



GUILIN G M TECHNOLOGY INDUSTRY LTD.

MODEL DACTS701C
GENERATOR AUTO CONTROLLER
USER'S MANUAL

GMTI LTD.

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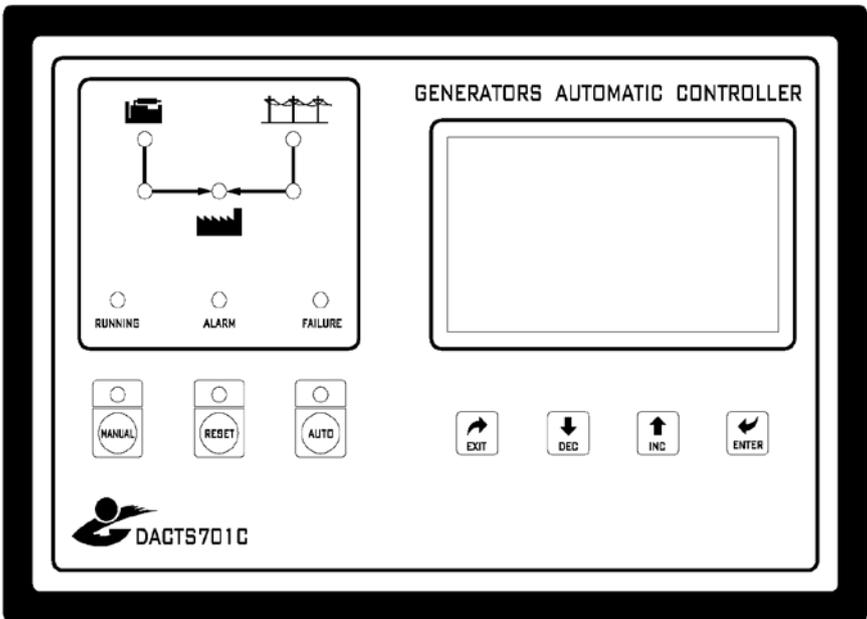
1. DESCRIPTION

The DACTS701C is a microcontroller-based engine generator module. It has a modular concept, designed to provide the functions necessary for emergency supply.

The module is used to monitor the grid voltage and the generator voltage at real time and automatically transfer load between grid and generator, and when a generator fault occurs, the engine generator will shut down in emergency, then the "failure" LED on the front panel lights on and the LCD displays the reason or status of the fault.

The optional serial port is a standard RS-232C capable of communicating directly with a personal computer (PC) or any Hayes-compatible modem.

In addition to direct serial communication, the DACTS701C is able to originate a telephone call to selected numbers if customer selected events occur. It is also capable of extensive data buffering capabilities. This is invaluable for remote sites where on-site inspection is extremely costly.



2. FEATURES

- Monitoring the grid and generator voltage synchronously
- Automatically control and monitor the engine generator
- Automatically shut down the engine generator on fault condition
- LED & LCD alarm indication
- Optionally provide remote control and monitoring of all functions
- Automatically transfer the load between generator and grid
- Automatically record the total runtime and fault records
- Pc configurable via MS windows based software
- Configurable time delays
- Configurable system parameters
- Configurable alarm limits of analogue

Multiple alarm channels are provided to monitor the following:

- Under/Over Generator Voltage alarm/shutdown
- Under/Over Generator Frequency alarm/shutdown
- Current overload alarm/shutdown
- Low Oil Pressure alarm/shutdown
- High Coolant Temperature alarm/shutdown
- High oil Temperature alarm/shutdown
- Over speed alarm/shutdown
- Low fuel level alarm/shutdown
- Generator transfer failure alarm/shutdown
- Low battery voltage alarm
- Emergency Stop
- Fail to Start (over crank)

3. SPECIFICATIONS

DC Supply:

12V DC (8 To 18V DC), 24V DC (18 To 35V DC)

Max. Operating Current:

250mA at 12V DC, 150mA at 24V DC

Generator Input Voltage Range:

0 To 450V AC, 3 phase 4 wire or 3 phase 3 wire

Generator Input Frequency Range:

0 To 99Hz at rated engine speed (Minimum: 15V AC Ph-N)

Relay output:

