

# **GTR-85**

# **Generator Controller**

# **Owner's Manual**



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## Table of contents

1	Introduction.....	1
1.1	GTR-85 Panel.....	1
1.1.1	Indicators.....	1
1.1.2	Rotary Switch Function.....	1
1.1.3	Push-Button Function.....	1
1.2	Wire Terminal.....	2
1.3	CASE DIMENSIONS.....	4
1.4	Specifications.....	4
1.4.1	General.....	4
1.4.2	Controller Function.....	4
1.4.3	Network function:.....	5
1.4.4	Panel function:.....	5
1.4.5	Protection function:.....	5
1.5	Wiring.....	5
1.5.1	Wiring example.....	5
1.5.2	Connection in short distance.....	6
1.5.3	Connection with modem.....	6
1.5.4	Inside fuse and protecting value.....	6
1.5.5	Group connection.....	6
2	Communication protocol for user monitoring.....	7
2.1	Communication Interface.....	7
2.1.1	Connect with GTR85 via RS-485 interface.....	7
2.1.2	Transmit information via MTR-1.....	8
2.1.3	C8 command description.....	9
2.1.4	Example for AC line voltage, phase voltage, and current readout.....	11
3	Software manual.....	15
3.1	GTR85 software installation.....	15
3.2	GTR85 software description.....	16
3.2.1	Button.....	16
3.3	Parameters description.....	18
3.3.1	ATS page.....	18
3.3.2	System page.....	25
3.3.3	Input page.....	28
3.3.4	Output page.....	30
3.3.5	Misc. page.....	<b>30</b>



# 1 Introduction

## 1.1 GTR-85 Panel

### 1.1.1 Indicators

- Power
- Run
- Stop
- Trip
- Alarm
- Over Crank
- High Water Temp.
- Over Speed
- Low Oil Pressure

### 1.1.2 Rotary Switch Function

- Network  
Allow online authorized user entry to perform monitoring and control.
- ATS  
The engine starts automatically, when shorted ATS1 and ATS2 terminal behind the controller under ATS mode.
- Manual  
User starts the engine directly.

- Off  
Shutdown the engine or forbid start function.

### 1.1.3 Push-Button on Function

- PAGE  
Change LCD display page for reading more information.
- Light Test  
Test lights for solid, clear and brightness. It also tests alarm.
- Reset
  1. First time "Reset" shutdown the alarm. Second time "Reset" clears fault lights.
  2. Holding down for a longer period will produce 1st and 2nd time "Reset" functions.
  3. Turn on the LCD backlight.

Figure 1 – GTR85 Panel

## 1.2 Wire Terminal

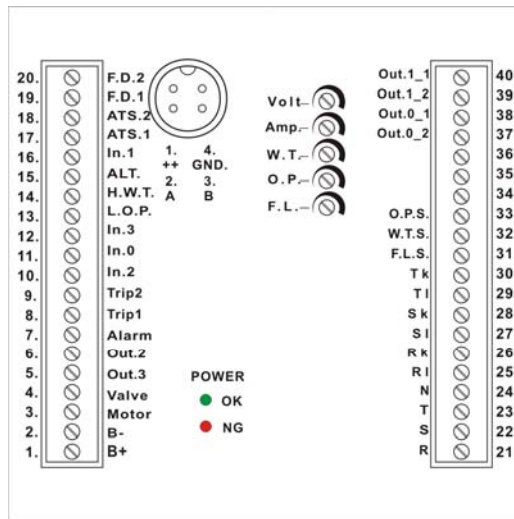



Figure 2 – GTR82 wire terminal

Table 1 – GTR82 back description

Continental terminal description					
	Symbol	Description		Symbol	Description
1	++	DC power (Battery +)	21	R	Analog input, R phase volt
2	GND	Ground (Battery -)	22	S	Analog input, S phase volt
3	Motor	Output, starter relay	23	T	Analog input, T phase volt
4	Valve	Output, fuel valve relay	24	N	Analog input, N phase volt
5	Output 3	Output, Aux 3 relay	25	R.C.T. L	Analog input, R line current (L)
6	Output 2	Output, Aux 2 relay	26	R.C.T. S	Analog input, R line current (S)
7	Alarm	Output, alarm relay	27	S.C.T. L	Analog input, S line current (L)
8	Trip 1	Output, electrical trip relay	28	S.C.T. S	Analog input, S line current (S)
9	Trip 2	Output, electrical trip relay	29	T.C.T. L	Analog input, T line current (L)
10	Input 2	Digital input, Aux 2 switch	30	T.C.T. S	Analog input, T line current (S)
11	Input 0	Digital input, Aux 0 switch	31	F.L. Sen.	Analog input, Fuel level sensor (option)
12	Input 3	Digital input, Aux 3 switch	32	W.T. Sen.	Analog input, Water temp. sensor
13	L.O.P.	Digital input, Low oil press. switch	33	O.P. Sen.	Analog input, Oil pressure sensor
14	H.W.T.	Digital input, High water temp. switch	34	Spare	Spare
15	ALT.	Digital input, Alternator plus	35	Spare	Spare
16	Input 1	Digital input, Aux 1 switch	36	Spare	Spare
17	ATS 1	Digital input, shorted with ATS2	37	Output 0_2	Output, Aux. 0 relay
18	ATS 2	Digital input, shorted with ATS1	38	Output 0_1	Output, Aux. 0 relay
19	F.D. 1	Analog input, Frequency detect terminal	39	Output 1_2	Output, Aux. 1 relay
20	F.D. 2	Analog input, Frequency detect terminal	40	Output 1_1	Output, Aux. 1 relay
VARIABLE REGISTER DESCRITOPN					
	Symbol	Description		Symbol	Description
	Volt -	AC voltage calibration		O.P. -	Oil Pressure calibration
	Amp. -	AC Ampere calibration		F.L. -	Fuel Level calibration
	W.T. -	Water Temp. calibration			
DC POWER STATUS DESCRIPTION					
	Symbol	Description		Symbol	Description

● OK	OK: Solid "green" LED
● Reverse	DC power polarity fault
<b>RS-485 COMMUNICATION PORT</b>	
<b>Symbol</b>	<b>Description</b>
	1. Battery +
	2. A
	3. B
	4. GND

**Note:**

1. Output Relay function can be changed according users requirements.
2. Output Trip Relay is intended to be used to trip the Breaker or AVR filed current in order to cut off load to the generator.
3. VRs are adjustment for matching tolerance between external and internal measuring meter readout.

## 1.3 CASE DIMENSIONS

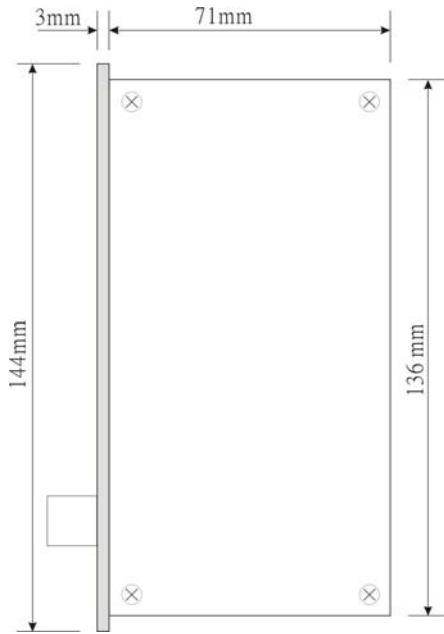


Figure 3 – GTR85 side view

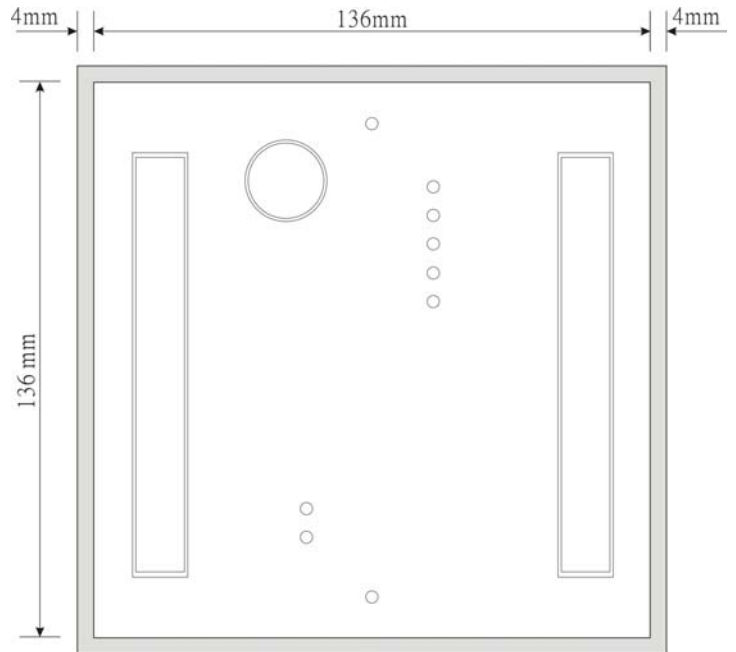


Figure 4 – GTR85 back view

## 1.4 Specifications

### 1.4.1 General

- DC Supply:  
8 ~ 36 VDC
- Power Consumption:  
Max. 10 W
- Measuring Voltage:  
10 ~ 300 VAC (Phase to Neutral, Accuracy 1.5 %)
- Measuring Current:  
..15 A (secondary current readout below 0.15 A shows zero on LCD display. Accuracy 1.5 %)
- Measuring Frequency:  
0 ~ 80 Hz (Min AC Volt: 8 V)
- Charger AC Output Voltage Sensitivity:  
3 V ~ 70 V Peak to Peak
- Charger AC Output Frequency Sensitivity:  
62 Hz ~ 10,000 Hz
- Relay Output:  
10 A /30 VDC
- Operating system:  
Windows 98, Windows ME, Windows 2000,  
Windows XP (recommend)
- Communication Protocol:  
RS-485 (Dynamic encryption by Monicon technology)

- Operating Temperature Range:

-10 °C ~ +60 °C

- Dimension (W x H x D):

144 mm x 144 mm x 74 mm

- Panel Cut-out (W x H):

138 mm x 138 mm

- Weight:

1.4 Kg (3.08 lb.)

### 1.4.2 Controller Function

- LCD display :

1. Three phase-phase voltage
2. Three line current
3. Three phase-neutral voltage
4. Frequency
5. RPM
6. Battery Voltage
7. Run hours
8. Coolant Temperature
9. Oil Pressure
10. PF
11. KW
12. KWH
13. KVAR

14. KVA

**1.4.3 Network function:**

- Remote start/stop the controller by two wires network circuitry
- Parameter setting and reading
- Input and output monitor
- Fault history readout
- Data acquisition can be done from a remote site

**1.4.4 Panel function:**

- Manual start / stop engine.
- Automatically start / stop engine by ATS.
- Reset the controller.
- Light test.

