WeiDian

Generator Sets Controller
210N

Operation Manual

Ver1.4

Note

This information could include technical inaccuracies or typographical error. Manufacturer may make improvements and/or changes in the product(s) and/or the program(s) described in this manual at any time without notice.

Contents

Important safety information

 **DANGER**

Danger is used to indicate the presence of a hazard that will cause severe personal injury, death, or substantial property damage if the warning is ignored.

 **WARNING**

Warning is used to indicate the presence of a hazard that can cause severe personal injury, death, or substantial property damage if the warning is ignored.

 **CAUTION**

Caution is used to indicate the presence of a hazard that will or can minor personal injury or property damage if the warning is ignored.

NOTE !

Note is used to notify people of installation, operation, or maintenance information that is important but not hazard-related.

 **WARNING**

Always connect grounding terminals!

In no case touch the terminals for voltage and current measurement!

In any case do not disconnect Controller CT terminals!

Disconnect power supply of Controller before working on generator set!

 **CAUTION**

All parameter are pre-adjusted to their typical values. But all the set points **must** be adjusted correctly before the first startup of the Generator set. Wrong adjustment of set points can destroy the Generator set!

Introduction

The 210N is a single diesel generator set controller. It is able to realize the automatic start and stop, self-protection and etc.

By pressing push buttons or when the Remote Start/Stop input is activated or de-activated, the controller can start or stop the generator set manually or automatically when all conditions are met. The user can also switch operation mode between the MANUAL Mode and the AUTO Mode smoothly. At the Auto Mode, the controller will start the generator set automatically when the Remote Start/Stop signal is activated, and enter the protection procedure when failure occurs. When the Remote Start/Stop input is de-activated, the generator set will enter the cooling state.

The main functions are：

- Start or Stop generator set manually
- Start or Stop generator set automatically
- Open Collector Output can be defined as Pre-heat Output *
- Open Collector Output can be defined as Idle Output *
- Over speed protection *
- Low Oil pressure protection *
- High Coolant temperature protection *
- Generator over voltage protection *
- Generator under voltage protection *
- Generator over/under frequency protection *
- Generator unbalance voltage protection *
- Over load protection *

Note：* indicate this function depend on the set points of the controller in field.

Section 1 Feature

Front Panel

The front panel of 210N includes alarm indicators, status indicators, keypad and LCD display. See figure 1-1 for LED, Key and Display location.

The information of program version of the controller, product code, and self-test will be displayed at power up, and then you can press the Display key to enter the keypad and led test screen.

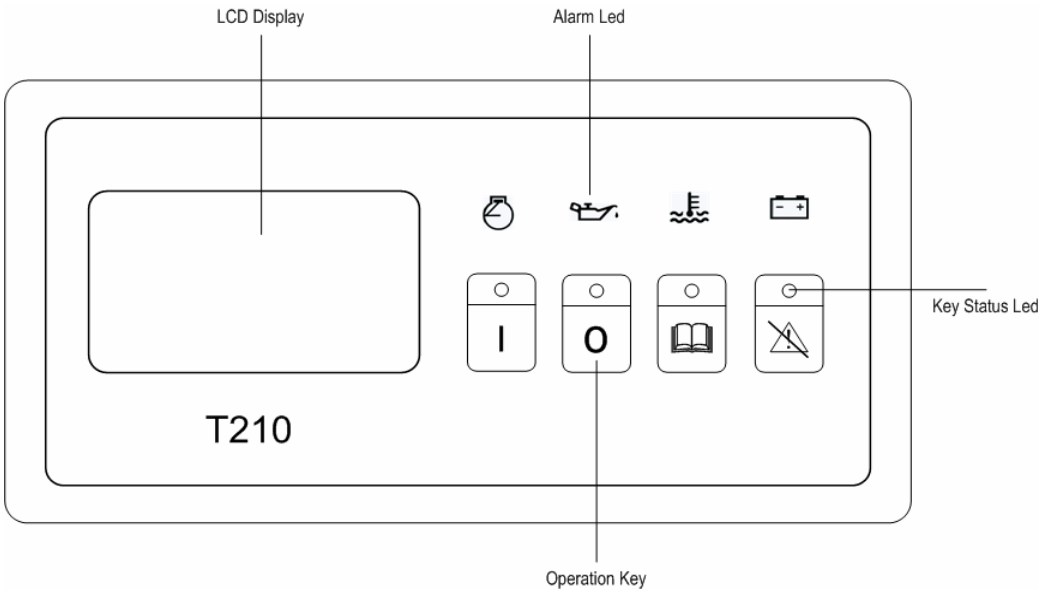

Figure 1-1 Front Panel

Alarm Indicators

There are four red LEDs for alarm indicators on the front panel, as follow:

- Over speed led

  LED illuminates when engine speed exceeds the “Overspeed” threshold after delay setting (max delay are 3s).

- Coolant temperature high led

  LED illuminates when coolant temperature approaches the threshold, or the sensor channel is shorted or opened after delay setting.

- Oil pressure led

  Led illuminates when oil pressure approaches the threshold, or the sensor channel is shorted or opened after delay setting.

- Battery led

  LED illuminates if battery voltage drops below the “Batt<V” setting or rises above the “Batt>V” setting after delay setting.

Keypad

There are four key buttons on the front panel, as follow:

- START key

   To start Generator set at MANUAL Mode

- STOP key

   To stop Generator set at MANUAL Mode; decrease the set point value in the set points menu.

- DISP key

   To change screen display mode or scroll down the displayed page in static display mode; increase the LCD contrast in a circle or the set point value in the set points menu; combine with RESET key to switch operation menu.

- RESET key

   Reset the Horn Output and Alarm List at MANUAL Mode and AUTO Mode; Exit and save the set point if press and hold down the key, or exit without saving the set point if click the key; combine with DISP key to switch operation menu.

Status Indicators

There are four red/green dual color LEDs for status indicators, as follow:

- START key LED
  Green LED illuminates when generator set is starting or running
  LED off when the generator set stopped

- STOP key LED
  Red LED illuminates when the generator set stopped
  LED off when the generator set is starting or running

- DISP key LED
  Green LED illuminates when the displays are at static display mode (page displayed at static for 300 seconds) or at contrast adjustment menu.
  LED is off when the displays are at scroll display mode (displays scrolling a page per 2 seconds).

- RESET key LED
  Red LED illuminates when the Alarm List is not blank (there are activated alarms in the list. Inverted alarms are still active, non-inverted alarms are not active, but not yet reset.)
  LED is off when the Alarm List is blank (there are no alarms in the list.)

LCD Display

210N are equipped with a powerful backlight graphic display showing icon, symbols and bar-graphs for intuitive operation and setting parameter. The contrast of LCD can be adjusted easily.

Rear Panel

The rear panel of 210N includes all the terminals which are Power Supply, Binary Inputs, Analog Sensor Inputs, Speed Sensor Inputs, Generator Voltage Inputs, Current CT Inputs, Open Collector Outputs, Relay Outputs and communication extension interface. See figure 1-2 for terminals location.

