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Modbus Reference Manual

TOUGHSeries
Digital Generator Controllers

c UL us

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1 Settings and Wiring

Settings and Information

The following table lists some basics on the Tough Series controllers modbus implementation.

Name	Description	Range / Values
Device Address	The device address of the controller.	1 ~ 247 (Default = 1)
Baud Rate (BPS)	The speed at which the controller (slave) communicates with the master.	9600 (Default), 19200, 38400, 57600
Communication Protocol	The controller always communicates in Modbus RTU.	Modbus RTU (Fixed)
Serial Port Configuration	8-N-1	8bits, no parity, 1 stop bit
Slave / Master Configuration	The controller is always the slave and must be queried by the master.	Slave (Fixed)

Register Types and Addresses

DYNAGEN only uses Holding registers and addressing starts at 40001.

At the protocol level DYNAGEN follows the Modbus standard when addressing registers: an address of 0x00 equates to register 40001. Some devices start addressing at 40000 or 0x01 equates to register 40001. **In these cases you will have to subtract one from the Modbus addresses given in this manual.**

Implementation

The controller supports the following Modbus commands:

- 0x03 (Read Multiple registers)
  - up to 70 registers can be read, otherwise the controller returns an error code
- 0x06 (Write Single Register)
- 0x10 (Write Multiple Registers)

Wiring Considerations

The following table outlines some items that must be taken into consideration when connecting up a Modbus system.

Consideration	Description
Bus Termination	Each end of the bus must be terminated from A to B with 120? resistors. If the controller is a device that is not at the end of the bus, it does not require a terminating resistor.
Cable Selection	A shielded twisted pair 120Ohm impedance cable is required for RS485 (Modbus) communications. One twisted pair is required for RS485 A and B and another wire or twisted pair is required for RS485 common. Possible options are: 1. Belden 7895A - Two twisted pair, 20AWG. The second pair can be used for modbus common.
Distance (Power and Ground)	If running power and ground from the battery of your system to another device, use the following guidelines for the gauge of the power and ground wires: 1. Up to 450ft - 22AWG 2. Up to 700ft - 20AWG 3. Up to 1125ft - 18AWG 4. Up to 1800ft - 16AWG 5. Up to 2800ft - 14AWG

1.1 Common Events

The common 1 events and common 2 events settings (Communications > Modbus > Common Events) are configurable only using the RapidCore Configuration software. They are linked to register 40009. They allow mapping of one or more events, warnings, and failures to modbus register 40009.

Note: The RA400 remote annonunicator uses "Common 1 Events" for it's common fault LED.

The following events, warnings, and failures can be selected:

Events	Warnings	Failures
Fuel	Low Engine Temperature	Over Crank
Crank	High Engine Temperature	Engine Failed To Stop
Pull Coil	Low Oil Pressure	DM1 Stop Lamp
Voltage Regulator	Under Speed	Common Failure
Energize to Stop	Over Speed	High Engine Temperature
OFF Mode	Low Fuel Level	Low Oil Pressure
Idle Mode	High Fuel Level	Low Fuel Level
Battle Mode	Low Battery Voltage	Under Speed
System OK	High Battery Voltage	Over Speed
Delay To Start	Under Frequency	Low Battery Voltage
Glowplug	Over Frequency	High Battery Voltage
Warmup	AC Under Voltage	Low Coolant Level
Cooldown	AC Over Voltage	Low Air Pressure
Engine Running	AC Over Current	Low Hydraulic Pressure
Exercising	Fuel In Basin	Under Frequency
Battery Recharging	Battery Charger Fault	Over Frequency
Maintenance Required	Configurable Warning 1	AC Under Voltage
Low Battery During Cranking	Configurable Warning 2	AC Over Voltage
Auxiliary Sensor 1	Auxiliary Sensor 1	ECM Communication Failure
Auxiliary Sensor 2	Auxiliary Sensor 2	Over Current
Auxiliary Sensor 3	Auxiliary Sensor 3	Configurable Failure 1
Auxiliary Sensor 4	Auxiliary Sensor 4	Configurable Failure 2
Force Regeneration	Load Imbalance Warn	Configurable Failure 3
Regeneration Inhibit	DTC/MIL	Auxiliary Sensor 1
RPM Increment		Auxiliary Sensor 2
RPM Decrement		Auxiliary Sensor 3
DEF Fluid Level		Auxiliary Sensor 4
Kubota T4F Generator Disable		Load Imbalance Fail
Dummy Load		Exception Fault
Breaker Trip		
Auto Idle		

2 Quick Register Reference

The following section is used as a quick reference to find out information about a register. To find more information about that register and how to interpret it, click on the register name or go to the Detailed Register Information section of the manual.

2.1 Remote Control Registers

These registers are used to start/stop the controller.

Name	Register
Remote Control Registers	40098

2.2 System Status Registers

Name	Register
System State	40168
Running State	40169
Event Bit Map 1	40183 ~ 40184
Event Bit Map 2	40185 ~ 40186
Warning Bit Map	40179 ~ 40180
Fault Bit Map	40181 ~ 40182

2.3 AC Sensing Registers

Name	Register
AC Voltage Configuration	40162
Generator Frequency	40154
Generator Voltage	40156 ~ 40158
Generator Current	40159 ~ 40161

2.4 Sensor Registers

Name	Register
Engine Temperature	40151
Oil Pressure	40152
Fuel Level	40153
Engine Speed	40150
Battery Voltage	40155
Aux Sensor 1	40172
Aux Sensor 2	40173

Aux Sensor 3	40195
Aux Sensor 4	40196
Auxiliary Units	40189
Internal Temperature[1]	40165

[1] Only available on controllers with the LCD heater option.

