SmartGen

MAKING CONTROL SMARTER

HGM9510/HGM9520/HGM9530

GENSET CONTROLLER

COMMUNICATION PROTOCOL

郑州众智科技股份有限公司

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Table 1 Software Version

Date	Version	Content
2013-04-27	1.0	Original release.
2021-10-21	1.1	1. Exchange the serial number of “After Stop” and “Stop Failure” in genset status table. 2. Add 06 function code. 3. Add some parameters.
2023-05-20	1.2	1. Update 05 function code address. 2. Modify the protocol according to the latest format. 3. Add “Remote Start & Stop Procedures”. 4. Update “Common Solutions of Communication Failure”.
2024-01-30	1.3	Modify the contents of 05 Function Code.
2024-11-08	1.4	1. Update partial address ratio of 03 function code. 2. Add 0440-0453 address contents for 03 function code.

CONTENT

1. DESCRIPTION

This protocol describes read and write command format of RS485 half-duplex serial port communication and definition of internal information data in detail for the third-party to develop and use

This controller has one RS485 port.

The controller is used as the slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Communication address: 1~254 (default: 1)
Baud rate: 9600bps
Start bit: 1-bit
Data bit: 8-bit
Parity bit: None
Stop bit: 2-bit

Supported function code: 03H, 05H, 06H. Function code 03H is used for reading controller alarm, status information and various electricity data; 05H is used for sending remote command; while 06H is used for saving single data to memory inside the device.

Data calibration method: CRC16.

Internal registers of controller are in the unit of “byte (double bytes)”.

Communication timeout period: over 200ms.

Communication distance: 9600 baud rate, the longest distance can reach 1,000m when using 120Ω shielding twisted pair line.

Once maximum 120 data of byte register can be read.

Up to 32 controllers can be deployed for network communication.

When RS485 is connected, 120Ω twisted pair line with shielding layer shall be used, and the shielding layer shall be grounded at one end.

2. WIRING DIAGRAM

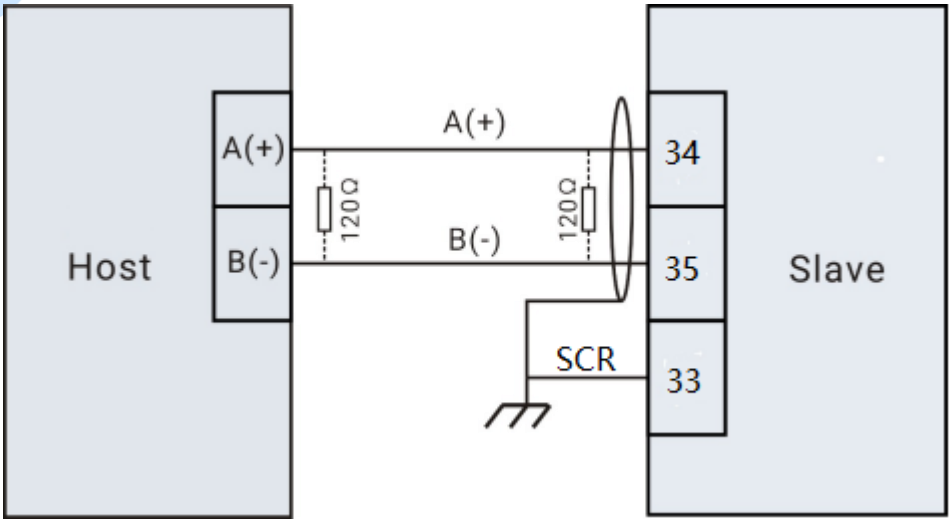

Fig.1 Single Unit Communication Wiring Diagram

NOTE1: Two 120Ω resistors can be connected automatically according to site situation, details refer to the following illustration.

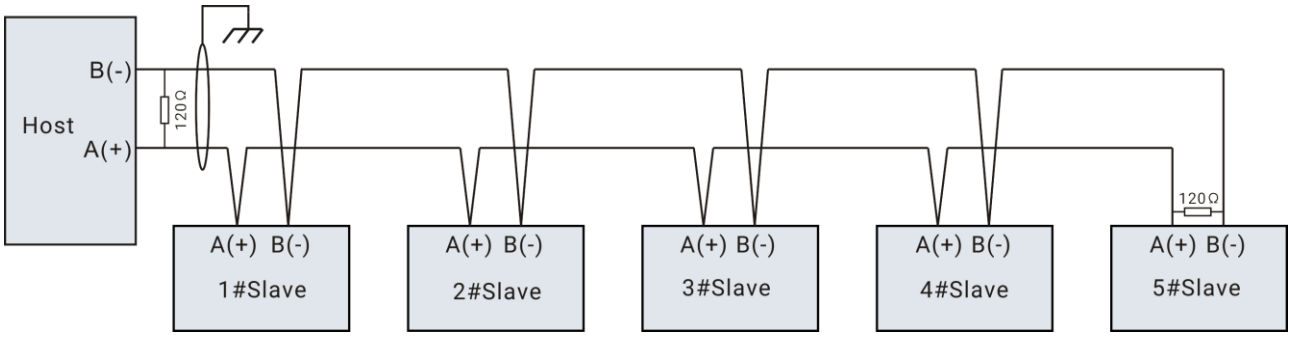

Fig.2 Multi-unit Communication Wiring Diagram

NOTE1: Please set each controller's communication module address before networking. Same module address is inhibited in the same network.

NOTE2: The shielding layer of communication line is single-end grounded on the host side.

3. CONTROLLER INTERNAL REGISTER ADDRESS AND DATA

3.1 ILLUSTRATION

In the following table, "/" represents this item is reserved.