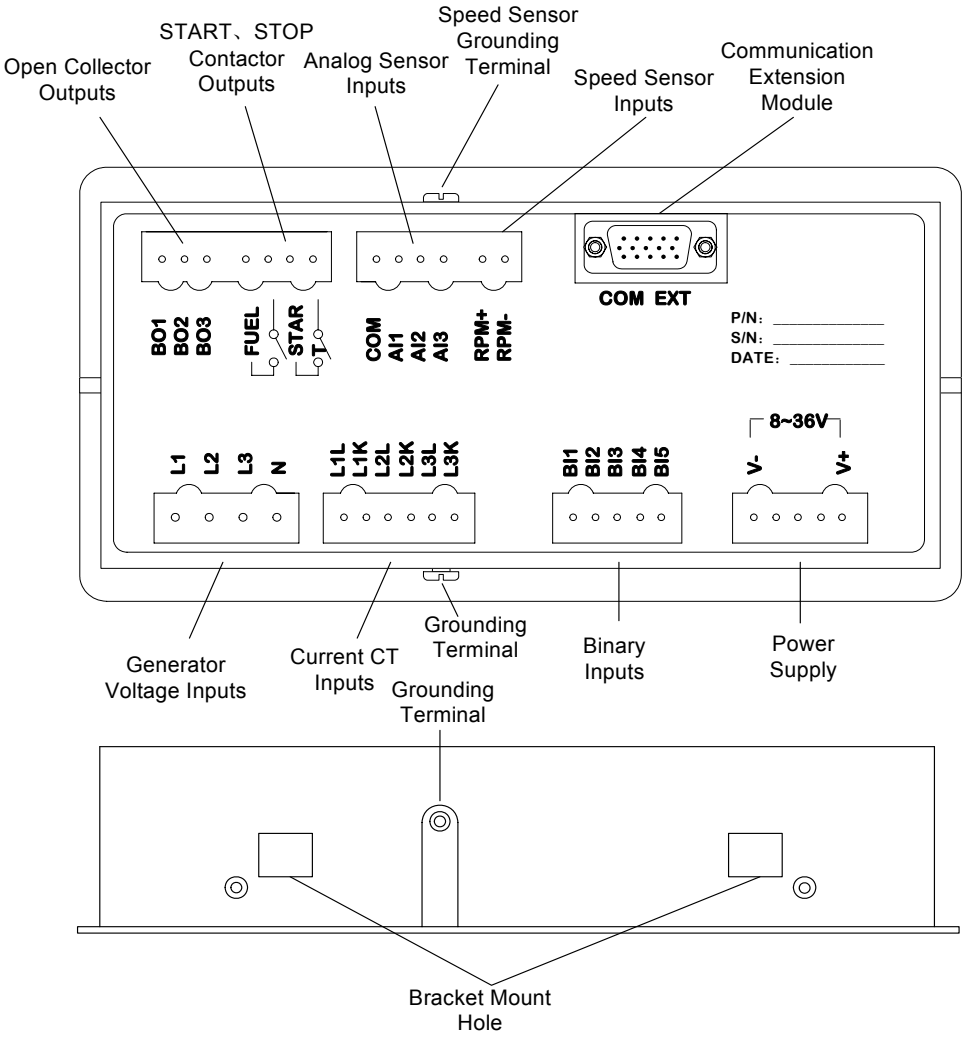

Figure 1-2 Rear Panel

Power Supply

The normal voltage range is from 8VDC to 36VDC. The controller will be damaged if the voltage exceeds 43VDC.

 **CAUTION**

Poor battery connection will damage the controller when generator set is running.

Binary Inputs

The function of five binary inputs of 210N (signed as BI1-BI5) can be separately defined in binary input configuration menu. The user can choose the definition from the following:

- BI_Body Temp
- BI_Pump Start
- BI_Coolant Temp
- BI_Belt
- BI_Remote Off
- BI_Emerg Stop
- BI_Fan
- BI_Access Lock
- BI_Oil Temp
- BI_Oil Pre
- BI_Fuel Lev
- BI_Coolant Lev
- BI_Manual/Auto
- BI_Pump FDBK
- BI_Air Door
- BI_Auto Start
- BI_Speed Down
- BI_Speed Up
- Reserve1
- Reserve2

Analog Inputs

Three analog inputs WAT.T, OIL.P, FUEL.L are available on the 210N controller. They can be connected with resistor sensor. Each analog input can be configured in analog sensor configuration menu.

Speed Sensor Inputs

Magnetic pick-up sensor is used for engine speed monitor, RPM+ terminal is for signal inputs. Using a shielded cable and grounding the shielded.

Open Collector Outputs

The function of three Open Collector Outputs of 210N (signed as BO1-BO3) can be separately defined in open collector output configuration menu. The user can choose the definition from the following:

- System OK
- Unload
- Speed Down
- Auto Standby
- Speed Up
- Fuel Pump
- Air Door
- Idle
- Running
- Pre-Lubr
- Pre-heat
- Horn

Relay Outputs

START relay closed energizes the starter motor. The relay opens if:

- The “startup RPM” is reached or
- Any phase voltage of the generator exceeds 15V or
- Oil Pressure exceeds CrankOilPre set point or
- Request to stop comes up

The “Fuel Solenoid” set point selects the output function.

When “Fuel Solenoid” is defined as “FUEL”, the relay closes to open the fuel solenoid and enable the engine start. The relay opens if:

- Emergency stop comes or
- The generator set is stopped or
- The generator set is in Pause state

When “Fuel Solenoid” is defined as “STOP”, the closed relay energized stop solenoid to stop the engine. The relay opens again if engine speed is lower than 30rpm and the delay from the relay closed exceeds Stop Min Time, or the delay from the relay closed exceeds Stop Max Time.

AC Voltage Inputs

Generator voltage terminals are available on the 210N.

Notes:

The input AC voltage on terminals should not be exceed 290V

Current CT Inputs

Each line of three-phase current terminal is available on the module. The three-phase CT ratio can be adjusted.

Section 2 Operation

Operating Checklist

 **WARNING**

Ensure the generator set is not loaded before starting.
Make sure all conditions are met before the controller worked on AUTO mode that generator set maybe start automatically anytime.
The running generator set will shutdown if the controller enter MAINTENANCE mode.

Menu Operating

The menu of General Display, Parameter Setting, Analog Input Setting, Binary Input Setting and Open Collector Output Setting can be displayed on the screen of the controller. After power up, the General Display screen displays the default General Display page. Press DISP key following RESET key (‘DISP’ key + ’RESET’ key) to exchange the menu between General Display and Set Menus.

Operation Mode

Three operation mode MAINTENANCE mode, MANUAL mode and AUTO mode are available on the 210N controller.

If a binary input which is defined as Mode Locked is activated, the operation mode will be locked that also can not be changed.

- MAINTENANCE mode
  The controller is at MAINTENANCE mode when the operation menu switch to Parameter Setting menu by press RESET key following DISP key (‘DISP’ key + ’RESET’ key) .