2.5 Timer Registers

Name	Register
Engine Run Hours	40163
Total Engine Hours	40187 ~ 40188
Maintenance Counter	40164

2.6 Switched I/O Registers

Name	Register
Switched Inputs	40166
Switched Outputs	40167

2.7 Controller Information Registers

Name	Register
Serial Number	40193 ~ 40194
Hardware Version	40178
Firmware Version	40177

3 Detailed Register Information

The following section is used as a detailed reference to find out information about a register. If you have any further questions about the functionality of the register, please contact DYNAGEN for more information.

3.1 Main Registers

3.1.1 40098 - Start / Stop

DataType	16 bit value unsigned
Scaling	1
Offset	0
Presentation	Write only value with enumeration.
Enumeration	Yes, see below.

Name	Description	Value
Enable System	Places the controller in AUTO mode if the controller was in the OFF mode.	0x5BA4
Disable System	Places the controller in OFF mode. If the controller is in the RUN mode a shutdown is performed skipping cool-down.	0x5DA2
Start Engine	Starts the controller if the controller is in the AUTO mode.	0x9768
Stop Engine	Stops the controller and places it in the AUTO mode. This will not override a local start; use system disable.	0x57A8
TSC1 Increment Speed	Increments speed by the bump amount.	0x6897
TSC1 Decrement Speed	Decrements speed by the bump amount.	0x6B94

3.1.2 40150 - Engine Speed

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration
Enumeration	65535 (0xFFFF) = Not available
Units	RPM
Range	0 ~ 6250.0

Example: A decimal reading of 17985 can be interpreted as 1798.5 RPM.

3.1.3 40151 - Engine Temperature

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not available
Units	°F
Range	0 ~ 1000.0

Example: A decimal reading of 2154 can be interpreted as 215.4 °F.

3.1.4 40152 - Oil Pressure

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not available
Units	PSI
Range	0 ~ 100.0

Example: A decimal reading of 404 can be interpreted as 40.4 PSI.

3.1.5 40153 - Fuel Level

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not available
Units	%
Range	0 ~ 100.0

Example: A decimal reading of 898 can be interpreted as 89.8 %.

3.1.6 40154 - Generator Frequency

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	Hz
Range	0 ~ 100.0

Example: A reading of 598 can be interpreted as 59.8 Hz.

3.1.7 40155 - Battery Voltage

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	VDC
Range	0 ~ 40.0

Example: A decimal reading of 135 can be interpreted as 13.5 VDC.

3.1.8 40156 to 40158 - Generator Voltage

40156	AC Generator Voltage L1-L2 (aka A - B)
40157	AC Generator Voltage L1-L2 (aka A - C)
40158	AC Generator Voltage L1-L2 (aka B - C)

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	Vrms
Range	0 ~ 1000.0

Interpretation: The readings will change based on which AC Voltage Configuration is selected. The following table indicates the what each register is reading based on the configuration:

Voltage Configuration	Register 40156	Register 40157	Register 40158
2-Wire Single Phase	Line A-N	N/A	N/A
3-Wire Single Phase	Line A-N	Line B-N	Line A-B
3-Wire Three Phase	Line A-B	Line B-C	Line C-A
4-Wire Three Phase	Line A-B	Line B-C	Line C-A
4-Wire Delta	Line A-B	Line B-C	Line C-A (High Leg)

Example: A reading of 2073 can be interpreted as 207.3 Vrms.

3.1.9 40159 to 40161 - Generator Current

40159	AC Generator Current L1 (aka Phase A)
40160	AC Generator Current L2 (aka Phase B)
40161	AC Generator Current L3 (aka Phase C)

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	Arms
Range	0 ~ 1000.0

Example: A reading of 894 can be interpreted as 89.4 Arms.

3.1.10 40162 - AC Voltage Configuration

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Mask	0xFF (Upper 8 bits should be ignored)
Presentation	Show as enumeration.
Enumeration	Yes, see table below

Interpretation: This 16 bit register is separated into two bytes. The low byte indicates the AC configuration of the generator. The high byte is reserved. The table below can be used to determine the voltage configuration.

Value	Name	Description
0x0000	Disabled	Controller has AC sensing disabled
0x0001	2-Wire Single Phase	Controller is sensing 2-Wire Single Phase voltage
0x0002	3-Wire Single Phase	Controller is sensing 3-Wire Single Phase voltage
0x0003	3-Wire Three Phase	Controller is sensing 3-Wire Three Phase voltage
0x0004	4-Wire Three Phase	Controller is sensing 4-Wire Three Phase voltage
0x0005	4-Wire Delta	Controller is sensing 4-Wire Delta voltage

Example: A reading of 0x0202 indicates that both the generator and mains voltages are 3-Wire Single Phase systems.

3.1.11 40163 - Engine Run Time

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	Hours
Range	0 ~ 6000.0

Note: This register only updates every 6 minutes as readings are done in 1/10ths of an hour.

Example: A decimal reading 104 can be interpreted as 10.4 hours

3.1.12 40164 - Maintenance Counter

DataType	16 bit value signed
Scaling (Gain)	1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	-30333 (-0x767D) = Not available
Units	Hours
Range	-30 000 to 9990

Interpretation: A negative number indicates the amount of hours since maintenance counter has expired.

Note: This register only updates every 6 minutes as readings are done in 1/10ths of an hour.

Example: A decimal reading 5973 can be interpreted as 597.3 hours.

3.1.13 40165 - Internal Temperature

This register is only used in the LCD heater version of the Tough Series controller.

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	-50
Presentation	Show as value.
Enumeration	No
Units	°C
Range	-5.0 ~ 45.0

Example: A decimal reading of 905 can be interpreted as 40.5°C.

3.1.14 40166 - Switched Inputs

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Bitmap (see table below)
Enumeration	No

Interpretation: This 16 bit register is separated into two bytes. The low byte indicates whether the corresponding input sees battery negative (aka ground) or battery positive. The high byte indicates if the corresponding input is active or inactive. Each byte is broken down as follows:

Bit	7	6	5	4	3	2	1	0
Input	N/A	N/A	N/A	Input E	Input D	Input C	Input B	Input A

Example: A binary reading of 0000 0111 0000 0101 can give us the following information:

1. Input A is tied to battery positive and active
2. Input B is grounded and active
3. Input C is tied to battery positive and active
4. All other inputs are open (as they are not tied to either grounded or battery positive) and inactive.