1 Amp DC at supply voltage

Operating Temperature Range:

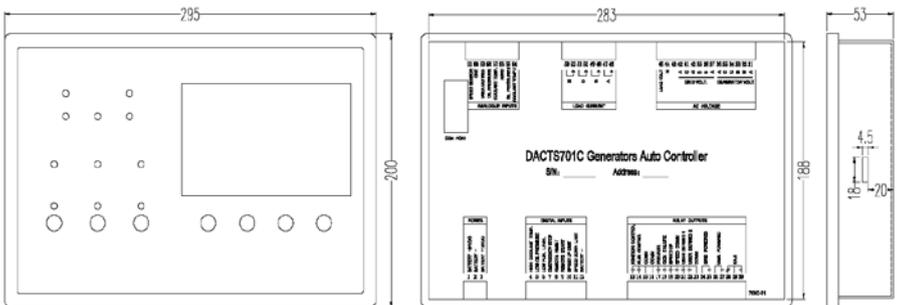
-10°C To +60°C

Store Temperature Range:

-10°C To +70°C

4. PHYSICAL STRUCTURE

The controller has a plastic front panel with an aluminum back cover. Overall dimensions are 295X200X53mm(WHD) and the back cover dimensions are 283X188mm (WH).



The 701C module has been designed for front panel mounting, the module is fitted into the panel cut-out with the fixing clips removed, these are then fitted from the rear.

5. THE FRONT PANEL

The front panel of DACTS701C controller consists of a liquid crystal display (LCD), seven membrane keys and seven high visibility indicated lamps, The simple arrangement provides the operator with complete instrumentation, system information and control.

5.1 The LCD is 7 lines, all menu parameters can be displayed on the LCD by using a simple menu arrangement. Under normal conditions, if the current display is grid status page, the LCD will display 3 phase grid voltage, 3 phase load current, grid frequency and grid power. On the generator status page, the LCD will display 3 phase generator voltage, 3 phase load current, generator speed, battery voltage, coolant temperature, oil pressure, oil temperature, generator frequency and power. Press [←] key, you can change the current display from the grid status page to generator status page or fault status.

GRID STATUS			
	LAB	LBC	LCA
Volt(v)	0	0	0
Load(A)	0	0	0
Freq(Hz)	0.0		
Pw(Kw)	0		

Grid status page

GENERATOR STATUS			
	LAB	LBC	LCA
Volt(v)	0	0	0
Load(A)	0	0	0
Freq(Hz)	0.0	OilT(°C)	0
Pw(Kw)	0	Speed	0
Cool(°C)	0	Batt(V)	11.8
Oil(kpa)	1701	runtime	3

Generator status page

The fault status page show current fault time and reason, when the controller is reset, the fault records information will be cleared out.

5.2 The seven membrane keys are used to control the DACTS701C, everything is done via the keys.

The function keys are as follows:

[→/Exit]: The function of the [Exit] key is to “back up”, or exit from your current menu level to the previous level. It can also cancel an editing operation. If you are prompted for a new value and you do not wish to change the original value when you are editing a parameter value, press this key.

[↓ /Dec] & [↑ /Inc]: The two keys are used by the DACTS701C menu system to scroll through all the items at the same level. Each key scrolls in a different direction, holding [Dec] or [Inc] key down will cause a continuous scroll at increasing speed.

The [Inc] key is also used to increase a numeric value, and the [Dec] key is used to decrease a numeric value when user is editing the parameter value in the menu system, you can increase or decrease the current value by using the [Dec] and [Inc] keys until you arrive at the value you want.

When you have finished editing, press the [Enter] key. If you decide not to change the original value, just press the [cancel] key.

[←/Enter]: The [Enter] key will take you to the next level menu each time it is pressed. It can also end an editing operation. When this key is pressed, the value in the numeric field just edited is evaluated. If it is valid, the new value is written to EEPROM(memory), and the editing field is removed. If it is invalid, the editing field is removed.

Under normal conditions, press [enter] key, you will be required to log on the menu system.

[Reset]: Pressing this key will stop the generator if it is running, and generator is placed in the “stop” state, at the moment, even though the grid is abnormal, the generator will not start.