3.2 FUNCTION CODE 03H MAPPLING ALARM, STATUS COIL FIELD

Table 2 Alarm, Status Coil Data Field

Modbus Address	PLC Address	Item	Description
0000.0	40001.0	Common Alarm	0 represents there is no common alarm; 1 represents there is common alarm (000.0 represents the Boolean value of bit 0 at address 000); and so on.
0000.1	40001.1	Common Shutdown Alarm	1 for active
0000.2	40001.2	Common Warning Alarm	1 for active
0000.3	40001.3	Common Trip and Stop Alarm	1 for active
0000.4	40001.4	Common Trip Alarm	1 for active
0000.5	40001.5	Common Safety Trip & Stop Alarm	1 for active
0000.6	40001.6	Common Safety Trip Alarm	1 for active
0000.7	40001.7	Common Block Alarm	1 for active
0000.8	40001.8	/	1 for active
0000.9	40001.9	In Auto Mode	1 for active
0000.10	40001.10	In Manual Mode	1 for active
0000.11	40001.11	In Stop Mode	1 for active
0000.12	40001.12	/	1 for active
0000.13	40001.13	/	1 for active
0000.14	40001.14	/	1 for active
0000.15	40001.15	/	1 for active
0001.0	40002.0	Emergency Stop Alarm	1 for active
0001.1	40002.1	Overspeed Shutdown	1 for active
0001.2	40002.2	Underspeed Shutdown	1 for active
0001.3	40002.3	Speed Signal Loss Alarm	1 for active
0001.4	40002.4	Gen Overfrequency Shutdown	1 for active
0001.5	40002.5	Gen Underfrequency Shutdown	1 for active
0001.6	40002.6	Gen Overvoltage Shutdown	1 for active
0001.7	40002.7	Gen Undervoltage Shutdown	1 for active
0001.8	40002.8	Crank Failure Alarm	1 for active
0001.9	40002.9	Gen Overcurrent Shutdown	1 for active
0001.10	40002.10	Maintenance Time Due Shutdown	1 for active
0001.11	40002.11	ECU Shutdown	1 for active
0001.12	40002.12	Reverse Power Shutdown	1 for active
0001.13	40002.13	Over Power Shutdown	1 for active

Modbus Address	PLC Address	Item	Description
0001.14	40002.14	High Temp. Input Shutdown	1 for active
0001.15	40002.15	Low OP Input Shutdown	1 for active
0002.0	40003.0	ECU Comm. Failure Shutdown	1 for active
0002.1	40003.1	MSC ID Error Shutdown	1 for active
0002.2	40003.2	Volt Bus Error Shutdown	1 for active
0002.3	40003.3	Gen Phase Error Shutdown	1 for active
0002.4	40003.4	Mains Bus Error Shutdown	1 for active
0002.5	40003.5	Current Imbalance Shutdown	1 for active
0002.6	40003.6	Earth Fault Shutdown	1 for active
0002.7	40003.7	Loss of Excitation Fault Shutdown	1 for active
0002.8	40003.8	Temp. Sensor Open	1 for active
0002.9	40003.9	High Temp. Shutdown	1 for active
0002.10	40003.10	/	1 for active
0002.11	40003.11	/	1 for active
0002.12	40003.12	Oil Pressure Sensor Open	1 for active
0002.13	40003.13	/	1 for active
0002.14	40003.14	Low Oil Pressure Shutdown	1 for active
0002.15	40003.15	/	1 for active
0003.0	40004.0	Level Sensor Open	1 for active
0003.1	40004.1	/	1 for active
0003.2	40004.2	/	1 for active
0003.3	40004.3	/	1 for active
0003.4	40004.4	Aux. Sensor 1 Open	1 for active
0003.5	40004.5	Aux. Sensor 1 High Shutdown	1 for active
0003.6	40004.6	Aux. Sensor 1 Low Shutdown	1 for active
0003.7	40004.7	Reserved	1 for active
0003.8	40004.8	Aux. Sensor 2 Open	1 for active
0003.9	40004.9	Aux. Sensor 2 High Shutdown	1 for active
0003.10	40004.10	Aux. Sensor 2 Low Shutdown	1 for active
0003.11	40004.11	/	1 for active
0003.12	40004.12	/	1 for active
0003.13	40004.13	/	1 for active
0003.14	40004.14	/	1 for active
0003.15	40004.15	Input Module 2 Cylinder Temp. High	1 for active
0004.0	40005.0	Input Module 1 Comm. Failure	1 for active
0004.1	40005.1	Input Module 1 Exhaust Temp. High	1 for active
0004.2	40005.2	Input Module 1 Sensor 15 Open	1 for active
0004.3	40005.3	Input Module 1 Sensor 15 High	1 for active
0004.4	40005.4	Input Module 1 Sensor 15 Low	1 for active
0004.5	40005.5	Input Module 1 Sensor 16 Open	1 for active
0004.6	40005.6	Input Module 1 Sensor 16 High	1 for active
0004.7	40005.7	Input Module 1 Sensor 16 Low	1 for active
0004.8	40005.8	Input Module 1 Sensor 17 Open	1 for active
0004.9	40005.9	Input Module 1 Sensor 17 High	1 for active

Modbus Address	PLC Address	Item	Description
0004.10	40005.10	Input Module 1 Sensor 17 Low	1 for active
0004.11	40005.11	Input Module 1 Sensor 18 Open	1 for active
0004.12	40005.12	Input Module 1 Sensor 18 High	1 for active
0004.13	40005.13	Input Module 1 Sensor 18 Low	1 for active
0004.14	40005.14	Input Module 1 Sensor 19 Open	1 for active
0004.15	40005.15	Input Module 1 Sensor 19 High	1 for active
0005.0	40006.0	Input Module 1 Sensor 19 Low	1 for active
0005.1	40006.1	Input Module 1 Sensor 20 Open	1 for active
0005.2	40006.2	Input Module 1 Sensor 20 High	1 for active
0005.3	40006.3	Input Module 1 Sensor 20 Low	1 for active
0005.4	40006.4	Input Module 1 Sensor 21 Open	1 for active
0005.5	40006.5	Input Module 1 Sensor 21 High	1 for active
0005.6	40006.6	Input Module 1 Sensor 21 Low	1 for active
0005.7	40006.7	Input Module 1 Sensor 22 Open	1 for active
0005.8	40006.8	Input Module 1 Sensor 22 High	1 for active
0005.9	40006.9	Input Module 1 Sensor 22 Low	1 for active
0005.10	40006.10	Input Module 1 Sensor 23 Open	1 for active
0005.11	40006.11	Input Module 1 Sensor 23 High	1 for active
0005.12	40006.12	Input Module 1 Sensor 23 Low	1 for active
0005.13	40006.13	Input Module 1 Sensor 24 Open	1 for active
0005.14	40006.14	Input Module 1 Sensor 24 High	1 for active
0005.15	40006.15	Input Module 1 Sensor 24 Low	1 for active
0006.0	40007.0	Input Module 2 Comm. Failure	1 for active
0006.1	40007.1	Input Module 2 Exhaust Temp. High	1 for active
0006.2	40007.2	Input Module 2 Sensor 15 Open	1 for active
0006.3	40007.3	Input Module 2 Sensor 15 High	1 for active
0006.4	40007.4	Input Module 2 Sensor 15 Low	1 for active
0006.5	40007.5	Input Module 2 Sensor 16 Open	1 for active
0006.6	40007.6	Input Module 2 Sensor 16 High	1 for active
0006.7	40007.7	Input Module 2 Sensor 16 Low	1 for active
0006.8	40007.8	Input Module 2 Sensor 17 Open	1 for active
0006.9	40007.9	Input Module 2 Sensor 17 High	1 for active
0006.10	40007.10	Input Module 2 Sensor 17 Low	1 for active
0006.11	40007.11	Input Module 2 Sensor 18 Open	1 for active
0006.12	40007.12	Input Module 2 Sensor 18 High	1 for active
0006.13	40007.13	Input Module 2 Sensor 18 Low	1 for active
0006.14	40007.14	Input Module 2 Sensor 19 Open	1 for active
0006.15	40007.15	Input Module 2 Sensor 19 High	1 for active
0007.0	40008.0	Input Module 2 Sensor 19 Low	1 for active
0007.1	40008.1	Input Module 2 Sensor 20 Open	1 for active
0007.2	40008.2	Input Module 2 Sensor 20 High	1 for active
0007.3	40008.3	Input Module 2 Sensor 20 Low	1 for active
0007.4	40008.4	Input Module 2 Sensor 21 Open	1 for active
0007.5	40008.5	Input Module 2 Sensor 21 High	1 for active