3.1.15 40167 - Switched Outputs

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Bitmap
Enumeration	No
Bit Mask	0xFF (only the low byte is used)

Interpretation: This 16 bit register only utilizes the low byte. Each bit corresponds to a switched output and indicates if it is active or inactive. The byte is broken down as follows:

Bit	7	6	5	4	3	2	1	0
Input	N/A	N/A	Output F	Output E	Output D	Output C	Output B	Output A

Example: A binary reading of 0000 0000 0000 0101 can give us the following information:

1. Switched Output A is active
2. Switched Output C is active
3. All other outputs are off

3.1.16 40168 - System Operating State

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Show as enumeration.
Enumeration	Yes, see table below.

Interpretation: This register is interpreted as per the table below.

Value	Name	Description
144 (0x0090)	Menu	Controller is in the menu system.
147 (0x0093)	Off	Controller is in the OFF mode.
150 (0x0096)	Auto	Controller is in the AUTO mode.
153 (0x0099)	Failure	Controller is in the FAILURE mode.
156 (0x009C)	Running	Controller is in the RUN mode.

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

3.1.17 40169 - Running State

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40169	List	N/A	N/A	N/A	16 bit unsigned

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Low and High byte with separate enumeration for each.
Enumeration	Yes, see tables below.

Interpretation: This 16 bit register is separated into two bytes. The low byte indicates the current running state of the controller and the high byte indicates the reason for start.

Low Byte

Value	Name	Description
0 (0x00)	No Running Mode	Controller is not in any running state
1 (0x01)	Delay to Start	Controller is delaying to start
2 (0x02)	Preheat	Controller is preheating engine
3 (0x03)	Cranking	Controller is cranking engine
4 (0x04)	Crank Rest	Controller is resting before next crank
5 (0x05)	Crank Success	Controller has successfully started engine
6 (0x06)	Reserved	Reserved
7 (0x07)	Warmup	Controller is warming up engine before applying load

8 (0x08)	Running	Controller is in a normal running state
9 (0x09)	Cooldown	Controller is cooling down engine before shutting down
10 (0x0A)	Shutdown	Controller has shut down the engine
11 (0x0B)	Failure	Controller has shut down the engine due to a fault

High Byte

Value	Name	Description
6 (0x06)	J1939 Remote Run	Controller was started from J1939
29 (0x1D)	Long Time Run	Controller was started manually and the long time run feature is enabled.
30 (0x1E)	Weekly Run	Controller was stated due to the weekly scheduler feature.
31 (0x1F)	Expansion Run	Controller was started from one of the expansion pack events
32 (0x20)	Remote	Controller was started from 'Start / Stop' switched input
33 (0x21)	Manual	Controller was started from the front panel button
34 (0x22)	Modbus	Controller was started by Modbus command
35 (0x23)	Battery Recharge	Controller was started to recharge batteries
36 (0x24)	Exerciser	Controller was started from the exerciser clock
37 (0x25)	Auxiliary Sensor 1	Controller was started based on Auxiliary Sensor 1 reading
38 (0x26)	Auxiliary Sensor 2	Controller was started based on Auxiliary Sensor 2 reading
39 (0x27)	Loss of Mains	Controller was started due to loss of mains voltage
40 (0x28)	Momentary Switch	Controller was started from 'Momentary' switched input
41 (0x29)	Auxiliary Sensor 3	Controller was started based on Auxiliary Sensor 3 reading
42 (0x2A)	Auxiliary Sensor 4	Controller was started based on Auxiliary Sensor 4 reading

Example: A reading of 0x2108 indicates the controller was started from the front panel button and is currently in a normal running state.

3.1.18 40170 - Active Event

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Display with enumeration
Enumeration	Yes.

Interpretation: This register is based on what the controllers LCD is currently displaying on the screen. Once a new message is displayed this register will update accordingly. It is recommended to use the Events, Faults and Warning Bit Maps. If use of this register is still desired, contact DYNAGEN directly.

3.1.19 40171 - Active Fault

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Display with enumeration
Enumeration	Yes.

Interpretation: This register is based on what fault the controllers LCD is currently displaying on the screen. Once a new message is displayed this register will update accordingly. It is recommended to use the Events, Faults and Warning Bit Maps. If use of this register is still desired, contact DYNAGEN directly.

3.1.20 40177 - Firmware Version

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40177	N/A	N/A	N/A	N/A	16 bit unsigned

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	See interpretation below.
Enumeration	No

Interpretation: This 16 bit register is separated into two sections as indicated in the below table. Combined they give the full firmware version in the format of "x.yy.0z".

Bits	Name	
0 ~ 5	Beta Number	Read as a value. Presentation is "0z".
6 ~ 15	Firmware Version	Read as a value with a scaling (gain) of 100. Presentation is "x.yy".

Example: A hexadecimal reading of 0x1E81 can be interpreted as follows:

1. The Beta Number can be read as decimal 1 which means "01".
2. The firmware version bits can be read as decimal 122 which means "1.22".
3. Combining both the beta and firmware version fields gives the full firmware version of 1.22.01.

3.1.21 40178 - Hardware Version

DataType	16 bit value unsigned
Scaling (Gain)	100
Offset	0
Presentation	Value
Enumeration	No
Range	0 ~ 9.99

Example: A decimal reading of 122 can be interpreted as hardware version 1.22.

3.1.22 40179/40180 - Warning Bit Map

DataType	32 bit value unsigned, 40179 is the least significant register
Scaling (Gain)	1
Offset	0
Presentation	Show as enumeration.
Enumeration	Yes, see table below.