If the generator is shut down because of generator fault when running, the generator will be locked and not start, only it makes true that the fault has been eliminated, press [reset] key, the controller is released.

[Auto]: The engine generator is placed in the “Auto” state, stopping or starting the engine generator is controlled by means of grid status, the

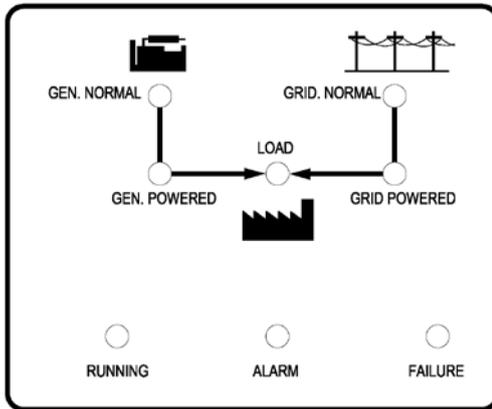
“remote reset” and “remote start” switch signal.

In “auto” state, if the controller is not in “remote reset” state, when the grid is abnormal or “remote start” switch is closed, the generator will be started, if the generator voltages and frequency are normal, after the relational delays times out, the load is transferred to generator; the grid comes back normal, again the load will be transferred to the grid and the generator will be stopped.

[Manual]: The generator will be started immediately when [Start] key is pressed, if the grid is normal, the generator will run without load; if the grid is abnormal and the generator voltages and frequency is within the limits, the load is transferred to generator, when the grid comes back normal, the load will be transferred to the grid.

If the controller is in “remote reset” state, this key is noneffective.

5.3 panel indicated lamps



Indicated leds figure

Running: When the generator is running naturally, the “running” indicated lamp lights on.

Alarm: When an alarm or a generator fault occurs, the “Alarm” indicated lamp will flash.

Failure: When a generator fault occurs, the lamp lights on.

Gen.Normal: if the generator voltage and frequency are normal, the lamp lights on.

Grid Normal: if the grid voltage and frequency are normal, the lamp lights on.

Gen. powered: While the load is powered by generator, the lamp lights on.

Grid powered: While the load is powered by the grid, the lamp lights on.

load: While the load is powered, the lamp lights on.

6. MENU SYSTEM AND CONFIGURATION

In order to log on the menu system, you must provide the password, just as if you were at the DACTS701C keypad. The password is four-digital, the default password is "3333". Press the [enter] key while the default display page is shown, you will be prompted for a password, press the [Inc] key thrice until the digital "3" appears, and then press the [enter] key to end it. Repeat this operation for 3 times, you will reach the parameter menu.

The parameter menu consists of the following items:

- Analogue input

- Time delay

- System params

- Digital inputs

- Relay outputs

To select an item from the menu, use the [Dec] or [Inc] key, and press [enter] key when you want to progress to the next menu level. If you want to go back a level, press [exit].

6.1 the DACTS701C controller provides 16 **analogue input channels**, they are 3 phase Generator voltage, 3 phase Grid voltage, 3 phase Load current, Load current N phase, Battery voltage, Coolant temperature, Oil pressure, Oil temperature, Generator frequency, Grid frequency.

Each analogue input channel has two parameters: alarm high limit and alarm low limit.

6.1.1 Alarm high limit: this parameter value determines the point at which an analogue input is considered a high fault, it is adjustable.

Note: This parameter value is noneffective to "oil pressure".

6.1.2 Alarm lower limit: this parameter value determines the point at which an analogue input is considered a low fault, it is adjustable.

Note: This parameter value is noneffective to "coolant temperature".

For example, you have set the alarm high limit of coolant temperature to 95, when the "coolant temperature" current value rises over the alarm high limit, the "high coolant temperature" delay will begin to time, once this delay times out, the current value remains over the alarm high limit, a common alarm output will be generated, and an high coolant temperature fault will occur.

6.1.3 You can also calibrate the analogue displayed value via the monitor software provided by the factory. (detailed in the monitor software)

Under normal condition, only an expert is allowed to calibrate the value.

6.2 Time delays (unit: second)

The DACTS701C has 23 time delays. Each of the time delays have one adjustable parameter: setpoint. This parameter sets the initial value for the time delay, the delay has decrement of 0.1 second from this value to 0. The value of setpoint can be changed by personnel.

