KCU-07

Modbus TCP/IP Communication Module

ISO 9001
ETC

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Section   **Page**

SECTION 1 Introduction

Modbus TCP/IP also known as Modbus RTU communication protocol, the communication interface to the Ethernet.

KCU-07 Modbus TCP/IP network communication module can only be applied to Kutai's advanced control units (For example GC4K/K-E, BTB type ATS and more).

- Support manual or automatic IP network configuration
- Number of connection allowed : 3
- Support 10/100Base-T network transmission
- IP Port : 502 (Factory pre-set)
- Communication Status Indicator

SECTION 2 Specification

Power Input

  5 Vdc

Static Consumption

  < 1.0 watt

Environment

  Operating Temperature   -20 to +70 ˚C

  Storage Temperature   -35 to +85 ˚C

  Relative Humidity   95% or Below

  Vibration   3 Gs @ 100 – 2K Hz

Dimension

  65.0 (L) x 23.0 (W) x 39.0 (H) mm

Weight
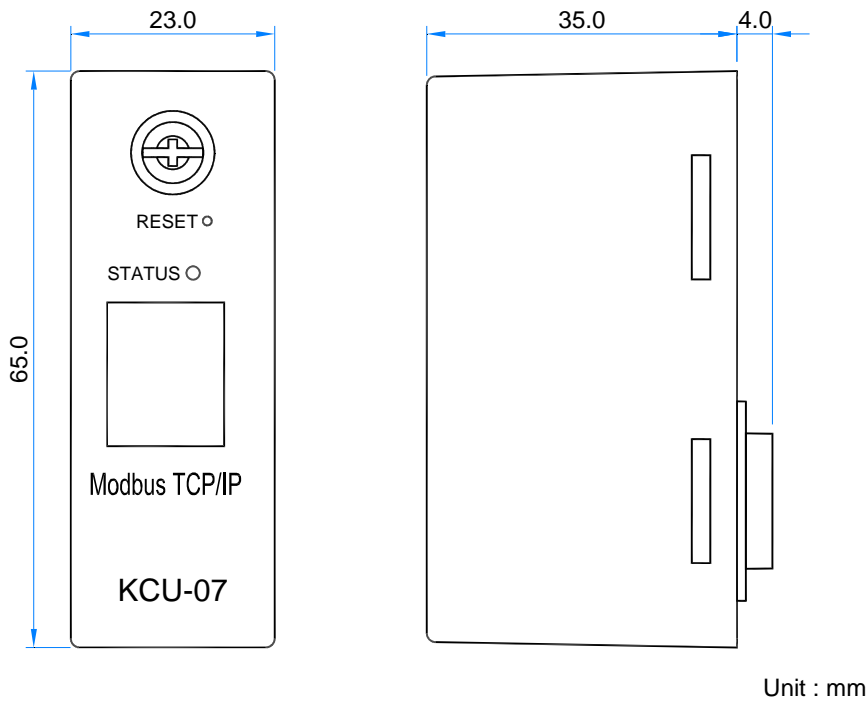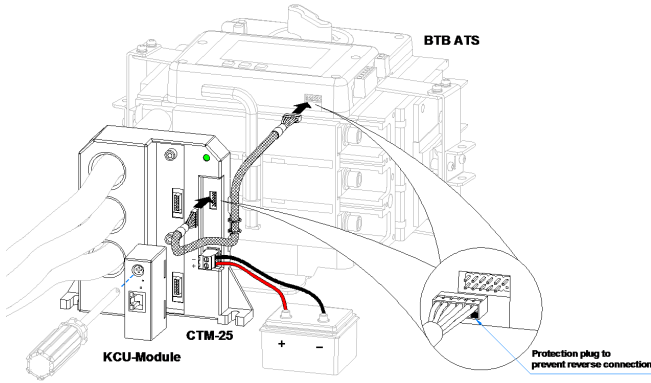
  31 g +/- 2%

  0.068 lb +/- 2%

Unit : mm

Fig 01   Dimention

SECTION 3 Installation Procedure

Always remove power input from control unit before installation. Refer to the following steps and connect KCU-07 to the CTM-25 expansion slot or KCU-IF module.

3.1 BTB-ATS Installation

Step 1：KCU-07 Installation Example

CTM-25 Installation Instruction
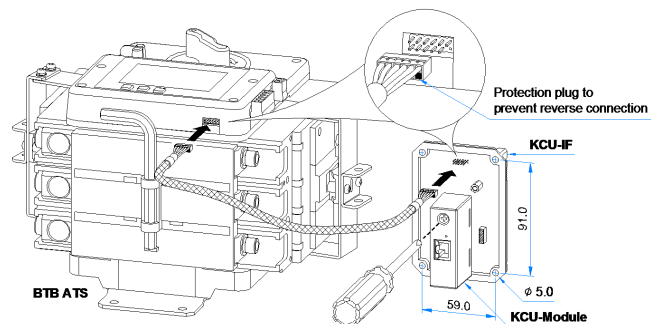
KCU-IF Installation Instruction

Step 2：Hand tighten the KCU-07 attachment screw.

Step 3：Connect power input to control unit and switch to OFF mode and enter system setting to entry【33】Remote control by KCU-XX module and select **Enable** and move on to entry【34】KCU-05 or KCU-07 module address to select the desire Slave Address from 1–99.

3.2 GC4K/K-E Installation

Step 1 : Place KCU-07 firmly onto the expension socket on the GC4K/K-E.
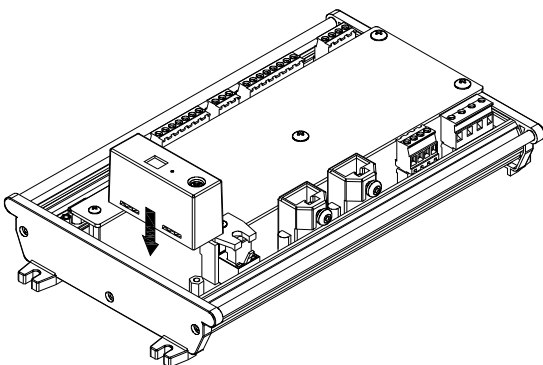
Step 2：Hand tighten the KCU-07 attachment screw.
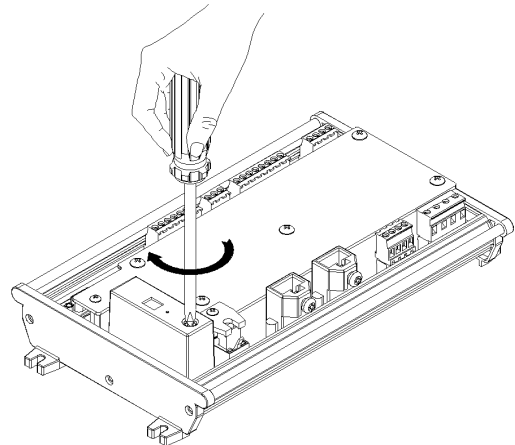
Step 3 : Connect power input to GC4K/K-E and push and hold "Owner SW" switch for 1 second, and select Enable Onsite Setting Permission from GC4K-D07. Then enter Setting ⚙ icon and click on System Setting to enter Communication Module Setting "Modbus KCU-05 or KCU-07" and click on Enable then enter the desire Slave Address from 1–99.

For more detail information and setting, please refer to the control unit user manual.

> *Warning!!*
> 1. **When Remote control by KCU-XX module option is cancelled, the GenOnCall remote monitoring app can only provide monitoring function, all remote operation will be disabled.**
> 2. **Kutai Electronics reserves the right to modify the content and setting from current and newly developed control unit(s), prior or after modification will not be notified by Kutai Electronics. User is free to connect to the official website to obtain latest information and update.**

3.3 KCU-07 Connection Diagram
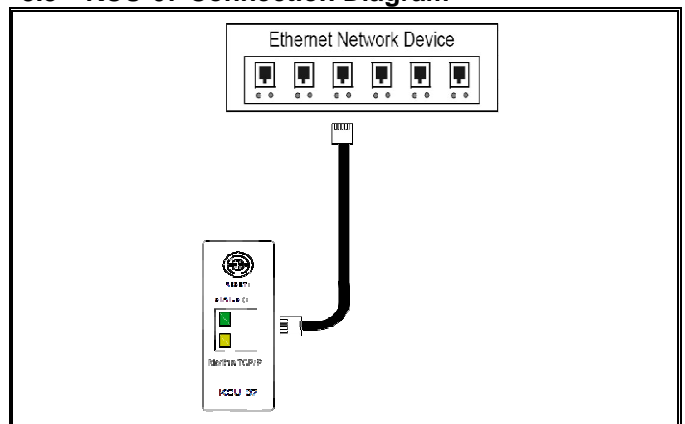
Fig 02 KCU-07 Network Device Installation

When KCU-07 is connected to network via ethernet network device Fig 02 (For example: HUB, IP Switch or IP Router). User must first enable the DHCP server function to allow KCU-07 to obtain valid connection IP provided by DHCP server.

SECTION 4   status and network connection indicator
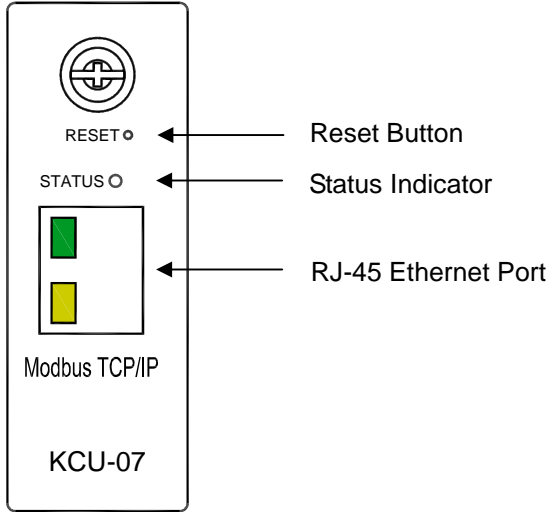
KCU-07 Status Indicator Description：

STATUS	Description
🔴 Flash	KCU-07 Connected and communicating to control unit
🟢 Flash	KCU-07 Network communication status："Requesting IP from DHCP server" or "In communication with client (Master)"
🟠 Flash	Above two status operating simultaneously
🔴 Flash 🟢 On	KCU-07 Communicating with control unit and pending connection (Green light entinguish when ready)

Network Connection Port Indicator：

STATUS	Description
🟩 🟨	Green On：Connection status normal Yellow Flash：Data Transmitting

KCU-07 Troubleshooting：

STATUS	Troubleshoot
Status Indicator does not flash	(1) Click control unit if faulty (2) If control unit is operating correctly, reinstall KCU-07 and check if returns to normal (3) If problem still exisit after following the above steps, replace KCU-07 or contact dealer.

SECTION 5 KCU-07 Parameter Configuration

KCU-07 Factory parameter reset：

Use a pointy object (tip of a pen or tooth pick) to hold and press down RESET for 2 seconds. When GREEN light is illuminated, the system is in process of reseting, once the light turns RED, all settings are resume to factory preset.

Item	Description
Host Name	KCU-07
Admin Name	admin
Admin Password	admin
DHCP	Enable
IP Address	192.168.1.3
Gateway	192.168.1.1
Subnet Mask	255.255.0.0
Primary DNS	192.168.1.1
Secondary DNS	0.0.0.0
Modbus-TCP Port	502

KCU-07 Configuration：

Step 1：Open Web browser and enter keyword "kcu-07/"
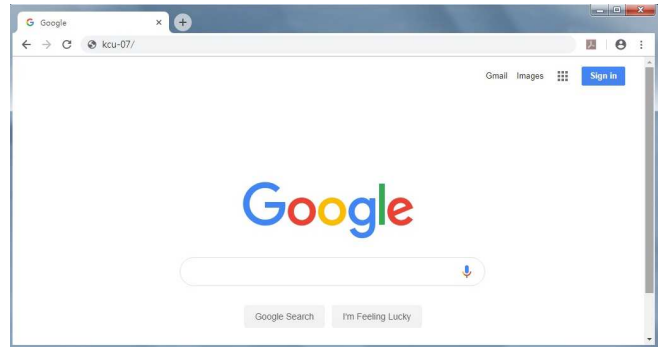
Step 2：Click "Network Configuration"
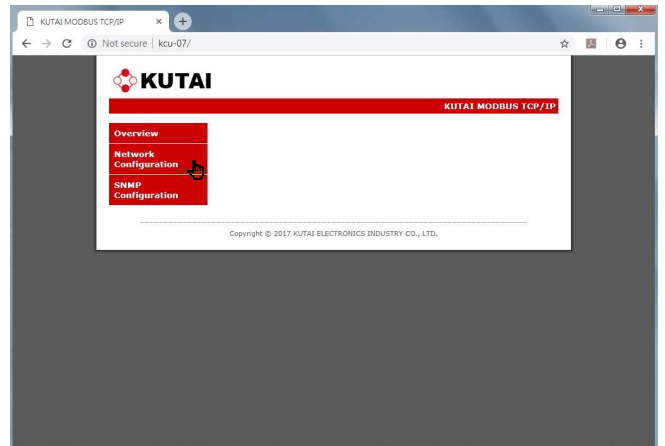
Step 3：Username and Password：Enter "admin" and click "Sign in".
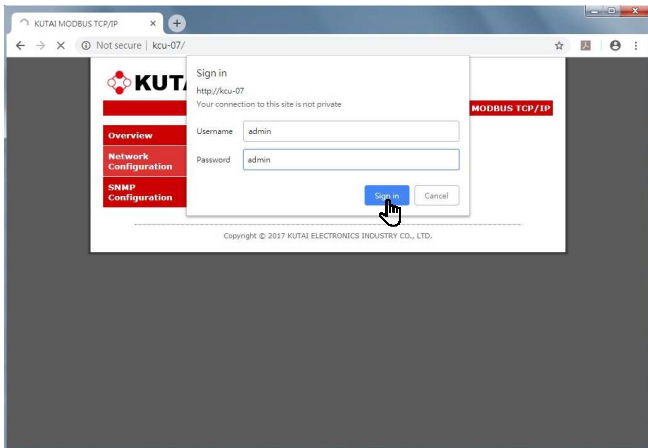
Step 4：Enter the required parameter settings and click "Save Config"
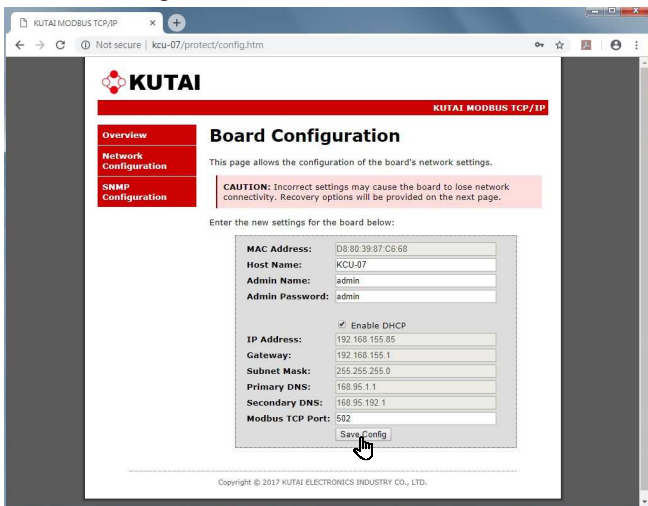
When multiple KCU-07 are connected in the same domain, different host Name (up to 15 characters) for each module is recommended.

Step 5：End screen. Click on "http://KCU-07/" to return to configuration.
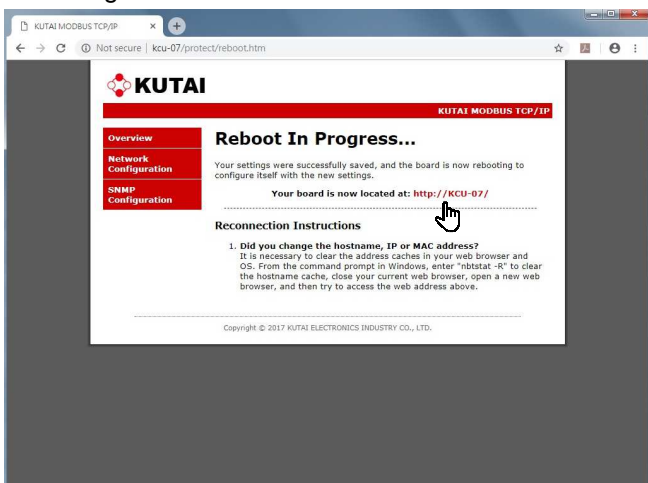
SECTION 6 Modbus-TCP/IP Data Packet Format

Modbus-TCP/IP Data packet includes MBAP(ModBus Application Protocol) headers, Function Code and Data Field three sections.　MBAP is divided into 4 field with total of 7 bytes.
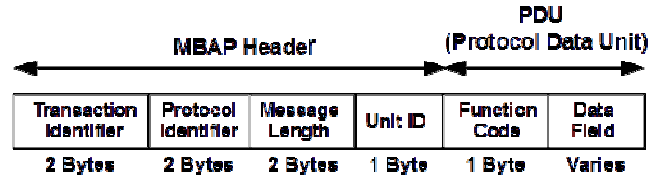
Transaction Identifier : Used to identify the corresponding code for transmitting and receiving packet(s).
Protocol Identifier : Modbus fixed to 0
Message Length : Unit ID to Data Field byte data length.
Unit ID : Remote Slave device identification code (Slave Address)
Function Code : execution code to request remote Slave device to carry out operation
Data Field : Contains a message string that makes a request or response to a remote slave device

SECTION 7 Modbus-TCP/IP Function Code

Function Code	Description
01 (01h)	Read Coil Status
02 (02h)	Read Input Status
03 (03h)	Read Holding Registers
04 (04h)	Read Input Registers
05 (05h)	Write Single Coil
06 (06h)	Write Single Register
16 (10h)	Write Multiple Registers
17 (11h)	Read Slave Device Information

7.1　Code 01 – Read Coil Status

This function code is to read 1 to 2000 consecutive Digital Output (DO) bit data (Single bit) from a remote control unit.

Each Coil Status from the data packet responded by KCU-07 occupies 1 bit. When status indicates 1 = ON, 0 = OFF. The reading of first Coil Status is stored in the least significant bit (lsb), and so on into each byte.