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
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	Doosan Amber Lamp[1]	Doosan DPM5 amber LED
29 ~ 31	Reserved	Reserved

[1] These items are only applicable when using the CAN protocol to communicate with an ECM.

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.

3.1.23 40181/40182 - Fault Bit Map

DataType	32 bit value unsigned, 40181 is the least significant register
Scaling (Gain)	1
Offset	0
Presentation	Show as enumeration.
Enumeration	Yes, see table below.

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[1]	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
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.

[1] These items are only applicable when using the J1939 CAN protocol to communicate with an ECM.

Also see bits 27 to 30 in the Event Bit Map 2. These are also failures.

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.

3.1.24 40183/40184 - Event Bit Map 1

DataType	32 bit value unsigned, 40183 is the least significant register
Scaling (Gain)	1
Offset	0
Presentation	Bitmap, see table below.
Enumeration	No

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

Bit	Name	Description
0	Not In Auto	Bit is on due to controller not being in auto mode
1	Idle Mode	Bit is on due to controller being in idle mode

2	Battle Mode	Bit is on due to controller being in battle mode
3	System OK	Bit is on due to controller being free of warnings and failures
4	Glowplug	Bit is on due to 'Preheat' timer
5	Warmup	Bit is on due to 'Warmup' timer
6	Cooldown	Bit is on due to 'Cooldown' timer
7	Engine Running	Bit is on due to engine running
8	Exerciser	Bit is on due to engine exercise
9	Battery Recharge	Bit is on due to battery recharge
10	Maintenance Required	Bit is on due to 'Maintenance Counter' timer expiring
11	Low Battery During Cranking	Bit is on due to 'Low Battery Voltage During Cranking'
12	Auxiliary Sensor 1	Bit is on due to Auxiliary Sensor 1 reading
13	Auxiliary Sensor 2	Bit is on due to Auxiliary Sensor 2 reading
14	Auxiliary Sensor 3	Bit is on due to Auxiliary Sensor 3 reading
15	Auxiliary Sensor 4	Bit is on due to Auxiliary Sensor 4 reading
16	Delay to Start	Bit is on due to 'Delay to Start' timer
17	Force Regeneration	Bit is on due to a force regeneration (DPF)
18	Regeneration Inhibit	Bit is on due to regeneration being inhibited (DPF)
19	Trip Breaker	Bit is active when trip breaker switched output is active.
20 ~ 23	Reserved	Reserved
24	Fuel	Bit is on due to fuel output enabled
25	Crank	Bit is on due to crank output enabled
26 ~ 27	Reserved	
28	Pull Coil	Bit is on due to pull coil being enabled
29	LCD Backlight	Bit is on due to the LCD backlight being on
30	Voltage Regulator	Bit is on when controller is not in idle mode
31	Energize to Stop	Bit is on due to Energize to Stop timer

Example: A reading of 0010 0001 0000 0000 0000 0000 1000 1000 has the following bits active: 3, 7, 24, 29.

Looking at the bits in the table will tell us the following things:

1. Controller is free from warnings and failures
2. Controller is currently running
3. Fuel output is currently on
4. Backlight is currently on

3.1.25 40185/40186 - Event Bit Map 2

DataType	32 bit value unsigned, 40185 is the least significant register
Scaling (Gain)	1
Offset	0
Presentation	Bitmap, see table below.
Enumeration	No

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

Bit	Name	Description
0	Group Output 1	Bit is on due to output set to Group Output 1 is active
1	Group Output 2	Bit is on due to output set to Group Output 2 is active
2	Group Output 3	Bit is on due to output set to Group Output 3 is active
3	Group Output 4	Bit is on due to output set to Group Output 4 is active
4	Increment RPM	Bit is on due to the RPM being manually incremented through speed control
5	Decrement RPM	Bit is on due to the RPM being manually decremented through speed control
6	DEF Fluid Pump	Bit is on due to DEF Fluid Pump being on
7	Genset Disable	Bit is on due to the Genset being disabled
8	Dummy Load ON	Bit is on due to Dummy Load being enabled
9 ~ 11	Reserved	Reserved
12	Glowplug	Bit is on due to preheat input or ECM preheat being active
13	Common Fault	Bit is on due to a any fault occurring
14	Temperature Unit	Reserved - Fixed to Fahrenheit
15	Pressure Unit	Reserved - Fixed to PSI
16	Overcrank Warning	Bit is on due to controller failing to crank engine on first attempt
17	Invalid Setting Warning	Bit is on due to an invalid setting being stored in the controller
18	Emergency Input	Bit is on due to Emergency Stop input being active
19	EPS Load is On	Bit is on due to current readings being at least 5% of the rated current setting
20 ~ 24	Reserved	
25	Start Inhibit	Bit is on due to Start Inhibit input being active
26	Remote Reset	Bit is on due to the Remote Reset input being active
27*	Exception*	Bit is on because controller reset itself and went to failure because of a lock-up
28*	Doosan Calibration Check Failed*	Doosan G2 calibration check failed.
29*	High Fuel*	High fuel temperature failure.
30*	High Exhaust*	High turbine inlet temperature failure. This is basically the exhaust temperature.
31	Reserved	

* These are failures, not events. They were placed here due to lack of room in the Fault Bit Map register.

Example: A reading of 0010 0001 0000 0000 0000 0000 1000 1000 has the following bits active: 3, 7, 24, 29.

Looking at the bits in the table will tell us the following things:

1. Controller is free from warnings and failures
2. Controller is currently running
3. Fuel output is currently on
4. Backlight is currently on

3.1.26 40187/40188 - Total Engine Hours

DataType	32 bit value. Register 40187 is the least significant register.
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	No
Units	Hours
Range	0 ~ 1000000.0

Note: This register only updates every 6 minutes as readings are done in 1/10ths of an hour.

