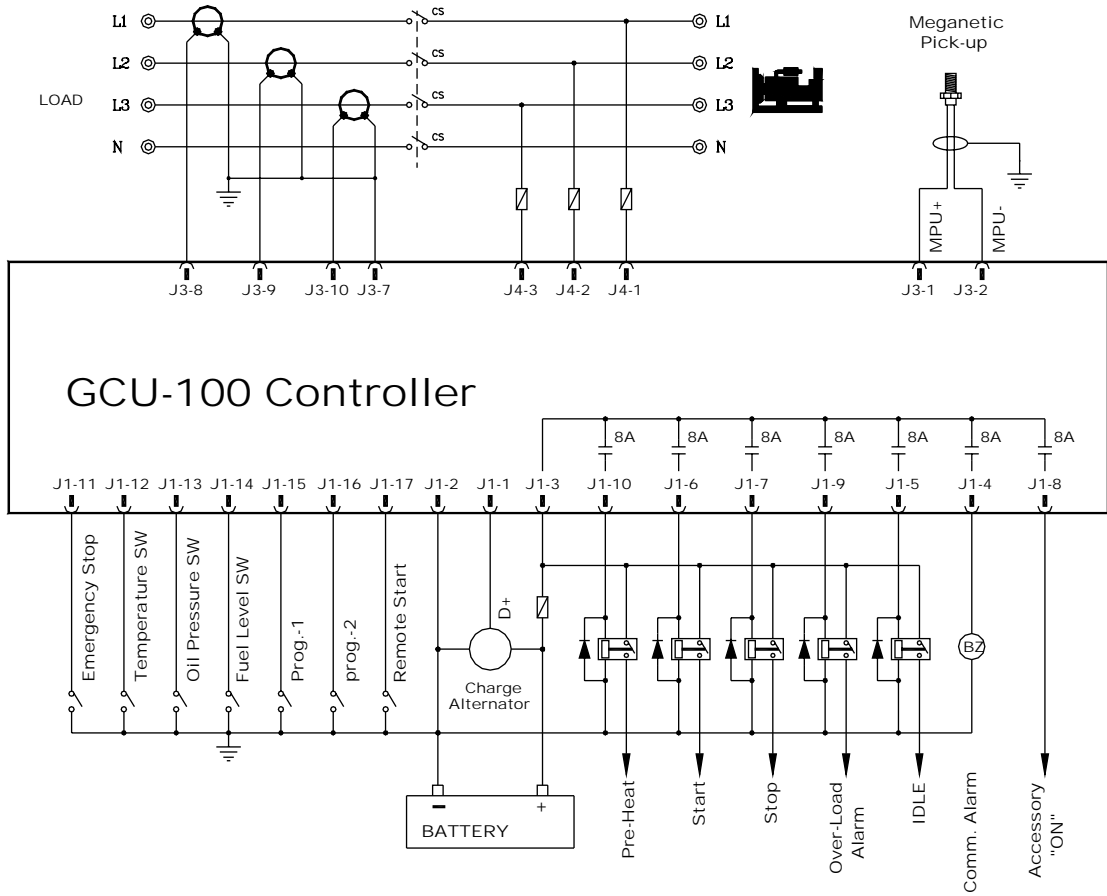
ITEM	SPECIFICATION
DC Supply	9 ~ 36 VDC
Alternator Input Range	15 ~ 510 VAC (Ph-Ph)
Alternator Input Frequency	50 ~ 60 Hz
Start Signal Output	10 Amp @ 12/24VDC
Fuel Solenoid Signal Output	10 Amp @ 12/24VDC
Preheat Signal Output	10 Amp @ 12/24VDC
Accessory "ON" Output	10 Amp @ 12/24VDC
Idle Control Conductor Capacity	10 Amp @ 12/24VDC
Warning Signal Output	10 Amp @ 12/24VDC
Overload Alarm Output	1.0 Amp @ 12/24VDC
Normal Power Connect to Load Signal	8 Amp @ 250VAC
Stand by Power Connect to Load Signal	8 Amp @ 250VAC
Power Consumption	Under 5W
Operating Temperature	-20 to 70°C
Relative Humidity	Under 95%
Rated CT Capacity	Above 2.5VA
Secondary Rated current	5A
Weight	604 g ± 2%