Request

Function Code	1 Byte	0x01
Start Address	2 Bytes	0x0000 – 0xFFFF
Quantity of Coils	2 Bytes	1 – 2000(0x7D0)

Response

Function Code	1 Byte	0x01
Byte Count	1 Byte	N*
Coil Status	n Byte	n = N or N+1

N = Quantity of Coils / 8. If the remainder is not 0, n = N+1

Error

Function Code	1 Byte	0x81
Exception code	1 Byte	Ref. section 7.9

Example : Reading from GC4K Digital Output (DO) bit data
    Output Status 1 – 10

Request

Field Name	HEX
Function Code	01
Starting Address Hi	00
Starting Address Lo	00
No. of Points Hi	00
No. of Points Lo	0A

Response

Field Name	HEX
Function Code	01
Byte Count	02
Output Status 8 – 1	04
Output Status 16 – 9	00

Description :

Appendix 04 <Reading Digital Output (DO) Data> Define only Output status 1 – 5. Output Status 6 – 16 are undefined, therefore the Output readings are OFF (0).
Output Status 1 being the least significant bit (lsb) of the first data byte, and Output Status 8 is the most significant bit (msb) of the byte. The other coils status follows with low order to high order in subsequent bytes.
Output Status 8 – 1 displaying status value 0x04 (Hex) or Binary 0000 0100.
Output Status 3 is ON(1) : The control unit current setting is under OFF mode operation

7.2   Code 02 – Read Input Status
This function code is to read 1 to 2000 consecutive Digital Input (DI) bit data (Single bit) from a remote control unit.

Each Input Status from the data packet responded by KCU-07 occupies 1 bit. When status indicates 1 = ON, 0 = OFF. The reading of first Input Status is stored in the least significant bit (lsb), and so on into each byte.

Request

Function Code	1 Byte	0x02
Start Address	2 Bytes	0x0000 – 0xFFFF
Quantity of Inputs	2 Bytes	1 – 2000(0x07D0)

Response

Function Code	1 Byte	0x02
Byte Count	1 Byte	N*
Input Status	n Byte	n = N or N+1

N = Quantity of Inputs / 8. If the remainder is not 0, n = N+1

Error

Function Code	1 Byte	0x82
Exception code	1 Byte	Ref. section 7.9

Example：Reading from GC4K Digital Input (DI) bit data
    Input Status 1 – 10

Request

Field Name	HEX
Function Code	02
Starting Address Hi	00
Starting Address Lo	00
No. of Points Hi	00
No. of Points Lo	0A

Response

Field Name	HEX
Function Code	02
Byte Count	02
Input Status 8 – 1	14
Input Status 16 – 9	00

Description :

In Appendix 04 <Reading Digital Input (DI) Data> Defines all Input Status from 1 – 62 (Address 0-61).
Input Status 1 being the least significant bit (lsb) of the first data byte, and Input Status 8 is the most significant bit (msb) of the byte. The other input status follows with low order to high order in subsequent bytes.
Input Status 8 – 1 displaying value 0x14 (Hex) or binary 0001 0100.
Input Status 3 is ON (1) : The control unit is at OFF mode operation.
Input Status 5 is ON (1) : The remote start signal is ON。

7.3   Code 03 – Read Holding Registers
This function code is to read from 1 to 125 holding register data from a remotely operated control unit.

There are 2 bytes occupied, with high byte prioritized in each holding register responded data packet.

Request

Function Code	1 Byte	0x03
Start Address	2 Bytes	0x0000 – 0xFFFF
Quantity of Registers	2 Bytes	1 – 125(0x7D)

Response

Function Code	1 Byte	0x01
Byte Count	1 Byte	2 x N
Register Value	N x 2 Bytes	

N = Quantity of Registers

Error

Function Code	1 Byte	0x83
Exception code	1 Byte	Ref. section 7.9

Example : Reading GC4K holding register

Register 1 : GC4K Current operation mode

Register 2 : <Phase> Setting Value

Rwgister 3 : <Nominal Voltage (Primary)>
Setting Value

Request

Field Name	HEX
Function Code	03
Starting Address Hi	00
Starting Address Lo	00
No. of Registers Hi	00
No. of Registers Lo	03

Response

Field Name	HEX
Function Code	03
Byte Count	06
Register Value Hi (Register 1)	00
Register Value Lo (Register 1)	02
Register Value Hi (Register 2)	00
Register Value Lo (Register 2)	00
Register Value Hi (Register 3)	00
Register Value Lo (Register 3)	DC

Description :
Appendix 04 <Read Holding Register Data> Definition table, each temporary storage occupies 2 bytes.
Register 1 (Address 0) the value is 0x0002 (Hex) or 2 (Decimal) : The Control Unit is in OFF mode operation.
Register 2 (Address 1) If the value is 0x0000 (Hex)or 0 (Decimal) : The Control Unit system phase is configured as 3 Phase 4 Wires (3P4W).

Register 3 (Address 2) The value is 0x00DC (Hex) or 220 (Decimal) : The Control Unit Nominal voltage is set to 220V.

7.4   Code 04 – Read Input Registers
This Funicion code is to read from 1 to 125 Analog Input (AI) register from the remotely operated control unit.

There are 2 bytes occupied in a register data packet responded by KCU-07. From Appendix 01 to 05 Read Analog Input (AI) table, the **Data Point** actual required register quantity is determined by **Data Type** (U16 / U32).

Request

Function Code	1 Byte	0x04
Start Address	2 Bytes	0x0000 - 0xFFFF
Quantity of Registers	2 Bytes	1 – 125(0x7D)

Response

Function Code	1 Byte	0x04
Byte Count	1 Byte	2 x N
Register Value	N x 2 Bytes	

N = Quantity of Registers

Error

Function Code	1 Byte	0x84
Exception code	1 Byte	Ref. section 7.9

Example : Reading GC4K Analog Input (AI) Data

Register 1 ,2 : Generator V_{12} voltage

Register 3 ,4 : Generator V_{23} voltage

Register 5 ,6 : Generator V_{31} voltage

Request

Field Name	HEX
Function Code	04
Start Address Hi	00
Start Address Lo	00
No. of Registers Hi	00
No. of Registers Lo	06

Response

Field Name	HEX
Function Code	04
Byte Count	0C
Register Value MB (Register 1)	00
Register Value UB (Register 1)	00
Register Value HB (Register 2)	08
Register Value LB (Register 2)	9E
Register Value MB (Register 3)	00
Register Value UB (Register 3)	00
Register Value HB (Register 4)	08
Register Value LB (Register 4)	9C
Register Value MB (Register 5)	00
Register Value UB (Register 5)	00
Register Value HB (Register 6)	08
Register Value LB (Register 6)	9D

MB: Most Significant Byte
UB: Upper Significant Byte
HB: High Significant Byte
LB: Least Significant Byte

Description :
Refer to Appendix 04 < Reading Analog Input (AI) Data > Definition Table. To read the **Data Point** <Generator V_{12} voltage>, <Generator V_{23} voltage> and <Generator V_{31} voltage> from control unit, the Data Type is **U32** and occupying 2 registers (4 Bytes) each, therefore total of 6 register values are read.

Generator V_{12} Voltage : Value 0x0000089E (Hex) or 2206 (Decimal). Because the Ratio = 0.1V, so the value must devided by 10 : V_{12} Voltage = 2206 * 0.1 = 220.6 V

Generator V_{23} Voltage : Value 0x0000089C (Hex) or 2204 (Decimal). Because the Ratio = 0.1V, so the value must devided by 10 : V_{23} Voltage = 2204 * 0.1 = 220.4 V

Generator V_{31} Voltage : Value 0x0000089D (Hex) or 2205 (Decimal). Because the Ratio = 0.1 V, so the value must devided by 10 : V_{31} Voltage = 2205 * 0.1 = 220.5 V

7.5 Code 05 – Write Single Coil
This Function Code is for Digital Output (DO) to estabilish ON or OFF status

When enter value to 0xFF00 status to **ON**, 0x0000 status to **OFF**, other value becomes invalid but does not affect the output status.

> *Warning!!*
> **When changing operation mode AUTO, OFF, MANU or TEST function on the remote-control unit, system can only accept entering value 0xFF00 (ON). Because once the operation mode is changed, it automatically disengages (OFF) and other operation functions.**
>
> **Example : To change operation mode on GC4K**
> **To change operation mode to OFF, user need only enter value 0xFF00 to Coil Number 3 (Address 2).**

Request

Function Code	1 Byte	0x05
Start Address	2 Bytes	0x0000 – 0xFFFF
Output Value	2 Bytes	0x0000 or 0xFF00

Response

Function Code	1 Byte	0x05
Start Address	2 Byte	0x0000 - 0xFFFF
Output Value	2 Bytes	0x0000 or 0xFF00

Error

Function Code	1 Byte	0x85
Exception code	1 Byte	Ref. section 7.9

Example : Write GC4K Digital Output (DO) Data
Set GC4K to AUTO operation mode

Request

Field Name	HEX
Function Code	05
Start Address Hi	00
Start Address Lo	01
Output Value Hi	FF
Output Value Lo	00

Respons

Field Name	HEX
Function Code	05
Start Address Hi	00
Start Address Lo	01
Output Value Hi	FF
Output Value Lo	00

Description :
Refer to Appendix 04 < Digital Output (DO) Data > Definition Table. To program GC4K to AUTO operation mode, enter value 0xFF00 (ON) to Coil Number 2 (Address 1).

7.6   Code 06 – Write Single Register

This Function Code is for writing a single register to a remote-control unit. The entered value must be a valid address and defined register value otherwise an exception code will be responded.

> ### *Warning!!*
> **When changing operation mode AUTO, OFF, MANU or TEST function on the remote-control unit. Simply enter value 0x0001 (AUTO) or 0x0002 (OFF) or 0x0003 (MANU) or 0x0004(TEST) to Register Number 1 (Address 0).**
>
> **Strongly Suggest : Not to enter other register settings while changing the operation mode on the remote-control unit in the sametime.**
>
> **Example : To change operation mode on GC4K To change operation mode to MANU, user need only enter value 0x0003 to Address 0**

Request

Function Code	1 Byte	0x06
Start Address	2 Bytes	0x0000 – 0xFFFF
Register Value	2 Bytes	0x0000 – 0xFFFF

Response

Function Code	1 Byte	0x06
Start Address	2 Byte	0x0000 – 0xFFFF
Register Value	2 Bytes	0x0000 – 0xFFFF

Error

Function Code	1 Byte	0x86
Exception code	1 Byte	Ref. section 7.9

Example : write GC4K holding register data
        To change GC4K operation mode to OFF mode

Request

Field Name	HEX
Function Code	06
Start Address Hi	00
Start Address Lo	00
Register Value Hi	00
Register Value Lo	02

Response

Field Name	HEX
Function Code	06
Start Address Hi	00
Start Address Lo	00
Register Value Hi	00
Register Value Lo	02

Description :

Refer to Appendix 04 < Write Holding Register Data > Definition Table. To change operation mode to OFF mode, user is to write 0x0002 (Hex) to register 1 (address 0).

7.7   Code 16 – Write Multiple Registers

This Function Code is for writing multiple **1 to 20** register(s) to a remote-control unit. When write a single or multiple register(s) value, the entered value(s) must be a valid address and defined register value otherwise an exception code will be responded.

> ### *Warning!!*
> **Strongly Suggest : Not to enter other register settings while changing the operation mode on the remote-control unit in the sametime.**

Request

Function Code	1 Byte	0x10
Start Address	2 Bytes	0x0000 – 0xFFFF
Quantity of Registers	2 Bytes	1 – 20(0x14)
Byte Count	1 Byte	2 x N
Registers Value	N x 2 Bytes	Value

Response

Function Code	1 Byte	0x10
Start Address	1 Byte	0x0000 – 0xFFFF
Quantity of Registers	2 Bytes	1 – 20(0x14)

N = Quantity of Registers

Error

Function Code	1 Byte	0x90
Exception code	1 Byte	Ref. section 7.9

Example : Write GC4K Holding Register Data

    Register 64 : Battery under voltage warning setting

    Register 65 : Battery over voltage warning setting

Request

Field Name	HEX
Function Code	10
Start Address Hi	00
Start Address Lo	3F
No. of Register Hi	00
No. of Register Lo	02
Byte Count	04
Register Value Hi (Register64)	80
Register Value Lo (Register64)	09
Register Value Hi (Register65)	80
Register Value Lo (Register65)	0E

Response

Field Name	HEX
Function Code	10
Start Address Hi	00
Start Address Lo	3F
No. of Register Hi	00
No. of Register Lo	02

Description :

Refer to Appendix 04 < Write Holding Register Data > Definition Table, to enter < Battery under voltage setting > and < Battery over voltage setting >.
Register 64 : Write value 0x8009 (Hex)
Bit15 = "1" : To enable battery under voltage warning setting
Voltage setting = (0x8009 & 0x7FFF) = 0x0009
$\qquad$ = 9 V
Register 65 : Write value 0x800E (Hex)
Bit15 = "1" : To enable battery over voltage warning setting
Voltage setting = (0x800E & 0x7FFF) = 0x000E
$\qquad$ = 14 V

7.8   Code 17 – Read Slave Device Information
This Function Code is for retrieve general information from the remote control unit.

Request

Function Code	0x11

Respond

Function Code	0x11
Byte of Count	0x01 – 0xFA
Fixed Code	0x5A
Run Indicator	0x00 = OFF 0xFF = Running
Device Type	0x0001 – 0xFFFF
Device Number	0x0001 – 0xFFFF
Manufacture Name	String Type
Device Product Name	String Type
Device Serial Number	String Type
Device Firmware Version	String Typr
KCU-07 Serial Number	String Type
KCU-07 Firmware Version	String Type

Error

Error Code	0x91
Exception Code	Ref. section 7.9

Example : Read GC4K general information

Request

Field Name	HEX
Function Code	11

Respond

Field Name	HEX
Function Code	11
Byte of Count	43
Fixed Code	5A
Indicator Status	FF
Device Type Hi	00
Device Type Lo	11
Device Number Hi	00
Device Number Lo	02
Manufacture Name (End of Code = 0x00)	String KUTAI Electronics
Device Product Name (End of Code = 0x00)	String GC4K
Device Serial Number (End of Code = 0x00)	String 201701025678
Device Firmware Version (End of Code = 0x00)	String 02.30
KCU-07 Serial Number (End of Code = 0x00)	String 201701021234
KCU-07 Firmware Version (End of Code = 0x00)	String 01.01

7.9   Modbus Exception Respond
When Master send request to a remote slave device (KCU-07), one of the follow 4 scenarios may occur.

● When KCU-07 receives request, with no communication error occurring during transmission and data packet validated, the system resume to normal message response.

● If KCU-07 fails to receive command due to communication error, no responding message will be issued.

● If KCU-07 receives request then communication error occurs, no responding message will be issued.

● When KCU-07 receives request with no communication error occurring, but unable to process the request; An Exception Code will be issued, notifying Master to take appropriate action.

Exception Codes Table

Code (Hex)	Name	Description
01	ILLEGAL Function	Function Code received in the query is not an allowable action for the server.
02	ILLEGAL Data Address	The data address received in the query is not an allowable address for the server.
03	ILLEGAL Data Value	A value contained in the query data field is not an allowable value for server.
51	Control Unit and KCU-07 Connection Lost	Control Unit and KCU-07 communication failure. This failure code is generated when Master issue a Read / Write request command and control unit and KCU-07 fails to estabilish connection.
52	Control Unit not ready	KCU-07 did not receive all necessary information from control unit. This failure code is generated when Master issue a Read / Write request command and KCU-07 fails to obtain all necessary information from control unit.
53	Data buffer overflow	This failure code is generated when Master issue a Read / Write request command and discovers data buffer overflow.
54	Controller not supported by KCU-07	This failure code is generated when Master issue a Read / Write request command but KCU-07 does not currently support the current control unit.
55	Operation mode change failure	This failure code is generated when Master issued operation mode change (AUTO/OFF/MANU/TEST) but fails. **Note : If GC4K or GC4K-E is the operating control unit, the front panel Mode Selector must be switched to REMOTE operation to enable remote command request.** **(For detailed information, please refer to corresponding control unit user manual)**
56	Write Failure	The failure code is generated when Master issue write holding register data request and received a request denial by Slave device. **Note : If GC4K or GC4K-E is the operating control unit, the front panel Mode Selector must be switched to REMOTE operation then press and hold the Owner SW for 2 seconds and select <Enable Remote Setting Permission> from the touch screen.** **(For detailed information, please refer to corresponding control unit user manual)**
57	Over Quantity of Registers	The failure code is generated when Master issue multiple Read / Write Register and exceed the maximum number (or Zero) allowed.