As an example, the following would be the procedure for changing the value of "time delay bypass" setpoint form 15.0 to 30.0 seconds:

- 1) From the default display page, press [enter] key, you are required to input the password (detailed operation see the foregoing section), finishing the password inputting, you enter the menu system.
- 2) Press the [dec] key, select the "Time Delays" item, press [enter] key.
- 3) Press the [dec] key until the "Bypass" item is selected, and press [enter], the LCD will display "setpoint: 15.0" on the right side.
- 4) press [enter] , the background of "15.0" lights on.
- 5) press [dec] and [inc] key to adjust the numerical value to digital "30.0", and press [enter] to confirm it.
- 6) You can press [exit] key to return to whatever level of menu you wish.

◆ Time Delay crank

The time delay begins to time when start the diesel generator, during the delay period, if the generator speed rises over the crank speed (described

in 6.3 System params section) and the generator oil pressure is normal, the delay is reset, and the generator has been started successfully.

◆ Time delay crank rest

It provides a delay between crank attempts assuming the crank cycle is set more than one. When the delay times out, the crank cycle value will increase 1.

◆ Time delay bypass

After the generator has started successfully and the delay speed up has timed out, the delay bypass begins to time. The time delay bypass inhibits generator shutdown due to low oil pressure, high coolant temperature, over generator frequency and over generator voltage faults during the delay period. When the delay times out, if any of the four parameters are still out of limits the generator is shut down and locked out.

◆ Time delay start

When a grid failure occurs, the delay begins to time, after it has timed out, If the controller is in "Auto" status, the generator is signaled to start and the pre-fuel time delay begins.

◆ Time delay cooling shutdown

When the "grid powered" relay is energized, the delay begins to time, during the delay period, if the generator is running, it will be allowed to run without load until the delay times out. Following the cooling shutdown time delay, the generator is signaled to stop.

◆ Time delay fuel

The delay is only used if the controller is configured with "energized to stop" fuel mode in the system parameter. When generator is signaled to stop, the fuel relay is energized and the delay fuel begins to time, when the delay times out and a low oil pressure fault is detected, the fuel relay will be de-energized.

Note: If energized to run fuel mode is selected, this delay has no effect.

◆ Time delay Re-fuel

The time delay begins to time once generator is signaled to start, at the same time, the Re-fuel relay is energized, following the Re-fuel delay, the time delay crank begin to time, the relay will be de-energized after the

generator has been running naturally.

◆ Time delay transfer fault

When the “grid powered” relay or “generator powered” relay is energized, the delay begins to time, during the delay period, if load potential is detected, the delay is reset. If no load potential is detected and the controller is not in “reset” state before this delay times out, a transfer fault is generated.

Note: the time delay is effective only when the “load monitor” in the system parameters is set to 1.

◆ Time delay low oil pressure

When oil pressure drops below the alarm lower limit, this delay begins to time, if oil pressure rises over the lower limit during the delay, the delay will be reset, or, a low oil pressure fault will occur.

◆ Time delay high coolant temperature

Be similar to time delay low oil pressure

◆ Time delay over speed

Be similar to time delay low oil pressure

◆ Time delay over generator frequency

Be similar to time delay low oil pressure

◆ Time delay over generator voltage

Be similar to time delay low oil pressure

◆ Time delay low fuel level

Be similar to time delay low oil pressure

◆ Time delay current overload

Be similar to time delay low oil pressure

◆ Time delay high oil temperature

Be similar to time delay low oil pressure

◆ Time delay low battery voltage

Be similar to time delay low oil pressure

◆ Time delay speed up

The delay speed up begins to time once the time delay idle has timed out,

during the delay period, the “speed up” relay remains energized. When “the speed up limit” switch closed, the delay is reset.

◆ Time delay speed down

Once the generator receives the stop signal, the delay speed down will begin to time, after the delay times out, the generator is stopped. On emergency condition, for example the generator fault occurs or the “stop” key is pressed, the generator is stopped immediately, at the same time, the delay speed down begins to time.

◆ Time delay idle

After the generator has started successfully, the delay begins to time, when it times out, the time delay speed up begins to time.