**1.4.5 Protection function:**

- Engine respect:
  1. Over crank protection
  2. Low oil pressure protection
  3. High water temperature protection

4. Low water level protection
5. Over speed protection

■ Generator respect:

1. Over load protection
2. Short circuit protection
3. Over voltage protection
4. Under voltage protection
5. High frequency protection
6. Low frequency protection

■ Battery respect:

1. Low battery indicator/ alarm
2. High battery indicator/ alarm
3. Charge failure indicator
4. Start prohibit on weak battery power

■ Peripheral respect:

1. Lower fuel level protection
2. Aux. 2
3. Aux. 3

**1.5 Wiring**

**1.5.1 Wiring example**

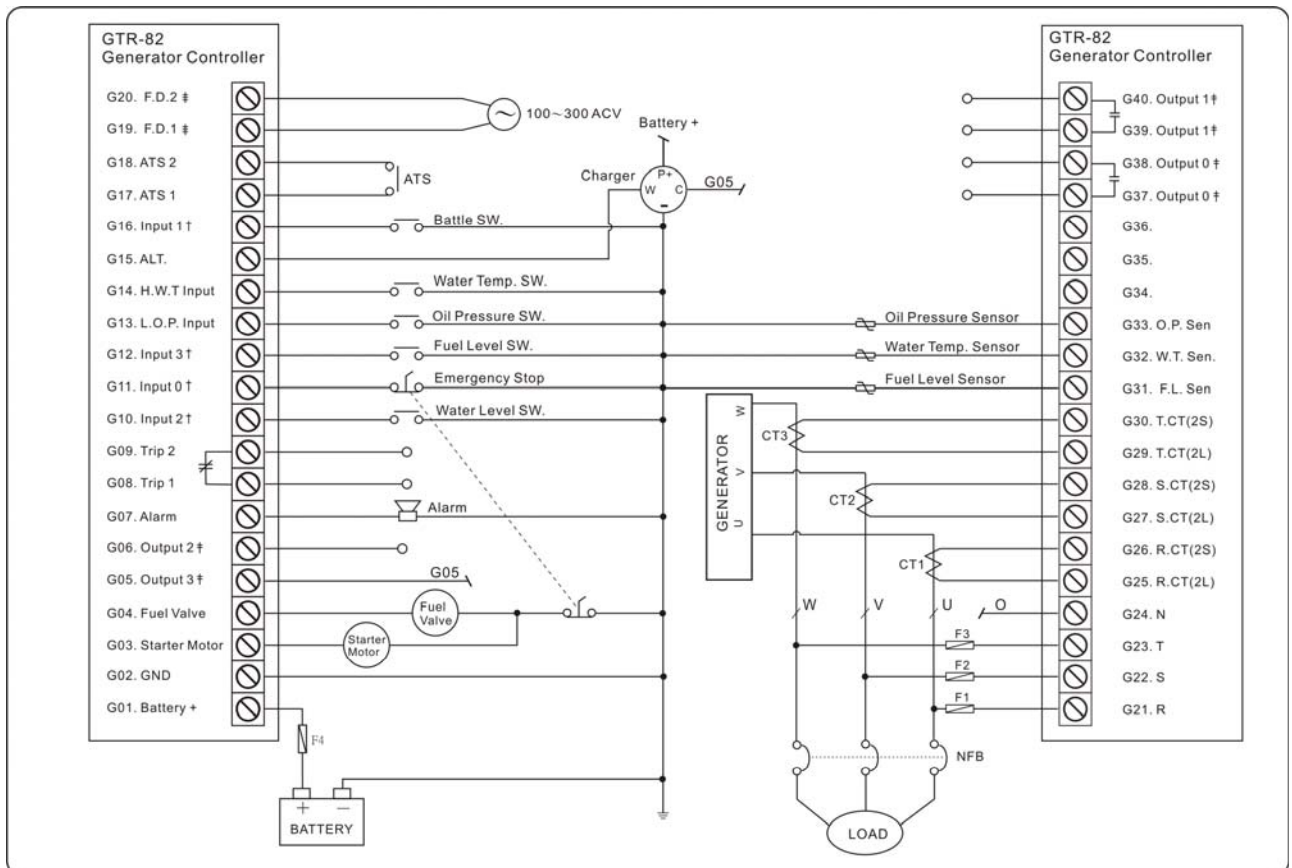


Figure 5 – GTR85 wiring diagram

### 1.5.2 Connection in short distance

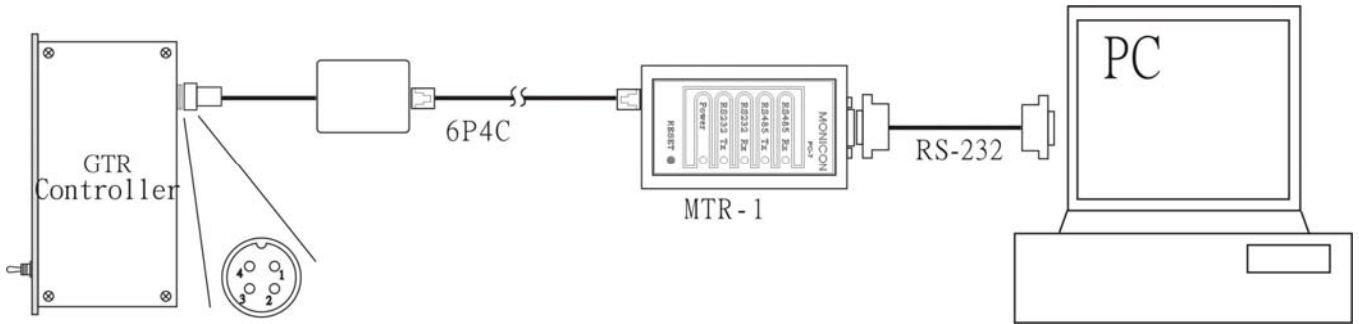


Figure 6 – GTR85 local connection diagram

### 1.5.3 Connection with modem

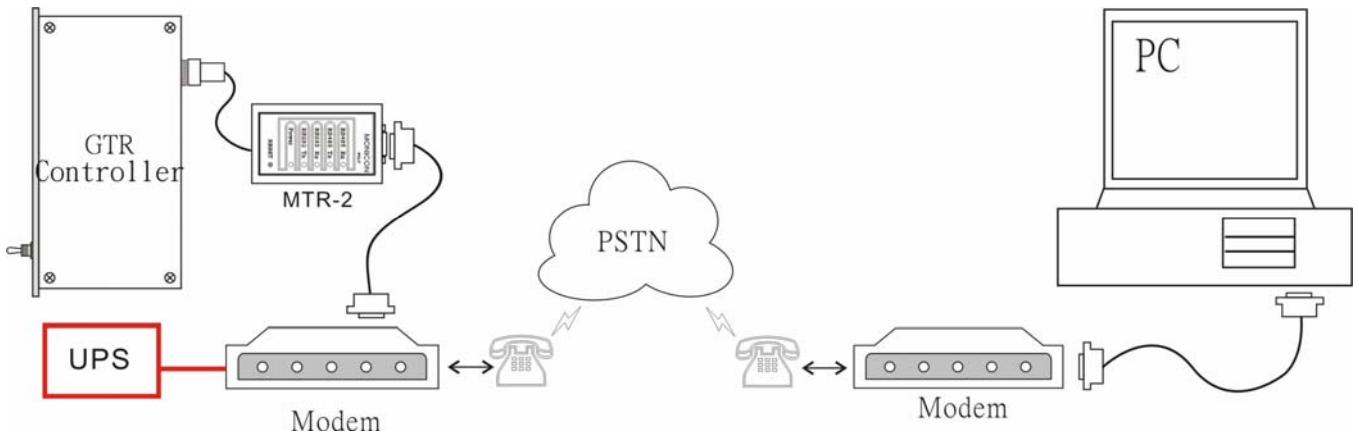
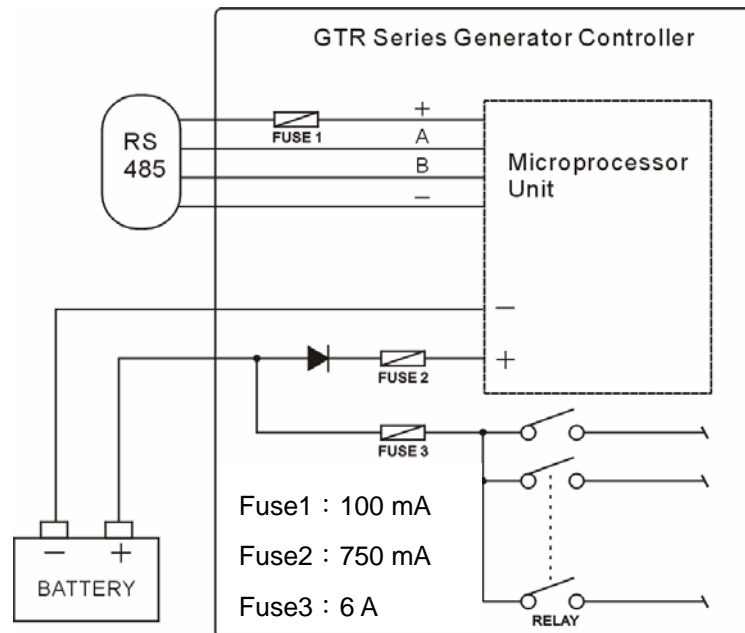


Figure 7 – GTR85 remote connection diagram

### 1.5.4 Inside fuse and protecting value



### 1.5.5 Group connection

1. Every controller must have its own identified number to support software recognition. Go to System / Misc. page, and change its id number.
2. Group wiring :  
 The MTR-1 terminal pin 1 and pin 4 are the power supplied ports, so just one MTR-1 needs to be connected with pin 1,2,3,4, and others connect with pin 2, 3 only.