SECTION 8 KCU-07 Compatible Control Unit List

Control Unit	Model			Reference
BTB-ATS-STANDARD	BTB2B1XD BTB2B2XD BTB2B3XD BTB2B1X2 BTB2B2X2 BTB2B3X2 BTB2B1X3 BTB2B2X3 BTB2B3X3 BTB2B1X4 BTB2B2X4 BTB2B3X4 BTB2B2XD-100A BTB2B2X2-100A BTB2B2X3-100A BTB2B2X4-100A BTB2B2XD-100A(MEXICO) BTB3B1X2-NCC	BTB3B1XD BTB3B2XD BTB3B1X2 BTB3B2X2 BTB3B1X3 BTB3B2X3 BTB3B1X4 BTB3B2X4 BTB3B2XD-100A BTB3B2X2-100A BTB3B2X3-100A BTB3B2X4-100A BTB3P2UD	BTB4B1XD BTB4B2XD BTB4B1X2 BTB4B2X2 BTB4B1X3 BTB4B2X3 BTB4B1X4 BTB4B2X4 BTB3B2XD-100A BTB3B2X2-100A BTB3B2X3-100A BTB3B2X4-100A	Appendix 01
BTB-ATS-24AG	BTB2B2G2 BTB2B3G2			Appendix 02
BTB-ATS-24AG (DC Version)	BTB2P2UD BTB2P4UD			Appendix 02
BTB-ATS-NFPA	BTB2B1XD-NFPA			Appendix 03
GC4K	GC4K			Appendix 04
GC4K-E	GC4K-E			Appendix 05

Note：

U16：Unsigned 16 bits integer

U32：Unsigned 32 bits integer

MSB: Most Significant Byte

LSB: Least Significant Byte

APPENDIX 01

BTB-ATS-STANDARD		
Reading Digital Input (DI) Data: Function Code 02		
Modbus Address (Decimal)	**Data Point**	**Note**
0	Remote Operation	1：Remote app operation granted
1	ATS panel function button：AUTO	1：Panel function button in AUTO mode
2	ATS panel function button：OFF	1：Panel function button in OFF mode
3	ATS panel function button：TEST	1：Panel function button in TEST mode
4	Safety lock status	1：LOCK (All operation mode selection disabled)
5	Power supply status when connect to load	1：Electricity supplied
Utility (Grid)		
6	Utility Power Status	1：Switch closed
7	Over Voltage	1：Over Voltage Warning
8	Under Voltage	1：Under Voltage Warning
9	Over Frequency	1：Over Frequency Warning
10	Under Frequency	1：Under Frequency Warning
11	Transfer Failure	1：Transfer Failure Warning
12	Tripped	1：Tripped Warning
13	Fail to switch to OFF position (NFPA only)	0
Emergency (Generator)		
14	Generator Power Status	1：Switch closed
15	Over Voltage	1：Over Voltage Warning
16	Under Voltage	1：Under Voltage Warning
17	Over Frequency	1：Over Frequency Warning
18	Under Frequency	1：Under Frequency Warning
19	Transfer Failure	1：Transfer Failure Warning
20	Tripped	1：Tripped Warning
21	Fail to switch to OFF position (NFPA only)	0
22	Is CTM-25 moduel installed?	1：CTM-25 module installed
23	Switch to OFF position (NFPA only)	0
24	TDEN Countdown Status	1：TDEN Executing Countdown
25	TDNE Countdown Status	1：TDNE Executing Countdown
26	TDES Countdown Status	1：TDES Executing Countdown
27	TDEC Countdown Status	1：TDEC Executing Countdown
28	TDOF Countdown Status	1：TDOD Executing Countdown

※ A ATS switch with center off is called a NFPA

BTB-ATS-STANDARD			
Read Digital Output (DO) Data: Function Code 01 **Write Digital Output (DO) Data: Function Code 05**			
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Note**
0	ATS Remote Start Signal	R	1 : ON
1	ATS Operation Mode：AUTO	R / W	1 : ATS In AUTO Mode
2	ATS Operation Mode：OFF	R / W	1 : ATS In OFF Mode
3	ATS Operation Mode：TEST	R / W	1 : ATS In TEST Mode

BTB-ATS-STANDARD				
Read Digital Input (AI) Data: Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
Utility (Grid)				
0	V_{12} Phase Voltage	U16	0.1 Volt	Example： (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal) V_{12} = 2203 / 10 = 220.3 Volt (2) Frequency Value = 0x0257(Hex) = 599(Decimal) Frequency = 599 / 10 = 59.9 Hz **Note： If system is <Single Phase>, Ignore Reading from V_{23} and V_{31}**
1	V_{23} Phase Voltage	U16	0.1 Volt	
2	V_{31} Phase Voltage	U16	0.1 Volt	
3	Frequency	U16	0.1 Hz	
Emergency (Generator)				
4	V_{12} Phase Voltage	U16	0.1 Volt	Example： (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal) V_{12} = 2203 / 10 = 220.3 Volt (2) Frequency Value = 0x0257(Hex) = 599(Decimal) Frequency = 599 / 10 = 59.9 Hz **Note： If system is <Single Phase>, Ignore Reading from V_{23} and V_{31}**
5	V_{23} Phase Voltage	U16	0.1 Volt	
6	V_{31} Phase Voltage	U16	0.1 Volt	
7	Frequency	U16	0.1 Hz	
Load Current **(Requires installation of CTM-25 module. Ignore the current reading if module not installed)**				
8	L1 Current	U16	0.1 A	Example： L1 Value = 0x086D(Hex) = 2157(Decimal) L1 = 2157 / 10 = 215.7 Amp **Note： If system is <Single Phase>, Ignore Reading from L2 and L3**
9	L2 Current	U16	0.1 A	
10	L3 Current	U16	0.1 A	

BTB-ATS-STANDARD					
Read Holding Register Data : Function Code 03 Write Holding Register Data : Function Code 06 or 16					
Modbus Address (Decimal)	Data Point	Read / Write	Data Type	Note	Fty Preset
0	ATS Operation Mode	R / W	U16	0x0001 = AUTO Mode 0x0002 = OFF Mode 0x0004 = TEST Mode	0x0002
1	Language / Idioma / 語言	R	U16	0x0000 = Mandarin 0x0001 = English 0x0002 = Español **(Some model does not support "Mandarin")**	0x0001
2	System Phase	R / W	U16	0x0000 = Single Phase 0x0001 = Three Phase	0x0001
3	Reserved	R	U16	Ignore	0x0000
4	TDEN Time Delay Emergency to Normal : 0 – 999	R / W	U16	Range : 0 – 999 sec	0x000A
5	TDNE Time Delay Normal to Emergency : 0 – 250	R / W	U16	Range : 0 – 250 sec	0x000A
6	TDES Time Delay Engine Start : 0 – 15	R / W	U16	Range : 0 – 15 sec	0x0005
7	TDEC Time Delay Engine Cool-down : 0 – 250	R / W	U16	Range : 0 – 250 sec	0x001E
8	TDOF Time Delay in the OFF Position : 0 – 99	R / W	U16	Range : 0 – 99 sec	0x0005
9	Utility side over voltage protection : 110 – 530	R / W	U16	Range : 110 – 530 V **(Different model will vary, please refer to manual)**	0x00FA
10	Utility under voltage protection : 80 – 470	R / W	U16	Range : 80 – 470 V **(Different model will vary, please refer to manual)**	0x00B4
11	Delay to confirm fault with Utility voltage : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No voltage protection function)	0x000A
12	Utility over frequency protection : 51 – 75	R / W	U16	Range : 51 – 75 Hz	0x0041
13	Utility under frequency protection : 40 – 59	R / W	U16	Range : 40 – 59 Hz	0x0037
14	Delay to confirm fault with Utility frequency : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = no frequency protection function)	0x000A
15	Generator over voltage protection : 110 – 530	R / W	U16	Range : 110 – 530 V **(Different model will vary, please refer to manual)**	0x00FA
16	Generator under voltage protection : 80 – 470	R / W	U16	Range : 80 – 470 V **(Different model will vary, please refer to manual)**	0x00B4

BTB-ATS-STANDARD					
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**					
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
17	Delay to confirm fault with Generator voltage : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No voltage protection function)	0x000A
18	Generator over frequency protection : 51 – 75	R / W	U16	Range : 51 – 75 Hz	0x0041
19	Generator under frequency protection : 40 – 59	R / W	U16	Range : 40 – 59 Hz	0x0037
20	Delay to confirm fault with Generator frequency : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No frequency protection function)	0x000A
21	Set current time : Year & Month <table><tr><td>MSB</td><td>LSB</td></tr><tr><td>Year : 18 – 99</td><td>Month : 1 – 12</td></tr></table>	R / W	U16	Example : value = 0x1201 (1) MSB = 0x12 = 18(Decima) 2000 + 18 = 2018 Year (2) LSB = 0x01 = 1(Decima) 1 Month	0x1201
22	Set current time : Day & Week <table><tr><td>MSB</td><td>LSB</td></tr><tr><td>Day of Month : 1 – 31</td><td>Day of Week : 1 – 7 (MON – SUN)</td></tr></table>	R / W	U16	Example : value = 0x0E07 (1) MSB = 0x0E = 14(Decima) 14 Day (2) LSB = 0x07 = 7(Decima) SUNDAY	0x0101
23	Set current time : Hour & Minute <table><tr><td>MSB</td><td>LSB</td></tr><tr><td>Hour : 0 – 23 (24 hour system)</td><td>Minute : 0 – 59</td></tr></table>	R / W	U16	Example : value = 0x0C00 (1) MSB = 0x0C = 12(Decimal) 12 Hour (2) LSB = 0x00 = 0(Decimal) 0 Minute	0x0C00
24	Set automatic exercise time (Day of Week) : 1 – 7	R / W	U16	Range : 0x0001 – 0x0007 MON – SUN	0x0006
25	Set automatic exercise time (Hour) : 0 – 23 (24 hour system)	R / W	U16	Range : 0 – 23 hours	0x000C
26	Generator exercise time interval : 1 – 4	R / W	U16	0x0001 = 1 week 0x0002 = 2 weeks 0x0003 = 3 weeks 0x0004 = 4 weeks	0x0001
27	Duration of exercise : 0 – 99	R / W	U16	Range : 0 – 99 minutes (0 = Exercise function disabled)	0x0000
28	Exercise test with load or without load?	R / W	U16	0x0000 = Without Load 0x0001 = With Load	0x0000
29	Manual test with load or without load?	R / W	U16	0x0000 = Without Load 0x0001 = With Load	0x0001
30	Gauge display	R / W	U16	0x0000 = Voltage meter 0x0001 = Frequency meter	0x0000
31	Restore factory settings?	R / W	U16	0x0000 = No 0x0001 = Yes	0x0000

BTB-ATS-STANDARD					
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**					
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
32	Remote control by KCU-XX Module	R	U16	0x0000 = No 0x0001 = Yes	0x0000
33	KCU-05 or KCU-07 Module address : 0 – 99	R	U16	Range: 0x0000 – 0x0063 (0 = Disable KCU Module)	0x0000
34	KCU-05 module parity check : 0 – 3	R	U16	0x0000 = N81 0x0001 = N82 0x0002 = E81 0x0003 = O81	0x0000
35	KCU-05 Module baud rate : 0 – 7	R	U16	0x0000 = 2400 0x0001 = 4800 0x0002 = 9600 0x0003 = 14400 0x0004 = 19200 0x0005 = 38400 0x0006 = 57600 0x0007 = 115200	0x0005
36	Back Light Brightness Setting : 1 – 10	R / W	U16	Range: 0x0001 – 0x000A (Lowest Brightness – Maximum Brightness)	0x0005

APPENDIX 02

Modbus Address (Decimal)	Data Point	Note
	**BTB-ATS-24AG / BTB-ATS-24AG (DC Version)**	
	**Reading Digital Input (DI) Data: Function Code 02**	
0	Remote Operation	1：Remote app operation granted
1	ATS panel function button：AUTO	1：Panel function button in AUTO mode
2	ATS panel function button：OFF	1：Panel function button in OFF mode
3	ATS panel function button：TEST	1：Panel function button in TEST mode
4	Safety lock status	1：LOCK (All operation mode selection disabled)
5	Power supply status when connect to load	1：Electricity supplied
Utility (Grid)		
6	Utility Power Status	1：Switch closed
7	Over Voltage	1：Over Voltage Warning
8	Under Voltage	1：Under Voltage Warning
9	Over Frequency	1：Over Frequency Warning
10	Under Frequency	1：Under Frequency Warning
11	Transfer Failure	1：Transfer Failure Warning
12	Tripped	1：Tripped Warning
13	Fail to switch to OFF position (NFPA only)	0
Emergency (Generator)		
14	Generator Power Status	1：Switch closed
15	Over Voltage	1：Over Voltage Warning
16	Under Voltage	1：Under Voltage Warning
17	Over Frequency	1：Over Frequency Warning
18	Under Frequency	1：Under Frequency Warning
19	Transfer Failure	1：Transfer Failure Warning
20	Tripped	1：Tripped Warning
21	Fail to switch to OFF position (NFPA only)	0
22	Is CTM-25 moduel installed?	1：CTM-25 module installed
23	Switch to OFF position (NFPA only)	0
24	TDEN Countdown Status	1：TDEN Executing Countdown
25	TDNE Countdown Status	1：TDNE Executing Countdown
26	TDES Countdown Status	1：TDES Executing Countdown
27	TDEC Countdown Status	1：TDEC Executing Countdown

※ A ATS switch with center off is called a NFPA

BTB-ATS-24AG / BTB-ATS-24AG (DC Version)			
Read Digital Output (DO) Data: Function Code 01 **Write Digital Output (DO) Data: Function Code 05**			
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Note**
0	ATS Remote Start Signal	R	1 : ON
1	ATS Operation Mode : AUTO	R / W	1 : ATS In AUTO Mode
2	ATS Operation Mode : OFF	R / W	1 : ATS In OFF Mode
3	ATS Operation Mode : TEST	R / W	1 : ATS In TEST Mode

BTB-ATS-24AG / BTB-ATS-24AG (DC Version)				
Read Digital Input (AI) Data: Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
Utility (Grid)				
0	V_{12} Phase Voltage	U16	0.1 Volt	Example : (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal) V_{12} = 2203 / 10 = 220.3 Volt (2) Frequency Value = 0x0257(Hex) = 599(Decimal) Frequency = 599 / 10 = 59.9 Hz **Note** : **The system fixed to \<Single Phase\>, Ignore Reading from V_{23} and V_{31}**
1	V_{23} Phase Voltage	U16	0.1 Volt	
2	V_{31} Phase Voltage	U16	0.1 Volt	
3	Frequency	U16	0.1 Hz	
Emergency (Generator)				
4	V_{12} Phase Voltage	U16	0.1 Volt	Example : (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal) V_{12} = 2203 / 10 = 220.3 Volt (2) Frequency Value = 0x0257(Hex) = 599(Decimal) Frequency = 599 / 10 = 59.9 Hz **Note** : **The system fixed to \<Single Phase\>, Ignore Reading from V_{23} and V_{31}**
5	V_{23} Phase Voltage	U16	0.1 Volt	
6	V_{31} Phase Voltage	U16	0.1 Volt	
7	Frequency	U16	0.1 Hz	
Load Current **(Requires installation of CTM-25 module. Ignore the current reading if module not installed)**				
8	L1 Current	U16	0.1 A	Example : L1 Value = 0x086D(Hex) = 2157(Decimal) L1 = 2157 / 10 = 215.7 Amp **Note** : **The system fixed to \<Single Phase\>, Ignore Reading from L2 and L3**
9	L2 Current	U16	0.1 A	
10	L3 Current	U16	0.1 A	

Modbus Address (Decimal)	Data Point	Read / Write	Data Type	Note	Fty Preset
	BTB-ATS-24AG / BTB-ATS-24AG (DC Version)				
	Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**				
0	ATS Operation Mode	R / W	U16	0x0001 = AUTO Mode 0x0002 = OFF Mode 0x0004 = TEST Mode	0x0002
1	Language / Idioma	R	U16	0x0001 = English 0x0002 = Español	0x0001
2	Phase Setting : 0	R	U16	Fixed : 0x0000 (Single Phase)	0x0000
3	Reserved	R	U16	Ignore	0x0000
4	TDEN Time Delay Emergency to Normal : 0 – 999	R / W	U16	Range : 0 – 999 sec	0x000A
5	TDNE Time Delay Normal to Emergency : 0 – 250	R / W	U16	Range : 0 – 250 sec	0x000A
6	TDES Time Delay Engine Start : 0 – 15	R / W	U16	Range : 0 – 15 sec	0x0005
7	TDEC Time Delay Engine Cool-down : 0 – 999	R / W	U16	Range : 0 – 999 sec	0x0000
8	TDOF Time Delay in the OFF Position : 0 – 25	R / W	U16	Range : 0 – 25 sec	0x0002
9	Utility side over voltage protection : 210 – 300	R / W	U16	Range : 210 – 300 V	0x010E
10	Utility under voltage protection : 160 – 240	R / W	U16	Range : 160 – 240 V	0x00B4
11	Delay to confirm fault with Utility voltage : 10	R	U16	Fixed : 10 sec	0x000A
12	Utility over frequency protection : 65	R	U16	Fixed : 65 Hz	0x0041
13	Utility under frequency protection : 45	R	U16	Fixed : 45 Hz	0x002D
14	Delay to confirm fault with Utility frequency : 10	R	U16	Fixed : 10 sec	0x000A
15	Generator over voltage protection : 210 – 300	R / W	U16	Range : 210 – 300 V	0x010E
16	Generator under voltage protection : 160 – 240	R / W	U16	Range : 160 – 240 V	0x00B4
17	Delay to confirm fault with Generator voltage : 10	R	U16	Fixed : 10 sec	0x000A
18	Generator over frequency protection : 65	R	U16	Fixed : 65 Hz	0x0041
19	Generator under frequency protection : 45	R	U16	Fixed : 45 Hz	0x002D
20	Delay to confirm fault with Generator frequenc : 10	R	U16	Fixed : 10 sec	0x000A

BTB-ATS-24AG / BTB-ATS-24AG (DC Version)						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Data Point**		**Read / Write**	**Data Type**	**Note**	**Fty Preset**
21	Set current time : Year & Month		R / W	U16	Example : value = 0x1201 (1) MSB = 0x12 = 18(Decima) 2000 + 18 = 2018 Year (2) LSB = 0x01 = 1(Decima) 1 Month	0x1201
	MSB	LSB				
	Year : 18 – 99	Month : 1 – 12				
22	Set current time : Day & Week		R / W	U16	Example : value = 0x0E07 (1) MSB = 0x0E = 14(Decima) 14 Day (2) LSB = 0x07 = 7(Decima) SUNDAY	0x0101
	MSB	LSB				
	Day of Month : 1 – 31	Day of Week : 1 – 7 (MON – SUN)				
23	Set current time : Hour & Minute		R / W	U16	Example : value = 0x0C00 (1) MSB = 0x0C = 12(Decimal) 12 Hour (2) LSB = 0x00 = 0(Decimal) 0 Minute	0x0C00
	MSB	LSB				
	Hour : 0 – 23 (24 hour system)	Minute : 0 – 59				
24	Set automatic exercise time (Day of Week) : 1 – 7		R / W	U16	Range : 0x0001 – 0x0007 MON – SUN	0x0006
25	Set automatic exercise time (Hour) : 0 – 23 (24 hour system)		R / W	U16	Range : 0 – 23 hours	0x000C
26	Generator exercise time interval : 1		R	U16	Fixed : 0x0001 (1 week)	0x0001
27	Duration of exercise : 0 – 99		R / W	U16	Range : 0 – 99 minutes (0 = Exercise function disabled)	0x0000
28	Exercise test with load or without load?		R / W	U16	0x0000 = Without Load 0x0001 = With Load	0x0000
29	Manual test with load or without load?		R	U16	Fixed : 0x0001 (With Load)	0x0001
30	Gauge display		R / W	U16	0x0000 = Voltage meter 0x0001 = Frequency meter	0x0000
31	Restore factory settings?		R / W	U16	0x0000 = No 0x0001 = Yes	0x0000
32	Remote control by KCU-XX Module		R	U16	Fixed : 0x0001 (Yes)	0x0000
33	KCU-05 or KCU-07 Module address : 1		R	U16	Fixed : 0x0001	0x0001
34	KCU-05 module parity check : 0		R	U16	Fixed : 0x0000 (N81)	0x0000
35	KCU-05 Module baud rate : 5		R	U16	Fixed : 0x0005 (38400)	0x0005
36	Back Light Brightness Setting : 10		R	U16	Fixed : 0x000A (Maximum Brightness)	0x000A