◆ Time delay generator-grid

When the grid voltage and frequency return to within limits following a failure, the load will transfer to the grid, the delay begins to time, after it times out, the “grid powered” relay is energized and the “generator powered” relay is de-energized.

◆ Time delay warm up

After the time delay bypass, if generator voltage and frequency are normal, the time delay warm up begins to time, during the delay period, the generator will run without load.

◆ Dead bus

The time delay dead bus provides a minimum break time between the transfer of the load from one supply to another.

Warning: this delay directly affects transfer time between one supply and another. Setting the delay to a large value may result in a considerable length of time with no power connected to the load.

System params:

◆ Module address

Range: from 1 to 254.

◆ Crank cycles

The module offers a cycle option, providing from one to eight crank cycles. If more than one cycle is selected, a rest period is inserted

the value is used to select a judgement method of a low oil pressure fault. If select "1", when the value of oil pressure is less than alarm lower limit of oil pressure, a low oil pressure fault will occur; select "0", only when the oil pressure switch close, a low oil pressure fault will occur.

- ◆ Load monitor
 - 0 -Not monitoring the load voltage
 - 1 -monitoring the load voltage
- ◆ Speed sensing source
 - The controller is capable of detecting generator speed from one of two sources: generator frequency or magnetic pickup.
 - 0 -generator frequency
 - 1 -magnetic pickup
- ◆ Set to defaults
 - 0 -analogue
 - all of the analogue inputs may be set to factory default values.
 - 1 -delay and system
 - all of time delays and system params may be set to factory default values .

It is important to notice, however, that all of the configuration parameters are reset when you perform this function.

6.4 The controller accepts the following **digital inputs**: low oil pressure, high coolant temperature, low fuel level, emergency stop, remote start, remote reset, speed up limit, speed down limit.

6.5 Relay outputs are provided for ignition control, fuel control, Pre-fuel, generator failure, grid powered, generator powered, speed down, speed up, idle, undefined 1 undefined 2.

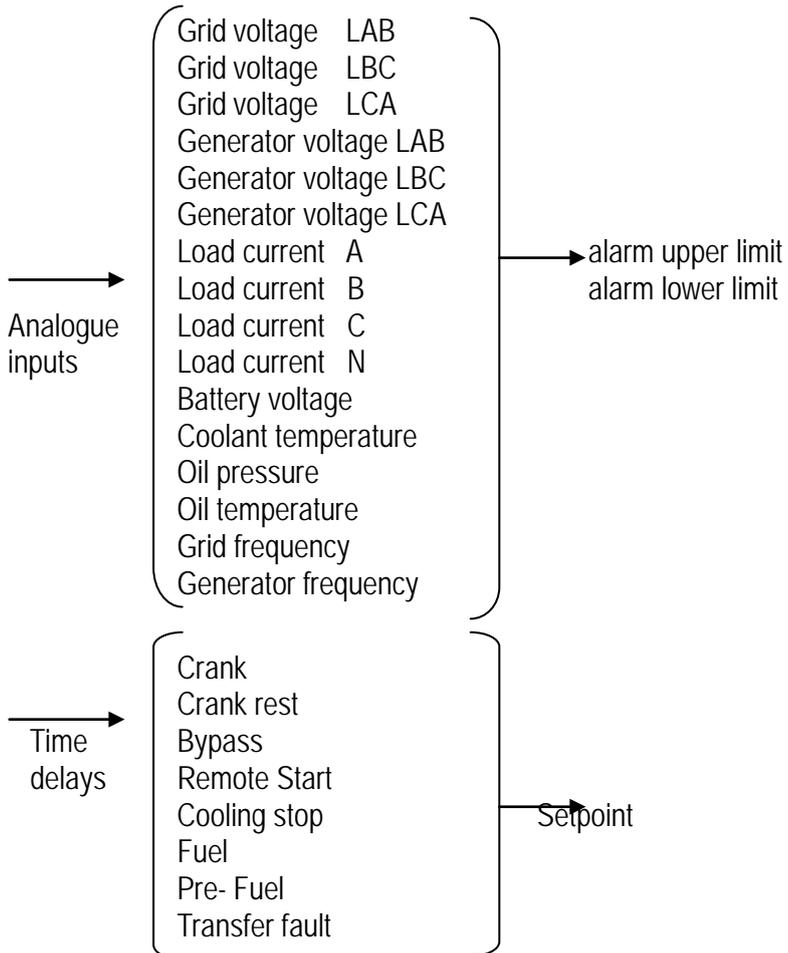
The status of any input can be monitored by scrolling through the digital inputs menu. Similarly any relay output can be monitored by scrolling through the relay outputs menu.