  The controller must be at MAINTENANCE mode before service the generator set. All parameter can be adjusted only at this mode.

  If a binary input is defined as Remote Off, activating this input channel will switch the operation mode at MAINTENANCE mode.

- MANUAL mode

  The controller is at MANUAL mode after power up. If a binary input is not defined as Manual/Auto Mode selection, when Remote Start/Stop is de-activated, the Manual mode will be not changed.

  If a binary input is defined as Manual/Auto Mode selection, the mode

will be selected by the input position.

- AUTO mode

  If a binary input is not defined as Manual/Auto Mode selection, at Manual mode when the Remote Start/Stop input is activated the controller will be working at AUTO mode and start the generator set.

  If a binary input is defined as Manual/Auto Mode selection, the mode will be selected by the input position.

General Display

The General Display includes five screens. Use the DISP key to page down the display.

Generator set State, Operation Mode, Engine Speed and Apparent Power Screen

See figure 2-1 for illustration of the value display.
See Appendix A for the states of generator set.

The Engine Speed Meter display the speed pick up value if the “Gear Teeth” set point is not zero, otherwise the display value is generator frequency multiplied by 30.

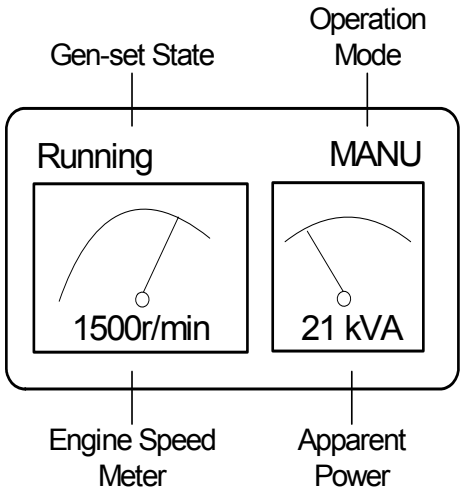

Figure 2-1

Oil Pressure, Coolant Temperature, Fuel Level and Battery Volts Screen

See figure 2-2 for illustration of the value display.

The name, unit and dot of three analog inputs can be configured in analog sensor set menu separately.

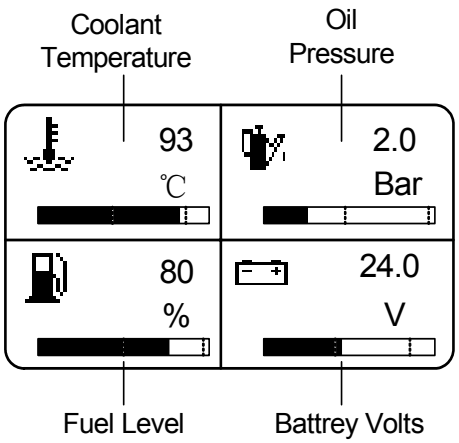

Figure 2-2

Generator Voltage, Frequency and Current Screen

See figure 2-3 for illustration of the value display.

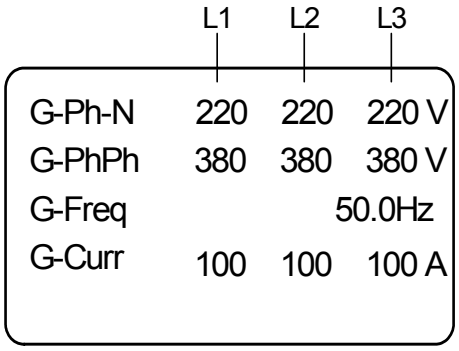

Figure 2-3

Act Power, Power Factor and Energy Screen

See figure 2-4 for illustration of the value display.

The value of Active Power and Power Factor is available when the generator set loaded.

Note: If the power factor and the active power are displayed with wrong value, try change the order of the generator voltage terminals or current CT terminals to correct.

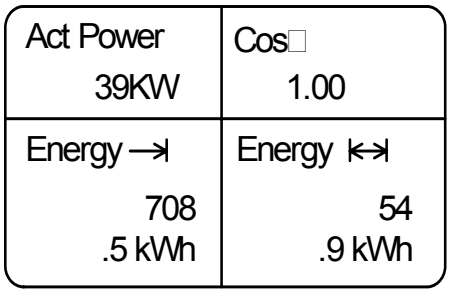

Figure 2-4

Number of Starts and Running Hours Screen

See figure 2-5 for illustration of the value display.

The Running Hours and the Number of Starts begin to count when engine speed reaches the “Startup RPM” set point.

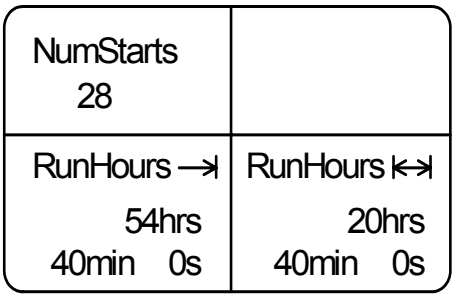

Figure 2-5

Binary Inputs, Open Collector Outputs and Relay Outputs Screen

See figure 2-6 for illustration of the value display.

The state of input and output channel is displayed inverted, When the channel function is activated, displayed Active, otherwise is De-Active. The active polarity can be configured by menu setting.

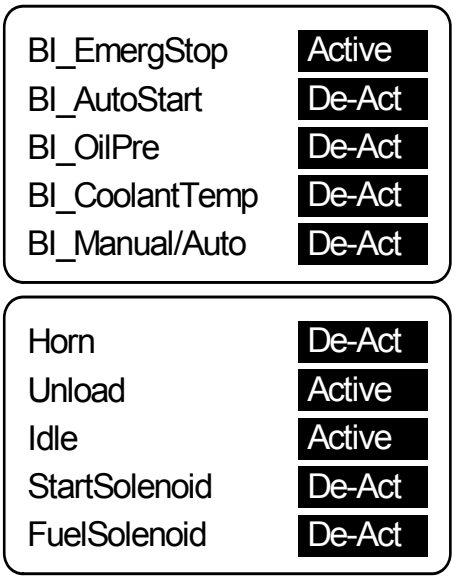

Figure 2-6

Alarm List

See figure 2-7 for illustration of the Alarm List display.

Four out of a maximum of sixteen alarms will be seen in one screen by active time sort. Press RESET key at MANUAL mode or AUTO mode accepts all alarms, and non-active alarms immediately disappear from the list. Active Alarm List appears on the screen when a new alarm comes up and General Display screen display currently.

See Appendix B for the possible alarm event.