APPENDIX 03

	BTB-ATS-NFPA	
	Reading Digital Input (DI) Data: Function Code 02	
Modbus Address (Decimal)	**Data Point**	**Note**
0	Remote Operation	1：Remote app operation granted
1	ATS panel function button：AUTO	1：Panel function button in AUTO mode
2	ATS panel function button：OFF	1：Panel function button in OFF mode
3	ATS panel function button：TEST	1：Panel function button in TEST mode
4	Safety lock status	1：LOCK (All operation mode selection disabled)
5	Power supply status when connect to load	1：Electricity supplied
Utility (Grid)		
6	Utility Power Status	1：Switch closed
7	Over Voltage	1：Over Voltage Warning
8	Under Voltage	1：Under Voltage Warning
9	Over Frequency	1：Over Frequency Warning
10	Under Frequency	1：Under Frequency Warning
11	Transfer Failure	1：Transfer Failure Warning
12	Tripped	1：Tripped Warning
13	Fail to switch to OFF position	1：Fail to switch to OFF position Warning
Emergency (Generator)		
14	Generator Power Status	1：Switch closed
15	Over Voltage	1：Over Voltage Warning
16	Under Voltage	1：Under Voltage Warning
17	Over Frequency	1：Over Frequency Warning
18	Under Frequency	1：Under Frequency Warning
19	Transfer Failure	1：Transfer Failure Warning
20	Tripped	1：Tripped Warning
21	Fail to switch to OFF position	1：Fail to switch to OFF position Warning
22	Is CTM-25 moduel installed?	1：CTM-25 module installed
23	Switch to OFF position	1：Switch to OFF position
24	TDEN Countdown Status	1：TDEN Executing Countdown
25	TDNE Countdown Status	1：TDNE Executing Countdown
26	TDES Countdown Status	1：TDES Executing Countdown
27	TDEC Countdown Status	1：TDEC Executing Countdown
28	TDOF Countdown Status	1：TDOD Executing Countdown

※ A ATS switch with center off is called a NFPA

BTB-ATS-NFPA			
Read Digital Output (DO) Data: Function Code 01			
Write Digital Output (DO) Data: Function Code 05			
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Note**
0	ATS Remote Start Signal	R	1 : ON
1	ATS Operation Mode : AUTO	R / W	1 : ATS In AUTO Mode
2	ATS Operation Mode : OFF	R / W	1 : ATS In OFF Mode
3	ATS Operation Mode : TEST	R / W	1 : ATS In TEST Mode

BTB-ATS-NFPA				
Read Anlog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
Utility (Grid)				

0	V_{12} Phase Voltage	U16	0.1 Volt	Example :
				 (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal)
				   V_{12} = 2203 / 10 = 220.3 Volt
				 (2) Frequency Value = 0x0257(Hex) = 599(Decimal)
				   Frequency = 599 / 10 = 59.9 Hz
				
				 Note :
				 If system is \<Single Phase\>, Ignore Reading from V_{23} and V_{31}

1	V_{23} Phase Voltage	U16	0.1 Volt	
2	V_{31} Phase Voltage	U16	0.1 Volt	
3	Frequency	U16	0.1 Hz	
Emergency (Generator)				

4	V_{12} Phase Voltage	U16	0.1 Volt	Example :
				 (1) V_{12} Value = 0x089B(Hex) = 2203(Decimal)
				   V_{12} = 2203 / 10 = 220.3 Volt
				 (2) Frequency Value = 0x0257(Hex) = 599(Decimal)
				   Frequency = 599 / 10 = 59.9 Hz
				
				 Note :
				 If system is \<Single Phase\>, Ignore Reading from V_{23} and V_{31}

5	V_{23} Phase Voltage	U16	0.1 Volt	
6	V_{31} Phase Voltage	U16	0.1 Volt	
7	Frequency	U16	0.1 Hz	
Load Current **(Requires installation of CTM-25 module. Ignore the current reading if module not installed)**				
8	L1 Current	U16	0.1 A	Example : L1 Value = 0x086D(Hex) = 2157(Decimal) L1 = 2157 / 10 = 215.7 Amp **Note :** **If system is \<Single Phase\>, Ignore Reading from L2 and L3**
9	L2 Current	U16	0.1 A	
10	L3 Current	U16	0.1 A	

BTB-ATS-NFPA					
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**					
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
0	ATS Operation Mode	R / W	U16	0x0001 = AUTO Mode 0x0002 = OFF Mode 0x0004 = TEST Mode	0x0002
1	Language / Idioma	R	U16	0x0001 = English 0x0002 = Español	0x0001
2	System Phase	R / W	U16	0x0000 = Single Phase 0x0001 = Three Phase	0x0001
3	Reserved	R	U16	Ignore	0x0000
4	TDEN Time Delay Emergency to Normal : 0 – 999	R / W	U16	Range : 0 – 999 sec	0x000A
5	TDNE Time Delay Normal to Emergency : 0 – 250	R / W	U16	Range : 0 – 250 sec	0x000A
6	TDES Time Delay Engine Start : 0 – 15	R / W	U16	Range : 0 – 15 sec	0x0005
7	TDEC Time Delay Engine Cool-down : 0 – 250	R / W	U16	Range : 0 – 250 sec	0x001E
8	TDOF Time Delay in the OFF Position : 0 – 99	R / W	U16	Range : 0 – 99 sec	0x0005
9	Utility side over voltage protection : 110 – 530	R / W	U16	Range : 110 – 530 V	0x00FA
10	Utility under voltage protection : 80 – 470	R / W	U16	Range : 80 – 470 V	0x00B4
11	Delay to confirm fault with Utility voltage : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No voltage protection function)	0x000A
12	Utility over frequency protection : 51 – 75	R / W	U16	Range : 51 – 75 Hz	0x0041
13	Utility under frequency protection : 40 – 59	R / W	U16	Range : 40 – 59 Hz	0x0037
14	Delay to confirm fault with Utility frequency : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = no frequency protection function)	0x000A
15	Generator over voltage protection : 110 – 530	R / W	U16	Range : 110 – 530 V	0x00FA
16	Generator under voltage protection : 80 – 470	R / W	U16	Range : 80 – 470 V	0x00B4
17	Delay to confirm fault with Generator voltage : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No voltage protection function)	0x000A
18	Generator over frequency protection : 51 – 75	R / W	U16	Range : 51 – 75 Hz	0x0041

BTB-ATS-NFPA					
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**					
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
19	Generator under frequency protection : 40 – 59	R / W	U16	Range : 40 – 59 Hz	0x0037
20	Delay to confirm fault with Generator frequency : 0 – 99	R / W	U16	Range : 0 – 99 sec (0 = No frequency protection function)	0x000A
21	Set current time : Year & Month MSB: Year : 18 – 99 / LSB: Month : 1 – 12	R / W	U16	Example : value = 0x1201 (1) MSB = 0x12 = 18(Decima) 2000 + 18 = 2018 Year (2) LSB = 0x01 = 1(Decima) 1 Month	0x1201
22	Set current time : Day & Week MSB: Day of Month : 1 – 31 / LSB: Day of Week : 1 – 7 (MON – SUN)	R / W	U16	Example : value = 0x0E07 (1) MSB = 0x0E = 14(Decima) 14 Day (2) LSB = 0x07 = 7(Decima) SUNDAY	0x0101
23	Set current time : Hour & Minute MSB: Hour : 0 – 23 (24 hour system) / LSB: Minute : 0 – 59	R / W	U16	Example : value = 0x0C00 (1) MSB = 0x0C = 12(Decimal) 12 Hour (2) LSB = 0x00 = 0(Decimal) 0 Minute	0x0C00
24	Set automatic exercise time (Day of Week) : 1 – 7	R / W	U16	Range : 0x0001 – 0x0007 MON – SUN	0x0006
25	Set automatic exercise time (Hour) : 0 – 23 (24 hour system)	R / W	U16	Range : 0 – 23 hours	0x000C
26	Generator exercise time interval : 1 – 4	R / W	U16	0x0001 = 1 week 0x0002 = 2 weeks 0x0003 = 3 weeks 0x0004 = 4 weeks	0x0001
27	Duration of exercise : 0 – 99	R / W	U16	Range : 0 – 99 minutes (0 = Exercise function disabled)	0x0000
28	Exercise test with load or without load?	R / W	U16	0x0000 = Without Load 0x0001 = With Load	0x0000
29	Manual test with load or without load?	R / W	U16	0x0000 = Without Load 0x0001 = With Load	0x0001
30	Gauge display	R / W	U16	0x0000 = Voltage meter 0x0001 = Frequency meter	0x0000
31	Restore factory settings?	R / W	U16	0x0000 = No 0x0001 = Yes	0x0000

	BTB-ATS-NFPA				
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**					
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
32	Remote control by KCU-XX Module	R	U16	0x0000 = No 0x0001 = Yes	0x0000
33	KCU-05 or KCU-07 Module address : 0 – 99	R	U16	Range: 0x0000 – 0x0063 (0 = Disable KCU Module)	0x0000
34	KCU-05 module parity check : 0 – 3	R	U16	0x0000 = N81 0x0001 = N82 0x0002 = E81 0x0003 = O81	0x0000
35	KCU-05 Module baud rate : 0 – 7	R	U16	0x0000 = 2400 0x0001 = 4800 0x0002 = 9600 0x0003 = 14400 0x0004 = 19200 0x0005 = 38400 0x0006 = 57600 0x0007 = 115200	0x0005
36	Back Light Brightness Setting : 1 – 10	R / W	U16	Range: 0x0001 – 0x000A (Lowest Brightness – Maximum Brightness)	0x0005

APPENDIX 04

	GC4K	
	Read Digital Input (DI) Data: Function Code 02	
Modbus Address (Decimal)	**Data Point**	**Note**
0	GC4K Mode Selector : REMOTE	1 : Set Mode Selector to "Remote" mode to allow remote operation via" GenOnCall®" APP from mobile device
1	GC4K Mode Selector : AUTO	1 : Set Mode Selector to "AUTO" mode
2	GC4K Mode Selector : OFF	1 : Set Mode Selector to "OFF" mode
3	GC4K Mode Selector : MANU	1 : Set Mode Selector to "MANU" mode (Manual)
4	Remote Start Signal	1 : Remote Start Signal ON
5	Owner Switch Status	1 : Owner Switch Activate
6	Over Voltage Shutdown	1 : Over Voltage Shutdown
7	Under Voltage Shutdown	1 : Under Voltage Shutdown
8	Current Overload Shutdown	1 : Over Current Shutdown
9	Over Speed (Frequency)Shutdown	1 : Over Speed Shutdown
10	Under Speed (Frequency) Shutdown	1 : Under Speed Shutdown
11	Over Frequency Shutdown (MPU)	1 : Over Frequency Shutdown (MPU)
12	Under Frequency Shutdown (MPU)	1 : Under Frequency Shutdown (MPU)
13	MPU Failure Shutdown	1 : MPU Failure Shutdown
14	Over Temperature Shutdown	1 : Over Temperature Shutdown
15	Temperature Sender Failure Shutdown	1 : Temperature Sender Failure Shutdown
16	Low Oil Pressure Shutdown	1 : Low Oil Pressure Shutdown
17	Oil Pressure Failure Shutdown	1 : Oil Pressure Failure Shutdown
18	Low Fuel Switch Shutdown (Fuel Level Switch)	1 : Low Fuel Switch Shutdown (Fuel Level Switch)
19	Low Fuel Level Shutdown (Fuel Level Sender)	1 : Low Fuel Level Shutdown (Fuel Level Sender)
20	Reserved	0
21	Fuel Level Sender Failure Shutdown	1 : Fuel Lever Sender Failure Shutdown
22	Reserved	0
23	User Defined Input-A Execute Shutdown	1 : User Defined Input-A Execute Shutdown
24	User Defined Input-B Execute Shutdown	1 : User Defined Input-B Execute Shutdown
25	Charge Alternator Failure Shutdown	1 : Charge Alternator Failure Shutdown
26	Over Cranking Shutdown	1 : Over Cranking Shutdown
27	Emergency Stop	1 : Emergency Stop
28	System Failure Shutdown	1 : System Failure Shutdown
29	Over Voltage Warning	1 : Over Voltage Warning
30	Under Voltage Warning	1 : Under Voltage Warning

	GC4K	
	Read Digital Input (DI) Data : Function Code 02	
Modbus Address (Decimal)	**Data Point**	**Note**
31	Current Overload Warning	1 : Current Overload Warning
32	Over Speed (Frequency) Warning	1 : Over Speed (Frequency) Warning
33	Under Speed (Frequency) Warning	1 : Under Speed (Frequency) Warning
34	Overs Frequency Warning (MPU)	1 : Overs Frequency Warning (MPU)
35	Under Frequency Warning (MPU)	1 : Under Frequency Warning (MPU)
36	MPU Failure Warning	1 : MPU Failure Warning
37	Over Temperature Warning	1 : Over Temperature Warning
38	Temperature Sender Failure Warning	1 : Temperature Sender Failure Warning
39	Low Oil Pressure Shutdown	1 : Low Oil Pressure Shutdown
40	Oil Pressure Failure Warning	1 : Oil Pressure Failure Warning
41	Low Fuel Switch Warning (Fuel Level Switch)	1 : Low Fuel Switch Warning (Fuel Level Switch)
42	Low Fuel Level Warning (Fuel Level Sender)	1 : Low Fuel Level Warning (Fuel Level Sender)
43	Reserved	0
44	Fuel Level Sender Failure Warning	1 : Fuel Level Sender Failure Warning
45	Reserved	0
46	User Defined Input-A Execute Warning	1 : User Defined Input-A Execute Warning
47	User Defined Input-B Execute Warning	1 : User Defined Input-B Execute Warning
48	Charge Alternator Failure Shutdown	1 : Charge Alternator Failure Warning
49	Battery Under Voltage Warning	1 : Battery Under Voltage Warning
50	Battery Over Voltage Warning	1 : Battery Over Voltage Warning
51	Service Maintenance Reminder	1 : Service Maintenance Reminder
52	Audio Playback Initialization Failure Warning	1 : Audio Playback Initialization Failure Warning
53	Reserved	0
54	Engine Prestart Voice Playback	1 : Engine Prestart Voice Playback
55	Voice Playback Status	1 : Engine Prestart Voice playback or Voice Alarm Playback
56	Engine Start Interval Timer Status	1 : Engine Start Interval Timer Countdown
57	Engine Start Timer Status	1 : Engine Start Timer Countdown
58	Engine Stop Timer Status	1 : Engine Stop Timer Countdown
59	Engine Failure Shutdown Timer Status	1 : Engine Failure Shutdown Timer Countdown
60	Engine Ideling Timer Status	1 : Engine Ideling Timer Countdown
61	Engine Cool Down Timer Status	1 : Engine Cool Down Timer Countdown

GC4K			
Reading Digital Output (DO) Data : Function Code 01 **Write Digital Output (DO) Data : Function Code 05**			
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Note**
0	ATS Simulate Normal Power Failure	R / W	1 : Normal Power Failure 0 : Normal Power Available ※ **Option Selected** ☑ **in System Function Setting** (**Refer to GC4K user manual**)
1	GC4K Operation Mode : AUTO	R / W	1 : GC4K in AUTO Mode
2	GC4K Operation Mode : OFF	R / W	1 : GC4K in OFF Mode
3	GC4K Operation Mode : MANU	R / W	1 : GC4K in MANU Mode
4	Block Heater Status	R	1 : Block Heater ON

GC4K				
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
0	Generator V_{12} Voltage	U32	0.1 V	Example： (1) V_{12} Value = 0x0000089B(Hex) = 2203(Decimal) V_{12} = 2203 / 10 = 220.3 Volt (2) Frequency Value = 0x0257(Hex) = 599(Decimal) Frequency = 599 / 10 = 59.9 Hz **Note：** **(1) If system is <Single Phase>, ignore V_{23} & V_{31} Value ; and V_{1N}，V_{2N} and V_{3N} Value。** **(2) In 3 Phase system <3 Phase 3 Wire>, ignore V_{1N}，V_{2N} and V_{3N} Value.**
2	Generator V_{23} Voltage	U32	0.1 V	
4	Generator V_{31} Voltage	U32	0.1 V	
6	Generator V_{1N} Voltage	U32	0.1 V	
8	Generator V_{2N} Voltage	U32	0.1 V	
10	Generator V_{3N} Voltage	U32	0.1 V	
12	Generator Frequency	U16	0.1 Hz	
13	Load L1 Current	U16	0.1 A	Example： L1 Value = 0x086D(Hex) = 2157(Decimal) L1 = 2157 / 10 = 215.7 Amp **Note：** **If system is <Single Phase>, ignore L2 & L3.**
14	Load L2 Current	U16	0.1 A	
15	Load L3 Current	U16	0.1 A	
16	Battery Voltage	U16	0.1 V	Example： Value = 0x0078(Hex) = 120(Decimal) Battery Voltage = 120 / 10 = 12.0 Volt
17	Fuel Level (%)	U16	0.1 %	Example： (1) Value = 0x0389(Hex) = 905(Decimal) Remaining Fuel = 905 / 10 = 90.5 % (2) Value = 0xFFFF(Hex)：No Fuel Level Sender Installed (3) Value = 0xAAAA(Hex)：Fuel Level Sender Failure or incorrect value
18	Oil Pressure	U16	0.1 Psi	Example： (1) Value = 0x0325(Hex) = 805(Decimal) Oil Pressure = 805 / 10 = 80.5 Psi (2) Value = 0xFFFF(Hex)：No Oil Pressure Sender Installed (3) Value = 0xAAAA(Hex)：Oil Pressure Sender Failure or incorrect value

GC4K				
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**

19	Engine Temperature	U16	0.1 ˚C	Example :
				(1) Value = 0x0141(Hex) = 321(Decimal)
				    Temperature = 321 / 10 = 32.1 ˚C
				(2) Value = 0x8141(Hex) & 0x07FF = 321(Decimal)
				    Temperature = -321 / 10 = -32.1 ˚C (**Bit15 = "1" : Negative Value**)
				(3) Value = 0xFFFF(Hex) : No Temperature Sender
				(4) Value = 0xAAAA(Hex) : Temperature Sender Failure or incorrect value

20	MPU Frequency	U16	1 Hz	Effective Range : 100 – 10K Hz Example : Value = 0x0F78(Hex) = 3960(Decimal) MPU Reading = 3960 Hz

21	Voltage / Current Phase Relevance	U16	1	**Bit Definition**
				Bit 0(L1 Current) : "1" = Leading Current
				                            "0" = LaggingCurrent
				Bit 1(L2 Current) : "1" = Leading Current
				                            "0" = LaggingCurrent
				Bit 2(L3 Current) : "1" = Leading Current
				                            "0" = Lagging Current
				Bit 3(L1+L2+L3 Current) : "1" = Leading Current
				                                        "0" = Lagging Current
				Bit 7(3 Phase voltage) :
				      "1" = 3 Phase voltage connection correct
				      "0" = 3 Phase voltage connection Incorrect
				(Do not refer to other undefined bits)
				
				Example :
				Value = 0x0001(Hex) = 1(Decimal)
				L1 Phase current leading phase voltage

22	Generator Power V$_{12}$ (PFA)	U16	0.01	Power Factor A : Fixed with 2 decimal places
				
				Example :
				(1) Value = 0x0062(Hex) = 98(Decimal)
				    PFA = 0.98
				(2) Value = 0x8062(Hex) & 0x7FFF= 98(Decimal)
				    PFA = -98 / 100 (**Bit15 = "1" : Negative Value**)
				        = -0.98 (Phase Current lagging Phase Voltage)

23	Generator Power V$_{23}$ (PFB)	U16	0.01	Power Factor B (Refer to PFA)
24	Generator Power V$_{31}$ (PFC)	U16	0.01	Power Factor C (Refer to PFA)