Modbus Address	PLC Address	Item	Description
0007.6	40008.6	Input Module 2 Sensor 21 Low	1 for active
0007.7	40008.7	Input Module 2 Sensor 22 Open	1 for active
0007.8	40008.8	Input Module 2 Sensor 22 High	1 for active
0007.9	40008.9	Input Module 2 Sensor 22 Low	1 for active
0007.10	40008.10	Input Module 2 Sensor 23 Open	1 for active
0007.11	40008.11	Input Module 2 Sensor 23 High	1 for active
0007.12	40008.12	Input Module 2 Sensor 23 Low	1 for active
0007.13	40008.13	Input Module 2 Sensor 24 Open	1 for active
0007.14	40008.14	Input Module 2 Sensor 24 High	1 for active
0007.15	40008.15	Input Module 2 Sensor 24 Low	1 for active
0008.0	40009.0	Input 1 Shutdown	1 for active
0008.1	40009.1	Input 2 Shutdown	1 for active
0008.2	40009.2	Input 3 Shutdown	1 for active
0008.3	40009.3	Input 4 Shutdown	1 for active
0008.4	40009.4	Input 5 Shutdown	1 for active
0008.5	40009.5	Input 6 Shutdown	1 for active
0008.6	40009.6	Input 7 Shutdown	1 for active
0008.7	40009.7	Input 8 Shutdown	1 for active
0008.8	40009.8	/	1 for active
0008.9	40009.9	/	1 for active
0008.10	40009.10	/	1 for active
0008.11	40009.11	/	1 for active
0008.12	40009.12	/	1 for active
0008.13	40009.13	/	1 for active
0008.14	40009.14	/	1 for active
0008.15	40009.15	/	1 for active
0009.0	40010.0	/	1 for active
0009.1	40010.1	/	1 for active
0009.2	40010.2	/	1 for active
0009.3	40010.3	/	1 for active
0009.4	40010.4	/	1 for active
0009.5	40010.5	/	1 for active
0009.6	40010.6	/	1 for active
0009.7	40010.7	/	1 for active
0009.8	40010.8	/	1 for active
0009.9	40010.9	/	1 for active
0009.10	40010.10	/	1 for active
0009.11	40010.11	/	1 for active
0009.12	40010.12	/	1 for active
0009.13	40010.13	/	1 for active
0009.14	40010.14	/	1 for active
0009.15	40010.15	/	1 for active
0010.0	40011.0	/	1 for active
0010.1	40011.1	/	1 for active

Modbus Address	PLC Address	Item	Description
0010.2	40011.2	/	1 for active
0010.3	40011.3	/	1 for active
0010.4	40011.4	/	1 for active
0010.5	40011.5	/	1 for active
0010.6	40011.6	/	1 for active
0010.7	40011.7	/	1 for active
0010.8	40011.8	/	1 for active
0010.9	40011.9	/	1 for active
0010.10	40011.10	/	1 for active
0010.11	40011.11	/	1 for active
0010.12	40011.12	/	1 for active
0010.13	40011.13	/	1 for active
0010.14	40011.14	/	1 for active
0010.15	40011.15	/	1 for active
0011.0	40012.0	/	1 for active
0011.1	40012.1	/	1 for active
0011.2	40012.2	/	1 for active
0011.3	40012.3	/	1 for active
0011.4	40012.4	/	1 for active
0011.5	40012.5	/	1 for active
0011.6	40012.6	/	1 for active
0011.7	40012.7	/	1 for active
0011.8	40012.8	/	1 for active
0011.9	40012.9	/	1 for active
0011.10	40012.10	/	1 for active
0011.11	40012.11	/	1 for active
0011.12	40012.12	/	1 for active
0011.13	40012.13	/	1 for active
0011.14	40012.14	/	1 for active
0011.15	40012.15	/	1 for active
0012.0	40013.0	Overcurrent Trip and Stop	1 for active
0012.1	40013.1	Maintenance Time Due Trip and Stop	1 for active
0012.2	40013.2	Reverse Power Trip and Stop	1 for active
0012.3	40013.3	Over Power Trip and Stop	1 for active
0012.4	40013.4	Input 1 Trip and Stop	1 for active
0012.5	40013.5	Input 2 Trip and Stop	1 for active
0012.6	40013.6	Input 3 Trip and Stop	1 for active
0012.7	40013.7	Input 4 Trip and Stop	1 for active
0012.8	40013.8	Input 5 Trip and Stop	1 for active
0012.9	40013.9	Input 6 Trip and Stop	1 for active
0012.10	40013.10	Input 7 Trip and Stop	1 for active
0012.11	40013.11	Input 8 Trip and Stop	1 for active
0012.12	40013.12	/	1 for active