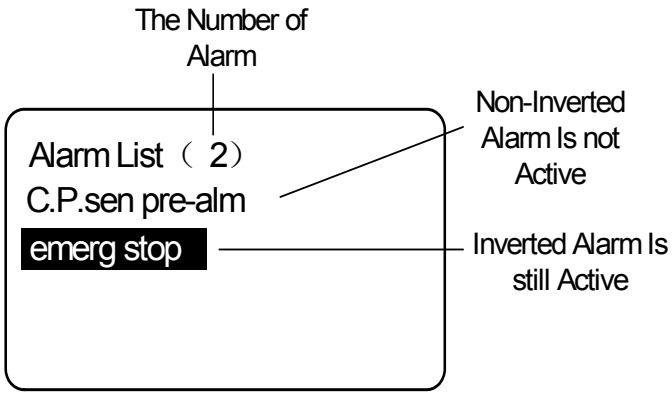

Figure 2-7

Set Points

The 210N controller supports parameter configuration on the front panel at MAINTENANCE mode. Using DISP key to select the set point to be changed or press and hold on DISP key to page down the screen.

All the set points are protected by password. You can enter right password to unlock the protection. The status of protection is displayed at the top-right corner of the screen. The parameter will be re-locked again if no parameter saved in five minutes or exiting MAINTENANCE mode. The default password is “0”, and can be changed.

See figure 2-8, for illustration of the Set Points display.

To set a parameter:

At first the password has to be unlocked as follow:

- Activate the Set Points screen
- Use DISP Key to select “Password” set point, press RESET key to enter editing status
- Press DISP key or STOP key to adjust it to the correct value
- Press and hold on RESET key until the protection unlocked

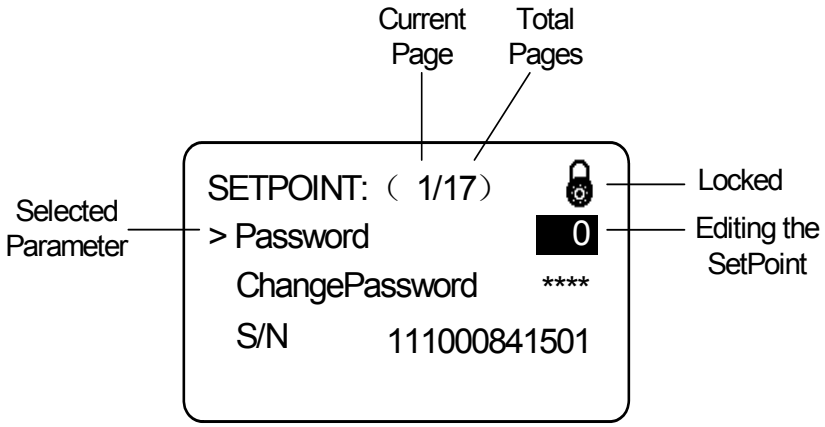

图 2-8

You can set “Nomin Power” as follow:

- Select “Nomin Power” set point, press RESET key to enter editing status, see figure 2-9

- Press the DISP key or STOP key to adjust the set point to the desired value
- Press and hold on RESET key to save the value and exit editing

You can speed up the adjustment by press and hold on DISP key or STOP key. Press RESET key to exit editing without saving.

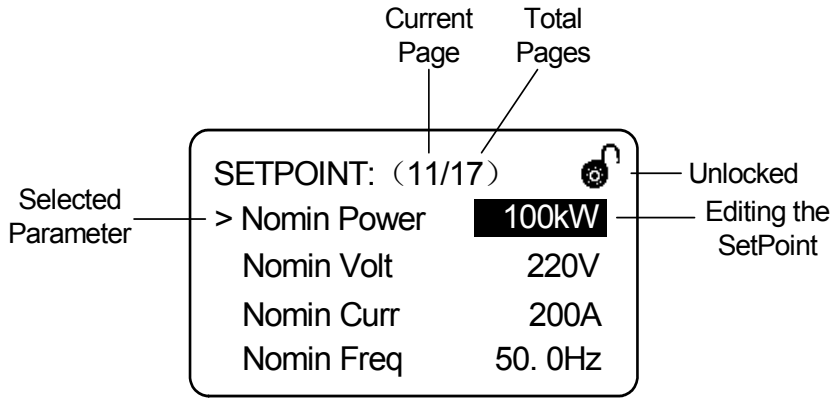

Figure 2-9

All Set Points defined in the screen of 210N as follow:

Basic settings

- AC System: Selection of the generator
  - 3 phase, 4 wire
  - 1 phase, 2 wire
- Nomin Power: The nominal power of the generator
  - Range: 1—3000 kW
- Nomin Voltage: The nominal generator voltage(phase to neutral)
  - Range: 80—15000 V
- Nomin Current: The nominal current of the alternator
  - Range: 1—5000 A
- Nomin freq: The nominal generator frequency(usually 50 or 60)
  - Range: 45—65 Hz
- Nomin RPM: The nominal speed of the engine
  - Range: 100—4000 r/min
- CT Ratio: The generator current transformer ratio
  - Range: 1—5000 A/5A
- Gear Teeth: The number of teeth on the engine gear for the pick-up. Set to zero, if no pick-up is used, and the engine speed is counted from the generator frequency.
  - Range: 0—5000
- RPM Ratio: The generator speed transformer ratio. Default value is 1
  - Range: 1—10

- PT Ratio: The generator voltage transformer ratio
  - Range: 100—15000V/100V

Engine parameters

- Fuel Solenoid: Selecting fuel or stop solenoid at FUEL relay output in stopping operation
  - FUEL: The relay closes when gen-set starts, opens when gen-set stops
  - STOP: The relay closes when gen-set stops, opens when RPM<30 r/min and stop time < Stop Min Time or stop time > Stop Max Time
- Stop Min Time:（When Fuel Solenoid set to STOP）Minimum time after the relay closing when gen-set stops
  - Range: 1-30s
- Stop Max Time:（When Fuel Solenoid set to STOP）Maximum time after the relay closing when gen-set stops
  - Range: 1-60s
- CrankOilPre: The oil pressure which the START relay opened to stop cranking
  - Range: 0—10.0Bar
- PreLubr Time: The time of closing of the PreLubr PUMP output prior to the engine start. Prelubrication is periodically(Prelubr period) repeated
  - Range: 1—600 s
- PreStart Time: The time of closing of the PreStart output prior to the engine start. Set to zero if you want to leave the output PreStart open
  - Range: 0—600 s
- Idle Time: The time of gen-set runs at the lower speed than nominal speed before MaxStab state for warming up the engine
  - Range: 0—3600 s
- Crank attempts: The max number of crank attempts
  - Range: 1—10
- Start Del: The time of start after gen-set received remote start signal
  - Range: 1—600 s
- MaxCrank Time: The maximum time limit of cranking
  - Range: 1—60 s
- Startup RPM: “Firing” speed. A little higher than the minimum stable speed. The START relay opened to stop cranking
  - Range: 1-50 % of nomin speed
- CrankFail Pause: Pause between crank attempts
  - Range: 1—60 s

- MaxStab Time: Maximum time after reaching of defined level of RPM to get proper voltage level of the generator
  - Range: 1-600s
- MinStab Time: Minimum time after reaching of defined level of RPM to the closing GCB
  - Range: 1-300s
- Cooling Time: Run time of the unloaded gen-set to cool the engine before stop
  - Range: 1-3600s