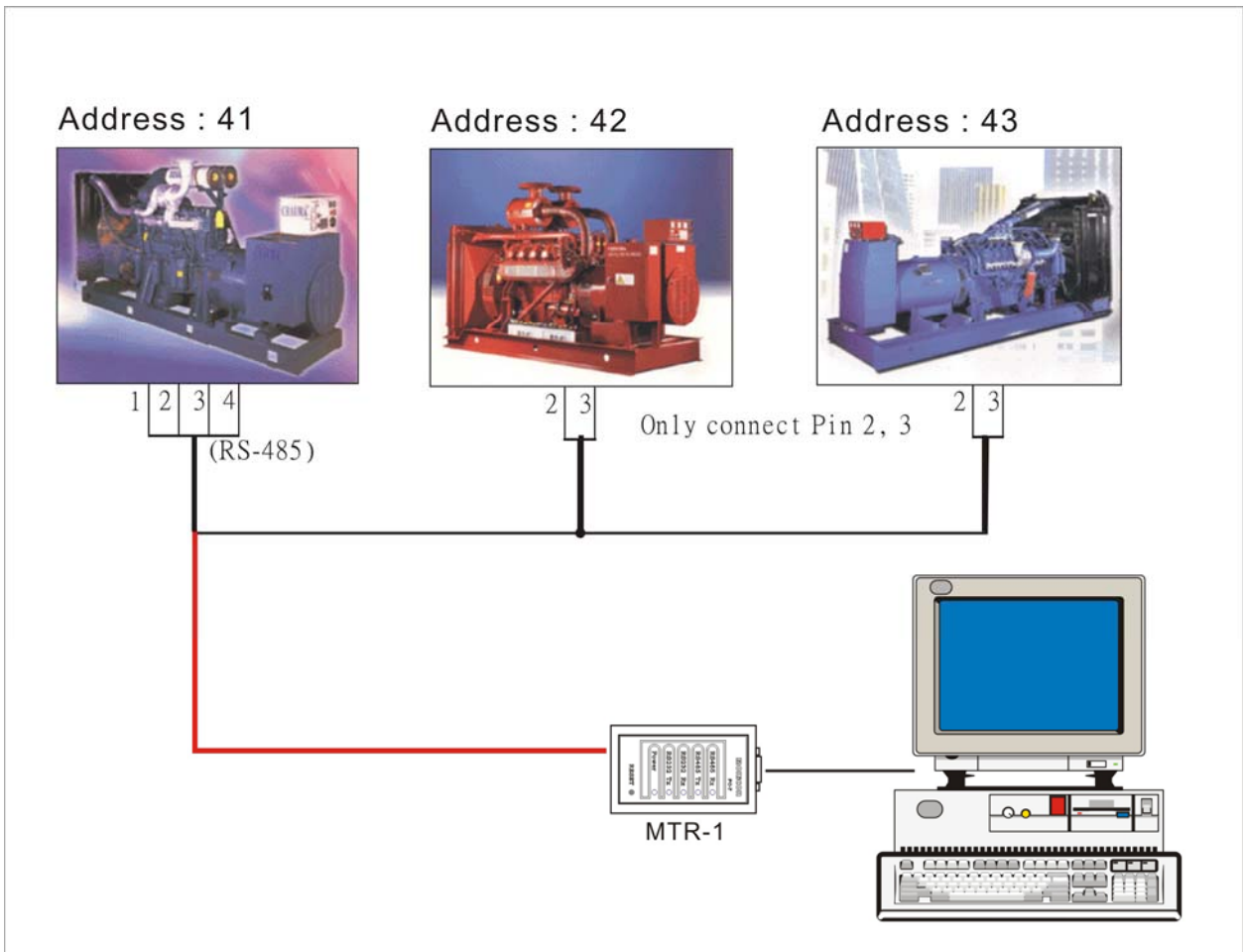


Figure 8 – Group connection diagram

**Note:** It is strong suggestion that using another power source to power the communication card (MTR-1), if the wire length over 25 meters. This prevents the MTR-1 go in an unpredictable condition by voltage drop.

## 2 Communication protocol for user monitoring (start)

### 2.1 Communication Interface

#### 2.1.1 Connect with GTR82 via RS-485 interface

- Connection method1

Master device (RS-485) ⇔ GTR85 as slave device (RS485)

- Master device UART configuration

9600 bps, no parity, 9 data bits, 1 stop bits

The leading 8 bits information defines as “Address”, when the 9<sup>th</sup> bit sets to 1 (or logic high), and it defines as “Data” when the 9<sup>th</sup> bit sets to 0 (or logic low).

- Information transmitting format

The master device transmitting information form includes three parts that are **Address**, **Command** as well as **Data** in three bytes.

Address represents the GTR85's identified number.

Command represents with function group that master device invoke to be executed.

Data represents which exactly command that master device invoke to be executed.

- Encryption processing

Each byte of the transmitting information must be encrypted as follow; let's say FID, the factory ID number, is

0x6F.

Data processing	Example
<b>Address</b> = <b>Address</b> XOR FID	<b>Address</b> = 0x41 XOR 0x6F = 0x2E
<b>Command</b> = <b>Command</b> XOR FID	<b>Command</b> = 0xC8 XOR 0x6F = 0xA7
<b>Data</b> = <b>Data</b> XOR FID	<b>Data</b> = 0x05 XOR 0x6F = 0x6A

For example, the master device transmits information to GTR85 controller via RS485 should be 0x2E then 0xA7 and then 0x6A as sequence.

■ Information receiving format

The master device receiving information form includes two parts **Echo** and **Check**.

Echo represents the information that GTR85 responds to the master device transmitting information.

Check is used for master device checks the accuracy of the receiving information.

■ Receiving information processing

Data processing	Example
<b>Echo</b> = <b>Echo</b> XOR FID	<b>Echo</b> = 0x6F XOR 0x6F = 0x00
<b>Check</b> = <b>Check</b> XOR FID	<b>Check</b> = 0x91 XOR 0x6F = 0xFE

The master device receives information from GTR85 controller via RS485 should be 0x00 and then 0xFE.

### 2.1.2 Transmit information via MTR-1

■ Connection method 2

Master device (RS-232) ⇔ MTR-1 as interface (RS232 ↔ RS-485) ⇔ GTR85 controller as slave device (RS485)

■ Device port configuration

19200 bps, no parity, 8 data bits, 2 stop bits

■ Information transmitting format

The master device transmitting information form includes four parts that are **Start**, **Address**, **Command** as well as **Data** in seven bytes.

Transmitted information							
Format	Start	Address		Command		Function	
Example		4	1	C	8	0	5

The start byte, '|' (0x7C in hexadecimal form), is the synchronous character of the MTR-1. The description of Address, Command and Data are the same as defined in section 2.1.1.

All transmitting information should be transfer from hexadecimal to two ASCII characters, for example, if the **Address** is 0x41, then the transmitting data is '4' '1', or 0x34 0x31 in hexadecimal form.

■ Encryption process

Data processing	Example	Split into two ASCII characters
<b>Address</b> = <b>Address</b> XOR FID	<b>Address</b> = 0x41 XOR 0x6F = 0x2E	2E
<b>Command</b> = <b>Command</b> XOR FID	<b>Command</b> = 0xC8 XOR 0x6F = 0xA7	A7
<b>Data</b> = <b>Data</b> XOR FID	<b>Data</b> = 0x05 XOR 0x6F = 0x6A	6A

The master device transmits information to GTR85 controller via MTR-1 interface should be '| '2' 'E' 'A' '7' '6' 'A' in character way, or 0x7C 0x32 0x69 0x65 0x67 0x66 0x65 in binary way.

■ Information receiving format

The format of receiving information form MTR-1 includes four bytes, and is combined with **Echo** and **Check** two parts. The descriptions of **Echo** and **Check** are the same as defined in section 2.1.1.

Received information				
Format	Echo		Check	
Example	6	F	9	1

■ Receiving information processing

1. Transfer the two ASCII characters of the **Echo** part into one byte, for example '6' 'F' → 0x6F.
2. Transfer the two ASCII characters of the **Check** part to one byte, for example '9' '1' → 0x91.
3. XOR process, **Echo** = **Echo** XOR FID, **Check** = **Check** XOR FID.
4. Check the accuracy of the receiving information. The receiving information is correct, only when the value of the de-encrypted information is equal to 0xFE.

### 2.1.3 C8 command description

Code	Description
00	<b>Controller Type</b> The readout value represents the type of the GTR controller. The value 0x80 represents the controller is GTR80, 0x82 represents the controller is GTR82, ... etc.
01	<b>Current page of LCD</b>
02	<b>R-S voltage low byte</b>
03	<b>S-T voltage low byte</b>
04	<b>T-R voltage low byte</b>
05	<b>R-S voltage high byte</b>
06	<b>S-T voltage high byte</b>
07	<b>T-R voltage high byte</b>
08	<b>Integral of frequency</b>
09	<b>Decimal of frequency</b>
0A	<b>R-N voltage</b>
0B	<b>S-N voltage</b>
0C	<b>T-N voltage</b>
0D	<b>Power factor</b> The value 102 represents that wiring is wrong. The value 101 represents that Power factor is lead. The value between 100 and 55 represents current power factor, and the power factor is value / 100. The value 55 represents power factor under 0.55.
0E	<b>Thousands number of the KW</b>
0F	<b>Hundreds number of the KW</b>
10	<b>Tens number of the KW</b>
11	<b>Units number of the KW</b>
12	<b>Decimal point of the KW</b>
13	<b>Decimal of the KW</b>
14	<b>Hundred thousands number of the KWH</b>
15	<b>Ten thousands number of the KWH</b>
16	<b>Thousands number of the KWH</b>

17	<b>Hundreds number of the KWH</b>
18	<b>Tens number of the KWH</b>
19	<b>Units number of the KWH</b>
1A	
1B	<b>RPM high byte calculated from frequency</b>
1C	<b>RPM low byte calculated from frequency</b>
1D	<b>Battery voltage</b> The battery voltage is calculated from the readout value divided 5.
1E	
1F	<b>Digital output status</b> Each digit represents an output relay status, 0: off; 1: on.  Bit 0: Aux. output 0 Bit 1: Aux. output 1 Bit 2: Aux output 2 Bit 3: Trip relay Bit 4: Alarm output Bit 5: Aux. output 3 Bit 6: Motor output Bit 7: Valve output
20	
21	
22	<b>Indicator status of group A</b> Each bit represents a light on the panel, 0: off; 1: on.  Bit 0: Run indicator Bit 1: Stop indicator Bit 2: Trip indicator Bit 3: Alarm indicator Bit 4: Over crank indicator Bit 5: High water temperature indicator Bit 6: Over speed indicator Bit 7: Low oil pressure indicator
23	
24	
25	
26	<b>Second number of run hour</b>
27	<b>Minute number of run hour</b>
28	<b>Hour number of run hour</b>