				GC4K
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
25	Generator Total Power Factor	U16	0.01	Power Factor : Fixed with 2 decimal places Example : Value = 0x0064(Hex) = 100(Decimal) PF = 1.00
26	Generator V_{12} Active Power	U32	1 Watt	Active Power A(WATT_A) : Watt Example : Value = 0x00000064(Hex) = 100(Decimal) WATT_A = 100 Watts
28	Generator V_{23} Active Power	U32	1 Watt	WATT_B (Refer to WATT_A)
30	Generator V_{31} Active Power	U32	1 Watt	WATT_C (Refer to WATT_A)
32	Generator Total Active Power	U32	1 Watt	Active Power (WATT) : Watt Example : Value = 0x0000012C(Hex) = 300(Decimal) Total Active Power = 300 Watts
34	Generator V_{12} Reactive Power	U32	1 VAR	Reactive Power A(VAR_A) : VAR Example : Value = 0x0000000A(Hex) = 10(Decimal) VAR_A = 10 VAR
36	Generator V_{23} Reactive Power	U32	1 VAR	VAR_B (Refer to VAR_A)
38	Generator V_{31} Reactive Power	U32	1 VAR	VAR_C (Refer to VAR_A)
40	Generator Total Reactive Power	U32	1 VAR	Reactive Power (VAR) : VAR Example : Value = 0x0000000C(Hex) = 12(Decimal) VAR = 12 VAR
42	Generator V_{12} Apparent Power	U32	1 VA	Apparent Power A(VA_A) : VA Example : Value = 0x00000064(Hex) = 100(Decimal) VA_A = 100 VA
44	Generator V_{23} Apparent Power	U32	1 VA	VA_B (Refer to VA_A)
46	Generator V_{31} Apparent Power	U32	1 VA	VA_C (Refer to VA_A)
48	Service Maintenance timer countdown : 0 – 59940	U16	1 Minutes	Service Maintenance timer coundown : 0 – 59940 minutes Example : Value = 0x1770(Hex) = 6000(Decimal) Time = 6000 minutes = 100 hours

GC4K				
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
49	Engine Running Time : 0x00000000 – 0xFFFFFFFF	U32	1 Minutes	Engine Running Time : Unit: Minutes Example : Value = 0x00006000(Hex) = 24576(Decimal) Running time = 24576 minutes = 409 hours 36 minutes
51	Kilo Watt per Hour	U32	0.1 KWH	KWH (kilowatt-hour) : Fixed with 1 decimal places Example : Value = 0x000004D2(Hex) = 1234(Decimal) = 123.4 KWH
53	Engine Revolution per Minute (rpm) : 0 – 5000	U16	1 rpm	rpm = (MPUFrequency Reading / Flywheel Tooth) * 60 When <Flywheel tooth> value = 0，rpm = 0

		GC4K				
		Read Holding Register Data : Function Code 03				
		Write Holding Register Data : Function Code 06 or 16				
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
0		GC4K Operation Mode：1 – 3	R / W	U16	0x0001 = AUTO Mode 0x0002 = OFF Mode 0x0003 = MANU Mode	0x0002
1		System Phase：0 – 2	R / W	U16	0x0000 = 3 Phase 4 Wire 0x0001 = 3 Phase 2 Wire 0x0002 = Single Phase 2 Wire	0x0000
2		Nominal Voltage (Phase to Phase) Effective Range (Primary)：100 – 35,000	R / W	U16	Voltage Input：100V – 35KV ※ **If Instrument Transformer not inplemented, the value must be identical with address [3]**	0x00DC
3		Nominal Voltage (Phase to Phase) Effective Range (PT Secondary)	R / W	U16	Voltage Input：100 – 500 V ※ **If Instrument Transformer not inplemented, the value must be identical with address [2]**	0x00DC
	0 | 14	100 – 500				
	15	1 = with Instrument Transformer (PT)				
4		Over Voltage Warning Protection Setting	R / W	U16	Nominal Voltage % Setting：101 – 120 % Example： Value = 0x806E(Hex)　(**Bit15 = "1"：Protection Enabled**) % = 0x006E(Hex) = 110(Decimal) Nominal Voltage = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 110% = 242V	0x806E
	0 | 14	101 – 120				
	15	1 = Protection Enabled				
5		Over Voltage Shutdown Protection Setting	R / W	U16	Nominal Voltage % Setting：101 – 120 % Example： Value = 0x806E(Hex)　(**Bit15 = "1"：Protection Enabled**) % = 0x0073(Hex) = 115(Decimal) Nominal Voltage = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 115% = 253V	0x8073
	0 | 14	101 – 120				
	15	1 = Protection Enabled				
6		Over Voltage permitted delay setting：1 – 99 sec	R / W	U16	Timer Setting：1 – 99 sec	0x000F

GC4K						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
7	0 | 14	Under Voltage Warning Protection Setting 80 – 99	R / W	U16	Nominal Voltage % Setting : 80 – 90 % Example : Value = 0x805A(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x005A(Hex) = 90(Decimal) Nominal Voltage = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 90% = 198V	0x805A
	15	1 = Protection Enabled				
8	0 | 14	Under Voltage Shutdown Protection Setting 80 – 99	R / W	U16	Nominal Voltage % Setting : 80 – 99 % Example : Value = 0x8055(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0055(Hex) = 85(Decimal) Nominal = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 85% = 187V	0x8055
	15	1 = Protection Enabled				
9		Under Voltage Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
10		Current Transformer (CT) Setting (Primary) 0 = Not in Use or select from 25, 50, 60, 75, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1600, 2000, 2500, 3000	R / W	U16	Current Transformer (CT) Setting : Current (A) Unit Example : Value = 0x01F4(Hex) = 500(Decimal) Factory Preset : CT @ 500A : 5A	0x01F4
11		Current Transformer (CT) Setting (Secondary) 1 = 1A 5 = 5A	R / W	U16	Current Transformer (CT) Setting : Current (A) Unit Example : Value = 0x0005(Hex) = 5(Decimal) Factory Preset : CT @ 500A : 5A	0x0005
12	0 | 14	Genset Running Reminder 1 – 10	R / W	U16	Genset Running Reminder Setting : 1 – 10 Hour Example : Value = 0x8001(Hex) (**Bit15 = "1" : Reminder Enabled**) Reminder Time = 0x0001(Hex) = 1 Hour	0x0001
	15	Reminder Enabled				

GC4K						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
13	0 | 14	Over Current Warning Protection Setting 50 – 100	R / W	U16	Current Transformer (CT) Rated Current % Setting : 50 – 100 % Example : Value = 0x8046(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0046(Hex) = 70(Decimal) Factory Preset : CT @ 500A : 5A Over Current Protection = 500A * 70% = 350A	0x8046
	15	1 = Over Current Warning Protection Enabled				
14	0 | 14	Over Current Shutdown Protection Setting 50 – 100	R / W	U16	Current Transformer (CT) Rated Current % Setting : 50 – 100 % Example : Value = 0x8050(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0050(Hex) = 80(Decimal) Factory Preset : CT @ 500A : 5A Over Current Protection = 500A * 80% = 400A	0x0050
	15	1 = Over Current Shutdown Protection Enabled				
15		Over Current Permitted Delay Setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
16		Rated Frequency : 0 , 1	R / W	U16	0x0000 = 60 Hz 0x0001 = 50 Hz	0x0000
17	0 | 14	Over Speed Warning Protection Setting 101 – 120	R / W	U16	Rated Frequency % Setting : 101 – 120 % **(Over Speed- Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x8069(Hex) (**Bit15 = "1" : Protection Enabled)** % = 0x0069(Hex) = 105(Decimal) Over Speed Protection = 60 Hz * 105% = 63 Hz	0x8069
	15	1 = Over Speed Warning Protection Enabled				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
		GC4K				
		Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**				
18		Over Speed Shutdown Protection Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % **(Over Speed- Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x806E(Hex)　(**Bit15 = "1" : Protection Enabled**) % = 0x006E(Hex) = 110(Decimal) Over Speed Protection = 60 Hz * 110% = 66 Hz	0x806E
	0 | 14	101 – 120				
	15	1 = Over Speed Shutdown Protection Enabled				
19		Over Speed Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x0005
20		Under Speed Warning Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % Example : Value = 0x8069(Hex)　(**Bit15 = "1" : Protection Enabled**) % = 0x005F(Hex) = 95(Decimal) Under Speed Protection = 60 Hz * 95% = 57 Hz	0x005F
	0 | 14	80 – 99				
	15	1 = Under Speed Warning Enabled				
21		Under Speed Shutdown Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % Example : Value = 0x805A(Hex)　(**Bit15 = "1" : Protection Enabled**) % = 0x005A(Hex) = 90(Decimal) Under Speed Protection = 60 Hz * 90% = 54 Hz	0x005A
	0 | 14	80 – 99				
	15	1 = Under Speed Shutdown Enabled				
22		Under Speed Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
23		MPU (Magnetic Pickups) Availability : 0、1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
24		MPU adopted to confirm engine start : 0、1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
25		MPU Failure Permitted Delay : 1 – 30	R / W	U16	Timer Setting : 1 – 30 sec	0x0005
26		MPU Failure Warning / Shutdown : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0001

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
GC4K						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
27		Over Temperature Warning Setting	R / W	U16	Over Temperature Warning Setting : 80 – 120 ˚C **(Over Temperature- Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x805A(Hex)　(**Bit15 = "1" : Protection Enabled**) Temp = 0x005A(Hex) = 90(Decimal) Over Temperature Protection Activate = 90 ˚C	0x005A
	0 | 14	80 – 120				
	15	1 = Over Temperature Warning Enabled				
28		Over Temperature Shutdown Setting	R / W	U16	Over Temperature Shutdown Setting : 80 – 120 ˚C **(Over Temperature Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x8069(Hex)　(**Bit15 = "1" : Protection Enabled**) Temp = 0x0069(Hex) = 105(Decimal) Over Temperature Protection Activate = 105 ˚C	0x8069
	0 | 14	80 – 120				
	15	1 = Over Temperature Shutdown Enabled				
29		Over Temperature Failure Permitted Delay setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
30		Temperature Sender Failure Permitted Delay Setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
31		Temperature Sender Failure Warning / Shutdown Setting : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
32		Temperature Reading Calibration : -5 – +5	R / W	U16	Setting Value : -5 – +5 ˚C Example : (1)　Value = 0x8001(Hex)　(**Bit15 = "1" : Negative Value**) 　　Temp = 0x0001(Hex) = 1(Decimal) -1 ˚C (2)　Value = 0x0001(Hex) 　　Temp = 0x0001(Hex) = 1(Decimal) = 1 ˚C	0x0000
	0 | 14	0 – 5				
	15	1 = Negative Temperature Value				

	**GC4K**
	**Read Holding Register Data : Function Code 03** **Write Holding Register Data : Function Code 06 or 16**
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
33	0 | 14	Low Oil Pressure Warning Setting 0 – 99	R / W	U16	Low Oil Pressure Warning Setting : 0 – 99 Psi **(Low oil pressure-Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x802D(Hex) (**Bit15 = "1" : Protection Enabled**) Pressure = 0x002D(Hex) = 45(Decimal) Low Oil Pressure Protection Activate = 45 Psi	0x002D
	15	1 = Low Oil Pressure Warning Enabled				
34	0 | 14	Low Oil Pressure Shutdown Setting 0 – 99	R / W	U16	Low Oil Pressure Shutdown Setting : 0 – 99 Psi (Low oil pressure-Warning / Shutdown can not be cancelled at the same time) Example : Value = 0x800F(Hex) (**Bit15 = "1" : Protection Enabled**) Pressure = 0x000F(Hex) = 15(Decimal) Low Oil Pressure Protection Activate = 15 Psi	0x000F
	15	1 = Low Oil Pressure Shurdown Enabled				
35		Low Oil Pressure permitted delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
36	0 | 14	Confirm engine operation via oil pressure 10 – 40	R / W	U16	Oil Pressure setting value range : 10 – 40 Psi Example : Value = 0x8019(Hex) (**Bit15 = "1" : For confirm engine operation**) Pressure = 0x0019(Hex) = 25(Decimal) Oil Pressure setting value = 25 Psi	0x0019
	15	1 = Confirm engine operation via oil pressure reading				
37		Oil Pressure failure permitted delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
38		Oil Pressure Sender Failure Warning / Shutdown setting : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
39		Fuel Level Calibration Device : 0、2、3	R / W	U16	0x0000 = Not Installed 0x0002 = Fuel Level Sender 0x0003 = Fuel Level Switch	0x0000

GC4K						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
40		Low Fuel Level Switch type : 0 · 1	R / W	U16	0x0000 = Low Fuel Level = NO (Normal Open) 0x0001 = Low Fuel Level = NC (Normal Close)	0x0000
41		Low Fuel Level Warning / Shutdown setting : 0 · 1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
42		Low Fuel Level Warning Setting	R / W	U16	Low Fuel Level Warning % setting : 0 – 50% **(Suitable : For Fuel Level Sender)** Example : Value = 0x8014(Hex) (**Bit15 = "1" : Protection Enabled**) Fuel Level % = 0x0014(Hex) = 20(Decimal) Low Fuel Level Protection Activate = 20 %	0x0014
	0 | 14	0 – 50				
	15	1 = Low Fuel Warning Protection Enabled				
43		Low Fuel Level Shutdown Setting	R / W	U16	Low Fuel Level Shutdown % setting : 0 – 50% **(Suitable : For Fuel Level Sender)** Example : Value = 0x800A(Hex) (**Bit15 = "1" : Protection Enabled**) Fuel Level % = 0x000A(Hex) = 10(Decimal) Low Fuel Level Protection Activate = 10 %	0x000A
	0 | 14	0 – 50				
	15	1 = Low Fuel Level Shutdown Protection Enabled				
44		Low Fuel Level Permitted Delay Setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
45		Low Fuel Level Sender Failure Confirmation timer : 10	R	U16	Fixed Timer : 10 secs	0x000A
46		Low Fuel Level Sender Warning mode : 0	R	U16	Fixed to Warning mode : 0x0000	0x0000

					GC4K	
					Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**	
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
47	0 | 14	User Defined Input-A Setting User Defined Input-A Switch type : 0 – 2	R / W	U16	Setting Value : 0 = Disabled，1 = NO (Normal Open) type，2 = NC (Normal Close) type Example： (1) Value = 0x8001(Hex) (**Bit15 = "1"：Check after engine start**) Switch Type : NO (Normal Open Type) (2) Value = 0x0002(Hex) (**Bit15 = "0"：Check at anytime**) Switch Type : NC (Normal Close Type) (3) Value = 0x8000 or 0x0000 User Defined Input-A function disabled **Note：Address [47] & [83] must never enable in the sametime**	0x0000
	15	1 = Check User Defined Input-A Status after engine start 0 = Check at anytime (Except OFF Mode)				
48		User Defined Input-A Warning / Shutdown Setting : 0，1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
49		User Defined Input-A Failure Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
50	0 | 14	User Defined Input-B Setting User Defined Input-B Switch type : 0 – 2	R / W	U16	Setting Value : 0 = Disabled，1 = NO (Normal Open) type，2 = NC (Normal Close) type Refer to address [47] Description **Note：Address [50] & [84] must never enable in the sametime**	0x0000
	15	1 = Check User Defined Input-B Status after engine start 0 = Check at anytime (Except OFF Mode)				
51		User Defined Input-B Warning / Shutdown mode : 0，1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
52		User Defined Input-B Failure Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F

		GC4K				
		Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**				
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
53		User Defined Output-A Warning / Shutdown Setting	R / W	U16	When system produce failure Warning / Shutdown output. User can custom configure Bit setting (Bit 0 – Bit 14) to activate User Defined Output-A operation ※ **Prior to Enable <User Defined Output-A > function, address [76] Bit15 value must set to "0" and address [62] enter 0x0000**	0x0000
	0	1 = Over Temperature Warning				
	1	1 = Over Temperature Shutdown				
	2	1 = Low Oil Pressure Warning				
	3	1 = Low Oil Pressure Shutdown				
	4	1 = Overspeed Warning				
	5	1 = Overspeed Shutdown				
	6	1 = Underspeed Warning				
	7	1 = Underspeed Shutdown				
	8	1 = Over Voltage Warning				
	9	1 = Over Voltage Shutdown				
	10	1 = Under Voltage Warning				
	11	1 = Under Voltage Shutdown				
	12	1 = User Defined Input-A Warning				
	13	1 = User Defined Input-A Shutdown				
	14	1 = Engine Operating				
	15	1 = Enabled Bit0 – Bit14 Function				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
		GC4K				
		Read Holding Register Data : Function Code 03				
		Write Holding Register Data : Function Code 06 or 16				
54		User Defined Output-B Warning / Shutdown Setting	R / W	U16	When system produce failure Warning / Shutdown output. User can custom configure Bit setting (Bit 0 – Bit 14) to activate User Defined Output-B operation	0x0000
	0	1 = Over Temperature Warning				
	1	1 = Over Temperature Shutdown				
	2	1 = Low Oil Pressure Warning				
	3	1 = Low Oil Pressure Shutdown				
	4	1 = Overspeed Warning				
	5	1 = Overspeed Shutdown				
	6	1 = Underspeed Warning				
	7	1 = Underspeed Shutdown				
	8	1 = Over Voltage Warning				
	9	1 = Over Voltage Shutdown				
	10	1 = Under Voltage Warning				
	11	1 = Under Voltage Shutdown				
	12	1 = User Defined Input-B Warning				
	13	1 = User Defined Input-B Shutdown				
	14	1 = Engine Operating				
	15	1 = Enabled Bit0 – Bit14 Function				
55		Engine Start Attempts Setting : 1 – 9	R / W	U16	Attempt Setting : 1 – 9 Attempts	0x0003
56		Preheat Timer Setting : 2 – 30	R / W	U16	Timer Setting : 2 – 30 secs	0x0006
57		Cranking Timer : 2 – 30	R / W	U16	Timer Setting : 2 – 30 secs	0x0006
58		Engine Stop Setting : 0 · 1	R / W	U16	0x0000 = Energized to stop 0x0001 = Energized to Start	0x0001
59		Engine Stop Timer Setting : 2 – 99	R / W	U16	Timer Setting : 2 – 99 secs	0x000A
60		Idle Timer Setting : 0 – 30 min	R / W	U16	Timer Setting : 0 – 30 min (0 = Disabled)	0x0000
61		Engine Cooldown Timer : 0 – 30 min	R / W	U16	Timer Setting : 0 – 30 min (0 = Disabled)	0x0000

GC4K						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**

62	0 | 14	ATS Simulate Normal Power Failure
		
		0 · 1
			R / W	U16	(1) Enabled
					  0x8001 = User Defined Output-A Output Enabled
					  0x8000 = User Defined Output-A Output Disabled
					(2) Disabled
					  0x0000 = User Defined Output-A Output Disabled
					