Engine protect

- PM Hours: Next running hours for preventive maintenance. When Run Hours exceeding the hours, a “pm hours arrival” alarm is activated. Set to zero if you want to leave the alarm de-activated
  - Range: 0—32767 h
- Overspeed: Threshold for over speed protection
  - Range: 50—150% of nominal speed
- Overspeed Del: Delay for engine overspeed
  - Range: 0—3s
- Underspeed: Threshold for under speed protection
  - Range: Startup RPM—100% of nominal speed
- Underspeed Del: Delay for engine underspeed
  - Range: 0—600s
- Protection Del: During the start of the gen-set, some engine protections （e.g. Oil pressure）have to be blocked. The protections are unblocked after the Protection Del time. The time starts after reaching start RPM.
  - Range: 0—300s
- Pump Run < %: To start the pump （If a binary input is not defined as Fuel Level，it is not worked）. When Fuel Level is under Pump Run < %, pump starts automatically
  - Range: 0—200%
- Pump Stop > %: To stop the pump（If a binary input is not defined as Fuel Level，it is not worked）. When Fuel Level is over Pump Stop > %, pump stops after Pump Run Time.
  - Range: 0—200%
- Pump Run Time: The time starts after Fuel Level reaching Pump Stop > %
  - Range: 0—3600s
- Batt > V: Threshold for battery high voltage
  - Range: Batt < V—36V

- Batt < V: Threshold for battery low voltage
  - Range: 8—Batt > V
- Batt V Del: Delay for battery low voltage and over voltage
  - Range: 0—600s
- Batt Drop: The default value is 0.1V
  - Range: 0—36V
- Horn Timeout: Max time limit of horn sounding. Set to zero if you want to leave the output HORN open
  - Range: 0—600s

Generator protect

- Gen >V: Threshold for generator over voltage. All three phases are checked. Maximum out of three is used.
  - Range: 100—150%
- Gen <V: Threshold for generator under voltage. All three phases are checked. Maximum out of three is used.
  - Range: 50—100%
- Gen V Del: Delay for generator under voltage and over voltage
  - Range: 0—600s
- Gen >f: Threshold for generator over frequency. All three phases are checked. Maximum out of three is used.
  - Range: 100—150 % of nominal frequency
- Gen <f: Threshold for generator under frequency. All three phases are checked. Maximum out of three is used
  - Range: 50—100 % of nominal frequency
- Gen f Del: Delay for generator under frequency and over frequency
  - Range: 0—600s
- Volt Unbal: Threshold for generator voltage unbalance
  - Range: 1—150%
- Volt Unbal Del: Delay for generator voltage unbalance
  - Range: 0—600s
- Curr Over: Threshold for generator over current. All three phases are checked. Maximum out of three is used
  - Range: 100—300%
- Curr Over Del: Delay for generator over current
  - Range: 0—600s
- Curr Short: Threshold for generator short current. All three phases are checked. Maximum out of three is used.
  - Range: 100—500 %

- Curr Short Del: Delay for generator short current
  - Range: 0—600s
- Curr Unbal: Threshold for generator current unbalance
  - Range: 0—100 %
- Curr Unbal Del: Delay for generator current unbalance
  - Range: 0—600

System settings

- Password: Password is a maximum four-digit number. Password disables adjustment of selected set points.
  - Range: 0—9999
- Change Password: Change the password to new value.
  - Range: 0—9999
- Scroll Mode: The screen display mode
  - Manual: The screen is scrolled down manually
  - Auto: The screen is scrolled down every 3 seconds automatically
- Controller Addr: Controller identification number. Each gen-set in the group has to have its own unique number. Default value is 1
  - Range: 1—32

Analog Sensor Set

The T210N controller supports analog inputs configuration. Three analog inputs AI1, AI2, AI3 are available. Each sensor channel can be configured in the analog input menu at MAINTENANCE mode.

After unlocking the protection on the Parameter Setting menu, press RESET key following DISP key (‘DISP’ key + ’RESET’ key) to switch to Analog Sensor Set menu.

See figure 2-10, for illustration of the Analog Sensor Set display.

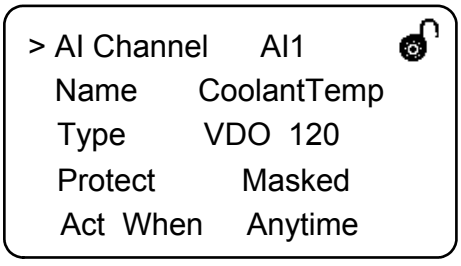

Figure 2-10

You can set “Name” as follow:

- Select “Name” set point, press RESET key to enter editing status, see figure 2-11
- Press the DISP key or STOP key to adjust the set point to the desired value

- Press and hold on RESET key to save the value and exit editing

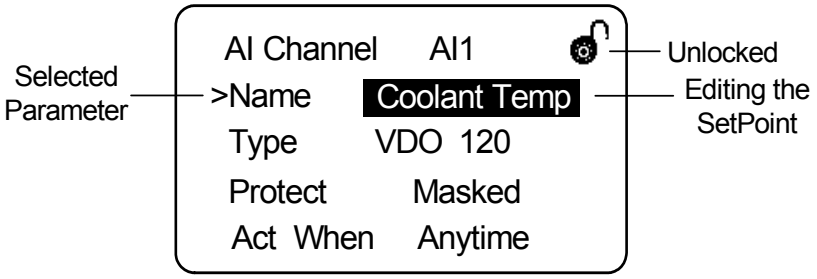

Figure 2-11

Each sensor channel can be configured in the screen menu following way:

- AI Channel: Selection of the analog input channel
  - Range: AI1—AI3
- Name: Selection of the name of analog input
  - Coolant Temp
  - Oil Pre
  - Fuel Level
  - Oil Temp
  - Body Temp
- Type（temperature）: Sensor characteristic
  - Not used
  - Bin close-act
  - Bin open-act
  - User config
  - VDO 120 290Ω，40℃；29Ω，110℃
  - Datcon high 213Ω，80℃；16Ω，180℃
  - Datcon low 280Ω，60℃；16Ω，140℃
  - Murphy 464Ω，60℃；17Ω，160℃
  - Cummins 288Ω，50℃；16Ω，141℃
  - PT 1000 1000Ω，0℃；1423Ω，110℃
  - PT 100 100Ω，0℃；146Ω，120℃
  - Curt is TS002 246Ω，60℃；47Ω，120℃
  - Daewoo (ABZ) 280Ω，40℃；17Ω，120℃
- Type（pressure）: Sensor characteristic
  - Not used
  - Bin close-act
  - Bin open-act

- User config
- VDO 5 Bar 16Ω，0Bar；172Ω，5Bar
- VDO 10 Bar 10Ω，0Bar；180Ω，10Bar
- Datcon 5 224Ω，0Bar；51Ω，5Bar
- Datcon 7 224Ω，0Bar；33Ω，7Bar
- Datcon 10 224Ω，0Bar；72Ω，6Bar
- Murphy 7 224Ω，0Bar；33Ω，7Bar
- Chaodao10 20Ω，0Bar；177Ω，10Bar