29	<b>100 hour number of run hour</b>
2A	<b>R phase current low byte</b>
2B	<b>S phase current low byte</b>
2C	<b>T phase current low byte</b>
2D	<b>R phase current high byte</b>
2E	<b>S phase current high byte</b>
2F	<b>T phase current high byte</b>
30	<p><b>Value of coolant temperature</b></p> <p>The value 0xFF (255) represents the coolant temperature sensor is open.</p> <p>The value 0xFE (254) represents the coolant temperature is over 120 °C.</p> <p>The value 0xFD (253) represents the coolant temperature is below 40 °C.</p> <p>The value 0xFC (252) represents the coolant temperature sensor is short.</p> <p>The other value represents current coolant temperature, for example, the readout value is 0x55 (85) that represents 85 °C.</p>
31	<p><b>Value of lubricant pressure</b></p> <p>The value 0xFF (255) represents the lubricant pressure sensor is open.</p> <p>The value 0xFE (254) represents the lubricant pressure is over 150 PSI.</p> <p>The value 0xFD (253) represents the lubricant pressure is 0 PSI.</p> <p>The value 0xFC (252) represents the lubricant pressure sensor is short.</p> <p>The other value represents current lubricant pressure, for example, the readout value 0x55 (85) represents 85 PSI.</p>
32	<p><b>Value of fuel level</b></p> <p>The value 0xFF (255) represents the fuel level sensor is open.</p> <p>The value 0xFE (254) represents the fuel level is full.</p> <p>The value 0xFD (253) represents the fuel level is empty.</p> <p>The value 0xFC (252) represents the fuel level sensor is short.</p> <p>The other value represent current coolant level, for example, the readout value is 0x55 (85) that represents 85 %.</p>
33	<b>Maximum page of LCD</b>
34	<b>Decimal of the KVA</b>
35	<b>Decimal point of the KVA</b>
36	<b>Units number of the KVA</b>

37	<b>Tens number of the KVA</b>
38	<b>Hundreds number of the KVA</b>
39	<b>Thousands number of the KVA</b>
3A	<b>RPM low byte calculated by charger</b>
3B	<b>RPM high byte calculated by charger</b>
3C	
3D	
3E	<b>System information</b>
3F	<p><b>Value of lubricant temperature</b></p> <p>The value 0xFF (255) represents the lubricant temperature sensor is open.</p> <p>The value 0xFE (254) represents the lubricant temperature is over 120 °C.</p> <p>The value 0xFD (253) represents the lubricant temperature is below 40 °C.</p> <p>The value 0xFC (253) represents the lubricant temperature sensor is short.</p> <p>The other value represents current lubricant temperature, for example, the value is 0x55 (85) that represents 85 °C.</p>
40	<b>Trip code</b>
41	<b>Alarm code</b>
42	<b>U-V voltage low byte</b>
43	<b>V-W voltage low byte</b>
44	<b>W-U voltage low byte</b>
45	<b>U-V voltage high byte</b>
46	<b>V-W voltage high byte</b>
47	<b>W-U voltage high byte</b>
48	<b>Remote run down-count counter</b>
49	<b>Remote run down-count aide counter</b>
4A	
4B	
4C	
4D	
4E	
4F	
50	<b>U-N voltage</b>
51	<b>V-N voltage</b>
52	<b>W-N voltage</b>

53	<b>Ratio of AC voltage</b>			
	Mask readout value with binary value 11111000B and right shift 3 digits to get the voltage ratio index.			
	Ratio index = readout value >> 3			
	Ratio index	System voltage	Line voltage ratio	Phase voltage ratio
	0	110V	0.01	1
	1	120V	0.01	1
	2	190V	0.01	1
	3	208V	0.01	1
	4	220V	0.01	1
	5	380V	0.01	1
	6	440V	0.02	2
	7	480V	0.02	2
54	<b>Ratio of current transformer</b>			
	Mask readout value with binary value 11111000B and right shift 3 digits to get the current ratio index.			
	Ratio index = readout value >> 3			

Ratio index	CT ratio		CT ratio
0	20:5	15	1000:5
1	30:5	16	1500:5
2	40:5	17	2000:5
3	50:5	18	3000:5
4	60:5	19	4000:5
5	80:5	20	5000:5
6	100:5	21	6000:5
7	150:5	22	10:5
8	200:5	23	15:5
9	300:5	24	75:5
10	400:5	25	250:5
11	500:5	26	750:5
12	600:5	27	1200:5
13	800:5	28	2500:5
14	900:5		

#### 2.1.4 Example for AC line voltage, phase voltage, and current readout

##### ■ R-S voltage readout

1. Let's say the GTR85 controller address is 0x41, the factory ID number (FID) is 0x6F, the RS voltage is 220V and the system voltage is 220V.
2. Get the voltage ratio:
  - a. Master device should send 0x41 0xC8 0x53 as an original command and data.
  - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x3C.
  - c. Receiving information:
    - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 3 C". The receive Echo and Check are "4F91". The receiving information is "20FE" after encrypt with factory ID number (FID, 0x6F).
    - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x3C. The receive Echo and Check are 0x4F 0x91. The receiving information is 0x20 0xFE after encrypt with factory ID number, FID 0x6F.
  - d. The readout of voltage ratio is 0x20 (32).
  - e. Mask the Echo value with binary value 11111000B and right shift three digit, and the answer is 0x04.
  - f. Check the look up table and get the ratio 0.01 and the system volt is 220V.
3. Get the R-S voltage low byte:
  - a. Master device should send 0x41 0xC8 0x02 as an original command and data.
  - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x6D.
  - c. Receiving information:
    - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 6 D". The receive Echo and Check are "9F91". The receiving information is "F0FE" after encrypt with factory ID number, FID 0x6F.
    - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x6D. The receive Echo and Check are 0x9F 0x91. The receiving information is 0xF0 0xFE

- after encrypt with factory ID number, FID 0x6F.
- d. The readout of R-S voltage low byte is 0xF0 (240).
4. Get R-S voltage high byte:
    - a. Master device should send 0x41 0xC8 0x05 as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x6A.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 6 A". The receive Echo and Check are "3A91". The receiving information is "55FE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x6A. The receive Echo and Check are 0x3A 0x91. The receiving information is 0x55 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of R-S voltage low byte is 0x55 (85).
  5. Combine the voltage high and low byte to get the RS true value.
    - a. High byte contribute value is  $256 * 85 = 21760$ .
    - b. Low byte contribute value is 240.
    - c. The voltage ratio is 0.01.
    - d. So the answer is  $(21760 + 240) * 0.01 = 220 \text{ V}$
- R-N voltage readout
1. Let's say the GTR85 controller address is 0x41, the factory ID number, FID is 0x6F, the RN voltage is 127V and the voltage ratio is 220V.
  2. Get the voltage ratio:
    - a. Master device should send 0x41 0xC8 0x53 as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x3C.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 3 C". The receive Echo and Check are "4F91". The receiving information is "20FE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x3C. The receive Echo and Check are 0x4F 0x91. The receiving information is 0x20 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of voltage ratio is 0x20 (32).
    - e. Mask the Echo value with binary value 11111000B and right shift three digit, and the answer is 0x04.
    - f. Check the look up table and get the ratio 1 and the system volt is 220V.
  3. Get the R-N voltage:
    - a. Master device should send 0x41 0xC8 0x0A as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x65.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 6 5". The receive Echo and Check are "1091". The receiving information is "7FFE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x65. The receive Echo and Check are 0x10 0x91. The receiving information is 0x7F 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of R-N voltage is 0x7F (127)
  4. The answer is  $127 * 1 = 127\text{V}$

■ R-phase current readout

1. Let's say the GTR85 controller address is 0x41, the factory ID number, FID is 0x6F, the R-phase current is 365A and the current ratio is 400:5.
  2. Get the current ratio:
    - a. Master device should send 0x41 0xC8 0x54 as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x3B.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 3 B". The receive Echo and Check are "3F91". The receiving information is "50FE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x3B. The receive Echo and Check are 0x3F 0x91. The receiving information is 0x50 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of current ratio is 0x50 (80).
    - e. Mask the Echo value with binary value 11111000B and right shift three digit, and the answer is 0x0A.
    - f. Check the look up table and get the ratio 400:5, and the full scale is 400.
  3. Get the R-phase current low byte:
    - a. Master device should send 0x41 0xC8 0x2A as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x45.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 4 5". The receive Echo and Check are "2D91". The receiving information is "42FE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x45. The receive Echo and Check are 0x2D 0x91. The receiving information is 0x42 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of R-phase current low byte is 0x42 (66).
  4. Get the R-phase current high byte:
    - a. Master device should send 0x41 0xC8 0x2D as an original command and data.
    - b. After encryption factory ID number 0x6F, the command should like 0x2E 0xA7 0x42.
    - c. Receiving information:
      - i. Master device via MTR-1 connect to GTR85: The transmitting information should be "| 2 E A 7 4 2". The receive Echo and Check are "6191". The receiving information is "0EFE" after encrypt with factory ID number, FID 0x6F.
      - ii. Master device direct connect to GTR85: The command transmitting information should be 0x2E 0xA7 0x42. The receive Echo and Check are 0x61 0x91. The receiving information is 0x0E 0xFE after encrypt with factory ID number, FID 0x6F.
    - d. The readout of R-phase current high byte is 0x0E (14).
  5. Calculate the R-phase current by the following procedure:
 

```

          if (full scale <= 80)
          {
              R-phase current = (256 * current-high-byte + current-low-byte) / 100;
              Current display format is XX.X A
          }
          else if (full scale <= 200)
          {
              R-phase current = (256 * current-high-byte + current-low-byte) / 100;
              Current display format is XXX.X A
          }
          
```

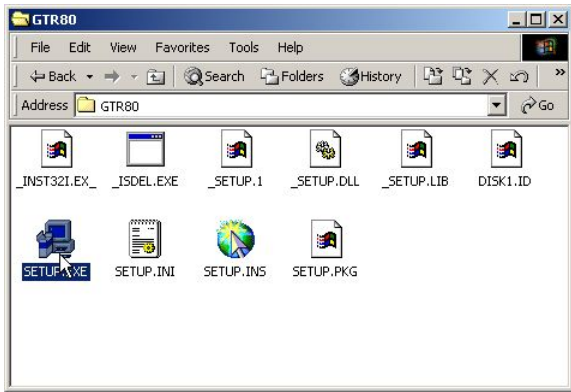
```
else
{
    R-phase current = (256 * current-high-byte + current-low-byte) / 10;
    Current display format is XXXX A
}
So, the answer is  $(256 * 14 + 66) / 10 = 3650 / 10 = 365$  A. (end)
```



### 3 Software manual

#### 3.1 GTR85 software installation

1. **Step 1:** open the GTR80 installation folder and double click the file "setup.exe". The setup wizard will guide you to finish the whole installing process.



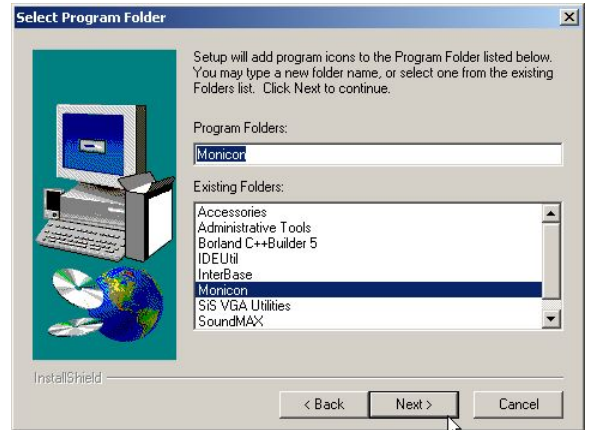
2. **Step 2:** welcome screen.