Modbus Address	PLC Address	Item	Description
0012.13	40013.13	/	1 for active
0012.14	40013.14	/	1 for active
0012.15	40013.15	/	1 for active
0013.0	40014.0	/	1 for active
0013.1	40014.1	/	1 for active
0013.2	40014.2	/	1 for active
0013.3	40014.3	/	1 for active
0013.4	40014.4	/	1 for active
0013.5	40014.5	/	1 for active
0013.6	40014.6	/	1 for active
0013.7	40014.7	/	1 for active
0013.8	40014.8	/	1 for active
0013.9	40014.9	/	1 for active
0013.10	40014.10	/	1 for active
0013.11	40014.11	/	1 for active
0013.12	40014.12	/	1 for active
0013.13	40014.13	/	1 for active
0013.14	40014.14	/	1 for active
0013.15	40014.15	/	1 for active
0014.0	40015.0	/	1 for active
0014.1	40015.1	/	1 for active
0014.2	40015.2	/	1 for active
0014.3	40015.3	/	1 for active
0014.4	40015.4	/	1 for active
0014.5	40015.5	/	1 for active
0014.6	40015.6	/	1 for active
0014.7	40015.7	/	1 for active
0014.8	40015.8	/	1 for active
0014.9	40015.9	/	1 for active
0014.10	40015.10	/	1 for active
0014.11	40015.11	/	1 for active
0014.12	40015.12	/	1 for active
0014.13	40015.13	/	1 for active
0014.14	40015.14	/	1 for active
0014.15	40015.15	/	1 for active
0015.0	40016.0	/	1 for active
0015.1	40016.1	/	1 for active
0015.2	40016.2	/	1 for active
0015.3	40016.3	/	1 for active
0015.4	40016.4	/	1 for active
0015.5	40016.5	/	1 for active
0015.6	40016.6	/	1 for active
0015.7	40016.7	/	1 for active
0015.8	40016.8	/	1 for active

Modbus Address	PLC Address	Item	Description
0015.9	40016.9	/	1 for active
0015.10	40016.10	/	1 for active
0015.11	40016.11	/	1 for active
0015.12	40016.12	/	1 for active
0015.13	40016.13	/	1 for active
0015.14	40016.14	/	1 for active
0015.15	40016.15	/	1 for active
0016.0	40017.0	Overcurrent Trip	1 for active
0016.1	40017.1	Maintenance Time Due Trip	1 for active
0016.2	40017.2	Reverse Power Trip	1 for active
0016.3	40017.3	Over Power Trip	1 for active
0016.4	40017.4	Input 1 Trip	1 for active
0016.5	40017.5	Input 2 Trip	1 for active
0016.6	40017.6	Input 3 Trip	1 for active
0016.7	40017.7	Input 4 Trip	1 for active
0016.8	40017.8	Input 5 Trip	1 for active
0016.9	40017.9	Input 6 Trip	1 for active
0016.10	40017.10	Input 7 Trip	1 for active
0016.11	40017.11	Input 8 Trip	1 for active
0016.12	40017.12	/	1 for active
0016.13	40017.13	/	1 for active
0016.14	40017.14	/	1 for active
0016.15	40017.15	/	1 for active
0017.0	40018.0	/	1 for active
0017.1	40018.1	/	1 for active
0017.2	40018.2	/	1 for active
0017.3	40018.3	/	1 for active
0017.4	40018.4	/	1 for active
0017.5	40018.5	/	1 for active
0017.6	40018.6	/	1 for active
0017.7	40018.7	/	1 for active
0017.8	40018.8	/	1 for active
0017.9	40018.9	/	1 for active
0017.10	40018.10	/	1 for active
0017.11	40018.11	/	1 for active
0017.12	40018.12	/	1 for active
0017.13	40018.13	/	1 for active
0017.14	40018.14	/	1 for active
0017.15	40018.15	/	1 for active
0018.0	40019.0	/	1 for active
0018.1	40019.1	/	1 for active
0018.2	40019.2	/	1 for active
0018.3	40019.3	/	1 for active
0018.4	40019.4	/	1 for active

Modbus Address	PLC Address	Item	Description
0018.5	40019.5	/	1 for active
0018.6	40019.6	/	1 for active
0018.7	40019.7	/	1 for active
0018.8	40019.8	/	1 for active
0018.9	40019.9	/	1 for active
0018.10	40019.10	/	1 for active
0018.11	40019.11	/	1 for active
0018.12	40019.12	/	1 for active
0018.13	40019.13	/	1 for active
0018.14	40019.14	/	1 for active
0018.15	40019.15	/	1 for active
0019.0	40020.0	/	1 for active
0019.1	40020.1	/	1 for active
0019.2	40020.2	/	1 for active
0019.3	40020.3	/	1 for active
0019.4	40020.4	/	1 for active
0019.5	40020.5	/	1 for active
0019.6	40020.6	/	1 for active
0019.7	40020.7	/	1 for active
0019.8	40020.8	/	1 for active
0019.9	40020.9	/	1 for active
0019.10	40020.10	/	1 for active
0019.11	40020.11	/	1 for active
0019.12	40020.12	/	1 for active
0019.13	40020.13	/	1 for active
0019.14	40020.14	/	1 for active
0019.15	40020.15	/	1 for active
0020.0	40021.0	Overspeed Warning	1 for active
0020.1	40021.1	Underspeed Warning	1 for active
0020.2	40021.2	Speed Signal Loss Warning	1 for active
0020.3	40021.3	Gen Overfrequency Warning	1 for active
0020.4	40021.4	Gen Underfrequency Warning	1 for active
0020.5	40021.5	Gen Overvoltage Warning	1 for active
0020.6	40021.6	Gen Undervoltage Warning	1 for active
0020.7	40021.7	Gen Overcurrent Warning	1 for active
0020.8	40021.8	Stop Failure Warning	1 for active
0020.9	40021.9	Charging Failure Warning	1 for active
0020.10	40021.10	Battery Overvoltage Warning	1 for active
0020.11	40021.11	Battery Undervoltage Warning	1 for active
0020.12	40021.12	Maintenance Time Due Warning	1 for active
0020.13	40021.13	Reverse Power Warning	1 for active
0020.14	40021.14	Over Power Warning	1 for active
0020.15	40021.15	ECU Warning	1 for active
0021.0	40022.0	Gen Loss of Phase Warning	1 for active