■ Type（level）: Sensor characteristic
- Not used
- Bin close-act
- Bin open-act
- User config
- 4-20mA/100
- VDO 10-180 10Ω，0%；180Ω，100%

■ Protect: Protection is activated when protection level is reached
- Masked: masked
- Warning: alarm List appears on the screen and warning is displayed inverted
- Historicize: warning information is only recorded in history record
- Unload: warning and running unloaded
- Cooling: warning and gen-set is cooling before stop
- Unload Stop: warning and unload and then stops

■ Act When: Alarm is check condition
- Starting
- Anytime

■ Alarm A/U:
- Above Alarm is activated when analog input value is above the analog input setting value
- Under Alarm is activated when analog input value is under the analog input setting value

■ Dec: Number of decimal points of measured value
- 0
- 1

- 2

- PreAlarm Lev: The threshold level for prealarm detection
  - Range: 0—9999
- Alarm Lev: The threshold level for alarm detection
  - Range: 0—9999
- Alarm Del: Delay for alarm
  - Range: 0—180s
- Unit: Physical dimension of measured value
  - ℃
  - %
  - ℉
  - PSI
  - MPa
  - KPa
  - Bar
- Set point:
  - Range: 0—10
- Resistor: Sensor resistance to create sensor characteristics
  - Range: -1—24000 Ω
- Value: Values to create sensor characteristics
  - Range: -1000—10000
- Copy:

NOTE！

The sensor chart supports maximum 10 characteristic. When you set less than 10 characteristic, the resistor value must be set to -1 of next point after last valid one to terminate the chart.

Binary Inputs Set

Binary switch default is open. the channel is close when the switch closed to negative pole of battery. Five binary inputs BI1, BI2, BI3, BI4, and BI5 are available. Each binary input channel can be configured in the binary input menu at MAINTENANCE mode.

After Analog Sensor Setting, press RESET key following DISP key (‘DISP’ key + ’RESET’ key) to switch to Binary Input Setting menu.

See figure 2-12, for illustration of the Binary Input Set display.

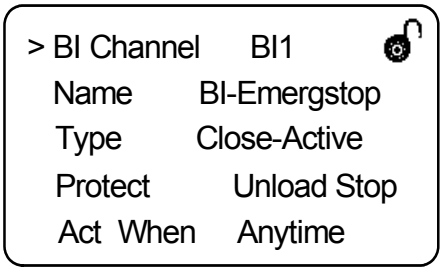

Figure 2-12

All Binary Input Set defined in the screen of 210N as follow:

- BI Channel: Selection of Binary input channel
  - Range: BI1—BI5
- Name: Selection of the name of binary input
  - BI_EmergStop

    If the input is activated, the gen-set will be shut down at once, and the Start relay and Fuel relay will be reset and warning immediately
  - BI_PumpFDBK
  - BI_Fan
  - BI_Air Door
  - BI_Acc.Lock

    If the input is closed, no set point can be adjusted and gen-set mode cannot be changed
  - BI_AutoStart

    If the input is activated, the gen-set will start after the delay time
  - BI_SpeedDown
  - BI_SpeedUp
  - BI_BodyTemp
  - BI_OilTemp
  - BI_PumpStart
  - BI_OilPre
  - BI_Coolant T
  - BI_FuelLev
  - BI_Belt
  - BI_Coolant L
  - BI_RemoteOff

    If closed, Gen-set is in OFF mode. To avoid start of the set, close RemoteOff input

- BI_Man/Auto
- BI_Reserve1
- BI_Reserve2

- Type: Selection of polarity of binary input
  - Close-Active If closes, selected alarm is activated
  - Open-Active If opens, selected alarm is activated
- Protect: Protection is active when protection level is reached
  - Masked: masked
  - Warning: alarm List appears on the screen and warning is displayed inverted
  - Historicize: warning information is only recorded in history record
  - Unload: warning and running unloaded
  - Cooling: warning and gen-set is cooling before stop
  - Unload Stop: warning and unload and then stops
- Act When: Alarm is check condition
  - Starting
  - Anytime

NOTE !

The sensor chart supports maximum 10 characteristic. When you set less than 10 characteristic, the resistor value must be set to -1 of next point after last valid one to terminate the chart.

Open Collector Outputs Set

Open collector output is as well as Binary output. Each channel is available for user-defined configuration. The output closes when switched on.

After Binary input Setting, press RESET key following DISP key (‘DISP’ key + ’RESET’ key) to switch to Open Collector Output Set menu.

See figure 2-13, for illustration of the Binary Input Set display.

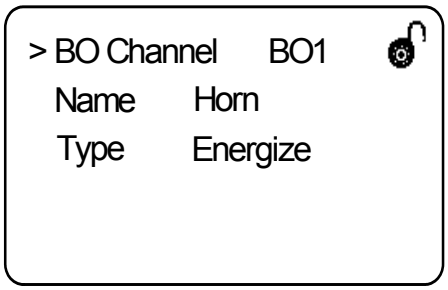

Figure 2-13

All Open Collector Outputs can be defined in the screen of 210N as follow:

- BO Channel: Selection of open collector output channel
  - Range: BO1—BO3
- Name: Selection of the name of open collector output
  - System Ok
  - Auto Standby
  - Unload
  - Speed Up
  - Speed Down
  - Fuel Pump
  - Air Door
  - Idle
  - Pre-Lubr
  - Pre-heat
  - Running
  - Horn
- Type: Selection of polarity of binary output
  - Energize The output relay closes if energized
  - De-energize The output relay opens if energized

AC Protection Set

T210N can be used to control 3phases and 1phase generator. The user can choose the definition.

After Open Collect Output Setting, press RESET key following DISP key (‘DISP’ key + ’RESET’ key) to switch to AC System Set menu.

See figure 2-14, for illustration of the AC Protection display.

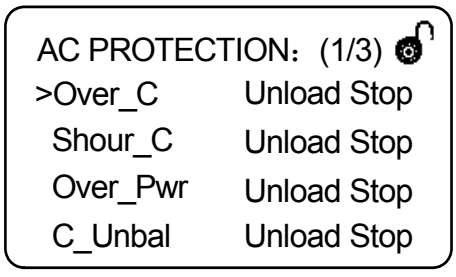

Figure 2-14

Protection can be selected as follow:

- Masked: masked

- Warning: alarm List appears on the screen and warning is displayed inverted
- Historicize: warning information is only recorded in history record
- Unload: warning and running unloaded
- Cooling: warning and gen-set is cooling before stop
- Unload Stop: warning and unload and then stops

Object of protection as follow:

- Over_C: Protect when over threshold of over current
- Short_C: Protect when over threshold of generator short current
- Over_Pwr: Protect when generator is overloaded
- C_Unbal: Protect when over threshold of generator current unbalance
- Vg_High: Protect when over upper limit of generator voltage
- Vg_Low: Protect when under lower limit of generator voltage
- Fg_High: Protect when over upper limit of generator frequency
- Fg_Low: Protect when under lower limit of generator frequency
- Vg_Unbal: Protect when over threshold of generator voltage unbalance

Contrast Adjustment

Press and hold on the DISP key until the screen enter the contrast adjustment screen. you can adjust the display contrast by pressing the DISP key, press the RESET key to save and exit contrast adjustment page.

