



Specification for general MODBUS Implimentation

For DYNAGEN OEM Solutions

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DYNAGEN MODBUS specification

Document Purpose: This document is intended to give the requirements of the registers which we must read from the DYNAGEN TG410 controller.

The source address of engine generator is programmable on the TG410 and can be set to preferred setting as a MODBUS slave.

The PLC master or MODBUS master must request all the register information from TG410 source address.

MODBUS COMMANDS

The two commands that are supported via MODBUS RTU are as follows:

Only the following Modbus RTU commands are supported by the TOUGH series controller, TG350 and TG410. All other Modbus RTU commands are not supported.

Name Command Address Range Description

Read Multiple Holding Registers 3 = 0x03 Base address is 40001. Must specify the starting address and the number of addresses to read. Maximum number of addresses supported by DYNAGEN TG350/TG410 is 70.

Write Single Register 6 = 0x06 Base address is 40001. If you request 150 you will get register 40150 from the DYNAGEN controller, however you must specify base address of 40001 or offset of 1.

Refer to the official “Modicon Modbus Protocol Reference Guide” available on the Modicon website for further details on Modbus RTU commands.

REGISTER ADDRESS vs REGISTER OFFSET

Some Modbus configuration software requires the 5-digit Register Address to be entered while other software uses the 1 to 4 digit Register Offset. The DYNAGEN controller uses an offset of 1, based of 40001.

To understand why this is, it is useful to know a bit about how Modbus RTU packets are structured. Modbus RTU packets encode the Register Address using a Command and a Register Offset. Each Command represents a Base Address which is the same as the first address listed in the table above next to each command. The Register Offset is calculated by subtracting the Base Address from the Register Address as follows:

Register Offset = Register Address – Base Address

For example, the Base Address for Command 0x03 is 40001. If you want to read register 40150, then the Register Offset encoded in the Modbus RTU packet would be 150 but with a based address of 40001 or an offset of 1.

DYNAGEN MODBUS specification

The Following MODBUS registers are recommended as a minimum to be read from the TOUGH series controller.

40155 (Engine Start Battery Voltage)

40150 (Engine Speed)

40151 (Engine Coolant Temperature)

40152 (Engine Oil Pressure)

40154 (AC Frequency Hz)

40156 (AC Voltage L-L) (40156 = Phase A-B, 40157 = Phase B-C, 40158 = Phase C-A)

40159 – 40161 (Generator Current) (40159 = Phase A, 40160 = Phase B, 40161 = Phase C)

40187 (Total Engine Hours)

40163 (Current Engine Run time) The total time the engine was running since it was last started.

40179 / 40180 (System Failure)

40181 / 40182 (System Warning) multiple warnings can be present.

40185 / 40186 (System Events) E-Stop is considered an Event not a failure.

40168 (System operating State) (AUTO-waiting to start, OFF-starting disabled, Failure-System failure, RUN- Engine-generator system run has been initiated.

DYNAGEN MODBUS specification

Overview of

Start / Stop Over MODBUS (Modbus Write single coil) 40098

Edit parameter

Name *

Unit

Type

Address *

Datatype

Scaling *

Offset *

Group

Presentation *

Enumeration (1024)

Number of decimals

Mask 0x

msb lsb

Valid range -

Enumeration: 23970=Off; 23460=Auto; 38760=Start; 22440=Stop

Battery Voltage Parameter Display: (Modbus read multiple holding coil) 40155

Edit parameter

Name *

Unit

Type

Address *

Datatype

Scaling *

Offset *

Group

Presentation *

Enumeration (1024)

Number of decimals

Mask 0x

msb lsb

Valid range -

DYNAGEN MODBUS specification

Engine Speed Parameter Display 40150

Edit parameter

Name *	<input type="text" value="Engine Speed (RPM)"/>
Unit	<input type="text"/>
Type	<input type="text" value="Holding"/>
Address *	<input type="text" value="150"/>
Datatype	<input type="text" value="16 bit value"/>
Scaling *	<input type="text" value="10"/>
Offset *	<input type="text" value="0"/>
Group	<input type="text" value="Engine Parameters"/>
Presentation *	<input type="text" value="Show as value with enumeration"/>
Enumeration	<input type="text" value="6553.5=Not available"/> (1024)
Number of decimals	<input type="text"/>
Mask	<input type="text" value="Disable mask"/> 0x <input type="text"/>
	msb <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> lsb
Valid range	<input type="text"/> - <input type="text"/>

Engine Temperature Parameter Display 40151

Edit parameter

Name *	<input type="text" value="Engine Temperature (F)"/>
Unit	<input type="text"/>
Type	<input type="text" value="Holding"/>
Address *	<input type="text" value="151"/>
Datatype	<input type="text" value="16 bit value"/>
Scaling *	<input type="text" value="10"/>
Offset *	<input type="text" value="0"/>
Group	<input type="text" value="Engine Parameters"/>
Presentation *	<input type="text" value="Show as value with enumeration"/>
Enumeration	<input type="text" value="6553.5=Not available"/> (1024)
Number of decimals	<input type="text"/>
Mask	<input type="text" value="Disable mask"/> 0x <input type="text"/>
	msb <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> lsb
Valid range	<input type="text"/> - <input type="text"/>

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DYNAGEN MODBUS specification

Engine Failure MODBUS Register 40181 40182 (32 Bit combined)

Interpretation: This register is separated into individual bits to indicate a fault. A bit can be either 0 (inactive) or 1 (active).