					※ **Prior to Enable < ATS Simulate Normal Power Failure > function, Address [53] & [76] Bit15 must be set to "0"**
						0x0000

	15	1 = Enabled				
63	0 | 14	Battery Under Voltage Warning Setting 8 – 31	R / W	U16	Battery Under Voltage Setting : 8 – 31 Vdc Example : Value = 0x8008(Hex) (**Bit15 = "1" : Protection Enabled**) Under Voltage Setting = 0x0008(Hex) = 8(Decimal) Protection Activating Voltage = 8 V	0x0008
	15	1 = Battery Under Voltage Warning Enabled				
64	0 | 14	Battery Over Voltage Warning Setting 13 – 45	R / W	U16	Battery Over Voltage Setting : 13 – 45 Vdc	0x0020
	15	1 = Battery Over Voltage Warning Enabled				
65	0 | 14	Charge Alternator D+ Terminal Minimum Voltage Setting 8 – 32	R / W	U16	Voltage Setting : 8 – 32 Vdc Example : Value = 0x800C(Hex) (**Bit15 = "1" : Protection Enabled**) Low Voltage Setting = 0x000C(Hex) = 12(Decimal) Protection Activating Voltage = 12 V	0x000C
	15	1 = Charge Alternator D+ Terminal Minimum Voltage Warning Protection Enabled				

GC4K						
Read Holding Register Data : Function Code 03						
Write Holding Register Data : Function Code 06 or 16						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
66	0 | 14	Charge Alternator D+ Terminal Minimum Voltage Setting 8 – 32	R / W	U16	Voltage Setting : 8 – 32 Vdc	0x0008
	15	1 = Charge Alternator D+ Terminal Minimum Voltage Shutdown Protection Enabled				
67		Charge Alternator Protection Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
68	0 | 14	Service Maintenance Reminder Timer Setting 1 – 999	R / W	U16	Timer Setting : 1 – 999 Hour Example : Value = 0x83E7(Hex)　　**(Bit15 = "1" : Indicate Enabled)** Hour Setting = 0x03E7(Hex) = 999(Decimal) Service Maintenance Reminder = 999 Hour	0x83E7
	15	1 = Service Maintenance Reminder Enabled				
69		Service Maintenance Reminder Clear and Reset Timer : 0、1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
70		Factory Setting Recovery : 0、1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
71		Interval Between Cranking : 2 – 30	R / W	U16	Timer Setting : 2 – 30 sec	0x0006
72	0 | 14	KCU-05 or KCU-07 Module Address Setting 1 – 99	R	U16	KCU-05 or KCU-07 Address : 1 – 99 Example : Value = 0x8001(Hex)　　**(Bit15 = "1" : Module Enabled)** Address = 0x0001(Hex) = 1(Decimal)	0x0000
	15	1 = KCU-05 or KCU-07 Modbus Application Enabled				
73		KCU-05 Module communication transimission parity setting : 0 – 3	R	U16	0x0000 = N81　　　0x0002 = E81 0x0001 = N82　　　0x0003 = O81	0x0000
74		KCU-05 Module Communication Baud RateSetting : 0 – 7	R	U16	0x0000 = 115200　　0x0001 = 57600　　0x0002 = 38400 0x0003 = 19200　　0x0004 = 14400　　0x0005 = 9600 0x0006 = 4800　　0x0007 = 2400	0x0002

GC4K						
Read Holding Register Data : Function Code 03						
Write Holding Register Data : Function Code 06 or 16						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
75		Engine Preheat Disable	R / W	U16	Temperature Setting Range : 20 – 30 ˚C ※ **Engine Preheat Enabled : When temperature is greater than configured setting, the Preheat operation will terminate immediately, before Preheat timer (Address [56]) is complete.**	0x0016
	0 | 14	20 – 30				
	15	1 = Engine Preheat Enabled				
76		Block Heater Setting	R / W	U16	Temp setting range : 10 – 50 ˚C Example : Value = 0x9914(Hex)　(**Bit15 = "1" : Block heater enabled**) Start heating temp = 0x14(Hex) = 20(Decimal) = 20 ˚C Stop heating temp = 0x19(Hex) = 25(Decimal) = 25 ˚C	0x1914
	0 | 7	Start heating temp : 10 – 50				
	8 | 14	Stop heating temp : 10 – 50				
	15	1 = Block Heater enabled				
77		ON/OFF GPS Function	R / W	U16	0x0000 = OFF 0x8000 = ON	0x8000
78		Flywheel tooth : 0 – 300	R / W	U16	Range : 0 – 300	0x0000

GC4K						
Read Holding Register Data : Function Code 03 Write Holding Register Data : Function Code 06 or 16						
Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
79		rpm Over speed warning setting : 0 – 5000	R	U16	rpm Over Speed & Under Speed Warning / Shutdown Setting : 0 – 5000 rpm **Description :** **(1) Value = 0x0000 or 0xFFFF : Factory Setting or MPU not installed or flywheel tooth setting = 0.** **(2) When MPU is installed and flywheel tooth setting is**	0x0000
80		rpm Over speed shutdown setting : 0 – 5000	R	U16	not set to "0", automatically creates rpm over speed and under speed setting. Formula = (MPU Over speed or Under speed (or shutdown) Value / Flywheel tooth) * 60 **(3) If MPU not installed : rpm Over speed & Under speed warning / shutdown value will be deleted 0x0000, in the sametime the rpm reading will be 0.In the sametime clearing MPU Over speed and Under**	0x0000
81		rpm Under speed warning setting : 0 – 5000	R	U16	speed warning / shutdown setting. **(4) When Flywheel tooth is set to "0" : rpm Over speed & Under speed warning / shutdown value will be deleted 0x0000, in the sametime the rpm reading will be 0.** **Note: When control unit starts engine in operation**	0x0000
82		rpm Under speed shutdown setting : 0 – 5000	R	U16	mode other than "OFF" mode and an MPU (Magnetic Pickups) is inplemented, the control unit will automatically starts the MPU auto-calibration function. Once the MPU auto-calibration is completed, the Rpm Over speed and Under speed waring / shutdown will be automatically programed. The process should take approximately 5 secs after the engine is started.	0x0000

KCU-05

				GC4K		
				Read Holding Register Data : Function Code 03		
				Write Holding Register Data : Function Code 06 or 16		
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
83		User Defined Input-A Function Setting：0 - 2	R / W	U16	Setting：0 = OFF，1 = NO type，2 = NC type **Note：** **(1) Address [47] & [83] can not be enabled in the same time** **(2) This operation permitted delay is the same as in address [49]** **(3) This operation only provides Warning mode** **(4) Dectection continues even under OFF mode**	0x0000
84		User Defined Input-B Function Setting：0 - 2	R / W	U16	Setting：0 =OFF，1 = NO type，2 = NC type **Note：** **(1) Address [50] & [84] can not be enabled in the same time** **(2) This operation permitted delay is the same as in address [52]** **(3) This operation only provides Warning mode** **(4) Detection Continues even under OFF mode**	0x0000

APPENDIX 05

GC4K-E		
Read Digital Input (DI) Data : Function Code 02		
Modbus Address (Decimal)	**Data Point**	**Note**
0	GC4K Mode Selector : REMOTE	1 : Set Mode Selector to "Remote" mode to allow remote operation via" GenOnCall®" APP from mobile device
1	GC4K Mode Selector : AUTO	1 : Set Mode Selector to "AUTO" mode
2	GC4K Mode Selector : OFF	1 : Set Mode Selector to "OFF" mode
3	GC4K Mode Selector : MANU	1 : Set Mode Selector to "MANU" mode (Manual)
4	Remote Start Signal	1 : Remote Start Signal ON
5	Owner Switch Status	1 : Owner Switch Activate
6	Over Voltage Shutdown	1 : Over Voltage Shutdown
7	Under Voltage Shutdown	1 : Under Voltage Shutdown
8	Current Overload Shutdown	1 : Over Current Shutdown
9	Over Speed (Frequency)Shutdown	1 : Over Speed Shutdown
10	Under Speed (Frequency) Shutdown	1 : Under Speed Shutdown
11	Reserved	0
12	Reserved	0
13	Reserved	0
14	Over Temperature Shutdown	1 : Over Temperature Shutdown (Determine by J1939)
15	Temperature Sender Failure Shutdown	1 : Temperature Sender Failure Shutdown (Determine by J1939)
16	Low Oil Pressure Shutdown	1 : Low Oil Pressure Shutdown (Determine by J1939)
17	Oil Pressure Failure Shutdown	1 : Oil Pressure Failure Shutdown (Determine by J1939)
18	Low Fuel Switch Shutdown (Fuel Level Switch)	1 : Low Fuel Switch Shutdown (Fuel Level Switch)
19	Low Fuel Level Shutdown (Fuel Level Sender)	1 : Low Fuel Level Shutdown (Fuel Level Sender)
20	Low Fuel Level Shutdown (CANbus)	1 : Low Fuel Level Shutdown (Determine by J1939)
21	Fuel Level Sender Failure Shutdown	1 : Fuel Lever Sender Failure Shutdown
22	Fuel Level Sender Failure Shutdown (CANbus)	1 : Fuel Lever Sender Failure Shutdown (Determine by J1939)
23	User Defined Input-A Execute Shutdown	1 : User Defined Input-A Execute Shutdown
24	User Defined Input-B Execute Shutdown	1 : User Defined Input-B Execute Shutdown
25	Charge Alternator Failure Shutdown	1 : Charge Alternator Failure Shutdown
26	Cranking Failure Shutdown	1 : Cranking Failure Shutdown
27	Emergency Stop	1 : Emergency Stop
28	System Failure Shutdown	1 : System Failure Shutdown
29	Over Voltage Warning	1 : Over Voltage Warning
30	Under Voltage Warning	1 : Under Voltage Warning

	GC4K-E	
	Read Digital Input (DI) Data : Function Code 02	
Modbus Address (Decimal)	**Data Point**	**Note**
31	Current Overload Warning	1：Current Overload Warning
32	Over Speed (Frequency) Warning	1：Over Speed (Frequency) Warning
33	Under Speed (Frequency) Warning	1：Under Speed (Frequency) Warning
34	Reserved	0
35	Reserved	0
36	Reserved	0
37	Over Temperature Warning (CANbus)	1：Over Temperature Warning (Determine by J1939)
38	Temperature Sender Failure Warning (CANbus)	1：Temperature Sender Failure Warning (Determine by J1939)
39	Low Oil Pressure Warning (CANbus)	1：Low Oil Pressure Warning (Determine by J1939)
40	Oil Pressure Sender Failure Warning (CANbus)	1：Oil Pressure Sender Failure Warning (Determine by J1939)
41	Oil Pressure Failure Warning	1：Oil Pressure Failure Warning
42	Low Fuel Level Warning (Fuel Level Switch)	1：Low Fuel Level Warning (Fuel Level Switch)
43	Low Fuel Level Warning (CANbus)	1：Low Fuel Level Shutdown (Determine by J1939)
44	Fuel Level Sender Failure Warning	1：Fuel Level Sender Failure Warning
45	Fuel Level Sender Failure Warning (CANbus)	1：Fuel Level Sender Failure Warning (Determine by J1939)
46	User Defined Input-A Execute Warning	1：User Defined Input-A Execute Warning
47	User Defined Input-B Execute Warning	1：User Defined Input-B Execute Warning
48	Charge Alternator Failure Shutdown	1：Charge Alternator Failure Warning
49	Battery Under Voltage Warning	1：Battery Under Voltage Warning
50	Battery Over Voltage Warning	1：Battery Over Voltage Warning
51	Service Maintenance Reminder	1：Service Maintenance Reminder
52	Audio Playback Initialization Failure Warning	1：Audio Playback Initialization Failure Warning
53	CANbus Communication Status	1：CANbusCommunication Failure Warning
54	Engine Prestart Voice Playback	1：Engine Prestart Voice Playback
55	Voice Playback Status	1：Engine Prestart Voice Playback or Voice Alarm Playback
56	Engine Start Interval Timer Status	1：Engine Start Interval Timer Countdown
57	Engine Start Timer Status	1：Engine Start Timer Countdown
58	Engine Stop Timer Status	1：Engine Stop Timer Countdown
59	Engine Failure Shutdown Timer Status	1：Engine Failure Shutdown Timer Countdown
60	Engine Ideling Timer Status	1：Engine Ideling Timer Countdown
61	Engine Cool Down Timer Status	1：Engine Cool Down Timer Countdown

GC4K-E			
Read Digital Output (DO) Data : Fuction Code 01 **Write Digital Output (DO) Data : Function Code 05**			
Modbus Address (Decimal)	**Data Point**	**Read / Write**	**Note**
0	ATS Simulate Normal Power Failure	R / W	1 : Normal Power Failure 0 : Normal Power Available ※ **Option Selected** ☑ **in System Function Setting** (**Refer to GC4K-E user manual**)
1	GC4K-E Operation Mode : AUTO	R / W	1 : GC4K-E in AUTO Mode
2	GC4K-E Operation Mode : OFF	R / W	1 : GC4K-E in OFF Mode
3	GC4K_E Operation Mode : MANU	R / W	1 : GC4K-E in MANU Mode

	GC4K-E			
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
0	Generator V_{12} Voltage	U32	0.1 V	Example :
2	Generator V_{23} Voltage	U32	0.1 V	(1) V_{12} Value = 0x0000089B(Hex) = 2203(Decimal)
4	Generator V_{31} Voltage	U32	0.1 V	V_{12} = 2203 / 10 = 220.3 Volt
6	Generator V_{1N} Voltage	U32	0.1 V	(2) Frequency Value = 0x0257(Hex) = 599(Decimal)
8	Generator V_{2N} Voltage	U32	0.1 V	Frequency = 599 / 10 = 59.9 Hz
10	Generator V_{3N} Voltage	U32	0.1 V	
12	Generator Frequency	U16	0.1 Hz	**Note :** **(3) If system is <Single Phase>, ignore V_{23} & V_{31} Value ; and V_{1N} , V_{2N} and V_{3N} Value。** **(4) In 3 Phase system <3 Phase 3 Wire>, ignore V_{1N} , V_{2N} and V_{3N} Value.**
13	Load L1 Current	U16	0.1 A	Example :
14	Load L2 Current	U16	0.1 A	L1 Value = 0x086D(Hex) = 2157(Decimal)
15	Load L3 Current	U16	0.1 A	L1 = 2157 / 10 = 215.7 Amp **Note :** **If system is <Single Phase>, ignore L2 & L3.**
16	Battery Voltage	U16	0.1 V	Example : Value = 0x0078(Hex) = 120(Decimal) Battery Voltage = 120 / 10 = 12.0 Volt
17	Fuel Level (%)	U16	0.1 %	Example : (1) Value = 0x0389(Hex) = 905(Decimal) Remaining Fuel = 905 / 10 = 90.5 % (2) Value = 0xFFFF(Hex) : No Fuel Level Sender Installed (3) Value = 0xAAAA(Hex) : Fuel Level Sender Failure or incorrect value
18	Oil Pressure	U16	0.1 Psi	Example : (1) Value = 0x0325(Hex) = 805(Decimal) Oil Pressure = 805 / 10 = 80.5 Psi (2) Value = 0xFFFF(Hex) : No Oil Pressure Sender Installed (3) Value = 0xAAAA(Hex) : Oil Pressure Sender Failure or incorrect value
19	Engine Temperature	U16	0.1 ˚C	Example : (1) Value = 0x0141(Hex) = 321(Decimal) Temperature = 321 / 10 = 32.1 ˚C (2) Value = 0x8141(Hex) & 0x07FF = 321(Decimal) Temperature = -321 / 10 = -32.1 ˚C (**Bit15 = "1" : Negative Value**) (3) Value = 0xFFFF(Hex) : No Temperature Sender (4) Value = 0xAAAA(Hex) : Temperature Sender Failure or incorrect value

GC4K-E				
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
20	Reserve	U16	1	Fixed Value : 0x0000
21	Voltage / Current Phase Relevance	U16	1	**Bit Definition** Bit 0(L1 Current) : "1" = Leading Current "0" = LaggingCurrent Bit 1(L2 Current) : "1" = Leading Current "0" = LaggingCurrent Bit 2(L3 Current) : "1" = Leading Current "0" = Lagging Current Bit 3(L1+L2+L3 Current) : "1" = Leading Current "0" = Lagging Current Bit 7(3 Phase voltage) : "1" = 3 Phase voltage connection correct "0" = 3 Phase voltage connection Incorrect **(Do not refer to other undefined bits)** Example : Value = 0x0001(Hex) = 1(Decimal) L1 Phase current leading phase voltage
22	Generator Power V_{12} (PFA)	U16	0.01	Power Factor A : Fixed with 2 decimal places Example : (1) Value = 0x0062(Hex) = 98(Decimal) PFA = 0.98 (2) Value = 0x8062(Hex) & 0x7FFF= 98(Decimal) PFA = -98 / 100 (**Bit15 = "1" : Negative Value**) = -0.98 (Phase Current lagging Phase Voltage)
23	Generator Power V_{23} (PFB)	U16	0.01	Power Factor B (Refer to PFA)
24	Generator Power V_{31} (PFC)	U16	0.01	Power Factor C (Refer to PFA)
25	Generator Total Power Factor	U16	0.01	Power Factor : Fixed with 2 decimal places Example : Value = 0x0064(Hex) = 100(Decimal) PF = 1.00
26	Generator V_{12} Active Power	U32	1 Watt	Active Power A(WATT_A) : Watt Example : Value = 0x00000064(Hex) = 100(Decimal) WATT_A = 100 Watts
28	Generator V_{23} Active Power	U32	1 Watt	WATT_B (Refer to WATT_A)
30	Generator V_{31} Active Power	U32	1 Watt	WATT_C (Refer to WATT_A)
32	Generator Total Active Power	U32	1 Watt	Active Power (WATT) : Watt Example : Value = 0x0000012C(Hex) = 300(Decimal) Total Active Power = 300 Watts

		GC4K-E		
	**Read Analog Input (AI) Data : Function Code 04**
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Ratio**	**Note**
34	Generator V_{12} Reactive Power	U32	1 VAR	Reactive Power A(VAR_A) : VAR Example : Value = 0x0000000A(Hex) = 10(Decimal) VAR_A = 10 VAR
36	Generator V_{23} Reactive Power	U32	1 VAR	VAR_B (Refer to VAR_A)
38	Generator V_{31} Reactive Power	U32	1 VAR	VAR_C (Refer to VAR_A)
40	Generator Total Reactive Power	U32	1 VAR	Reactive Power (VAR) : VAR Example : Value = 0x0000000C(Hex) = 12(Decimal) VAR = 12 VAR
42	Generator V_{12} Apparent Power	U32	1 VA	Apparent Power A(VA_A) : VA Example : Value = 0x00000064(Hex) = 100(Decimal) VA_A = 100 VA
44	Generator V_{23} Apparent Power	U32	1 VA	VA_B (Refer to VA_A)
46	Generator V_{31} Apparent Power	U32	1 VA	VA_C (Refer to VA_A)
48	Service Maintenance timer countdown : 0 – 59940	U16	1 Minutes	Service Maintenance timer coundown : 0 – 59940 minutes Example : Value = 0x1770(Hex) = 6000(Decimal) Time = 6000 minutes = 100 hours
49	Engine Running Time : 0x00000000 – 0xFFFFFFFF	U32	1 Minutes	Engine Running Time : Minutes Unit Example : Value = 0x00006000(Hex) = 24576(Decimal) Running time = 24576 minutes = 409 hours 36 minutes
51	Kilo Watt per Hour	U32	0.1 KWH	KWH (kilowatt-hour) : Fixed with 1 decimal places Example : Value = 0x000004D2(Hex) = 1234(Decimal) = 123.4 KWH