Example: A decimal reading 1004 can be interpreted as 100.4 hours

3.1.27 40193 - Serial Number

DataType	32 bit value unsigned, 40193 is the least significant register
Scaling (Gain)	1
Offset	0
Presentation	Value
Enumeration	No

Example: A decimal reading of 10256 can be interpreted as 10256.

3.2 Auxiliary Sensor Inputs

3.2.1 40172/40173 - Auxiliary Sensors 1 and 2

40172	Auxiliary Sensor 1
40173	Auxiliary Sensor 2

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not Available
Units	Auxiliary Units Dependent
Range	Auxiliary Units Dependent

Note: This registers units, range and resolution are all dependent upon the sender table that has been programmed to the controller. To determine these values, you must read the Auxiliary Sensor Units register.

Example: See other sensor examples.

3.2.2 40189 - Auxiliary Sensor Units

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Bitmap, Informational only.
Enumeration	No

Interpretation: This 16 bit register is separated into 4 sections, one for each of the Auxiliary Sensors. Use the tables below to determine the units, range and resolution.

Bits	Name
0 ~ 3	Auxiliary Sensor 1
3 ~ 7	Auxiliary Sensor 2
8 ~ 11	Auxiliary Sensor 3
12 ~ 15	Auxiliary Sensor 4

Value	Name	Units	Range	Resolution
16 (0x0F)	Disabled	N/A	N/A	N/A
0 (0x00)	Temperature	°F	320 ~ 999.9	0.1
1 (0x01)	Level	%	10 ~ 125.0	0.1
2 (0x02)	Pressure	PSI	10 ~ 6000.0	0.1
3 (0x03)	Voltage	V	0 ~ 100.0	0.1
4 (0x04)	Length	ft	1 ~ 99.9	0.1

Example: A hexadecimal reading of 0xF012 gives the following information:

1. Auxiliary Sensor 1 is configured for Pressure.
2. Auxiliary Sensor 2 is configured for Level.
3. Auxiliary Sensor 3 is configured for Temperature.
4. Auxiliary Sensor 4 is Disabled.

3.2.3 40195/40196 - Auxiliary Sensors 3 and 4

40195	Auxiliary Sensor 1
40196	Auxiliary Sensor 2

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not Available
Units	Auxiliary Units Dependent
Range	Auxiliary Units Dependent

Note: This registers units, range and resolution are all dependent upon the sender table that has been programmed to the controller. To determine these values, you must read the Auxiliary Sensor Units register.

Example: See other sensor examples.

3.2.4 40223 - Aux 5 Start Setpoint

TE410 only.

This is the register value that corresponds to the Transducer Start level setting in the Application menu (or under Sensors > Auxiliary Sensor 5 in RapidCore Configuration software).

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not Available
Units	Auxiliary Units Dependent
Range	0 ~ 6553.5

3.2.5 40224 - Aux 5 Stop Setpoint

TE410 only.

This is the register value that corresponds to the Transducer Stop level setting in the Application menu (or under Sensors > Auxiliary Sensor 5 in RapidCore Configuration software).

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration.
Enumeration	65535 (0xFFFF) = Not Available
Units	Auxiliary Units Dependent
Range	0 ~ 6553.5

3.2.6 40225 - Aux 5 Units

TE410 only.

DataType	16 bit value unsigned
Scaling (Gain)	1
Offset	0
Presentation	Enumeration
Enumeration	Yes: 0 = Fahrenheit, 1 = Percent, 2 = Pressure (PSI), 3 = Voltage, 4 = Length (Foot)

3.2.7 40226 - Aux 5 Value

TE410 only.

This is the register value that corresponds to the Transducer reading. Settings for the Transducer sensor are located in the Application menu (or under Sensors > Auxiliary Sensor 5 in RapidCore Configuration software).

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value.
Enumeration	N/A
Units	Refer to register 40225.
Range	Unknown

3.3 Events History

The following registers are associated with the Events History log.

3.3.1 40130 - Log Control

Use the following commands to change the currently viewed event:

Name	Description	Write Single Register	Value
Read Previous Event	Read Previous Event	40130	0x6C93
Read Next Event	Read Next Event	40130	0x639C

3.3.2 40131 - Log Type

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40131	N/A	N/A	1	N/A	16 bit unsigned

Interpretation:

Value	Name	Type

0x00DE	Empty	No Log Returned
0x00E9	DTC	DTC Log Returned
0x00A0	Configurable Warning 1	User Defined Text
0x00A1	Configurable Warning 2	User Defined Text
0x00A4	Auxiliary Sensor 1 Warning	User Defined Text
0x00A5	Auxiliary Sensor 2 Warning	User Defined Text
0x00A6	Auxiliary Sensor 3 Warning	User Defined Text
0x00A7	Auxiliary Sensor 4 Warning	User Defined Text
0x00B4	Auxiliary Sensor 1 Event	User Defined Text
0x00B5	Auxiliary Sensor 2 Event	User Defined Text
0x00B6	Auxiliary Sensor 3 Event	User Defined Text
0x00B7	Auxiliary Sensor 4 Event	User Defined Text
0x00B8	Start Inhibit	User Defined Text
0x00C2	Configurable Failure 1	User Defined Text
0x00C3	Configurable Failure 2	User Defined Text
0x00C4	Auxiliary Sensor 1 Failure	User Defined Text
0x00C5	Auxiliary Sensor 2 Failure	User Defined Text
0x00C6	Auxiliary Sensor 3 Failure	User Defined Text
0x00C7	Auxiliary Sensor 4 Failure	User Defined Text
0x00C8	Reserved	User Defined Text
0x00C9	Configurable Failure 3	User Defined Text
0x00CA	Exception Fault	User Defined Text
0x8000	Power ON	Event
0x8001	Auto Enabled	Event
0x8002	Off Enabled	Event
0x8003	Manual Start	Event
0x8004	Start Cooldown	Event
0x8005	Remote Start	Event
0x8006	Remote Stop	Event
0x8007	Emergency Stop	Event
0x8008	Start Charging	Event
0x8009	Stop Charging	Event
0x800A	Service Required	Event
0x800B	Reset Defaults	Event
0x800C	Service Complete	Event
0x800D	Exerciser Bypass	Event
0x800E	Start Exercise	Event
0x800F	Stop Exercise	Event
0x8010	Log Cleared	Event
0x8011	Modbus Start	Event
0x8012	Modbus Stop	Event