Digital input status is either 0 or 1, a value of 0 indicates the switch is open; a value of 1 indicates the switch is closed. When the value is 1, the

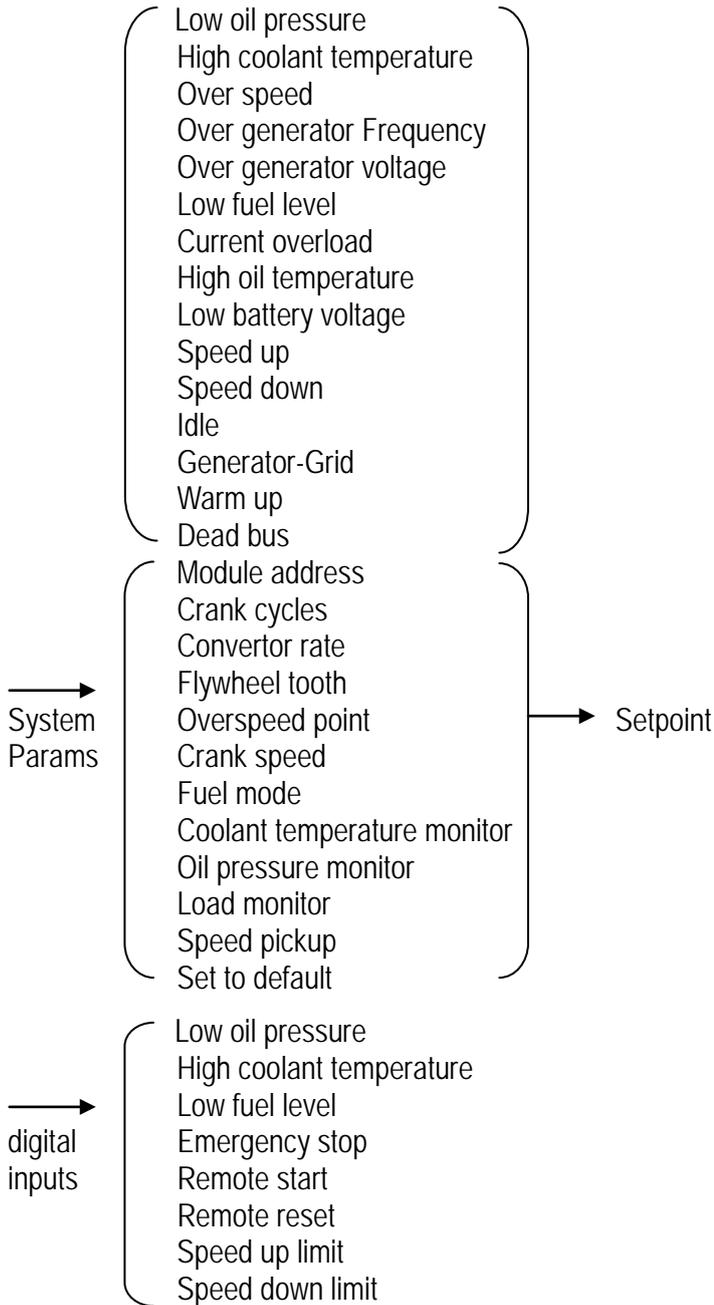
background of digital input will light on, and the value is 0, the background is normal.

Relay output status is either 0 or 1, a value of 0 indicates the relay is de-energized; a value of 1 indicates the relay is energized. When the value is 1, the background of Relay output will light on, and the value is 0, the background is normal.

6.6 The menu layout:



The time delays menu continued.