Language Selection

T210N support language selection between Chinese and English. Press and hold on the DISP key on power up until the current language displayed inverted at the top-left corner.

Starting

- MANUAL mode
  When the state of generator set displays Ready, press START key to start the generator set, and then the status displays PreStart. The generator set begins the start procedure.
- AUTO mode
  If the Remote Start/Stop input is activated, the 210N controller will start the generator set.

 **CAUTION**

The all protection function will not work if the generator set was started not by the controller.

Stopping

- MANUAL mode
  Press STOP key will stop the running generator set.
- AUTO mode
  When the Remote Start/Stop input is de-activated, the running generator set will stop after the cooling delay elapsed.
- Emergency Stop
  When Emergency Stop input is activated, the controller will shuts down the generator set in emergency situation and alarm raises in Alarm List.
- Protection Stop
  At MANUAL mode and AUTO mode, any shutdown protection alarm raises in Alarm List, the 210N controller will shut down the generator set.

 **WARNING**

The running generator set will be shut down, when operation mode worked at MAINTENANCE mode.

 **CAUTION**

Make sure the load is not present at generator before generator set starts.

Section 3 Specifications

Power Source

- 8V-36V DC
- Consumption: 0.1A-0.4A（at 24V）

Environment

- Storage temperature：-30℃~+80℃
- Operating temperature：-20℃~+70℃
- Humidity：90%RH Max at 40℃

Dimensions

- Width: 200mm
- Height: 100mm
- Depth: 47mm

Weight

- 1.0kg

Generator Related

- Nominal frequency：50-60Hz
- Frequency measurement tolerance：0.1Hz
- Max. measured voltage:
  - 290V (phase to neutral)
  - 400V(phase to phase)
- Voltage measurement tolerance：2%（220V）
- Rated input current (from CT)：5A
- Current measurement tolerance：2%（5A）

Binary Inputs

- Input resistance: 4.7kΩ
- Low voltage level for active indication：0-2V
- High voltage level for de-active indication：8-36V

Open Collector Outputs

- Max. current：0.5A
- Max. switching voltage：36V

Relay Outputs

- Max. current：
  - 10A resistive load

- 3A inductive load
- Max. switching voltage：36V

Analog Inputs

- Resolution: 10bits
- Sensor resistor range: 0-2.4kΩ

Speed Sensor Inputs

- Type of Sensor: Magnetic pick-up
- Min. Input Voltage: 2Vpk-pk(4Hz to 4kHz)
- Max. Input Voltage: 50V
- Frequency measurement rang: 4Hz-10kHz

Section 4 General Troubleshooting

This section contains generator sets troubleshooting, diagnostic information.

Use the following chart to diagnose and correct common problems. The chart includes a list of common problems, possible causes of the problem, recommended corrective actions. If the procedures in this manual do not explain how to correct the problem, record all the set points in field reference to Appendix C and contact an authorized distributor/dealer.

Problem	Possible Cause	Corrective Action
Alarm in Alarm List don't disappear by press RESET key	Operation mode at MAINTENANCE mode	Change operation mode at MANUAL or AUTO mode
	The alarm is activated (display diverted in the screen)	Correct fault activated the alarm
Does not enter MANUAL or AUTO mode	Remote Off input is activated	Release the input
	Self-test error on power up	Contact dealer
Operation mode locked at MANUAL or AUTO	Mode Locked input is activated	Release the input
Generator state display Not Ready but no alarm in Alarm List	Engine speed displayed	Check speed correlation
	The generator voltage >15V	Check the grounding
Prepare-fail stop alarm arise in starting procedure	The oil pressure is above the CrankOilPre set point when starting	Check the oil pressure sensor correlation
The W.T. display OPEN or SHRT, generator set Not Ready in clod weather	The resistor of sensor outranges the sensor chart	Adjust the sensor chart
	The input is opened or shorted	Check the sensor input connections
The controller display is blank when starting and controller reset	Weak or dead battery	Recharge or replace
	Poor battery connections	Check connections
Unit cranks but will not start	Improper fuel	Replace fuel
	Air in fuel system	Bleed air from system

	The “Startup RPM” set point is too small	Adjust the set point
Frequency display ****, but engine speed is normal	Load harmonics affected	Improve load feature; Mask frequency protection by setting “Gen >f” and “Gen <f” set points to 100

Appendix A. Generator set States Table

States	Description	Next States
Stop	Under maintain mode	Not Ready, Ready
Not Ready	At MANUAL or AUTO mode, there is activated alarm in the list, or the generator set is stopped, but there is still voltage or RPM ， Generator sets is not ready for starting	Ready
Ready	Generator sets is ready for starting	Not Ready，Starting
Prestart	Pre-heat Output is activated before Cranking	Starting
Starting	Start Relay Output is activated	Cranking
Cranking	Engine cranking sequence in process	Not Ready, Ready, Idle，Pause
Idle	Waiting for generator sets to warm up, Idle Output is activated	Over SPD, MaxStab, Fail Stop
Under SPD	Running at engine speed under rated on	Fail Stop
Over SPD	Running at engine speed over rated on	Fail Stop
Pause	Waiting before next start attempts in the auto start procedure	Starting
MaxStab	Generator sets waiting to get proper voltage level after reaching of defined level of RPM	Under SPD, Over SPD, AVR Fail, MinStab
MinStab	Generator sets waiting for loaded after got proper voltage level	Running, Over SPD, Fail Stop, RPM Fail, Under SPD
AVR Fail	Generator sets fail to get proper voltage level in MaxStab state	Fail Stop
RPM Fail	Engine speed is under Startup RPM	Fail Stop
Fail Stop	Generator sets stop by alarm of failure	Not Ready, Ready
Running	Generator sets is running, ready to load anytime	Under SPD, Over SPD, Cooling, Fail Stop, RPM Fail
Cooling	Generator sets is cooling before stop	Not Ready, Ready, Fail Stop, Running