0x8013	Genset Disabled	Event
0x8014	Engine Started	Event
0x8015	J1939 Start	Event
0x8016	Idle Speed	Event
0x8017	Normal Speed	Event
0x8018	Auxiliary Sensor 1 Run	Event
0x8019	Auxiliary Sensor 2 Run	Event
0x801A	Auxiliary Sensor 1 Stop	Event
0x801B	Auxiliary Sensor 2 Stop	Event
0x801C	Mains Failed	Event
0x801D	Mains Return	Event
0x801E	Switch Start	Event
0x801F	Switch Stop	Event
0x8020	Regen Inhibited	Event
0x8021	Force Regen	Event
0x8022	Regen Enabled	Event
0x8023	Auxiliary Sensor 3 Run	Event
0x8024	Auxiliary Sensor 4 Run	Event
0x8025	Auxiliary Sensor 3 Stop	Event
0x8026	Auxiliary Sensor 4 Stop	Event
0x8027	Start for Long Time Run	Event
0x8028	Weekly Scheduler Start	Event
0x8029	Weekly Scheduler start canceled	Event
0x8080	Expansion Pack Function A	Event
0x8081	Expansion Pack Function B	Event
0x8082	Expansion Pack Function C	Event
0x8083	Expansion Pack Function D	Event
0x8084	Expansion Pack Function E	Event
0x8085	Expansion Pack Function F	Event
0x8086	Expansion Pack Function G	Event
0x8087	Expansion Pack Function H	Event
0x8088	Expansion Pack Function I	Event
0x8089	Expansion Pack Function J	Event
0x808A	Expansion Pack Function K	Event
0x808B	Expansion Pack Function L	Event
0x808C	Expansion Pack Function M	Event
0x808D	Expansion Pack Function N	Event
0x808E	Expansion Pack Function O	Event
0x808F	Expansion Pack Function P	Event
0xC000	Crank Failed	Warning
0xC001	Low Battery During Cranking	Warning

0xC002	Charger Fault	Warning
0xC003	High Fuel Level	Warning
0xC004	Low AC Voltage	Warning
0xC005	Under Speed	Warning
0xC006	Over Speed	Warning
0xC007	High Engine Temperature	Warning
0xC008	Low Oil Pressure	Warning
0xC009	Low Fuel Level	Warning
0xC00A	False Restart	Warning
0xC00B	Breaker Tripped	Warning
0xC00C	High Current	Warning
0xC00D	Fuel In Basin	Warning
0xC00E	Low Battery Voltage	Warning
0xC00F	High Battery Voltage	Warning
0xC010	Low Engine Temperature	Warning
0xC011	Battle Mode	Warning
0xC012	Low Frequency	Warning
0xC013	High Frequency	Warning
0xC014	Load Imbalance	Warning
0xC015	High AC Voltage	Warning
0xC016	High Fuel Temperature	Warning
0xC017	High Turbine Inlet Temperature	Warning
0xC080	Expansion Pack Function A	Warning
0xC081	Expansion Pack Function B	Warning
0xC082	Expansion Pack Function C	Warning
0xC083	Expansion Pack Function D	Warning
0xC084	Expansion Pack Function E	Warning
0xC085	Expansion Pack Function F	Warning
0xC086	Expansion Pack Function G	Warning
0xC087	Expansion Pack Function H	Warning
0xC088	Expansion Pack Function I	Warning
0xC089	Expansion Pack Function J	Warning
0xC08A	Expansion Pack Function K	Warning
0xC08B	Expansion Pack Function L	Warning
0xC08C	Expansion Pack Function M	Warning
0xC08D	Expansion Pack Function N	Warning
0xC08E	Expansion Pack Function O	Warning
0xC08F	Expansion Pack Function P	Warning
0xF000	Failed to Stop	Failure
0xF001	Breaker Failed	Failure
0xF002	AC Current Load Imbalance	Failure

0xF003	Reserved	Failure
0xF004	High Current	Failure
0xF005	ECM Shutdown	Failure
0xF006	High Engine Temperature	Failure
0xF007	Low Oil Pressure	Failure
0xF008	Under Speed	Failure
0xF009	Over Speed	Failure
0xF00A	Low Fuel Level	Failure
0xF00B	Low Battery Voltage	Failure
0xF00C	Low Coolant Level	Failure
0xF00D	Cranking Failed	Failure
0xF00E	High AC Voltage	Failure
0xF00F	Low AC Voltage	Failure
0xF010	Transfer Failed	Failure
0xF011	Kubota Regen Level 3 Shutdown	Failure
0xF012	Low Air Pressure	Failure
0xF013	Low Hydraulic Pressure	Failure
0xF014	High Battery Voltage	Failure
0xF015	ECM Communication Failure	Failure
0xF016	Low AC Frequency	Failure
0xF017	High AC Frequency	Failure
0xF018	DPF Service Required (Kubota Regen Level 4 Shutdown)	Failure
0xF019	Service DPF!!! (Kubota Regen Level 5 Shutdown)	Failure
0xF01A	Calibration (Doosan G2 ECM calibration is not correct)	Failure
0xF01B	High Fuel Temp (Doosan G2 High Fuel Temperature over J1939)	Failure
0xF01C	High Inlet Temp (Doosan G2 High Turbine Inlet Temperature over J1939)	Failure
0xF080	Expansion Pack Function A	Failure
0xF081	Expansion Pack Function B	Failure
0xF082	Expansion Pack Function C	Failure
0xF083	Expansion Pack Function D	Failure
0xF084	Expansion Pack Function E	Failure
0xF085	Expansion Pack Function F	Failure
0xF086	Expansion Pack Function G	Failure
0xF087	Expansion Pack Function H	Failure
0xF088	Expansion Pack Function I	Failure
0xF089	Expansion Pack Function J	Failure
0xF08A	Expansion Pack Function K	Failure
0xF08B	Expansion Pack Function L	Failure

0xF08C	Expansion Pack Function M	Failure
0xF08D	Expansion Pack Function N	Failure
0xF08E	Expansion Pack Function O	Failure
0xF08F	Expansion Pack Function P	Failure

Example: A reading of 0xF00A indicates that the current log item was due to 'Low Fuel Level.'