3. **Step 3:** choose the destination folder.



4. **Step 4:**



5. **Step 5:** restart computer.

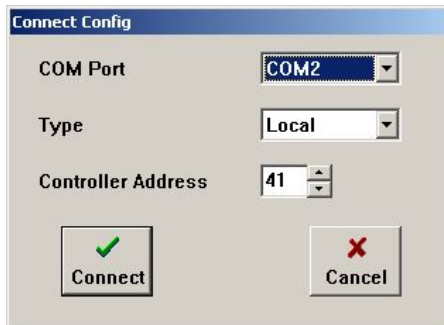


## 3.2 GTR85 software description

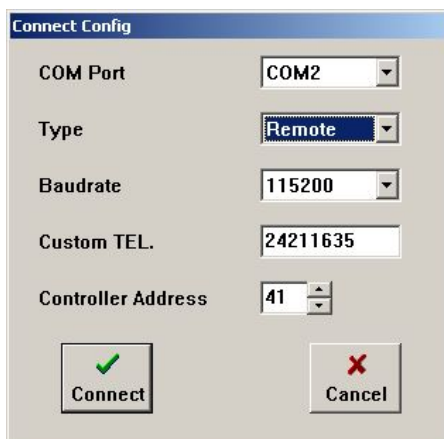
### 3.2.1 Button

#### ■ Connection

The connection config window will display after clicked this button. User need to be set comport, connection method and controller ID. Then click “Connect” button makes the communication working between controller and computer.



Local connection setting window



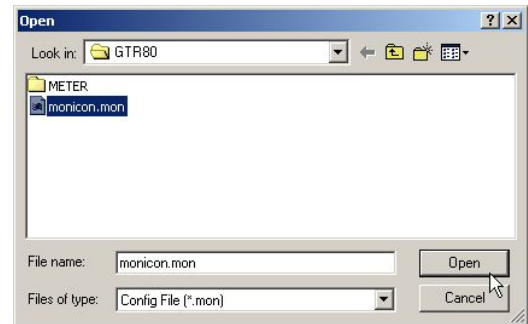
Remote connection window

#### ■ Disconnection

Click this button cuts off connection between computer & controller

#### ■ Open file

Open an existed configuration file of GTR85. It is convenience for configuring the GTR85 controller with the same requirement.



#### ■ Save file

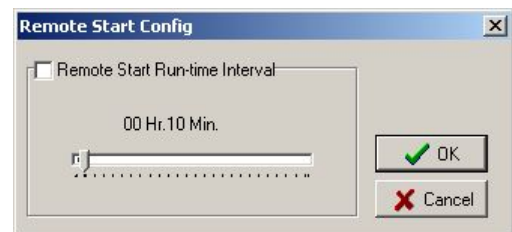
Save the configuration of GTR85 in to a file as a record or a configuration library.

#### ■ Remote start

When the connection between GTR85 and software is setup, User can remote start engine by two ways:

1. Enable the “Remote start run-time interval” item then click OK. The engine will be started at next second, and will be stopped until the timer is expired, or click the remote stop button.
2. Click OK directly, the engine will be started and will be stopped if the communication is failed or click the remote stop button.

**Note:** Communication may fail by many reasons, so it is strong suggestion that using method 1 to remote start the engine.



#### ■ Remote stop

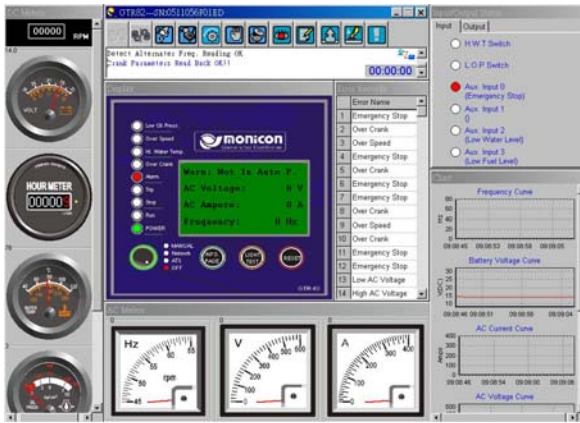
Click this button shuts down the running engine that by network remote start.

#### ■ Reset

Click this button clears the fault indicate and set the whole system in a normal status.

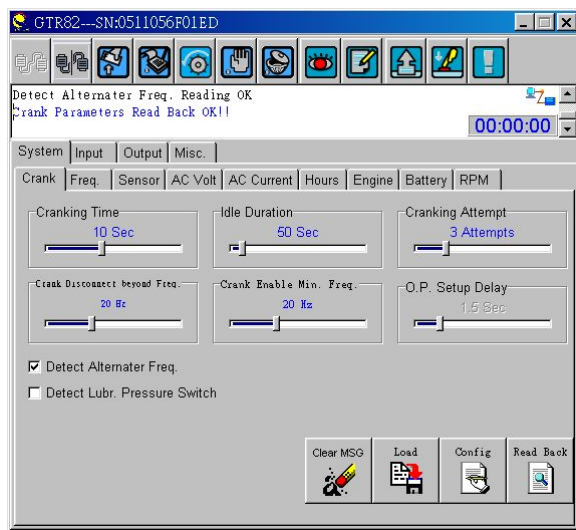
#### ■ Panel

Click this button shows the controller’s panel and all real time information.



■ **Setting** 

Click this button shows the configuration screen.



■ **Read all parameters** 

Click this button, all configuration settings will be read from the GTR85 controller.

■ **Set all parameters** 

Click this button, all configuration settings will be written into the GTR85 controller.

■ **About** 

Click this button shows the information of the Monicon instruments Co., Ltd. and the version of the GTR85 software.

■ **Read parameters** 

Click this button reads all the parameters in the current page that user selects.

■ **Set parameters** 

Click this button configures all the parameters in the current page that user selects.

■ **Refresh** 

After configuring settings to the GTR85 controller, the settings are in the un-working memory. Click this button lets the GTR82 controller to refresh its settings into the running procedure.

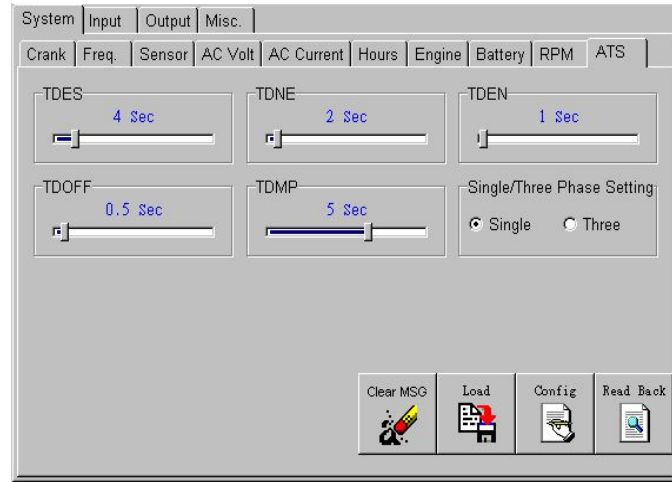
■ **Clear MSG** 

Click this button clears the texts in the message box.



### 3.3 Parameters description

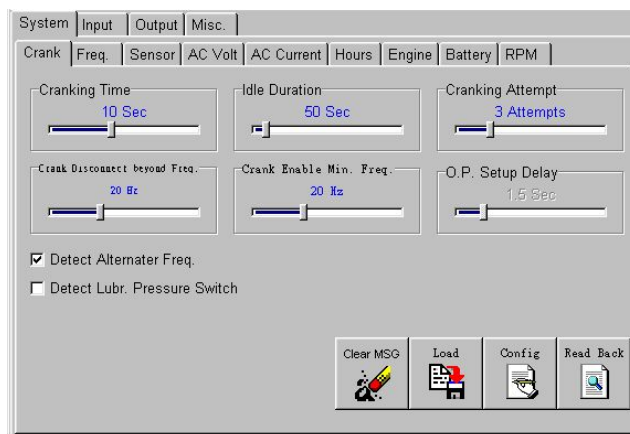
#### 3.3.1 ATS page



ATS Parameter			
	Range	Default	Description
Emergency start time delay (TDES)	0,5~30sec	4sec.	When utility (normal) power failure exceeds this setting, the GTR85 starts generator.
Normal to emergency time delay(TDNE)	0,5sec~ 30 sec	2sec.	Time delay between the circuit switch transfers from the utility (normal) power side to the emergency power side. This function executed by activation of EG side relay (terminal G39, G40).
Emergency to normal Time delay(TDEN)	0,5~30 sec	1sec.	The interval between the circuit switch transfers from emergency power side to the utility (normal) power side after utility (normal) power recovered. This function executed by activation of MG side relay (terminal G37, G38).
TDOFF	0,25~5sec	0,5sec.	The interval of circuit switch in the off state that means the circuit switch neither in utility (normal) power side nor in emergency power side.
TDMP	0,5~7,5sec	5sec.	The time delay of utility (normal) power recovers from failure status to normal status.
Phase1/3 setting	Phase1 Phase 3	Phase3	When single phase is selected, the utility (normal) power connects to the terminal G34(U) & G36(W).

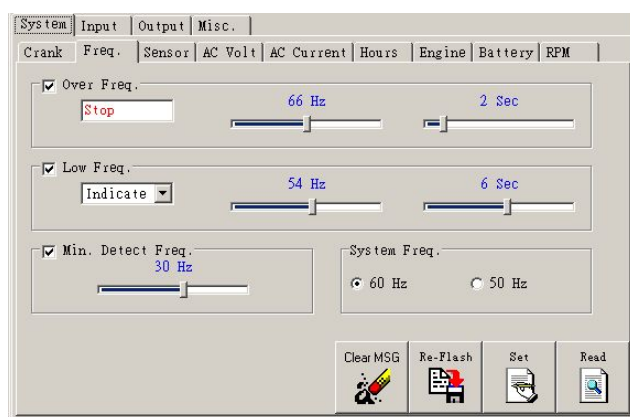
#### 3.3.2 System page

■ Crank page



Item	Name	Default	Range	Description
1	Cranking time	10 Sec.	3 ~ 20 Sec.	Set the maximum limitation of the cranking time.
2	Idle duration	10 Sec.	5 ~ 600 Sec.	The interval of the idle running.
3	Crank disconnect beyond frequency	20 Hz	15 ~ 30 Hz	When frequency goes above this setting, the starter motor will escape.
4	Crank enable minimum frequency	20 Hz	15 ~ 30 Hz	When frequency is below this setting the starter motor will be activated during cranking interval.
5	Crank attempt	3	1 ~ 10	Total cranking attempts.
6	Detect alternate frequency	Checked	Checked / Un-checked	Checked means enable this function. Controller escapes starter motor refers to frequency value.
7	Detect Lubricant pressures sw.	Un-checked	Checked / Un-checked	Controller escapes starter motor refers to lubricant pressure built up.
8	Lubricant pressures sw. escape starter	1.5 Sec.	0.5 ~ 6.25 Sec.	If the system's setting "Detect Lubricant Pressure sw." is enabled, when oil pressure switch is activated and the active period is longer than this setting, the controller will escape the starter motor during crank interval. This setting is nothing to do with low oil pressure delay.