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 **(If the read value is 0xFFFF, it indicates the engine ECU did not transmit the SPN data)**			
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Note**
200	Transmission torque converter lockup engaged	U16	SPN 573 0x0000 = Torque converter unlocked 0x0001 = Torque converter locked 0x0002 = Error 0x0003 = Not available
201	Reserved	U16	Ignore (SPN 91 : 0xFFFF)
202	Engine Load Percentage at Current Speed	U16	SPN 92 Resolution : 1 % / bit, 0 offset Range : 0 to 250 %
203	Driver's Demand Engine - Percent Torque	U16	SPN 512 Resolution : 1 % / bit, -125% offset Range : -125 to 250%
204	Actual Engine - Percent Torque		SPN 513 Resolution : 1 % / bit, 0 offset Range : 0 to 250% Operational
205	Reserved	U16	Ignore (SPN 524 : 0xFFFF)
206	Reserved	U16	Ignore (SPN 523 : 0xFFFF)
207	Auxiliary Temperature 1	U16	SPN 441 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C
208	Auxiliary Pressure #1	U16	SPN 1387 Resolution : 16 kPa / bit, 40 offset Range : 0 to 4000 kPa
209	Engine Fuel Leakage-1	U16	SPN 1239 0x0000 = No Leakage 0x0001 = Leak 0x0002 = Error 0x0003 = Not available
210	Engine Fuel Leakage-2	U16	SPN 1240 0x0000 = No Leakage 0x0001 = Leak 0x0002 = Error 0x0003 = Not available
211	Fan Speed Estimated Percent	U16	SPN 975 Resolution : 0.4 % / bit, 0 offset Range : 0 to 100%

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 (If the read value is 0xFFFF, it indicates the engine ECU did not transmit the SPN data)			
Modbus Address (Decimal)	Data Point	Data Type	Note
212	Engine Start Air Pressure	U16	SPN 82 Resolution : 4 kPa / bit, 0 offset Range : 0 to 1000 kPa
213	Coolant Temperature	U16	SPN 110 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C
214	Fuel Temperature−1	U16	SPN 174 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C
215	Intercooler Temperature	U16	SPN 52 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C
216	Fuel Pressure	U16	SPN 94 Resolution : 4 kPa / bit, 0 offset Range : 0 to 1000 kPa
217	Engine Oil Level	U16	SPN 98 Resolution : 0.4 % / bit, 0 offset Range : 0 to 100 %
218	Engine Oil Pressure	U16	SPN 100 Resolution : 4 kPa / bit, 0 offset Range : 0 to 1000 kPa
219	Coolant Pressure	U16	SPN 109 Resolution : 2 kPa / bit, 0 offset Range : 0 to 500 kPa
220	Coolant Level	U16	SPN 111 Resolution : 0.4 % / bit, 0 offset Range : 0 to 100 %
221	Throttle Position	U16	SPN 51 Resolution : 0.4 % / bit, 0 offset Range : 0 to 100 %
222	Barometric Pressure	U16	SPN 108 Resolution : 0.5 kPa / bit, 0 offset Range : 0 to 125 kPa
223	Engine Intake Temperature	U16	SPN 172 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 **(If the read value is 0xFFFF, it indicates the engine ECU did not transmit the SPN data)**			
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Note**
224	Enginge turbocharger boost pressure	U16	SPN 102 Resolution : 2 kPa / bit, 0 offset Range : 0 to 500 kPa
225	Intake manifold −1 Temperature	U16	SPN 105 Resolution : 1 ˚C / bit, -40 ˚C offset Range : -40 to 210 ˚C
226	Engine air inlet pressure	U16	SPN 106 Resolution : 2 kPa / bit, 0 offset Range : 0 to 500 kPa
227	Engine intake air filter−1 Pressure Difference	U16	SPN 107 Resolution : 0.05 kPa / bit, 0 offset Range : 0 to 12.5 kPa
228	14 Net Battery Current	U16	SPN 114 Resolution : 1 A / bit, -125A offset Range : -125 to 125 A
229	Alternator charge current	U16	SPN 115 Resolution : 1 A / bit, 0 offset Range : 0 to 250 A
230	Clutch Pressure	U16	SPN 123 Resolution : 16 kPa / bit, 0 offset Range : 0 to 4000 kPa
231	Transmission fluid pressure	U16	SPN 127 Resolution : 16 kPa / bit, 0 offset Range : 0 to 4000 kPa
232	Fuel Level	U16	SPN 96 Resolution : 0.4 % / bit, 0 offset Range : 0 to 100 %
233	Water in fuel indicator	U16	SPN 97 0x0000 = No 0x0001 = Yes 0x0002 = Error 0x0003 = Not Available
234	Fuel filter pressure difference	U16	SPN 1382 Resolution : 2 kPa / bit, 0 offset Range : 0 to 500 kPa
235	Reserved	U16	Ignore (0xFFFF)
236	Reserved	U16	Ignore (SPN 191 : 0xFFFF)
237	Reserved	U16	Ignore (SPN 161 : 0xFFFF)

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 **(If the read value is 0xFFFF, it indicates the engine ECU did not transmit the SPN data)**			
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Note**
238	Engine speed RPM	U16	SPN 190 Resolution : 0.125 rpm / bit, 0 offset Range : 0 to 8,031.875 rpm
239	Engine exhaust gas-1 temperature	U16	SPN 1137 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
240	Engine exhaust gas-2 temperature	U16	SPN 1138 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
241	ECU temperature	U16	SPN 1136 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
242	Engine fuel injection control pressure	U16	SPN 164 Resolution : 1/256 MPa / bit, 0 offset Range : 0 to 251 MPa
243	Engine injector metering rail-1 pressure	U16	SPN 157 Resolution : 1/256 MPa / bit, 0 offset Range : 0 to 251 MPa
244	Engine injector metering rail-2 pressure	U16	SPN 1349 Resolution : 1/256 MPa / bit, 0 offset Range : 0 to 251 MPa
245	Engine turbocharger-1 RPM	U16	SPN 103 Resolution : 4 rpm / bit, 0 offset Range : 0 to 257,020 rpm
246	Engine's expected operating speed RPM	U16	SPN 515 Resolution : 0.125 rpm / bit, 0 offset Range : 0 to 8,031.875 rpm
247	Reserved	U16	Ignore (SPN 84 : 0xFFFF)
248	Engine oil temperature-1	U16	SPN 175 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
249	Engine turbocharger oil temperature	U16	SPN 176 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
250	Engine fuel consumption rate	U16	SPN 183 Resolution : 0.05 L / h per bit, 0 offset Range : 0 to 3,212.75 L/h

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 **(If the read value is 0xFFFF, it indicates the engine ECU did not transmit the SPN data)**			
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Note**
250	Engine fuel consumption rate	U16	SPN 183 Resolution : 0.05 L / h per bit, 0 offset Range : 0 to 3,212.75 L/h
251	Engine exhaust manifold temeperature	U16	SPN 173 Resultion : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
252	Charge alternator voltage	U16	SPN 167 Resolution : 0.05 V / bit, 0 offset Range : 0 to 3212.75 V
253	Battery voltage / Power input	U16	SPN 168 Resolution : 0.05 V / bit, 0 offset Range : 0 to 3212.75 V
254	Key switch battery voltage	U16	SPN 158 Resolution : 0.05 V / bit, 0 offset Range : 0 to 3212.75 V
255	Transmission fluid temperature	U16	SPN 177 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
256	Turbocharger-1 inlet temperature	U16	SPN 1172 Resolution : 0.03125 ˚C / bit, -273 ˚C offset Range : -273 to 1735 ˚C
257	Reserved	U16	Ignore (SPN 184 : 0xFFFF)
258	Reserved	U16	Ignore (SPN 185 : 0xFFFF)
259	Reserved	U16	Ignore (SPN 517 : 0xFFFF)

GC4K-E (CANbus J1939)			
Read Analog Input (AI) Data : Function Code 04 **(If the read value is 0xFFFFFFFF, it indicates the engine ECU did not transmit the SPN data)**			
Modbus Address (Decimal)	**Data Point**	**Data Type**	**Note**
260	Reserved	U32	Ignore (SPN 244 : 0xFFFFFFFF)
262	Reserved	U32	Ignore (SPN 245 : 0xFFFFFFFF)
264	Engine total hours of operation	U32	SPN 247 Resolution : 0.05 hr / bit, 0 offset Range : 0 to 210,554,060.75 hr
266	Engine trip fuel	U32	SPN 182 Resolution : 0.5 L / bit, 0 offset Range : 0 to 2,105,540,607.5 L
268	Engine total fuel consumption	U32	SPN 250 Resolution : 0.5 L / bit, 0 offset Range : 0 to 2,105,540,607.5 L
270	Reserved	U32	Ignore (SPN 917 : 0xFFFFFFFF)
272	Reserved	U32	Ignore (SPN 918 : 0xFFFFFFFF)
274	Reserved	U32	Ignore (0xFFFFFFFF)

※ J1939 Read value conversion formula

Value Calculation = Read Value * Resolution value per bit + Compensation value

Example (Battery voltage / Power input) : Modbus address = 253, SPN 168
SPN 168 :
Resolution : 0.05 V / bit, 0 offset
Range : 0 to 3212.75 V

Read value = 0x00F4(Hex) = 244(Decimal)
Resolution value per bit = 0.05 V/bit
Compensation Value = 0
Battery Voltage = 244 * 0.05 + 0 = 12.2 V

Example (Coolant temperature) : Modbus address = 213 , SPN 110
SPN 110 :
Resolution : 1 ˚C / bit, -40 ˚C offset
Range : -40 to 210 ˚C

Read value = 0x006B(Hex) = 107(Decimal)
Resolution value per Bit = 1 ˚C / bit
Compensation Value = -40 ˚C
Coolant temperature = (107 * 1) - 40 = 67 ˚C

\multicolumn{6}{c}{**GC4K-E (CANbus J1939)**}

| \multicolumn{6}{c}{**Read Analog Input (AI) Data : Function Code 04**} |

Modbus Address (Decimal)	Bit	\multicolumn{2}{c}{Data Point}	Data Type	Note
276		Warning1		U16	When ECU detects non-critical failure event, warning will be issued; the engine does not shutdown.
	0	SPN 573	1 = Transmission torque converter lockup engaged		
	1	\multicolumn{2}{c}{0}		
	2	SPN 92	1 = Engine Load Percentage at Current Speed		
	3	SPN 512	1 = Driver's Demand Engine - Percent Torque		
	4	SPN 513	1 = Actual Engine - Percent Torque		
	5	\multicolumn{2}{c}{0}		
	6	\multicolumn{2}{c}{0}		
	7	SPN 441	1 = Auxiliary Temperature -1		
	8	SPN 1387	1 = Auxiliary Pressure -1		
	9	SPN 1239	1 = Engine Fuel Leakage-1		
	10	SPN 1240	1 = Engine Fuel Leakage-2		
	11	SPN 975	1 = Fan Speed Estimated Percent		
	12	SPN 82	1 = Engine Start Air Pressure		
	13	SPN 110	1 = Coolant Temperature		
	14	SPN 174	1 = Fuel Temperature−1		
	15	SPN 52	1 = Intercooler Temperature		
277		Warning2		U16	When ECU detects non-critical failure event, warning will be issued; the engine does not shutdown.
	0	SPN 94	1 = Fuel Pressure		
	1	SPN 98	1 = Engine Oil Level		
	2	SPN 100	1 = Engine Oil Pressure		
	3	SPN 109	1 = Coolant Pressure		
	4	SPN 111	1 = Coolant Level		
	5	SPN 51	1 = Throttle Position		
	6	SPN 108	1 = Barometric Pressure		
	7	SPN 172	1 = Engine Intake Temperature		
	8	SPN 102	1 = Enginge turbocharger boost pressure		
	9	SPN 105	1 = Intake manifold −1 Temperature		
	10	SPN 106	1 = Engine air inlet pressure		
	11	SPN 107	1 = Engine intake air filter−1 Pressure Difference		
	12	SPN 114	1 = 14 Net Battery Current		
	13	SPN 115	1 = Alternator charge current		
	14	SPN 123	1 = Clutch Pressure		
	15	SPN 127	1 = Transmission fluid pressure		

GC4K-E (CANbus J1939)				
Read Analog Input (AI) Data : Function Code 04				
Modbus Address (Decimal)	Bit	Data Point	Data Type	Note
278		Warning3	U16	When ECU detects non-critical failure event, warning will be issued; the engine does not shutdown.
	0	SPN 96 1 = Fuel Level		
	1	SPN 97 1 = Water in fuel indicator		
	2	SPN 1382 1 = Fuel filter pressure difference		
	3	0		
	4	0		
	5	0		
	6	SPN 190 1 = Engine speed RPM		
	7	SPN 1137 1 = Engine exhaust gas-1 temperature		
	8	SPN 1138 1 = Engine exhaust gas-2 temperature		
	9	SPN 1136 1 = ECU temperature		
	10	SPN 164 1 = Engine fuel injection control pressure		
	11	SPN 157 1 = Engine injector metering rail-1 pressure		
	12	SPN 1349 1 = Engine injector metering rail-2 pressure		
	13	SPN 103 1 = Engine turbocharger-1 RPM		
	14	SPN 515 1 = Engine's expected operating speed RPM		
	15	0		
279		Warning4	U16	When ECU detects non-critical failure event, warning will be issued; the engine does not shutdown.
	0	SPN 175 1 = Engine oil temperature-1		
	1	SPN 176 1 = Engine turbocharger oil temperature		
	2	SPN 183 1 = Engine fuel consumption rate		
	3	SPN 173 1 = Engine exhaust manifold temeperature		
	4	SPN 167 1 = Charge alternator voltage		
	5	SPN 168 1 = Battery voltage / Power inpu		
	6	SPN 158 1 = Key switch battery voltage		
	7	SPN 177 1 = Transmission fluid temperature		
	8	SPN 1172 1 = Turbocharger-1 inlet temperature		
	9	0		
	10	0		
	11	0		
	12	0		
	13	0		
	14	SPN 247 1 = Engine total hours of operation		
	15	SPN 182 1 = Engine trip fuel		
280		Warning5	U16	When ECU detects non-critical failure event, warning will be issued; the engine does not shutdown.
	0	SPN 250 1 = Engine total fuel consumption		
	1	0		
	2	0		
	3 | 15	0		

GC4K-E (CANbus J1939)					
Read Analog Input (AI) Data : Function Code 04					
Modbus Address (Decimal)	**Bit**	**Data Point**		**Data Type**	**Note**
281		Alarm1		U16	When ECU detects critical failure event; Engine shutdown is executed.
	0	SPN 573	1 = Transmission torque converter lockup engaged		
	1		0		
	2	SPN 92	1 = Engine Load Percentage at Current Speed		
	3	SPN 512	1 = Driver's Demand Engine - Percent Torque		
	4	SPN 513	1 = Actual Engine - Percent Torque		
	5		0		
	6		0		
	7	SPN 441	1 = Auxiliary Temperature -1		
	8	SPN 1387	1 = Auxiliary Pressure -1		
	9	SPN 1239	1 = Engine Fuel Leakage-1		
	10	SPN 1240	1 = Engine Fuel Leakage-2		
	11	SPN 975	1 = Fan Speed Estimated Percent		
	12	SPN 82	1 = Engine Start Air Pressure		
	13	SPN 110	1 = Coolant Temperature		
	14	SPN 174	1 = Fuel Temperature-1		
	15	SPN 52	1 = Intercooler Temperature		
282		Alarm2		U16	When ECU detects critical failure event; Engine shutdown is executed.
	0	SPN 94	1 = Fuel Pressure		
	1	SPN 98	1 = Engine Oil Level		
	2	SPN 100	1 = Engine Oil Pressure		
	3	SPN 109	1 = Coolant Pressure		
	4	SPN 111	1 = Coolant Level		
	5	SPN 51	1 = Throttle Position		
	6	SPN 108	1 = Barometric Pressure		
	7	SPN 172	1 = Engine Intake Temperature		
	8	SPN 102	1 = Enginge turbocharger boost pressure		
	9	SPN 105	1 = Intake manifold -1 Temperature		
	10	SPN 106	1 = Engine air inlet pressure		
	11	SPN 107	1 = Engine intake air filter-1 Pressure Difference		
	12	SPN 114	1 = 14 Net Battery Current		
	13	SPN 115	1 = Alternator charge current		
	14	SPN 123	1 = Clutch Pressure		
	15	SPN 127	1 = Transmission fluid pressure		

| \multicolumn{5}{c}{**GC4K-E (CANbus J1939)**} |
| \multicolumn{5}{c}{**Read Analog Input (AI) Data : Function Code 04**} |

Modbus Address (Decimal)	Bit	Data Point		Data Type	Note
283		Alarm3		U16	When ECU detects critical failure event; Engine shutdown is executed.
	0	SPN 96	1 = Fuel Level		
	1	SPN 97	1 = Water in fuel indicator		
	2	SPN 1382	1 = Fuel filter pressure difference		
	3		0		
	4		0		
	5		0		
	6	SPN 190	1 = Engine speed RPM		
	7	SPN 1137	1 = Engine exhaust gas-1 temperature		
	8	SPN 1138	1 = Engine exhaust gas-2 temperature		
	9	SPN 1136	1 = ECU temperature		
	10	SPN 164	1 = Engine fuel injection control pressure		
	11	SPN 157	1 = Engine injector metering rail-1 pressure		
	12	SPN 1349	1 = Engine injector metering rail-2 pressure		
	13	SPN 103	1 = Engine turbocharger-1 RPM		
	14	SPN 515	1 = Engine's expected operating speed RPM		
	15		0		
284		Alarm4		U16	When ECU detects critical failure event; Engine shutdown is executed.
	0	SPN 175	1 = Engine oil temperature-1		
	1	SPN 176	1 = Engine turbocharger oil temperature		
	2	SPN 183	1 = Engine fuel consumption rate		
	3	SPN 173	1 = Engine exhaust manifold temeperature		
	4	SPN 167	1 = Charge alternator voltage		
	5	SPN 168	1 = Battery voltage / Power inpu		
	6	SPN 158	1 = Key switch battery voltage		
	7	SPN 177	1 = Transmission fluid temperature		
	8	SPN 1172	1 = Turbocharger-1 inlet temperature		
	9		0		
	10		0		
	11		0		
	12		0		
	13		0		
	14	SPN 247	1 = Engine total hours of operation		
	15	SPN 182	1 = Engine trip fuel		
285		Warning5		U16	When ECU detects critical failure event; Engine shutdown is executed.
	0	SPN 250	1 = Engine total fuel consumption		
	1		0		
	2		0		
	3 | 15		0		