Use the table below to determine the fault. Register Value 40181 and 40182 check bit status. Each individual bit corresponds to a specific failure indicator.

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40181 ~ 40182	List	N/A	N/A	N/A	32 bit unsigned

Interpretation: This register is separated into individual bits to indicate a fault. A bit can be either 0 (inactive) or 1 (active). Use the table below to determine the fault.

Bit	Name	Description
0	Overcrank	Fault due to max attempts at cranking without starting
1	Engine Failed to Stop	Fault due to engine speed not being 0 RPM at shutdown
2	DM1 Stop Lamp	DM1 Stop Lamp is on
3	High Engine Temperature	Fault due to high engine temperature
4	Low Oil Pressure	Fault due to low oil pressure
5	Low Fuel Level	Fault due to low fuel level
6	Under Speed	Fault due to low engine speed
7	Over Speed	Fault due to high engine speed
8	Low Battery Voltage	Fault due to low battery voltage
9	High Battery Voltage	Fault due to high battery voltage
10	Low Coolant Level	Fault due to low coolant level
11	Low Air Pressure	Fault due to low air pressure
12	Low Hydraulic Pressure	Fault due to low hydraulic pressure
13	Under Frequency	Fault due to low AC frequency
14	Over Frequency	Fault due to high AC frequency
15	AC Under Voltage	Fault due to low AC voltage

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DYNAGEN MODBUS specification

16	AC Over Voltage	Fault due to high AC voltage
17	ECM Communication Failure ¹	Fault due to loss of communications with ECM
18	Configurable Failure 1	Fault due to Configurable Fail Input 1 being active
19	Configurable Failure 2	Fault due to Configurable Fail Input 2 being active
20	Auxiliary Sensor 1	Fault due to low / high reading on Auxiliary Sensor 1
21	Auxiliary Sensor 2	Fault due to low / high reading on Auxiliary Sensor 2
22	Auxiliary Sensor 3	Fault due to low / high reading on Auxiliary Sensor 3
23	Auxiliary Sensor 4	Fault due to low / high reading on Auxiliary Sensor 4
24	Over Current	Fault due to high current reading
25	Configurable Failure 3	Fault due to Configurable Fail Input 3 being active
26	Load Imbalance	Fault due to load imbalance in AC current phases
27	Breaker Trip	Fault due to breaker output
28	Kubota Regen Level 3	
29	Kubota Regen Level 4	
30	Kubota Regen Level 5	
31	Expansion Pack	Fault due to expansion pack feature triggering a fault.

Example: A reading of 0000 0000 0000 0000 1000 0000 0000 0000 indicates that the controller shutdown due to low AC voltage from the generator.

Engine Warning MODBUS Register 40179 40180 (32 Bit combined)

Interpretation: This register is separated into individual bits to indicate a fault. A bit can be either 0 (inactive) or 1 (active).

Use the table below to determine the fault. Register Value 40181 and 40182 check bit status. Each individual bit corresponds to a specific failure indicator.

DYNAGEN MODBUS specification

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40179 ~ 40180	List	N/A	N/A	N/A	32 bit unsigned

Interpretation: This register is separated into individual bits to indicate a fault. A bit can be either 0 (inactive) or 1 (active). Use the table below to determine the fault.

Bit	Name	Description
0	Low Engine Temperature	Warning due to low engine temperature
1	High Engine Temperature	Warning due to high engine temperature
2	Low Oil Pressure	Warning due to low oil pressure
3	Under Speed	Warning due to low engine speed
4	Over Speed	Warning due to high engine speed
5	Low Fuel Level	Warning due to low fuel level
6	High Fuel Level	Warning due to high fuel level
7	Low Battery Voltage	Warning due to low battery voltage
8	High Battery Voltage	Warning due to high battery voltage
9	Under Frequency	Warning due to low AC frequency
10	Over Frequency	Warning due to high AC frequency
11	AC Under Voltage	Warning due to low AC voltage
12	AC Over Voltage	Warning due to high AC voltage
13	Battery Charger Fault	Warning due to battery charger fault
14	Over Current	Warning due to high AC current
15	Fuel In Basin	Warning due to fuel being in the catch basin
16	Configurable Warning 1	Warning due to Configurable Warn Input 1 being active
17	Configurable Warning 2	Warning due to Configurable Warn Input 2 being active
18	Auxiliary Sensor 1	Warning due to low / high reading on Auxiliary Sensor 1
19	Auxiliary Sensor 2	Warning due to low / high reading on Auxiliary Sensor 2
20	Auxiliary Sensor 3	Warning due to low / high reading on Auxiliary Sensor 3