→
Relay
Status

Ignition control
Fuel control
Pre- Fuel
Generator failure
Grid powered
Generator powered
Speed up
Speed down
Idle
Undefined 1
Undefined 2

7. TERMINAL DESCRIPTION

No.	Definition	Remark
Terminal 1	Battery +24V DC	18~35V DC
Terminal 2	GND	
Terminal 3	Battery +12V DC	8~18V DC
Terminal 4	high coolant temp.	Digital input Digital input is either 0 or 1.
Terminal 5	low oil pressure	
Terminal 6	low fuel level	
Terminal 7	emergency stop	
Terminal 8	remote reset	
Terminal 9	remote start	
Terminal 10	Speed up limit	
Terminal 11	Speed down limit	
Terminal 12	Battery -	
Terminal 13	Ignition control	
Terminal 14	Fuel control	

Terminal 15 , 16	Comm	Relay output contact capacity: 2A/250VAC the idle relay is a separate contact.
Terminal 17	Pre-fuel	
Terminal 18	Generator failure	
Terminal 19	Speed up	
Terminal 20	Speed down	
Terminal 21 , 22	User defined	
Terminal 23	Comm	
Terminal 24 , 25	Grid powered	
Terminal 26 , 27	Generator powered	
Terminal 28 , 30	Idle	
Terminal 31 , 36	Generator voltage A	AC Voltage 0~250V AC
Terminal 32 , 33	Generator voltage B	
Terminal 34 , 35	Generator voltage C	
Terminal 37 , 42	Grid voltage A	
Terminal 38 , 39	Grid voltage B	
Terminal 40 , 41	Grid voltage C	
Terminal 43	Null	
Terminal 44	N	
Terminal 45	Load voltage	100~250V AC
Terminal 46 , 47	Load current A	AC Load Current 0~5AAC
Terminal 48 , 49	Load current B	
Terminal 50 , 51	Load current C	
Terminal 52 , 53	Load current N	
Terminal 54	Coolant temperature 2	Resistance sensor input 0~120°C

Terminal 55	Oil pressure 2	Resistance sensor input 0~1000KPA
Terminal 56	AGND	
Terminal 57	Coolant temperature	Resistance sensor input 0~120°C
Terminal 58	Oil pressure	Resistance sensor input 0~1000KPA
Terminal 59	User defined	
Terminal 60, 61	Speed sensor	0~7500Hz, linked with a two-core shielded cable , the length of cable is less than 20 meters。