6. TERMINAL & WIRING DESCRIPTION

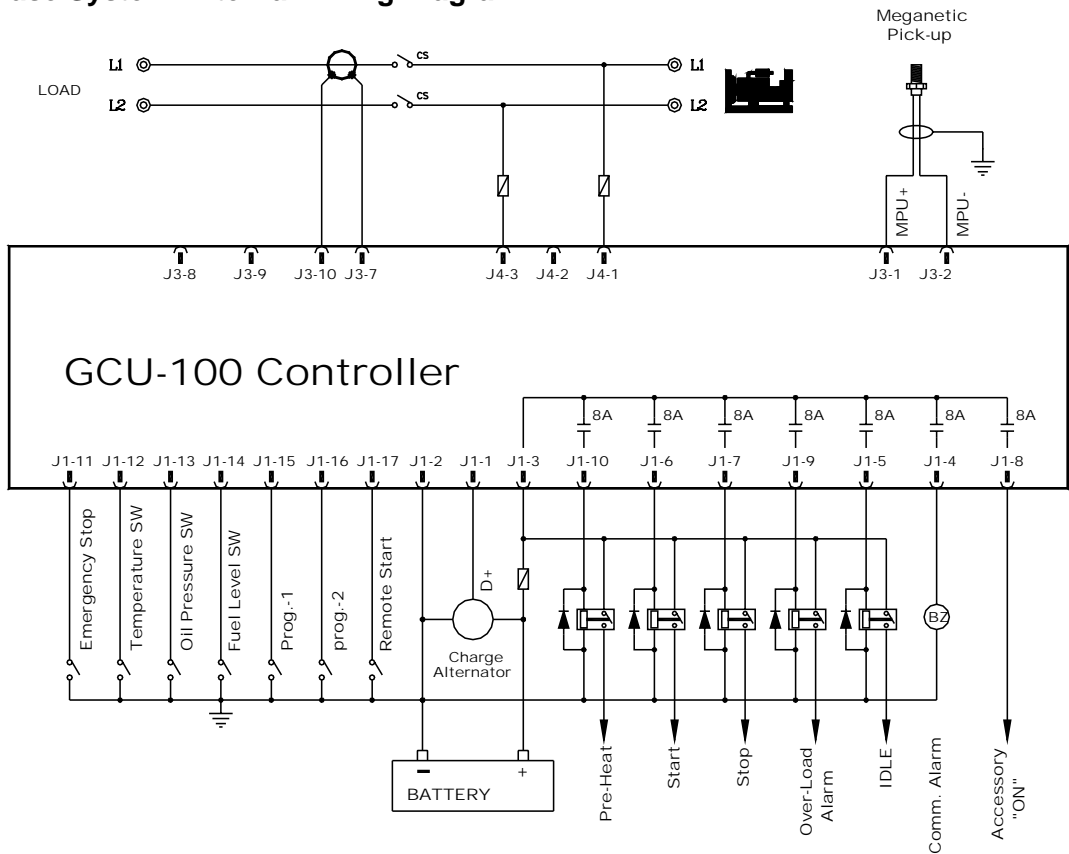
6.1 Connection Detail

PIN No.	DESCRIPTION	ATTENTION
J1-1	Charge alternator D+ terminal input	Connect to charge alternator D+ terminals
J1-2	Battery negative (-V)	Connect to battery negative
J1-3	Battery positive (+V)	Connect to battery positive (12 / 24V)
J1-4	Failure signal output	Used to control external alarm buzzer Supply (+V) (Max. rated output 8Amp)
J1-5	Idle speed control signal output	Connect to electronic governor for idle speed control Supply (+V) (Max. rated output 8Amp)
J1-6	Starter motor signal output	Connect to starter motor Supply (+V) (Max. rated output 8Amp)
J1-7	Fuel solenoid signal output	Connect to fuel solenoid or fuel valve control Supply (+V) (Max. rated output 8Amp)
J1-8	Accessory on output	Connect to the panel lamp (Max. rated output 8Amp)
J1-9	Overload alarm signal output	Used to trip the AC output breaker Supply (+V) (Max. rated output 8Amp)
J1-10	Preheat signal output	Used to control the internal heater Supply (+V) (Max. rated output 8Amp)
J1-11	Emergency stop signal output	Connect to panel emergency stop push button
J1-12	High water temperature signal input	Connect to water temperature switch