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colspan="7" **GC4K-E**
**Read Holding Register Data : Function Code 03** **Write Holding Register Data : Function Code 06 or 16**
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
0		GC4K Operation Mode : 1 – 3	R / W	U16	0x0001 = AUTO Mode 0x0002 = OFF Mode 0x0003 = MANU Mode	0x0002
1		System Phase : 0 – 2	R / W	U16	0x0000 = 3 Phase 4 Wire 0x0001 = 3 Phase 2 Wire 0x0002 = Single Phase 2 Wire	0x0000
2		Nominal Voltage (Phase to Phase) Effective Range (Primary) : 100 – 35,000	R / W	U16	Voltage Input : 100V – 35KV ※ **If Instrument Transformer not inplemented, the value must be identical with address [3]**	0x00DC
3		Nominal Voltage (Phase to Phase) Effective Range (PT Secondary)	R / W	U16	Voltage Input : 100 – 500 V ※ **If Instrument Transformer not inplemented, the value must be identical with address [2]**	0x00DC
	0 | 14	100 – 500				
	15	1 = with Instrument Transformer (PT)				
4		Over Voltage Warning Protection Setting	R / W	U16	Nominal Voltage % Setting : 101 – 120 % Example : Value = 0x806E(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x006E(Hex) = 110(Decimal) Nominal Voltage= 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 110% = 242V	0x806E
	0 | 14	101 – 120				
	15	1 = Protection Enabled				
5		Over Voltage Shutdown Protection Setting	R / W	U16	Nominal Voltage % Setting : 101 – 120 % Example : Value = 0x806E(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0073(Hex) = 115(Decimal) Nominal Voltage = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 115% = 253V	0x8073
	0 | 14	101 – 120				
	15	1 = Protection Enabled				
6		Over Voltage permitted delay setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x000F

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
GC4K-E						
Read Holding Register Data : Function Code 03 Write Holding Register Data : Function Code 06 or 16						
7		Under Voltage Warning Protection Setting	R / W	U16	Nominal Voltage % Setting : 80 – 90 % Example : Value = 0x805A(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x005A(Hex) = 90(Decimal) Nominal Voltage = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 90% = 198V	0x805A
	0 | 14	80 – 99				
	15	1 = Protection Enabled				
8		Under Voltage Shutdown Protection Setting	R / W	U16	Nominal Voltage % Setting : 80 – 99 % Example : Value = 0x8055(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0055(Hex) = 85(Decimal) Nominal = 0x00DC(Hex) = 220(Decimal) Protection Activating Voltage = 220V * 85% = 187V	0x8055
	0 | 14	80 – 99				
	15	1 = Protection Enabled				
9		Under Voltage Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
10		Current Transformer (CT) Setting (Primary) 0 = Not in Use or select from 25, 50, 60, 75, 100, 150, 200, 250, 300, 400, 500, 600, 750, 800, 1000, 1200, 1600, 2000, 2500, 3000	R / W	U16	Current Transformer (CT) Setting : Current (A) Unit Example : Value = 0x01F4(Hex) = 500(Decimal) Factory Preset : CT @ 500A : 5A	0x01F4
11		Current Transformer (CT) Setting (Secondary) 1 = 1A 5 = 5A	R / W	U16	Current Transformer (CT) Setting : Current (A) Unit Example : Value = 0x0005(Hex) = 5(Decimal) Factory Preset : CT @ 500A : 5A	0x0005
12		Genset Running Reminder	R / W	U16	Genset Running Reminder Setting : 1 – 10 Hour Example : Value = 0x8001(Hex) (**Bit15 = "1" : Reminder Enabled**) Reminder Time = 0x0001(Hex) = 1 Hour	0x0001
	0 | 14	1 – 10				
	15	Reminder Enabled				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
	**GC4K-E**
	**Read Holding Register Data : Function Code 03** **Write Holding Register Data : Function Code 06 or 16**
13		Over Current Warning Protection Setting	R / W	U16	Current Transformer (CT) Rated Current % Setting : 50 – 100 % Example : Value = 0x8046(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0046(Hex) = 70(Decimal) Factory Preset : CT @ 500A : 5A Over Current Protection = 500A * 70% = 350A	0x8046
	0 | 14	50 – 100				
	15	1 = Over Current Warning Protection Enabled				
14		Over Current Shutdown Protection Setting	R / W	U16	Current Transformer (CT) Rated Current % Setting : 50 – 100 % Example : Value = 0x8050(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0050(Hex) = 80(Decimal) Factory Preset : CT @ 500A : 5A Over Current Protection = 500A * 80% = 400A	0x0050
	0 | 14	50 – 100				
	15	1 = Over Current Shutdown Protection Enabled				
15		Over Current Permitted Delay Setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
16		Rated Frequency : 0 , 1	R / W	U16	0x0000 = 60 Hz 0x0001 = 50 Hz	0x0000
17		Over Speed Warning Protection Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % **(Over Speed- Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x8069(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x0069(Hex) = 105(Decimal) Over Speed Protection = 60 Hz * 105% = 63 Hz	0x8069
	0 | 14	101 – 120				
	15	1 = Over Speed Warning Protection Enabled				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
		GC4K-E				
		Read Holding Register Data : Function Code 03				
		Write Holding Register Data : Function Code 06 or 16				
18		Over Speed Shutdown Protection Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % **(Over Speed- Warning / Shutdown Can not be cancelled at the same time)** Example : Value = 0x806E(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x006E(Hex) = 110(Decimal) Over Speed Protection = 60 Hz * 110% = 66 Hz	0x806E
	0 | 14	101 – 120				
	15	1 = Over Speed Shutdown Protection Enabled				
19		Over Speed Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x0005
20		Under Speed Warning Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % Example : Value = 0x8069(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x005F(Hex) = 95(Decimal) Under Speed Protection = 60 Hz * 95% = 57 Hz	0x005F
	0 | 14	80 – 99				
	15	1 = Under Speed Warning Enabled				
21		Under Speed Shutdown Setting	R / W	U16	Rated Frequency % Setting : 101 – 120 % Example : Value = 0x805A(Hex) (**Bit15 = "1" : Protection Enabled**) % = 0x005A(Hex) = 90(Decimal) Under Speed Protection = 60 Hz * 90% = 54 Hz	0x005A
	0 | 14	80 – 99				
	15	1 = Under Speed Shutdown Enabled				
22		Under Speed Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
23 | 38		Reserved	R	U16	Ignore	
39		Fuel Level Calibration Device : 0 – 3	R / W	U16	0x0000 = Not Installed 0x0001 = J1939 Read Value 0x0002 = Fuel Level Sender 0x0003 = Fuel Level Switch	0x0000
40		Low Fuel Level Switch type : 0 · 1	R / W	U16	0x0000 = Low Fuel Level = NO (Normal Open) 0x0001 = Low Fuel Level = NC (Normal Close)	0x0000

GC4K-E						
	**Read Holding Register Data : Function Code 03** **Write Holding Register Data : Function Code 06 or 16**
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
41		Low Fuel Level Warning / Shutdown setting : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
42		Low Fuel Level Warning Setting	R/W	U16	Low Fuel Level Shutdown % setting : 0 – 50 % Example： Value = 0x8014(Hex)　(**Bit15 = "1"：Protection Enabled**) Fuel Level % = 0x0014(Hex) = 20(Decimal) Low Fuel Level Protection Activate = 20 %	0x0014
	0 | 14	0 – 50				
	15	1 = Low Fuel Warning Protection Enabled				
43		Low Fuel Level Shutdown Setting	R / W	U16	Low Fuel Level Shutdown % setting : 0 – 50% **(Suitable：For Fuel Level Sender)** Example： Value = 0x800A(Hex)　(**Bit15 = "1"：Protection Enabled**) Fuel Level % = 0x000A(Hex) = 10(Decimal) Low Fuel Level Protection Activate = 10 %	0x000A
	0 | 14	0 – 50				
	15	1 = Low Fuel Level Shutdown Protection Enabled				
44		Low Fuel Level Permitted Delay Setting : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000A
45		Low Fuel Level Sender Failure Confirmation timer : 10	R	U16	Fixed Timer : 10 secs	0x000A
46		Low Fuel Level Sender Warning mode : 0	R	U16	Fixed to Warning mode : 0x0000	0x0000
47		User Defined Input-A Setting	R / W	U16	Setting Value : 0 = Disabled、1 = NO (Normal Open) type、2 = NC (Normal Close) type Example： (1)　Value = 0x8001(Hex)　(**Bit15 = "1"：Check after engine start**) 　　Switch Type : NO (Normal Open Type) (2)　Value = 0x0002(Hex) (**Bit15 = "0"：Check at anytime**) 　　Switch Type : NC (Normal Close Type) (3)　Value = 0x8000 or 0x0000 　　User Defined Input-A function disabled **Note：Address [47] & [83] must never enable in the sametime**	0x0000
	0 | 14	User Defined Input-A Switch type : 0 – 2				
	15	1 = Check User Defined Input-A Status after engine start 0 = Check at anytime (Except OFF Mode)				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
				GC4K-E		
				Read Holding Register Data : Function Code 03		
				Write Holding Register Data : Function Code 06 or 16		
48		User Defined Input-A Warning / Shutdown Setting : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
49		User Defined Input-A Failure Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
50		User Defined Input-B Setting	R / W	U16	Setting Value : 0 = Disabled、1 = NO (Normal Open) type、2 = NC (Normal Close) type Refer to address [47] Description **Note：Address [50] & [84] must never enable in the sametime**	0x0000
	0 | 14	User Defined Input-B Switch type : 0 – 2				
	15	1 = Check User Defined Input-B Status after engine start 0 = Check at anytime (Except OFF Mode)				
51		User Defined Input-B Warning / Shutdown mode : 0、1	R / W	U16	0x0000 = Warning 0x0001 = Shutdown	0x0000
52		User Defined Input-B Failure Permitted Delay : 1 – 99	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
53		User Defined Output-A Warning / Shutdown Setting	R / W	U16	When system produce failure Warning / Shutdown output. User can custom configure Bit setting (Bit 0 – Bit 14) to activate User Defined Output-A operation ※ **Prior to Enable <User Defined Output-A > function, address [76] Bit 15 value must set to "0" and address [62] enter 0x0000**	0x0000
	0	1 = Over Temperature Warning				
	1	1 = Over Temperature Shutdown				
	2	1 = Low Oil Pressure Warning				
	3	1 = Low Oil Pressure Shutdown				
	4	1 = Overspeed Warning				
	5	1 = Overspeed Shutdown				
	6	1 = Underspeed Warning				
	7	1 = Underspeed Shutdown				
	8	1 = Over Voltage Warning				
	9	1 = Over Voltage Shutdown				
	10	1 = Under Voltage Warning				
	11	1 = Under Voltage Shutdown				
	12	1 = User Defined Input-A Warning				
	13	1 = User Defined Input-A Shutdown				
	14	1 = Engine Operating				
	15	1 = Enabled Bit0 – Bit14 Function				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
		GC4K-E				
		Read Holding Register Data : Function Code 03				
		Write Holding Register Data : Function Code 06 or 16				
54		User Defined Output-B Warning / Shutdown Setting	R / W	U16	When system produce failure Warning / Shutdown output. User can custom configure Bit setting (Bit 0 – Bit 14) to activate User Defined Output-B operation	0x0000
	0	1 = Over Temperature Warning				
	1	1 = Over Temperature Shutdown				
	2	1 = Low Oil Pressure Warning				
	3	1 = Low Oil Pressure Shutdown				
	4	1 = Overspeed Warning				
	5	1 = Overspeed Shutdown				
	6	1 = Underspeed Warning				
	7	1 = Underspeed Shutdown				
	8	1 = Over Voltage Warning				
	9	1 = Over Voltage Shutdown				
	10	1 = Under Voltage Warning				
	11	1 = Under Voltage Shutdown				
	12	1 = User Defined Input-B Warning				
	13	1 = User Defined Input-B Shutdown				
	14	1 = Engine Operating				
	15	1 = Enabled Bit0 – Bit14 Function				
55		Engine Start Attempts Setting : 1 – 9	R / W	U16	Attempt Setting : 1 – 9 Attempts	0x0003
56		Reserved	R / W	U16	Ignore	0x0000
57		Cranking Timer : 2 – 30	R / W	U16	Timer Setting : 2 – 30 secs	0x0006
58		Engine Stop Setting : 0 · 1	R / W	U16	0x0000 = Energized to stop 0x0001 = Energized to Start	0x0001
59		Engine Stop Timer Setting : 2 – 99	R / W	U16	Timer Setting : 2 – 99 secs	0x0002
60		Idle Timer Setting : 0 – 30 min	R / W	U16	Timer Setting : 0 – 30 min (0 = Disabled)	0x0000
61		Engine Cooldown Timer : 0 – 30 min	R / W	U16	Timer Setting : 0 – 30 min (0 = Disabled)	0x0000

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
	**GC4K-E**						
	**Read Holding Register Data : Function Code 03** **Write Holding Register Data : Function Code 06 or 16**						
62	0 | 14	ATS Simulate Normal Power Failure 0 · 1	R / W	U16	(1) Enabled 　　0x8001 = User Defined Output-A Output Enabled 　　0x8000 = User Defined Output-A Output Disabled (2) Disabled 　　0x0000 = User Defined Output-A Output Disabled ※　**Prior to Enable < ATS Simulate Normal Power Failure > function, Address [53] & [76] Bit 15 must be set to "0"**	0x0000
	15	1 = Enabled				
63	0 | 14	Battery Under Voltage Warning Setting 8 – 31	R / W	U16	Battery Under Voltage Setting : 8 – 31 Vdc Example : Value = 0x8008(Hex)　(**Bit15 = "1" : Ptotection Enabled**) Under Voltage Setting = 0x0008(Hex) = 8(Decimal) Protection Activating Voltage = 8 V	0x0008
	15	1 = Battery Under Voltage Warning Enabled				
64	0 | 14	Battery Over Voltage Warning Setting 13 – 45	R / W	U16	Battery Over Voltage Setting : 13 – 45 Vdc	0x0020
	15	1 = Battery Over Voltage Warning Enabled				
65	0 | 14	Charge Alternator D+ Terminal Minimum Voltage Setting 8 – 32	R / W	U16	Voltage Setting : 8 – 32 Vdc Example : Value = 0x800C(Hex)　(**Bit15 = "1" : Protection Enabled**) Low Voltage Setting = 0x000C(Hex) = 12(Decimal) Protection Activating Voltage = 12 V	0x000C
	15	1 = Charge Alternator D+ Terminal Minimum Voltage Warning Protection Enabled				

Modbus Address (Decimal)	Bit	Data Point	Read / Write	Data Type	Note	Fty Preset
		GC4K-E				
		Read Holding Register Data : Function Code 03				
		Write Holding Register Data : Function Code 06 or 16				
66		Charge Alternator D+ Terminal Minimum Voltage Setting	R / W	U16	Voltage Setting : 8 – 32 Vdc	0x0008
	0 | 14	8 – 32				
	15	1 = Charge Alternator D+ Terminal Minimum Voltage Shutdown Protection Enabled				
67		Charge Alternator Protection Permitted Delay Setting : 1 – 99 sec	R / W	U16	Timer Setting : 1 – 99 sec	0x000F
68		Service Maintenance Reminder Timer Setting	R / W	U16	Timer Setting : 1 – 999 Hour Example : Value = 0x83E7(Hex)　　(**Bit15 = "1" : Indicate Enabled**) Hour Setting = 0x03E7(Hex) = 999(Decimal) Service Maintenance Reminder = 999 Hour	0x83E7
	0 | 14	1 – 999				
	15	1 = Service Maintenance Reminder Enabled				
69		Service Maintenance Reminder Clear and Reset Timer : 0 · 1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
70		Factory Setting Recovery : 0 · 1	R / W	U16	0x0000 = NO 0x0001 = YES	0x0000
71		Interval Between Cranking : 2 – 30	R / W	U16	Timer Setting : 2 – 30 sec	0x0006
72		KCU-05 or KCU-07 Module Address Setting	R	U16	KCU-05 or KCU-07 Address : 1 – 99 Example : Value = 0x8001(Hex)　　(**Bit15 = "1" : Module Enabled**) Address = 0x0001(Hex) = 1(Decimal)	0x0000
	0 | 14	1 – 99				
	15	1 = KCU-05 or KCU-07 Modbus Application Enabled				
73		KCU-05 Module communication transimission parity setting : 0 – 3	R	U16	0x0000 = N81　　　0x0002 = E81 0x0001 = N82　　　0x0003 = O81	0x0000
74		KCU-05 Module Communication Baud RateSetting : 0 – 7	R	U16	0x0000 = 115200　　0x0001 = 57600　　0x0002 = 38400 0x0003 = 19200　　0x0004 = 14400　　0x0005 = 9600 0x0006 = 4800　　0x0007 = 2400	0x0002

GC4K-E						
Read Holding Register Data : Function Code 03 **Write Holding Register Data : Function Code 06 or 16**						
Modbus Address (Decimal)	**Bit**	**Data Point**	**Read / Write**	**Data Type**	**Note**	**Fty Preset**
75		Reserved	R	U16	Ignore	0x0016
76		Reserved	R	U16	Ignore	0x1914
77		ON/OFF GPS Function	R / W	U16	0x0000 = Turn OFF 0x8000 = Turn ON	0x8000
78		Reserved	R	U16	Ignore	0x0000
79		Reserved	R	U16	Ignore	0x0000
80		Reserved	R	U16	Ignore	0x0000
81		Reserved	R	U16	Ignore	0x0000
82		Reserved	R	U16	Ignore	0x0000
83		User Defined Input-A Function Setting：0 - 2	R / W	U16	Setting：0 = OFF，1 = NO type，2 = NC type **Note：** **(1) Address [47] & [83] can not be enabled in the same time** **(2) This operation permitted delay is the same as in address [49]** **(3) This operation only provides Warning mode** **(4) Dectection continues even under OFF mode**	0x0000
84		User Defined Input-B Function Setting：0 - 2	R / W	U16	Setting：0 =OFF，1 = NO type，2 = NC type **Note：** **(1) Address [50] & [84] can not be enabled in the same time** **(2) This operation permitted delay is the same as in address [52]** **(3) This operation only provides Warning mode** **(4) Detection Continues even under OFF mode**	0x0000