3.3.3 40132 - Log Time

Log Minute

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40132	N/A	0 ~ 59	1	N/A	16 bit unsigned

Log Hours

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40133	N/A	0 ~ 23	1	N/A	16 bit unsigned

Log Date

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40134	N/A	1 ~ 31	1	N/A	16 bit unsigned

Log Month

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40135	N/A	1 ~ 12	1	N/A	16 bit unsigned

Interpretation: All these registers are meant to be read in a decimal format.

Example: A log reading with the following register values can be interpreted as July 4th, 12:01am.

1. 40132 = 0x0001
2. 40133 = 0x0000
3. 40134 = 0x0004
4. 40134 = 0x0007

3.3.4 40136 - Log DTC Code

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40136 ~ 40137[1]	List	N/A	N/A	N/A	32 bit unsigned

[1] Register only valid if the Log Type register is DTC (0x00E9).

Interpretation: This 32 bit register is separated into 4 sections. Use the tables below to determine the SPN, OC, FMI and CM of the DTC code for the current log.

Bits	Name
0 ~ 18	Suspect Parameter Number (SPN)
19 ~ 25	Occurrence (OC)
26 ~ 30	Failure Mode Identifer (FMI)
31	Connection Management (CM)

Example: A hexadecimal reading of 0x0C10006E can be interpreted as follows:

1. The SPN bits can be read as decimal 110 which is Engine Coolant Temperature.
2. The OC bits can be read as decimal 2 occurrences
3. The FMI bits can be read as decimal 3 which is Above Normal.
4. The CM bit can be read as decimal 0 which is Version 4.

Note: You must have access to J1939 specifications to interpret all the data appropriately.

3.3.5 40138 - Log Number

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40138	N/A	1 ~ 150	1	N/A	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. It indicates what the number of the currently viewed log is.

Example: A decimal reading of 7 can be interpreted as the 7th log out of the Total Logs.

3.3.6 40139 - Total Logs

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40139	N/A	1 ~ 150	1	N/A	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. It indicates how many logs there are in the Events History.

Example: A decimal reading of 96 can be interpreted as a total of 96 logs.

3.4 J1939

The following are J1939 specific registers.

3.4.1 40201 - Engine Torque

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40201	%	-125 ~ 125	1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number minus 125. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Example: A decimal reading of 150 can be interpreted as 25%.

3.4.2 40212 - Doosan

Doosan Calibration ID0

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40212	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID1

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40213	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID2

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40214	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID3

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40215	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID4

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40216	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID5

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40217	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID6

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40218	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID7

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40219	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID8

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40220	Ascii	N/A	N/A	N/A	16 bit unsigned

Doosan Calibration ID9

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40221	Ascii	N/A	N/A	N/A	16 bit unsigned

These display the calibration name of the Doosan G2 ECM as programmed in the controller. ID0 is the first character in the name and ID9 is the last character in the name. Refer to the Doosan G2 ECM in the Tough Series J1939 user manual.

3.4.3 40222 - Engine Load %

Engine Percent Load is read from the J1939 CANbus.

DataType	16 bit value unsigned
Scaling (Gain)	0.1
Offset	0
Presentation	Show as value with enumeration
Enumeration	65535 (0xFFFF) = Not available
Units	%
Range	0 ~ 110.0 in 0.1 increments

3.4.4 Aftertreatment

These registers deal with the J1939 Aftertreatment parameters.

3.4.4.1 40174 - Soot Level

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40174	%	0 ~ 250	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number.

Note: This registers information is gathered through CAN bus and only functions if controller is connected to a compatible ECM.

Example: A decimal reading of 45 can be interpreted as 45%.

3.4.4.2 40175 - Ash Level

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40175	%	0 ~ 250	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number.

Note: This registers information is gathered through CAN bus and only functions if controller is connected to a compatible ECM.

Example: A decimal reading of 74 can be interpreted as 74%.

3.4.4.3 40176 - Exhaust Temperature

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40176	°F	0 ~ 60000	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Note: This registers information is gathered through CAN bus and only functions if controller is connected to a compatible ECM.

Example: A decimal reading of 5093 can be interpreted as 509.3°F.

3.4.4.4 40191 - Time Since Last Regen

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40191 ~ 40192	Hours	0 ~ 10000	0.1	0xFFFFFFFF	32 bit unsigned

Interpretation: The register is meant to be read as a decimal number. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Note: This register only updates every 6 minutes as readings are done in 1/10ths of an hour.

Note: This registers information is gathered through CAN bus and only functions if controller is connected to a compatible ECM.

Example: A decimal reading 5973 can be interpreted as 597.3 hours.

3.4.4.5 40197 - DPF/DEF Icon Status

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40197	List	N/A	N/A	N/A	16 bit unsigned

Interpretation: This 16 bit register is separated into 4 sections, one for each of the DPF/DEF icons.