J1-13	Low oil pressure signal input	to oil pressure switch or J1939 reader dry contact
J1-14	Low fuel signal input	connect to fuel level switch
J1-15	User defined signal input 2	Negative input when action
J1-16	User defined signal input 1	Negative input when action
J1-17	Remote start signal input	Connect to A.T.S or remote start terminal
J1-18	Spare terminal	
J2-1	Spare terminal	
J2-2	Spare terminal	
J2-3	Spare terminal	
J3-1	Magnetic Pick-up input	Connect to magnetic Pick-up to monitor engine speed
J3-2	Magnetic Pick-up input	Connect to magnetic Pick-up to monitor engine speed
J3-3	Spare terminal	
J3-4	Spare terminal	
J3-5	Spare terminal	
J3-6	Spare terminal	
J3-7	CT (COMM) terminal input	Connect to external CTs common position
J3-8	CT Secondary for (L1)	Connect to secondary phase R (L1) monitoring CT
J3-9	CT Secondary for (L2)	Connect to secondary phase S (L2) monitoring CT
J3-10	CT Secondary for (L3)	Connect to secondary phase T (L3) monitoring CT
J4-1	AC Input (L1)	Connect to AC input phase R
J4-2	AC Input (L2)	Connect to AC input phase S
J4-3	AC Input (L3)	Connect to AC input phase T

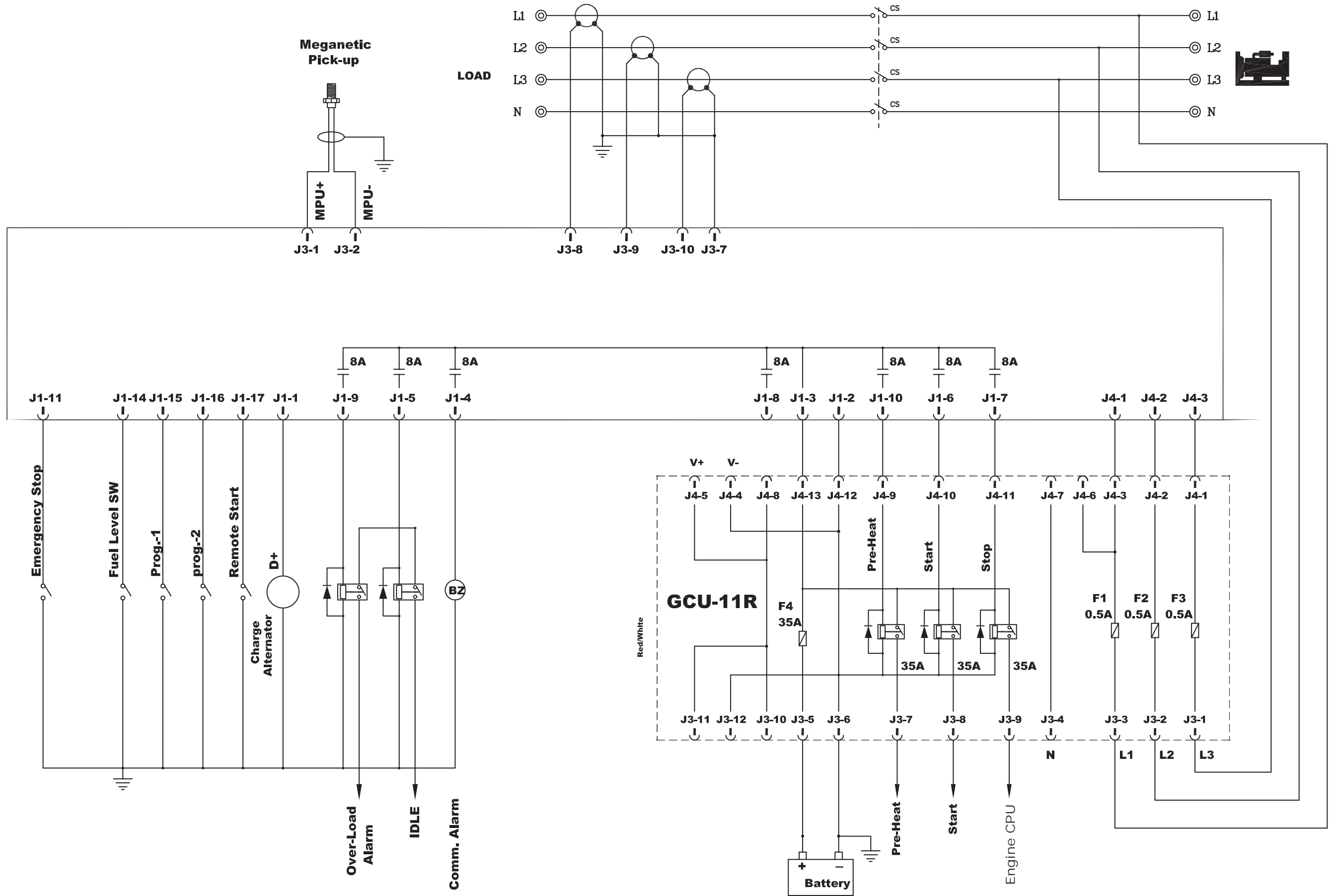
6.2 Three Phase System External Wiring Diagram