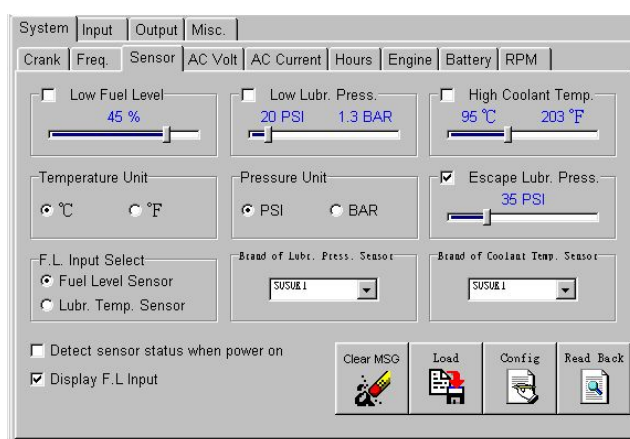
■ Freq. page



Item	Name	Default	Range	Description
<b>Over frequency</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
2	Action mode	Stop	Un-changeable	
3	Setting	66 Hz	60 ~ 72 Hz	60 Hz system
		55 Hz	50 ~ 60 Hz	50 Hz system
4	Timer	2 sec.	1 ~ 10 Sec.	
<b>Low frequency</b>				
5	Checked box	Checked	Checked / Un-checked	Checked means enable this function.

Item	Name	Default	Range	Description
6	Action mode	Indicate		There are four kind action mode can be selected. Stop <sup>*</sup> , Trip <sup>†</sup> , Alarm <sup>‡</sup> , Indicate <sup>§</sup>
7	Setting	54 Hz	48 ~ 59 Hz	60 Hz system
		45 Hz	40 ~ 50 Hz	50 Hz system
8	Timer	6 Sec.	1 ~ 10 Sec.	
<b>Minimum detect frequency</b>				
9	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
10	Setting	30 Hz	10 ~ 45 Hz	Low frequency protection will be disabled if frequency is under this setting.
11	System frequency	60 Hz	50 / 60 Hz	Rated frequency of the generator system.

## ■ Sensor page



Item	Name	Default	Range	Description
<b>Low fuel level</b>				
1	Checked box	Un-Checked	Checked / Un-checked	Checked means enable this function.
2	Setting	20 %	6 ~ 55 %	Controller gives an alarm signal when this function is enabled and the fuel level is under this setting.
<b>Low lubricant pressure</b>				
3	Checked box	Un-Checked	Checked / Un-checked	Checked means enable this function.
4	Setting	20 PSI	15 ~ 60 PSI	Controller gives an alarm signal when this function is enabled and the value of the lubricant pressure sensor is under this setting.
<b>High coolant temperature</b>				
5	Checked box	Un-Checked	Checked / Un-checked	Checked means enable this function.
6	Setting	95 °C	85 ~ 110 °C	Controller gives an alarm signal when this function is enabled and the value of the coolant temperature sensor is over this setting.
7	Temperature unit	°C	°C / °F	The unit of the temperature on the LCD display.
8	Pressure unit	PSI	PSI / BAR	The unit of the pressure on the LCD display.
<b>Escape lubricant pressure</b>				
9	Checked box	Un-Checked	Checked / Un-checked	Checked means enable this function.

\* Stop means controller shuts down the engine when the function is activated.

† Trip means controller gives an open signal via Trip output (Trip output is normal close relay) when the function is activated.

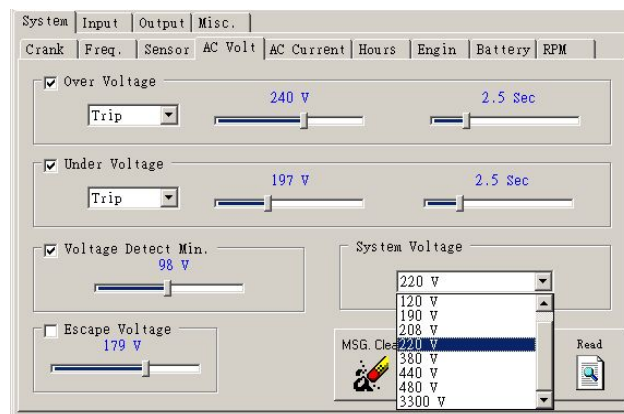
‡ Alarm means controller gives a warning signal via Alarm output when the function is activated.

§ Indicate means controller indicates the fault signal via the indicator of the panel when the function is activated.



Item	Name	Default	Range	Description
10	Setting	35 PSI	25 ~ 65 PSI	Controller escapes the starter motor when the value of the lubricant pressure sensor is greater than this setting.
11	F.L. input select	Fuel level sensor	Fuel level sensor	Use fuel level sensor as the F.L. input.
			Lubricant temp. sensor	Use lubricant temperature sensor as the F.L. input.
12	Brand of lubricant pressure sensor	SUSUKI	SUSUKI PRO VDO 10 BAR VDO 5 BAR SCD	GTR85 supports five brand of the lubricant pressure sensor.
13	Brand of coolant temperature sensor	SUSUKI	SUSUKI PRO VDO SCD	GTR85 supports four brand of the coolant temperature sensor.
14	Detect sensor status when power on	Checked	Checked / Un-checked	Checked means enable this function.
15	Display F.L. input	Checked	Checked / Un-checked	Checked means display fuel level value or lubricant temperature depends on selecting.

■ AC volt page

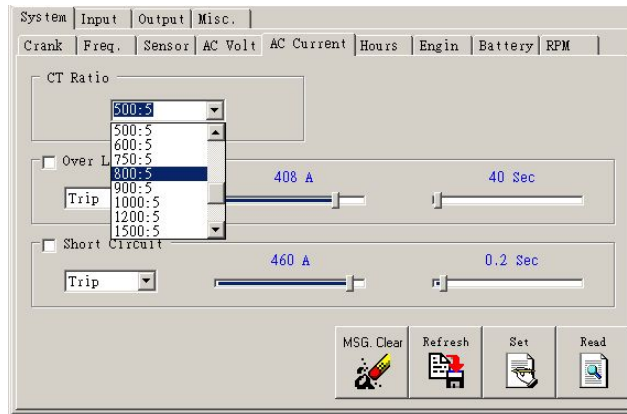


Item	Name	Default	Range	Description
<b>3</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
2	Action mode	Trip		Refer to the description in *, †, ‡, §.
3	Setting	121 V	110 ~ 128 V	AC 110 V system
		131 V	119 ~ 138 V	AC 120 V system
		207 V	190 ~ 219 V	AC 190 V system
		228 V	207 ~ 240 V	AC 208 V system
		242 V	219 ~ 254 V	AC 220 V system
		416 V	378 ~ 439 V	AC 380 V system
		484 V	439 ~ 512 V	AC 440 V system
		525 V	477 ~ 553 V	AC 480 V system
		3632 V	2197 ~ 3823 V	AC 3300 V system
726 V	659 ~ 762 V	AC 660 V system		
4	Timer	2.5 Sec.	0.25 ~ 10 Sec.	
<b>Under voltage</b>				
5	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
6	Action mode	Trip		Refer to the description in *, †, ‡, §.

Item	Name	Default	Range	Description		
7	Setting	98 V	91 ~ 110 V	AC 110 V system		
		107 V	100 ~ 119 V	AC 120 V system		
		171 V	159 ~ 190 V	AC 190V system		
		186 V	174 ~ 207 V	AC 208 V system		
		197 V	185 ~ 219 V	AC 220 V system		
		340 V	318 ~ 378 V	AC 380 V system		
		394 V	370 ~ 439 V	AC 440 V system		
		432 V	401 ~ 477 V	AC 480 V system		
		2958 V	1851 ~ 3304 V	AC 3300 V system		
	591 V	555 ~ 659 V	AC 660 V system			
8	Timer	2.5 Sec.	0.25 ~ 10 Sec.			
<b>Voltage detect minimum</b>						
9	Checked box	Checked	Checked / Un-checked	Checked means enable this function.		
10	Setting	34 V	25 ~ 72 V	AC 110 V system	Under voltage protection is disabled when the value of the AC voltage is under this setting.	
		39 V	29 ~ 79 V	AC 120 V system		
		62 V	46 ~ 124 V	AC 190V system		
		62 V	51 ~ 136 V	AC 208 V system		
		72 V	53 ~ 145 V	AC 220 V system		
		124 V	93 ~ 252 V	AC 380 V system		
		145 V	107 ~ 290 V	AC 440 V system		
		159 V	117 ~ 318 V	AC 480 V system		
		1089 V	813 ~ 2197 V	AC 3300 V system		
	217 V	160 ~ 435 V	AC 660 V system			
11	System voltage	220 V	110 V	Connect directly.		
			120 V			
			190 V			
			208 V			
			220 V			
			380 V	Connect with transformer (440V / 220 V)		
			440 V			
			480 V			Connect with transformer (480V / 240 V)
			3300 V			Connect with transformer (3300V / 330 V)
	660 V	Connect with transformer (660V / 330 V)				
<b>Escape voltage</b>						
12	Checked box	Un-checked	Checked / Un-checked	Checked means enable this function.		
13	Setting	93 V	53 ~ 108 V	AC 110 V system	Controller escapes the starter motor when the value of AC voltage is greater than this setting if the escape voltage function is enabled.	
			100 V	58 ~ 119 V		AC 120 V system
			160 V	93 ~ 188 V		AC 190V system
			176 V	103 ~ 207 V		AC 208 V system
			186 V	108 ~ 219 V		AC 220 V system
			321 V	188 ~ 378 V		AC 380 V system
			373 V	217 ~ 439 V		AC 440 V system
			404 V	238 ~ 477 V		AC 480 V system
			2802 V	1643 ~ 3286 V		AC 3300 V system
	560 V	326 ~ 659 V	AC 660 V system			