Modbus Address	PLC Address	Item	Description
0021.1	40022.1	Gen Reverse Phase Sequence Warning	1 for active
0021.2	40022.2	/	1 for active
0021.3	40022.3	Current Imbalance Warning	1 for active
0021.4	40022.4	Earth Fault Warning	1 for active
0021.5	40022.5	Loss of Excitation Fault Warning	1 for active
0021.6	40022.6	/	1 for active
0021.7	40022.7	Switch Failure Warning	1 for active
0021.8	40022.8	Temp. Sensor Warning	1 for active
0021.9	40022.9	High Temp. Warning	1 for active
0021.10	40022.10	Low Temp. Warning	1 for active
0021.11	40022.11	/	1 for active
0021.12	40022.12	Oil Pressure Sensor Open	1 for active
0021.13	40022.13	/	1 for active
0021.14	40022.14	Low Oil Pressure Warning	1 for active
0021.15	40022.15	/	1 for active
0022.0	40023.0	Level Sensor Open	1 for active
0022.1	40023.1	/	1 for active
0022.2	40023.2	Low Level Warning	1 for active
0022.3	40023.3	/	1 for active
0022.4	40023.4	Aux. Sensor 1 Open Warning	1 for active
0022.5	40023.5	Aux. Sensor 1 High Warning	1 for active
0022.6	40023.6	Aux. Sensor 1 Low Warning	1 for active
0022.7	40023.7	/	1 for active
0022.8	40023.8	Aux. Sensor 2 Open Warning	1 for active
0022.9	40023.9	Aux. Sensor 2 High Warning	1 for active
0022.10	40023.10	Aux. Sensor 2 Low Warning	1 for active
0022.11	40023.11	/	1 for active
0022.12	40023.12	/	1 for active
0022.13	40023.13	/	1 for active
0022.14	40023.14	/	1 for active
0022.15	40023.15	/	1 for active
0023.0	40024.0	/	1 for active
0023.1	40024.1	/	1 for active
0023.2	40024.2	/	1 for active
0023.3	40024.3	/	1 for active
0023.4	40024.4	/	1 for active
0023.5	40024.5	/	1 for active
0023.6	40024.6	/	1 for active
0023.7	40024.7	/	1 for active
0023.8	40024.8	/	1 for active
0023.9	40024.9	/	1 for active
0023.10	40024.10	/	1 for active
0023.11	40024.11	/	1 for active

Modbus Address	PLC Address	Item	Description
0023.12	40024.12	/	1 for active
0023.13	40024.13	/	1 for active
0023.14	40024.14	/	1 for active
0023.15	40024.15	/	1 for active
0024.0	40025.0	/	1 for active
0024.1	40025.1	/	1 for active
0024.2	40025.2	/	1 for active
0024.3	40025.3	/	1 for active
0024.4	40025.4	/	1 for active
0024.5	40025.5	/	1 for active
0024.6	40025.6	/	1 for active
0024.7	40025.7	/	1 for active
0024.8	40025.8	/	1 for active
0024.9	40025.9	/	1 for active
0024.10	40025.10	/	1 for active
0024.11	40025.11	/	1 for active
0024.12	40025.12	/	1 for active
0024.13	40025.13	/	1 for active
0024.14	40025.14	/	1 for active
0024.15	40025.15	/	1 for active
0025.0	40026.0	/	1 for active
0025.1	40026.1	/	1 for active
0025.2	40026.2	/	1 for active
0025.3	40026.3	/	1 for active
0025.4	40026.4	/	1 for active
0025.5	40026.5	/	1 for active
0025.6	40026.6	/	1 for active
0025.7	40026.7	/	1 for active
0025.8	40026.8	/	1 for active
0025.9	40026.9	/	1 for active
0025.10	40026.10	/	1 for active
0025.11	40026.11	/	1 for active
0025.12	40026.12	/	1 for active
0025.13	40026.13	/	1 for active
0025.14	40026.14	/	1 for active
0025.15	40026.15	/	1 for active
0026.0	40027.0	/	1 for active
0026.1	40027.1	/	1 for active
0026.2	40027.2	/	1 for active
0026.3	40027.3	/	1 for active
0026.4	40027.4	/	1 for active
0026.5	40027.5	/	1 for active
0026.6	40027.6	/	1 for active
0026.7	40027.7	/	1 for active

Modbus Address	PLC Address	Item	Description
0026.8	40027.8	/	1 for active
0026.9	40027.9	/	1 for active
0026.10	40027.10	/	1 for active
0026.11	40027.11	/	1 for active
0026.12	40027.12	/	1 for active
0026.13	40027.13	/	1 for active
0026.14	40027.14	/	1 for active
0026.15	40027.15	/	1 for active
0027.0	40028.0	GSM Comm. Failure Warning	1 for active
0027.1	40028.1	/	1 for active
0027.2	40028.2	/	1 for active
0027.3	40028.3	/	1 for active
0027.4	40028.4	/	1 for active
0027.5	40028.5	/	1 for active
0027.6	40028.6	/	1 for active
0027.7	40028.7	/	1 for active
0027.8	40028.8	/	1 for active
0027.9	40028.9	/	1 for active
0027.10	40028.10	/	1 for active
0027.11	40028.11	/	1 for active
0027.12	40028.12	/	1 for active
0027.13	40028.13	/	1 for active
0027.14	40028.14	/	1 for active
0027.15	40028.15	/	1 for active
0028.0	40029.0	/	1 for active
0028.1	40029.1	/	1 for active
0028.2	40029.2	/	1 for active
0028.3	40029.3	/	1 for active
0028.4	40029.4	/	1 for active
0028.5	40029.5	/	1 for active
0028.6	40029.6	/	1 for active
0028.7	40029.7	/	1 for active
0028.8	40029.8	/	1 for active
0028.9	40029.9	/	1 for active
0028.10	40029.10	/	1 for active
0028.11	40029.11	/	1 for active
0028.12	40029.12	/	1 for active
0028.13	40029.13	/	1 for active
0028.14	40029.14	/	1 for active
0028.15	40029.15	/	1 for active
0029.0	40030.0	Input 1 Warning	1 for active
0029.1	40030.1	Input 2 Warning	1 for active
0029.2	40030.2	Input 3 Warning	1 for active
0029.3	40030.3	Input 4 Warning	1 for active