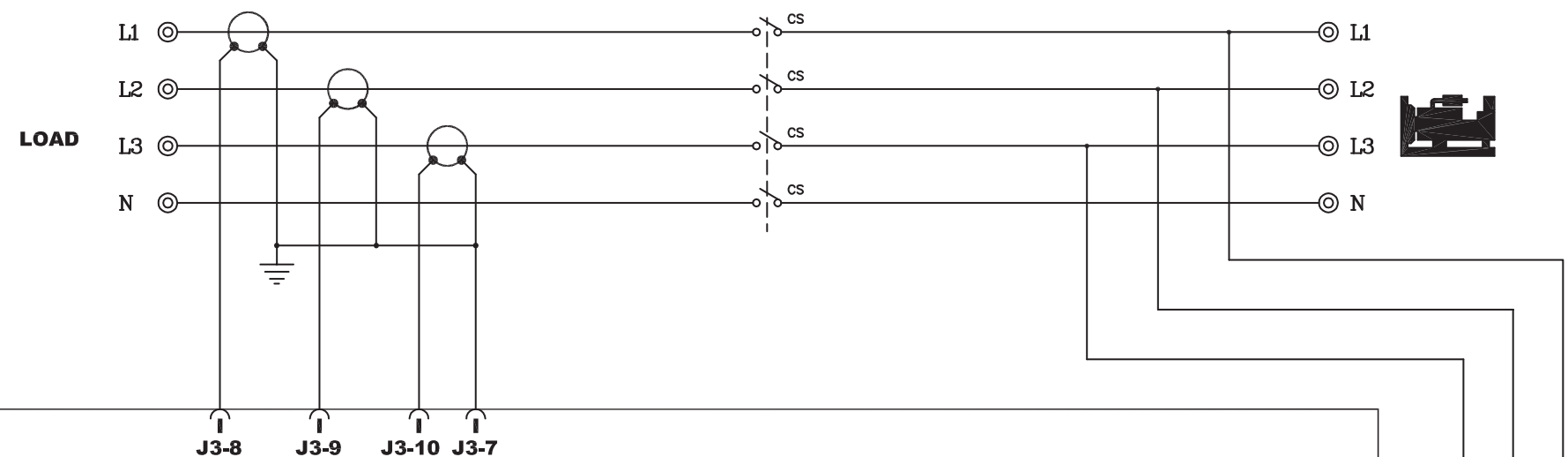
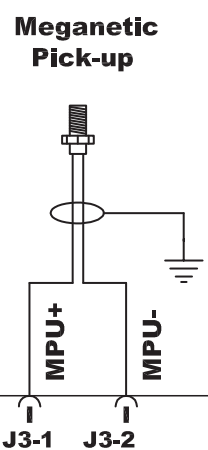
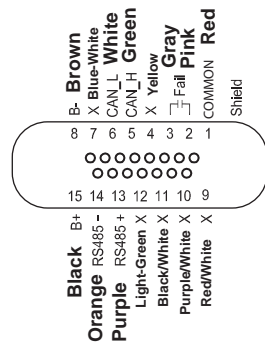


6.3 Single Phase System External Wiring Diagram



J1-13
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GCU-100 Controller