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DYNAGEN MODBUS specification

21	Auxiliary Sensor 4	Warning due to low / high reading on Auxiliary Sensor 4
22	Load Imbalance	Warning due to load imbalance between the AC current phases.
23	Remote Start Inhibit	Remote start is inhibited by the inhibit switched input.
24	Expansion Pack	General warning due to a warning being triggered by an expansion pack feature.
25	DM1	One or more warnings were received from the ECM.
26	High Fuel Temperature	Doosan High Temperature Fuel Warning over J1939.
27	High Turbine Inlet Temperature	Doosan Turbine Inlet Temperature Warning over J1939.
28 ~ 31	Reserved	Reserved

Example: A reading of 0000 0000 0000 0000 1000 0000 0000 0000 indicates that a warning occurred due to Aux Sensor 1 high/low warning.

Example of High AC Frequency Warning

The screenshot shows a configuration window titled "Edit parameter" for a parameter named "High AC Frequency". The fields are as follows:

- Name ***: High AC Frequency
- Unit**: (empty)
- Type**: Holding
- Address ***: 179 (with subtext: Dec: 179 Hex: 0xb3)
- Datatype**: Swapped 32 bit value
- Scaling ***: 1
- Offset ***: 0
- Group**: Warnings
- Presentation ***: Show as value with enumeration
- Enumeration**: 0=----;1=Active (with an "Edit" link)
- Number of decimals**: (empty)
- Mask**: Use mask (dropdown) 0x400. Below this is a 32-bit mask grid with "msb" on the left and "lsb" on the right.
- Valid range**: (empty)

At the bottom of the window are "save" and "cancel" buttons.

DYNAGEN MODBUS specification

Example of Low DC Starting battery Warning

The screenshot shows a configuration window titled "Edit parameter" for a "Low Battery" warning. The parameters are as follows:

Name *	Low Battery
Unit	
Type	Holding
Address *	179 <small>Dec: 179 Hex: 0xb3</small>
Datatype	Swapped 32 bit value
Scaling *	1
Offset *	0
Group	Warnings
Presentation *	Show as value with enumeration
Enumeration	0=----;1=Active Edit
Number of decimals	
Mask	Use mask <input type="checkbox"/> 0x00000080
Valid range	<input type="text"/> - <input type="text"/>

Buttons:

Example of AC Overcurrent Warning

The screenshot shows a configuration window titled "Edit parameter" for an "Over Current" warning. The parameters are as follows:

Name *	Over Current
Unit	
Type	Holding
Address *	180 <small>Dec: 180 Hex: 0xb4</small>
Datatype	Swapped 32 bit value
Scaling *	1
Offset *	0
Group	Warnings
Presentation *	Show as value with enumeration
Enumeration	0=----;1=Active Edit
Number of decimals	
Mask	Use mask <input type="checkbox"/> 0x00004000
Valid range	<input type="text"/> - <input type="text"/>

Buttons:

System Operating State

If System is OFF, it will not start Automatically Via a MODBUS signal, so it is important to know status when using the Start and Stop commands.

If System is in Failure, System Autostart is disabled until failure is reset.

System State (Register 40168) This register determines the state of the controller.

AUTO – System is ready for AUTOstart via MODBUS.

OFF – System cannot be started via MODBUS

RUN – Engine-generator system run has been initiated.

The screenshot shows a 'Edit parameter' dialog box with the following fields:

- Name: System State
- Unit: (empty)
- Type: Holding
- Address: 168 (Dec: 168, Hex: 0xa8)
- Datatype: 16 bit value
- Scaling: 1
- Offset: 0
- Group: System Status
- Presentation: Show as value with enumeration
- Enumeration: 144=Menu;147=Off;150=Auto;156=Run
- Number of decimals: (empty)
- Disable mask: 0x (empty)
- Mask: (empty)
- Valid range: (empty)

144=Menu 147=Off 150=Auto 156=Running 153=Failure

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40168	List	N/A	N/A	N/A	16 bit unsigned

Interpretation: This register is interpreted by comparing the read value to the table below.

Value	Name	Description
0x0090 (144 decimal)	Menu	Controller is in the menu system

DYNAGEN MODBUS specification

0x0093 (147 decimal)	Off	Controller is in the off mode
0x0096 (150 decimal)	Auto	Controller is in the auto mode
0x0099 (153 decimal)	Failure	Controller is in the failure mode
0x009C (156 decimal)	Running	Controller is in the running mode

Example: A reading of 0x009C indicates that the controller is currently running.