Modbus Address	PLC Address	Item	Description
0029.4	40030.4	Input 5 Warning	1 for active
0029.5	40030.5	Input 6 Warning	1 for active
0029.6	40030.6	Input 7 Warning	1 for active
0029.7	40030.7	Input 8 Warning	1 for active
0029.8	40030.8	/	1 for active
0029.9	40030.9	/	1 for active
0029.10	40030.10	/	1 for active
0029.11	40030.11	/	1 for active
0029.12	40030.12	/	1 for active
0029.13	40030.13	/	1 for active
0029.14	40030.14	/	1 for active
0029.15	40030.15	/	1 for active
0030.0	40031.0	/	1 for active
0030.1	40031.1	/	1 for active
0030.2	40031.2	/	1 for active
0030.3	40031.3	/	1 for active
0030.4	40031.4	/	1 for active
0030.5	40031.5	/	1 for active
0030.6	40031.6	/	1 for active
0030.7	40031.7	/	1 for active
0030.8	40031.8	/	1 for active
0030.9	40031.9	/	1 for active
0030.10	40031.10	/	1 for active
0030.11	40031.11	/	1 for active
0030.12	40031.12	/	1 for active
0030.13	40031.13	/	1 for active
0030.14	40031.14	/	1 for active
0030.15	40031.15	/	1 for active
0031.0	40032.0	Inhibit Shutdown Indication	1 for active
0031.1	40032.1	Maintenance Time Due Indication	1 for active
0031.2	40032.2	In Scheduled Not Run Indication	1 for active
0031.3	40032.3	GSM Comm. Failure Indication	1 for active
0031.4	40032.4	/	1 for active
0031.5	40032.5	/	1 for active
0031.6	40032.6	/	1 for active
0031.7	40032.7	/	1 for active
0031.8	40032.8	/	1 for active
0031.9	40032.9	/	1 for active
0031.10	40032.10	/	1 for active
0031.11	40032.11	/	1 for active
0031.12	40032.12	/	1 for active
0031.13	40032.13	/	1 for active
0031.14	40032.14	/	1 for active
0031.15	40032.15	/	1 for active

Modbus Address	PLC Address	Item	Description
0032.0	40033.0	/	1 for active
0032.1	40033.1	/	1 for active
0032.2	40033.2	/	1 for active
0032.3	40033.3	/	1 for active
0032.4	40033.4	/	1 for active
0032.5	40033.5	/	1 for active
0032.6	40033.6	Auto Mode Input	1 for active
0032.7	40033.7	Auto Mode Inactive	1 for active
0032.8	40033.8	GSM Start Inhibit	1 for active
0032.9	40033.9	Reserved	1 for active
0032.10	40033.10	Alternate Config. 1 Indication	1 for active
0032.11	40033.11	Alternate Config. 2 Indication	1 for active
0032.12	40033.12	Alternate Config. 3 Indication	1 for active
0032.13	40033.13	Overcurrent Indication	1 for active
0032.14	40033.14	Reverse Power Indication	1 for active
0032.15	40033.15	Over Power Indication	1 for active
0033.0	40034.0	Input 1 Indication	1 for active
0033.1	40034.1	Input 2 Indication	1 for active
0033.2	40034.2	Input 3 Indication	1 for active
0033.3	40034.3	Input 4 Indication	1 for active
0033.4	40034.4	Input 5 Indication	1 for active
0033.5	40034.5	Input 6 Indication	1 for active
0033.6	40034.6	Input 7 Indication	1 for active
0033.7	40034.7	Input 8 Indication	1 for active
0033.8	40034.8	Input 9 Indication	1 for active
0033.9	40034.9	Input 10 Indication	1 for active
0033.10	40034.10	/	1 for active
0033.11	40034.11	/	1 for active
0033.12	40034.12	/	1 for active
0033.13	40034.13	/	1 for active
0033.14	40034.14	/	1 for active
0033.15	40034.15	/	1 for active
0034.0	40035.0	/	1 for active
0034.1	40035.1	/	1 for active
0034.2	40035.2	/	1 for active
0034.3	40035.3	/	1 for active
0034.4	40035.4	/	1 for active
0034.5	40035.5	/	1 for active
0034.6	40035.6	/	1 for active
0034.7	40035.7	/	1 for active
0034.8	40035.8	/	1 for active
0034.9	40035.9	/	1 for active
0034.10	40035.10	/	1 for active
0034.11	40035.11	/	1 for active

Modbus Address	PLC Address	Item	Description
0034.12	40035.12	/	1 for active
0034.13	40035.13	/	1 for active
0034.14	40035.14	/	1 for active
0034.15	40035.15	/	1 for active
0035.0	40036.0	Emergency Stop Input Status	1 for active
0035.1	40036.1	Input 1 Status	1 for active
0035.2	40036.2	Input 2 Status	1 for active
0035.3	40036.3	Input 3 Status	1 for active
0035.4	40036.4	Input 4 Status	1 for active
0035.5	40036.5	Input 5 Status	1 for active
0035.6	40036.6	Input 6 Status	1 for active
0035.7	40036.7	Input 7 Status	1 for active
0035.8	40036.8	Input 8 Status	1 for active
0035.9	40036.9	/	1 for active
0035.10	40036.10	/	1 for active
0035.11	40036.11	/	1 for active
0035.12	40036.12	/	1 for active
0035.13	40036.13	/	1 for active
0035.14	40036.14	/	1 for active
0035.15	40036.15	/	1 for active
0036.0	40037.0	Exp. Input 1 Status	1 for active
0036.1	40037.1	Exp. Input 2 Status	1 for active
0036.2	40037.2	Exp. Input 3 Status	1 for active
0036.3	40037.3	Exp. Input 4 Status	1 for active
0036.4	40037.4	Exp. Input 5 Status	1 for active
0036.5	40037.5	Exp. Input 6 Status	1 for active
0036.6	40037.6	Exp. Input 7 Status	1 for active
0036.7	40037.7	Exp. Input 8 Status	1 for active
0036.8	40037.8	Exp. Input 9 Status	1 for active
0036.9	40037.9	Exp. Input 10 Status	1 for active
0036.10	40037.10	Exp. Input 11 Status	1 for active
0036.11	40037.11	Exp. Input 12 Status	1 for active
0036.12	40037.12	Exp. Input 13 Status	1 for active
0036.13	40037.13	Exp. Input 14 Status	1 for active
0036.14	40037.14	Exp. Input 15 Status	1 for active
0036.15	40037.15	Exp. Input 16 Status	1 for active
0037.0	40038.0	Fuel Relay Output Status	1 for active
0037.1	40038.1	Crank Relay Output Status	1 for active
0037.2	40038.2	Aux. Output 1 Status	1 for active
0037.3	40038.3	Aux. Output 2 Status	1 for active
0037.4	40038.4	Aux. Output 3 Status	1 for active
0037.5	40038.5	Aux. Output 4 Status	1 for active
0037.6	40038.6	Aux. Output 5 Status	1 for active
0037.7	40038.7	Aux. Output 6 Status	1 for active