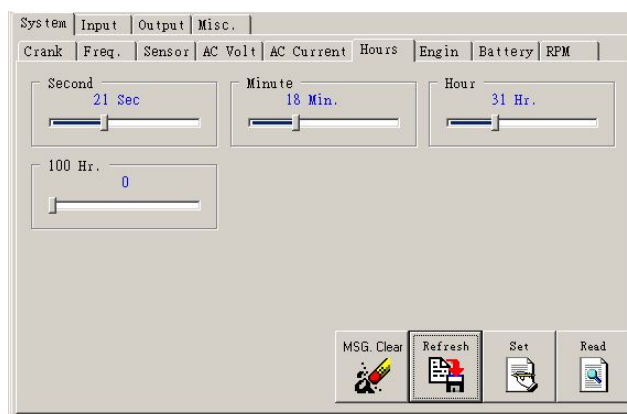


■ AC current page



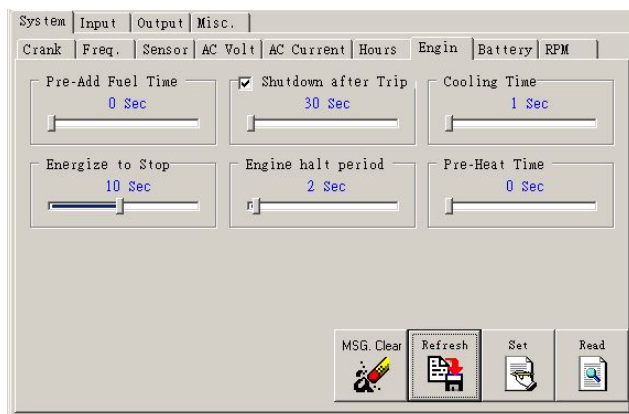
Item	Name	Default	Range	Description
1	CT ratio	400:5	10:5 ~ 6000:5	Select system current transformer ratio.
<b>Over load</b>				
2	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
3	Action mode	Trip	Stop Trip Alarm Indicate	
4	Setting	348 A	1 ~ 400 A	The value depends on CT ratio which user selects.
5	Timer	40 Sec.	10 ~ 2550 Sec.	
<b>Short circuit</b>				
6	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
7	Action mode	Trip	Stop Trip Alarm Indicate	
8	Setting	376 A	1 ~ 400 A	The value depends on CT ratio which user selects.
9	Timer	0.2 Sec.	0.1 ~ 2 Sec.	

■ Hours page



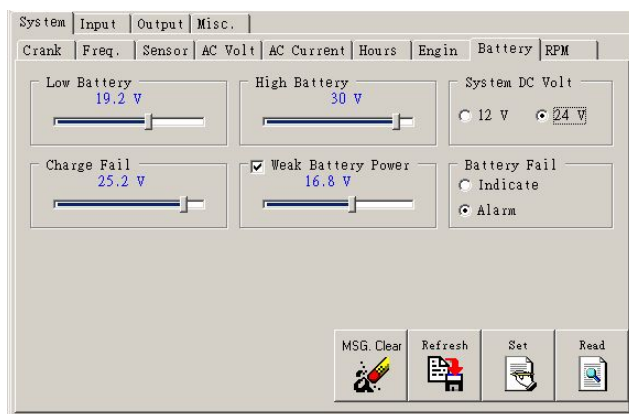
Item	Name	Default	Range	Description
1	Second	0	0 ~ 59	
2	Minute	0	0 ~ 59	
3	Hour	0	0 ~ 99	
4	100 Hour	0	0 ~ 99	

■ Engine page



Item	Name	Default	Range	Description
1	Pre-add fuel time	0 Sec.	0 ~ 10 Sec.	The interval of pre-add fuel before start engine.
2	Engine halt period	2 Sec.	1~ 30 Sec.	Engine will be halt a period of time after system shut down by fault occurred.
3	Cooling time	1 Sec.	1 ~ 240 Sec.	After normal shut down the engine, the cooling procedure will be activated. Cooling time will be no used in fault shut down or by manual switch off.
4	Energies to stop	10 Sec.	1 ~ 20 Sec.	The timer is setting how long the fuel solenoid should be energized to stop the engine completely
5	Pre-heat timer	0 Sec.	0 ~ 60 Sec.	The Pre-Heat procedure will be activated and the AUX. relay outputs if signet.
<b>Shutdown After Trip</b>				
6	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
7	Timer	30 Sec.	30 ~ 900 Sec.	When trip activated the Run light will flash and trip relay energized, the control will shut down the engine if fault not clear before the setting time is up.

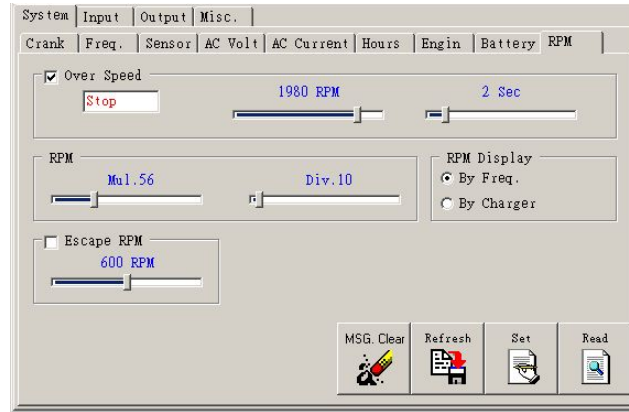
■ Battery page



Item	Name	Default	Range	Description
1	Low battery volt setting	19.2 V	7.6 ~ 26 V	DC volts under this setting value will cause warning or alarm depends on setting.
2	High Battery Volt. Setting	30 V	12 ~ 32 V	DC volts above this setting value will cause warning or alarm depends on setting.
3	System DC Volt.	24 V	12V / 24V	
4	Charge Fail	25.2 DCV	11 ~ 26 V	Sets the minimum charger output voltage while engine running. The action mode is Indicate.
<b>Week battery power</b>				
5	Checked box	Checked	Checked / Un-checked	Checked means enable this function.

Item	Name	Default	Range	Description
6	Setting	16.8 V	7.6 V ~ 23 V	During the crank interval, if DC voltage drop below this setting exceeds cranking time minus one second then GTR82 will shut down the engine and display “DC weak power”.
7	Battery fail	Alarm	Indicate Alarm	Controller gives an alarm or indicate signal when the low battery or high battery occurred.

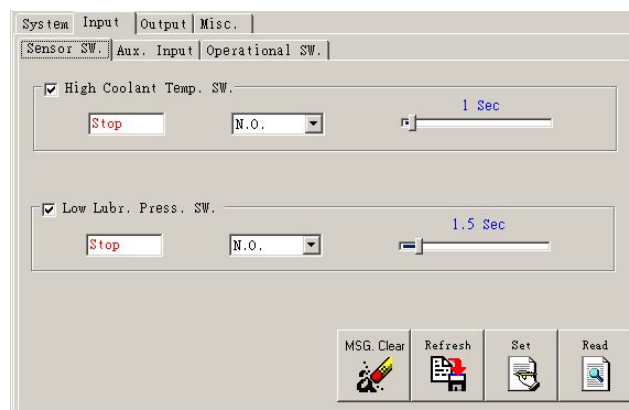
■ RPM page



Item	Name	Default	Range	Description
<b>Over Speed</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
2	Action mode	Stop	Un-changeable	
3	Setting	1980 RPM	1350 ~ 2100 RPM	Over speed detecting method is sensed alternator charger RPM. IF over this setting then will cause engine stop.
4	Timer	2 Sec.	1 ~ 10 Sec.	
<b>RPM ratio</b>				
5	Multiple factor	56	1 ~ 200	The ratio of rotation of main frame versus alternator chargers' pulley.
6	Divider factor	10	1 ~ 200	
<b>Escape RPM</b>				
7	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
8	Setting	600 RPM	400 ~ 1000 RPM	Controller escapes the starter motor when engine speed is greater this setting.
9	RPM display	By Freq.	By Freq. / By Charger	The engine speed can be calculated by the AC frequency or by the alternator charger frequency depends on setting.

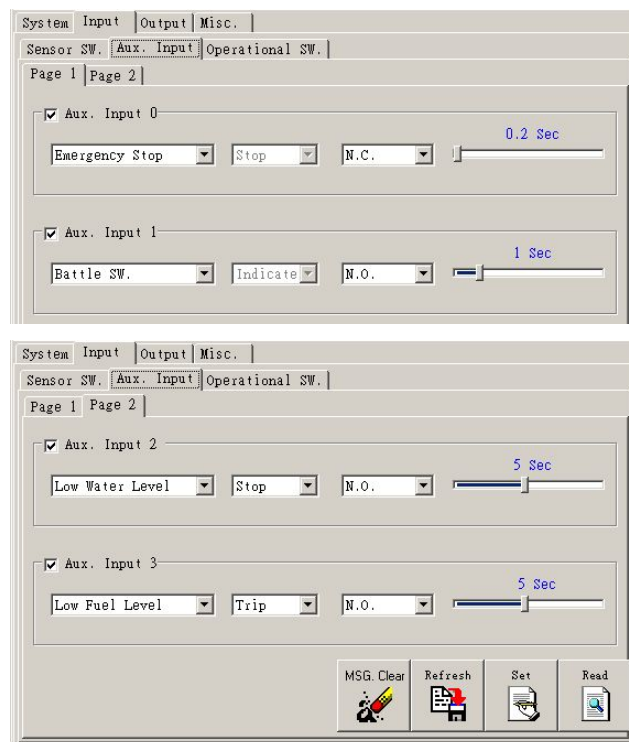
3.3.3 Input page

■ Sensor switch page



Item	Name	Default	Range	Description
<b>High coolant temperature switch</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
2	Action mode	Stop	Un-changeable	
3	Type	N.O.	N.O. N.C.	N.O. : This switch returns a closed signal during high water temperature conditions, once the engine water temperature is cool down the switch will open. N.C. : This switch returns an open signal during high water temperature conditions, once the engine water temperature is cool down the switch will close.
4	Timer	1 Sec.	0.5 ~ 10 Sec.	
<b>Low lubricant pressure switch</b>				
5	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
6	Action mode	Stop	Un-changeable	
7	Type	N.O.	N.O. N.C.	N.O. : This switch returns a closed signal during low oil pressure conditions, once oil pressure is established the switch will open. N.C. : This switch returns an open signal during low oil pressure conditions, once oil pressure is established the switch will close.
8	Timer	1.5 Sec.	0.125 ~ 12.5 Sec.	

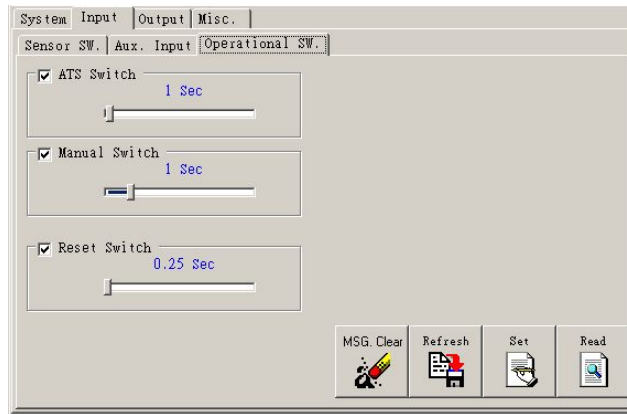
■ Aux. input page



Item	Name	Default	Range	Description
<b>Auxiliary input 0</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.