Bits	Name	Interpretation
0 ~ 1	Regeneration Status	0 = Off, 1 = Solid, 2 = Blinking
2 ~ 3	DEF Status	0 = Off, 1 = Solid, 2 = Blinking
4	High Exhaust Temp. Lamp	0 = Off, 1 = Solid
5	Inhibit Lamp	0 = Off, 1 = Solid
6	Check Engine	0 = Off, 1 = Solid

Example: A binary reading of 0000 0000 0001 0010 indicates that the Regeneration Status Lamp is blinking and the High Exhaust Temp. Lamp is solid.

3.4.4.6 40198 - DEF Tank Level

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40198	%	0 ~ 1000	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Example: A decimal reading of 898 can be interpreted as 89.8%.

3.4.4.7 40199 - DEF Tank Temperature

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40199	°F	320 ~ 4100	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Example: A decimal reading of 2154 can be interpreted as 215.4°F.

3.4.4.8 40200 - DPF Gas Temperature

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40200	°C	0 ~ 1000	0.1	0xFFFF	16 bit unsigned

Interpretation: The register is meant to be read as a decimal number. The right digit is the decimal point. All digits to the left of it are the whole numbers.

Example: A decimal reading of 8675 can be interpreted as 867.5°C.

3.5 J1939 Expansion Pack

This section lists the registers that apply if using the Dynagen J1939 Expansion Module.

3.5.1 40202 - Expansion Pack Control Bits

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40202	N/A	N/A (Bitmap)	N/A	N/A	32 bit unsigned

Interpretation: The register is meant to be read as a bitmap.

Example: The first bit is bit 1. The last bit is bit 32.

The 32 bits correspond to binary variables (store either a zero or a one) that the expansion pack logic either reads or sets. They variables are used to piece logic units together to create complex logic. Refer to the expansion pack documentation for more information.

3.5.2 40204 - Expansion Sensor 1 to 7

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40204 (Sensor 1)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40205 (Sensor 2)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40206 (Sensor 3)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40207 (Sensor 4)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40208 (Sensor 5)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40209 (Sensor 6)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned
40210 (Sensor 7)	N/A	0 ~ 6553.4	0.1	0xFFFF	16 bit unsigned

Interpretation: These registers are meant to be read as a decimal number . The right digit is the decimal point. All digits to the left of it are the whole numbers.

Example: A decimal reading of 150 can be interpreted as 15.0.

The sensors registers are unit-less as they can be programmed to any type of sensor.

3.5.3 40211 - Expansion Pack Switched Inputs

Default Register	Units / Format	Range	Resolution	Not Available	Bit Format
40211	List	N/A	N/A	N/A	32 bit unsigned

Interpretation: This 16 bit register is separated into two bytes. The low byte indicates the status of the inputs. The high byte is not used. The low byte is broken down as follows:

Bit	7	6	5	4	3	2	1	0
Input	Switched Input 4	Switched Input 4	Switched Input 3	Switched Input 3	Switched Input 2	Switched Input 2	Switched Input 1	Switched Input 1

Each input has four possible values:
0 = input is off
1 = input is on
2 = input has an error
3 = input is not available (disabled)

Example: A binary reading of 0000 0000 1100 1001 can give us the following information:

1. Input 1 is on.
2. Input 2 has an error
3. Input 3 is off.
4. Input 4 is not available

3.6 40009 - Common Faults

There are two common faults -- Common Fault 1 and Common Fault 2 -- and both are located in register 40009.
They are linked to the Common 1 Events and Common 2 Events setttings in the TG410 under Communications > Modbus. These settings are only configurable using the RapidCore Configuration software.

DataType	16 bit value unsigned
Scaling	1
Offset	0
Presentation	Read Only
Enumeration	Yes, see below.

Common Fault 1 is bits 0 to 4. Common Fault 2 is bits 5 to 9.

Common Fault 1 and 2 Bit Meanings:

Common Fault 1 / Common Fault 2 Bits	Value and Description
Bit 0 / Bit 5	1 if warning or shutdown occurred, 0 = inactive
Bits 1-2 / Bits 6-7	(Range: 0 ~ 3) 0 = Take No Action, 1 = Warning, 2 = Action Required, 3 = Shutdown
Bit 3 / Bit 8	0 = No Audible Alarm, 1 = Sound Audible Alarm
Bit 4 / Bit 9	0 = Disabled, 1 = Enable

Note: The RA400 remote announicator uses Common Fault 1 for it's common fault LED.

3.7 40104/40105 - Remote Access

TE410 only.

Registers 40104 and 40105 allow more advanced control. Currently one can do the following:
- Set the goal TSC1 J1939 speed.

- Change the Auxiliary Sensor 5 Start level setting.
- Change the Auxiliary Sensor 5 Stop level setting.

The following procedure must be followed.

Step 1: Send the desired command and password in registers 40104 and 40105. The must be written simultaneously.

Register 40104 - set the command:
- Speed: 0xFFF0
- Write one word size setting: 0xFFE2

Register 40105: The 4 digit front panel pass code (as a numeric value). It is four zeros by default.

Step 2: Within 20s use registers 40104 and 40105 to send the desired value. The two registers must be written simultaneously.

- If requesting speed set both registers to the desired speed (500 to 4000 RPM)

- If changing a setting:

Set register 40104 to:
- 0x13C if writing Aux 5 sensor start level.
- 0x13E if writing Aux 5 sensor stop level.

Set register 40105 to the desired value multiplied by ten. For example if you want to send 24.1 then set register 40105 to 241.

Note: In both steps both registers must be written simultaneously. Use function code 16: write multiple registers.

4 Contact Information

Contacting DYNAGEN can be done by any of the methods below. Technical support is offered Monday - Friday, 8:00am - 4:00pm (EST). If you are unable to get a hold of one of our engineers, please leave a message and they will return your call as soon as possible.

Type	Information
Website	www.dynagen.ca/support
Email	support@dynagen.ca
Phone Number	(902) 406-0133
Twitter	@DynaGenTech
Facebook	www.facebook.com/DYNAGEN
Address	3 Spectacle Lake Drive, Unit B105 Dartmouth, NS B3B1W8, Canada