Modbus Address	PLC Address	Item	Description
0037.8	40038.8	Aux. Output 7 Status	1 for active
0037.9	40038.9	Aux. Output 8 Status	1 for active
0037.10	40038.10	Aux. Output 9 Status	1 for active
0037.11	40038.11	Aux. Output 10 Status	1 for active
0037.12	40038.12	/	1 for active
0037.13	40038.13	/	1 for active
0037.14	40038.14	/	1 for active
0037.15	40038.15	/	1 for active
0038.0	40039.0	Exp. Output 1 Status	1 for active
0038.1	40039.1	Exp. Output 2 Status	1 for active
0038.2	40039.2	Exp. Output 3 Status	1 for active
0038.3	40039.3	Exp. Output 4 Status	1 for active
0038.4	40039.4	Exp. Output 5 Status	1 for active
0038.5	40039.5	Exp. Output 6 Status	1 for active
0038.6	40039.6	Exp. Output 7 Status	1 for active
0038.7	40039.7	Exp. Output 8 Status	1 for active
0038.8	40039.8	Exp. Output 9 Status	1 for active
0038.9	40039.9	Exp. Output 10 Status	1 for active
0038.10	40039.10	Exp. Output 11 Status	1 for active
0038.11	40039.11	Exp. Output 12 Status	1 for active
0038.12	40039.12	Exp. Output 13 Status	1 for active
0038.13	40039.13	Exp. Output 14 Status	1 for active
0038.14	40039.14	Exp. Output 15 Status	1 for active
0038.15	40039.15	Exp. Output 16 Status	1 for active
0039.0	40040.0	/	1 for active
0039.1	40040.1	/	1 for active
0039.2	40040.2	/	1 for active
0039.3	40040.3	/	1 for active
0039.4	40040.4	/	1 for active
0039.5	40040.5	/	1 for active
0039.6	40040.6	/	1 for active
0039.7	40040.7	/	1 for active
0039.8	40040.8	/	1 for active
0039.9	40040.9	/	1 for active
0039.10	40040.10	/	1 for active
0039.11	40040.11	/	1 for active
0039.12	40040.12	/	1 for active
0039.13	40040.13	/	1 for active
0039.14	40040.14	/	1 for active
0039.15	40040.15	/	1 for active
0040.0	40041.0	/	1 for active
0040.1	40041.1	/	1 for active
0040.2	40041.2	/	1 for active
0040.3	40041.3	/	1 for active

Modbus Address	PLC Address	Item	Description
0040.4	40041.4	/	1 for active
0040.5	40041.5	/	1 for active
0040.6	40041.6	/	1 for active
0040.7	40041.7	/	1 for active
0040.8	40041.8	/	1 for active
0040.9	40041.9	/	1 for active
0040.10	40041.10	/	1 for active
0040.11	40041.11	/	1 for active
0040.12	40041.12	/	1 for active
0040.13	40041.13	/	1 for active
0040.14	40041.14	/	1 for active
0040.15	40041.15	/	1 for active
0041.0	40042.0	/	1 for active
0041.1	40042.1	/	1 for active
0041.2	40042.2	/	1 for active
0041.3	40042.3	/	1 for active
0041.4	40042.4	/	1 for active
0041.5	40042.5	/	1 for active
0041.6	40042.6	/	1 for active
0041.7	40042.7	/	1 for active
0041.8	40042.8	/	1 for active
0041.9	40042.9	/	1 for active
0041.10	40042.10	/	1 for active
0041.11	40042.11	/	1 for active
0041.12	40042.12	/	1 for active
0041.13	40042.13	/	1 for active
0041.14	40042.14	/	1 for active
0041.15	40042.15	/	1 for active
0042.0	40043.0	/	1 for active
0042.1	40043.1	/	1 for active
0042.2	40043.2	/	1 for active
0042.3	40043.3	/	1 for active
0042.4	40043.4	/	1 for active
0042.5	40043.5	/	1 for active
0042.6	40043.6	/	1 for active
0042.7	40043.7	/	1 for active
0042.8	40043.8	/	1 for active
0042.9	40043.9	/	1 for active
0042.10	40043.10	/	1 for active
0042.11	40043.11	/	1 for active
0042.12	40043.12	/	1 for active
0042.13	40043.13	/	1 for active
0042.14	40043.14	/	1 for active
0042.15	40043.15	/	1 for active

Modbus Address	PLC Address	Item	Description
0043.0	40044.0	Mains Normal	1 for active
0043.1	40044.1	Mains Close	1 for active
0043.2	40044.2	Gen Normal	1 for active
0043.3	40044.3	Gen Close	1 for active
0043.4	40044.4	Alarm Mute Indicator Status	1 for active
0043.5	40044.5	Running Indicator Status	1 for active
0043.6	40044.6	/	1 for active
0043.7	40044.7	/	1 for active
0043.8	40044.8	/	1 for active
0043.9	40044.9	/	1 for active
0043.10	40044.10	/	1 for active
0043.11	40044.11	/	1 for active
0043.12	40044.12	/	1 for active
0043.13	40044.13	/	1 for active
0043.14	40044.14	/	1 for active
0043.15	40044.15	/	1 for active
0044.0	40045.0	Mains Abnormal	1 for active
0044.1	40045.1	Mains Overvoltage	1 for active
0044.2	40045.2	Mains Undervoltage	1 for active
0044.3	40045.3	Mains Overfrequency	1 for active
0044.4	40045.4	Mains Underfrequency	1 for active
0044.5	40045.5	Mains Loss of Phase	1 for active
0044.6	40045.6	Mains Reverse Phase Sequence	1 for active
0044.7	40045.7	Mains Blackout	1 for active
0044.8	40045.8	/	1 for active
0044.9	40045.9	/	1 for active
0044.10	40045.10	/	1 for active
0044.11	40045.11	/	1 for active
0044.12	40045.12	/	1 for active
0044.13	40045.13	/	1 for active
0044.14	40045.14	/	1 for active
0044.15	40045.15	/	1 for active
0045.0	40046.0	Input 1 Active	1 for active
0045.1	40046.1	Input 2 Active	1 for active
0045.2	40046.2	Input 3 Active	1 for active
0045.3	40046.3	Input 4 Active	1 for active
0045.4	40046.4	Input 5 Active	1 for active
0045.5	40046.5	Input 6 Active	1 for active
0045.6	40046.6	Input 7 Active	1 for active
0045.7	40046.7	Input 8 Active	1 for active
0045.8	40046.8	/	1 for active
0045.9	40046.9	/	1 for active
0045.10	40046.10	/	1 for active
0045.11	40046.11	/	1 for active