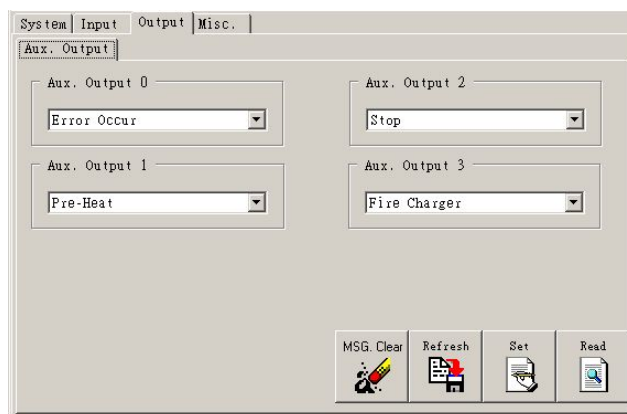
Item	Name	Default	Range	Description
2	Function name	Emergency stop	See description	GTR85 supports the following function input as auxiliary input 0: Emergency stop, Low Battery Volt, High Fuel Level, Pre-Alarm, Charge fail, Over Load, Low Water Temp., and Spare. The function name Emergency stop is the special function for the auxiliary input 0. Controller shuts down the engine immediately when the Emergency stop switch is activated.
3	Action mode	Stop		Refer to the description in *, †, ‡, §. When function name, Emergency stop, is selected, the action mode is set as Stop and is un-changeable.
4	Type	N.C.	N.C. N.O.	
5	Timer	0.2 Sec.	0.1 ~ 10 Sec	
<b>Auxiliary input 1</b>				
6	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
7	Function name	Battle switch	See description	GTR85 supports the following function input as auxiliary input 1: Battle switch, Low Battery Volt, High Fuel Level, Pre-Alarm, Charge fail, Over Load, Low Water Temp., and Spare. The function name battle switch is the special function for the auxiliary input 1. Controller bypassed the fault signal except the emergency stop and over speed when the battle switch input is activated and function name is selected.
8	Action mode	Stop		Refer to the description in *, †, ‡, §. When function name battle switch is selected, the action mode is un-changeable.
9	Type	N.O.	N.O. N.C.	
10	Timer	1 Sec.	0.25 ~ 5 Sec	
<b>Auxiliary input 2</b>				
11	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
12	Function name	Low water level	See description	GTR85 supports the following function input as auxiliary input 2: Low water level, Low Battery Volt, High Fuel Level, Pre-Alarm, Charge fail, Over Load, Low Water Temp., and Spare.
13	Action mode	Stop		Refer to the description in *, †, ‡, §.
14	Type	N.O.	N.O. N.C.	
15	Timer	5 Sec.	0.5 ~ 10 Sec	
<b>Auxiliary input 3</b>				
16	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
17	Function name	Low fuel level	See description	GTR85 supports the following function input as auxiliary input 3: Low fuel level, Low Battery Volt, High Fuel Level, Pre-Alarm, Charge fail, Over Load, Low Water Temp., and Spare.
18	Action mode	Stop		Refer to the description in *, †, ‡, §.
19	Type	N.O.	N.O. N.C.	
20	Timer	5 Sec.	0.5 ~ 10 Sec	

■ Operational switch page



Item	Name	Default	Range	Description
<b>ATS switch</b>				
1	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
2	Timer	1 Sec.	0.25 ~ 63.75 Sec.	
<b>Manual switch</b>				
3	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
4	Timer	1 Sec.	0.25 ~ 5 Sec.	
<b>Reset switch</b>				
5	Checked box	Checked	Checked / Un-checked	Checked means enable this function.
6	Timer	0.25 Sec.	0.25 ~ 2.5 Sec.	

3.3.4 Output page

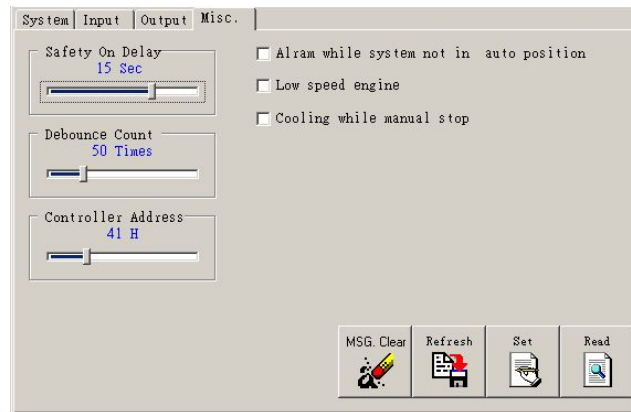


Item	Name	Default	Range	Description
1	Aux. output 0	Error occur	See description	GTR85 supports the following function output as auxiliary output: 1. Error Occur, 2. Standby, 3. Pre-heat, 4. Start Period, 5. Start Interval, 6. Run, 7. Stop, 8. Engine Halt, 9. Generator Working, 10. Reset Activate, 11. System Trip, 12. System Alarm, 13. Fire Charger, 14. High Coolant Temp. Value, 15. Low Fuel Level Value, 16. Low Lube Press. Value, 17. Under Frequency Active, 18. High Voltage Active, 19. Under Voltage Active, 20. Over Load Active, 21. Short Circuit Active, 22. Error Occur (B), 23. Reserve 2, 24. Spare, 25. Engine
2	Aux. output 1	Pre-heat duration	See description	
3	Aux. output 2	Energized to stop	See description	

Item	Name	Default	Range	Description
4	Aux. output 3	Fire changer	See description	Running, 26. Low Water Level Active, 27. Low Bat. Volt Active, 28. Low Fuel Level Active, 29. Over Crank, 30. High Coolant Temp. Active, 31. Over Speed Active, 32. Low Lube Press. Active, 33. Emergency Stop Active, 34. Not Auto Position, 35. Manual Start, 36. Auto Start, 37. Remote Position, 38. Reserve 3, 39. Reserve 4
5	Trip output	System trip	See description	
<b>Auxiliary output function description</b>				
Item	Function name	Description		
1	Standby	When system is under standby status, the aux. output relay energized and will be de-energized when escape standby mode.		
2	Start Period	An aux. output relay will be energized during the starter motor is activated.		
3	Start Interval	An aux. output relay will be energized between the periods of two continuous cranking attempts. The time period is decided by the setting of the Energies to stop.		
4	Run	An aux. output relay will be energized during the system is in running mode.		
5	Stop	An aux. output relay will be energized when accepts the stop command or in start interval mode. The time period is decided by the setting of the Energies to stop.		
6	Engine Halt	An aux. output relay will be energized during the engine halt mode. The time period is decided by the setting of Engine halt.		
7	Generator Working			
8	Reset Activate	An aux. output relay will be energized while the reset button is pressed.		
9	System Trip	An aux. output relay will be energized during system in the trip mode.		
10	System Alarm	An aux. output relay will be energized during system in the alarm mode.		
11	Fire Changer	An aux. output relay will be energized to fire the charger. The time period of the output signal is from start command accepts to the safety on timer expired.		
12	High Coolant Temp. Value	An aux. output relay will be energized when the vale of the coolant temperature sensor is greater than the setting of the high coolant temperature.		
13	Low Fuel Level Value	An aux. output relay will be energized when the vale of the fuel level sensor is less than the setting of the low fuel level.		
14	Low Lube Press. Value	An aux. output relay will be energized when the vale of the lubricant pressure sensor is less than the setting of the low lubricant pressure.		
15	Under Frequency Active	An aux. output relay will be energized when under frequency is occurred.		
16	High Voltage Active	An aux. output relay will be energized when high voltage is occurred.		
17	Under Voltage Active	An aux. output relay will be energized when under voltage is occurred.		
18	Over Load Active	An aux. output relay will be energized when over load is occurred.		
19	Short Circuit Active	An aux. output relay will be energized when short circuit is occurred.		
20	Error Occur (B)	It is the same function of Error Occur but reverse action.		
21	Reserve 1	Reserve for the function extension in the future.		
22				
23	Engine Running			
24	Aux. In 2 Active	An aux. output relay will be energized when the auxiliary input 2 activated and caused engine stop.		
25	Low Bat. Volt Active	An aux. output relay will be energized when low battery is occurred.		
26	Aux. In 3 Active	An aux. output relay will be energized when the auxiliary input 3 activated and caused engine stop.		
27	Over Crank	An aux. output relay will be energized when over crank is occurred.		
28	High Coolant Temp. Active	An aux. output relay will be energized if there is a stop fault occurred due to high coolant temperature detected by high coolant temperature switch.		
29	Over Speed Active	An aux. output relay will be energized when over speed fault is occurred.		
30	Low Lube Press. Active	An aux. output relay will be energized if there is a fault occurred due to the low		

Item	Function name	Description
		oil pressure detected by low oil pressure switch.
31	Aux. In 0 Active	An aux. output relay will be energized when the auxiliary input 0 activated and cause engine stop.
32	Not Auto Position	An aux. output relay will be energized when rotary switch is not in auto position.
33	Manual Start	An aux. output relay will be energized while system is running by manual start command.
34	Auto Start	An aux. output relay will be energized while system is running by auto start command.
35	Remote Position	An aux. output relay will be energized when rotary switch is in network position.
36	High Battery Volt	An aux. output relay will be energized when the DC voltage is greater than the setting of high battery volt.
37	Idle	An aux. output relay will be energized when system is in idle procedure.

### 3.3.5 Misc. page



Item	Name	Default	Range	Description
1	Safety on timer	10 Sec.	3 ~ 20 Sec.	All alarms are ignored until safety on timer expired, except the emergency stop, over speed.
2	De-bounce	50	5 ~ 200	De bounce time can avoid the interference by Electronic or magnetic.
3	Controller Address	41 H	01 ~ FF H	Controller address is for identification while multiple controllers connected in the same network.
4	System not auto	Checked	Checked / Un-checked	Checked means enable this function. Controller gives an alarm signal when the position of rotary switch is not in auto position.
5	Low speed engine	Un-checked	Checked / Un-checked	Checked means enable this function. The frequency vale multiple 20 as engine speed if checked otherwise multiple 30. For example, if the rated frequency is 60.0 Hz and the low speed engine is checked, then the engine speed is equal to 1200 rpm (60.0 * 20 = 1200 rpm).
6	Not cooling while manual stop	Checked	Checked / Un-checked	Checked means enable this function. While manual stop, the controller will stop the engine immediately if this function is enable. Otherwise the controller will run in to cooling mode.