8. TABLE OF MAIN PARAMETERS

Analogue inputs

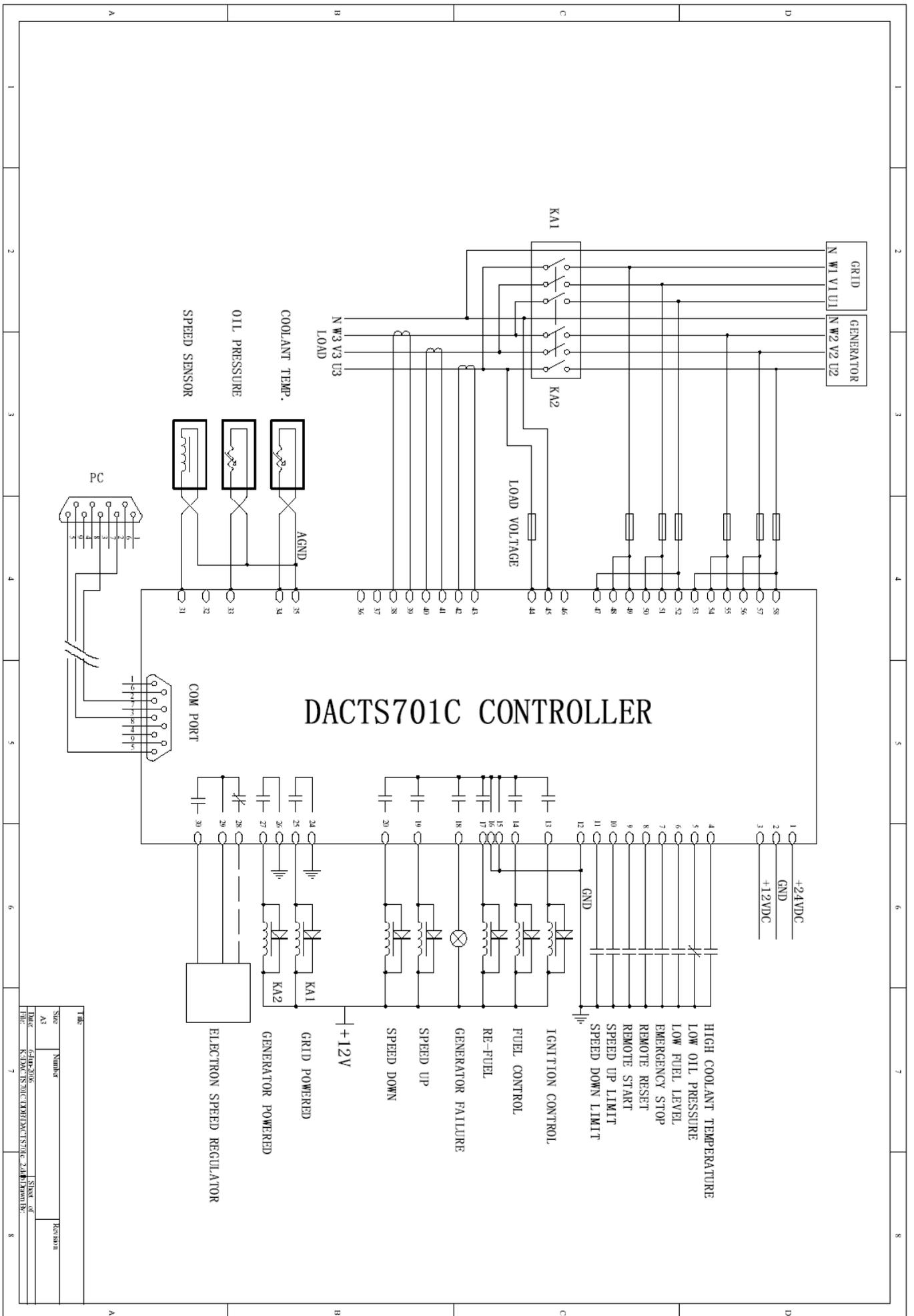
NO.	Analogue inputs	Alarm upper limit	Alarm lower limit
1.	3 phase Gen. voltage	440 V	320 V
2.	3 phase Grid voltage	440 V	320 V
3.	3 phase load current	400V	invalid
4.	Battery voltage	invalid	20 V
5.	Coolant temperature	95 °C	invalid
6.	Oil pressure	invalid	200 Kpa
7.	Grid frequency	50.0 Hz	48.0 Hz
8.	Generator frequency	53.0 Hz	48.0 Hz

Time delays (unit: second)

No.	Time delays	default	No.	Time delays	default
1.	Crank	6 s	13.	Over Gen. Volt.	10 sec.
2.	Crank rest	15 sec.	14.	Low fuel level	5 sec.
3.	Bypass	15 sec.	15.	Current overload	10 sec.
4.	Remote start	30 sec.	16.	High oil temp.	600 sec.
5.	Cooling stop	30 sec.	17.	Low battery volts	30 sec.
6.	Fuel	10 sec.	18.	Speed up	30 sec.
7.	Pre-fuel	120 sec.	19.	Speed down	60 sec.
8.	Transfer fault	120 sec.	20.	Idle	120 sec.
9.	Low oil pressure	3 sec.	21.	Generator-Grid	30 sec.
10.	High cool temp.	3 sec.	22.	Warm up	30 sec.
11.	Over speed	10 sec.	23.	Dead bus	5 sec.
12.	Over Gen. Freq.	10 sec.			

System params

No.	System params.	default	No.	System params.	default
1.	Module address	120	7.	Fuel mode	1
2.	Crank cycles	3	8.	Coolant Temp. monitor	0
3.	Convertor rate	500	9.	Oil pressure monitor	0
4.	Flywheel tooth	128	10.	Load monitor	1
5.	Overpeed point	1650	11.	Speed pickup	0
6.	Crank speed	300			



Title	
Size	Number
A1	
Date: 04/19/2006	
Drawn: K. DAVIS	
Checked: J. STINE	
Title: DACTS701C CONTROLLER	
Part Number: 0000000000	
Revision: 1	