Appendix B. Alarm Event

Event	Description
fail-stop stop	Stopping sequence activated when unsuccessful Generator sets Stop happening
emerg stop	Emergency stop activated
o.p. sw alm	Oil pressure switch alarm
w.t. sw alm	Coolant temperature switch alarm
f.l. sw alm	Fuel level switch alarm
o.p. sen. Pre_alm	Oil pressure sensor pre-alarm under “O.P. Lev1” set point)
o.p. sen alm	Oil pressure sensor alarm(under “O.P. Lev2” set point)
w.t. sen. Pre-alm	Coolant temperature sensor pre-alarm(above “W.T. Lev1” set point)
w.t. sen. alm	Coolant temperature sensor pre-alarm (above “W.T. Lev1” set point)
f.l. sen. Pre-alm	Fuel level sensor pre-alarm(under “F.L. Lev1” set point)
f.l. sen. alm	Fuel level sensor alarm(under “F.L. Lev2” set point)
high batt	High battery voltage alarm(above “Batt>V” set point)
low batt	Low battery voltage alarm(under “Batt<V” set point)
v-batt under stop	Generator sets stop by battery alarm
gen freq alm	Generator frequency alarm
vg1 alm	Generator phase 1 voltage alarm
vg2 alm	Generator phase 2 voltage alarm
vg3 alm	Generator phase 3 voltage alarm
gen-fail stop	Generator voltage not present in MaxStab state
ig unbal	Generator current unbalance
vg unbal alm	Generator voltage unbalance
ig-short	Generator current over “Curr Short” set point
ig-over	Generator current over “Curr Over” set point
active power over	Generator active power over “Curr Over” set point

under-speed stop	Generator set under speed stop
over-speed stop	Generator set over speed stop
start-fail stop	Generator set continued start fail at AUTO mode
pm hours arrival	Generator set preventive maintenance hours is overtime

Appendix C. User Defined Settings

Program version of the controller _____

Serial Number _____

Below are all the set points for T210N.

Set Points	Range Setting	Default Setting	User Defined Setting
AC System	3phase4wire / 1phase2wire	3phase4wire	
Nomin Power (kW)	1—3000	100	
Nomin Volt (V)	80—15000	230	
Nomin Curr (A)	1—5000	200	
Nomin Freq (Hz)	45—65	50	
Nomin RPM (r/min)	100-4000	1500	
Gear Teeth	0—500	0	
CT Ratio (/5A)	1—5000	200	
RPM Ratio	1—10	1	
PT Ratio(/100V)	100—15000V	100	
Fuel Solenoid	Fuel / Stop	Fuel	
Stop Min Time	1-30s	0	
Stop Max Time	1-60s	25	
PreLubr Time	0-600	0	
PreStart Time (s)	0-600	0	
Idle Time (s)	0—3600	0	
Crank Attempts	1—10	3	
CrankOilPre (bar)	0-10	3.5	
Start Delay (s)	0—600	5	
Startup RPM (%)	1—50% of Nomin RPM	25	
MaxCrank Time (s)	1—60	10	
CrankFail Pause (s)	5—60	30	
MinStab Time (s)	0-300	5	
MaxStab Time (s)	0—300	60	
Cooling Time (s)	0—3600	180	
PM Hours (h)	0-32767	0	
Overspeed (%)	100-150% of Nomin RPM	110	
OverspeedDel (s)	0-3	3	
Underspeed (%)	0-100	90	
UnderspeedDel	0-600	30	
Protection Del (s)	0—300	15	
Horn Timeout (s)	0—600	60	
Pump Run < %	0—200%	20	
Pump Stop > %	0—200%	80	
Pump Run Time (s)	0—3600	30	
Batt >V (V)	8.0—36.0	31.0	
Batt <V (V)	8.0—Batt >V	20.0	

Batt V Delay (s)	0—600	60	
Batt Drop	0.0—36.0V	0.0	
Gen >V (%)	100—150% of Nomin Volt	120	
Gen <V (%)	50—100% of Nomin Volt	80	
Gen V Del (s)	0.0—600.0	10	
Gen >f (%)	100—150% of Nomin Freq	110	
Gen <f (%)	50—100% of Nomin Freq	90	
Gen f Del (s)	0.0—600.0	8	
Volt Unbal (%)	1—150%	25	
Volt Unbal Del (s)	0.0—600.0	5	
Curr Over (%)	100—300% of Nomin Curr	105	
Curr Over Del（s）	0.0—600.0	30	
Curr Short (%)	100—500% of Nomin Curr	150	
Curr Short Del (s)	0.0—600.0	1	
Curr Unbal (%)	1—100% of Nomin Curr	45	
Curr Unbal Del (s)	0.0—600.0	30	
Password	0—9999	0	
Change Password	0—9999	--	
Scroll Mode	Manual / Auto	Manual	
Controller Addr	1—32	1	

Below is Analog Inputs, Binary Inputs and Open Collect Outputs setting

Analog Inputs setting

Channel Name	Parameter	Default Setting			User Defined Setting	
AI1	Name	Coolant Temp				
	Type	VDO 120				
	Protect	Masked				
	Act When	Anytime				
	Alarm A/U	Above				
	Dec	0				
	PreAlmLev	95				
	AlmLev	100				
	AlarmDel	10				
	Unit	℃				
	Sensor characteristic	Set point	Resistor	Value	Resistor	Value
		1	20000	-20		
		2	1800	0		
		3	440	30		
		4	290	40		
		5	195	50		
		6	135	60		
		7	95	70		
		8	69	80		
		9	51	90		
		10	29	110		

Channel Name	Parameter	Default Setting			User Defined Setting	
AI2	Name	Oil Pre				
	Type	VDO 10 Bar				
	Protect	Masked				
	Act When	Starting				
	Alarm A/U	Under				
	Dec	1				
	PreAlmLev	2.0				
	AlmLev	1.5				
	AlarmDel	10				
	Unit	Bar				
	Sensor characteristic	Set point	Resistor	Value	Resistor	Value
		1 2 3 4 5 6 7 8 9 10	10 50 85 119 152 180 -1	0.0 2.0 4.0 6.0 8.0 10.0 0		
AI3	Name	Fuel Level				
	Type	VDO 10-180				
	Protect	Masked				
	Act When	Anytime				
	Alarm A/U	Under				
	Dec	0				
	PreAlmLev	20				
	AlmLev	10				
	AlarmDel	30				
	Unit	%				
	Sensor characteristic	Set point	Resistor	Value	Resistor	Value
		1 2 3 4 5 6 7 8 9 10	4 10 180 -1	0 0 100 0		

Binary Inputs setting

Channel Name	Parameter	Default Setting	User Defined Setting
BI1	Name	BI_EmergStop	
	Type	Open-Active	
	Protect	-	
	Act When	-	
BI2	Name	BI_AutoStart	
	Type	Close-Active	
	Protect	-	
	Act When	-	
BI3	Name	BI_OilPre	
	Type	Close-Active	
	Protect	Unld Stop	
	Act When	Starting	
BI4	Name	BI_Coolant T	
	Type	Close-Active	
	Protect	Cooling	
	Act When	Anytime	
BI5	Name	BI_Man/Auto	
	Type	Close-Active	
	Protect	-	
	Act When	-	

Open Collect Outputs setting

Channel Name	Parameter	Default Setting	User Defined Setting
BO1	Name	Horn	
	Type	Energize	
BO2	Name	Running	
	Type	Energize	
BO3	Name	Idle	
	Type	De-energize	

AC Protection setting

Parameter	Default Setting	User Defined Setting
Over_C	Stop	
Short_C	Stop	
Over_Pwr	Stop	
C_Unbal	Stop	
Vg_High	Stop	
Vg_Low	Stop	
Fg_High	Stop	
Fg_Low	Stop	
V_Unbal	Stop	

Appendix D. Recommended Wiring