Modbus Address	PLC Address	Item	Description
0045.12	40046.12	/	1 for active
0045.13	40046.13	/	1 for active
0045.14	40046.14	/	1 for active
0045.15	40046.15	/	1 for active
0046.0	40047.0	/	1 for active
0046.1	40047.1	/	1 for active
0046.2	40047.2	/	1 for active
0046.3	40047.3	/	1 for active
0046.4	40047.4	/	1 for active
0046.5	40047.5	/	1 for active
0046.6	40047.6	/	1 for active
0046.7	40047.7	/	1 for active
0046.8	40047.8	/	1 for active
0046.9	40047.9	/	1 for active
0046.10	40047.10	/	1 for active
0046.11	40047.11	/	1 for active
0046.12	40047.12	/	1 for active
0046.13	40047.13	/	1 for active
0046.14	40047.14	/	1 for active
0046.15	40047.15	/	1 for active
0047	40048	/	1 for active
0048	40049	/	1 for active
0049	40050	/	1 for active
0050	40051	/	1 for active
0051	40052	/	1 for active
0052	40053	/	1 for active
0053	40054	/	1 for active
0054	40055	/	1 for active

Example:

If need to read “Level Sensor Open” status and “Input Module 1 Sensor 17 Open” status, firstly get their addresses are 0003.0 and 0004.8 by checking the table, then it is known that 2-address data needs to be read.

Assume the slave (controller) address is 01, the master (can be computer) request command is as following:

Table 3 Master Request Command

Slave Address	Function Code	Starting Address (0003)		Request Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**03**	**00**	**02**	**34**	**0B**

The slave response command is as following:

Table 4 Slave Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 0003	Data LSB of Address 0003	Data MSB of Address 0004	Data LSB of Address 0004	LSB	MSB
01	**03**	**04**	**00**	**01**	**01**	**00**	**AA**	**63**

Table 5 Data Analysis

Address	Received Data (Hex)	Binary	Data Signification
0003	0001H	0000 0000 0000 0001 (corresponds to 0003.15, 0003.14…….0003.1, 0003.0	Data of bit 0 is 1, which means “Level Sensor Open” status is active.
0004	0100H	0000 0001 0000 0000 (corresponds to 0004.15, 0004.14…….0004.1, 0004.0	Data of bit 8 is 1, which means “Input Module 1 Sensor 17 Open” status is active.

3.3 FUNCTION CODE 03H, 06H MAPPING VALUE DATA FIELD

06H function code only can be written by address 0199-0210 and 0225-0231, other addresses are unavailable.

Table 6 Function Code 03H, 06H Mapping Data Field

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0000	40001	Common Alarm					
0001 -0011	40002 -40012	Shutdown Alarm Field					
0012 -0015	40013 -40016	Trip and Stop Alarm Field					
0016 -0019	40017 -40020	Trip Field					
0020 -0030	40021 -40031	Warning Field					
0031 -0034	40032 -40035	Indication Field					
0035	40036	Input Status Field					
0036	40037	Exp. Input Status Field					
0037	40038	Output Status Field					
0038	40039	Exp. Output Module Output Status Field					
0039	40040	/					
0040	40041	/					
0041	40042	/					
0042	40043	/					
0043	40044	Indicator Status Field					
0044	40045	Mains Status Field					
0045	40046	Input Field					
0046	40047	Exp. Input Field					
0047	40048	/					
0048	40049	/					
0049	40050	/					
0050	40051	/					
0051	40052	/					
0052	40053	/					
0053	40054	/					
0054	40055	/					
0055	40056	Mains UAB	0~4294967295	1	V	16-bit Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0056	40057	Mains UBC	0~4294967295	1	V	16-bit Unsigned	
0057	40058	Mains UCA	0~4294967295	1	V	16-bit Unsigned	
0058	40059	Mains UA	0~4294967295	1	V	16-bit Unsigned	
0059	40060	Mains UB	0~4294967295	1	V	16-bit Unsigned	
0060	40061	Mains UC	0~4294967295	1	V	16-bit Unsigned	
0061	40062	Mains UA Phase	0~360.0	0.1	°	16-bit Signed	
0062	40063	Mains UB Phase	0~360.0	0.1	°	16-bit Signed	
0063	40064	Mains UC Phase	0~360.0	0.1	°	16-bit Signed	
0064	40065	Mains Frequency	0~100.00	0.01	Hz	16-bit Signed	
0065	40066	Frequency Change	0~100.00	0.01	Hz	16-bit Signed	
0066	40067	Vector Value	0~360.0	0.1	°	16-bit Signed	
0067	40068	/					
0068	40069	/					
0069	40070	/					
0070	40071	/					
0071	40072	/					
0072	40073	/					
0073	40074	/					
0074	40075	/					
0075	40076	Gen UAB	0~4294967295	1	V	16-bit Unsigned	
0076	40077	Gen UBC	0~4294967295	1	V	16-bit Unsigned	
0077	40078	Gen UCA	0~4294967295	1	V	16-bit Unsigned	
0078	40079	Gen UA	0~4294967295	1	V	16-bit Unsigned	
0079	40080	Gen UB	0~4294967295	1	V	16-bit Unsigned	
0080	40081	Gen UC	0~4294967295	1	V	16-bit Unsigned	
0081	40082	Gen UA Phase	0~360.0	0.1	°	16-bit Signed	
0082	40083	Gen UB Phase	0~360.0	0.1	°	16-bit Signed	
0083	40084	Gen UC Phase	0~360.0	0.1	°	16-bit Signed	
0084	40085	Gen Frequency	0~100.00	0.01	Hz	16-bit Signed	
0085	40086	Volt Difference	-32768~32767	1	V	16-bit Signed	
0086	40087	Freq. Difference	0~100.00	0.01	Hz	16-bit Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0087	40088	Phase Difference	0~360.0	0.1	°	16-bit Signed	
0088	40089	Current Gen Active Percentage	-32768~32767	0.1	%	16-bit Signed	
0089	40090	Target Gen Active Percentage	-32768~32767	0.1	%	16-bit Signed	
0090	40091	Current Gen Reactive Percentage	-32768~32767	0.1	%	16-bit Signed	
0091	40092	Target Gen Reactive Percentage	-32768~32767	0.1	%	16-bit Signed	
0092	40093	GOV Percentage	-100~100	0.1	%	16-bit Signed	
0093	40094	Average Power Percentage	-100~100	0.1	%	16-bit Signed	
0094	40095	/					
0095	40096	A Phase Current	0~65535	0.1	A	16-bit Unsigned	
0096	40097	B Phase Current	0~65535	0.1	A	16-bit Unsigned	
0097	40098	C Phase Current	0~65535	0.1	A	16-bit Unsigned	
0098	40099	N Wire Current	0~65535	0.1	A	16-bit Unsigned	
0099	40100	A Phase Current Phase	0~360.0	0.1	°	16-bit Unsigned	
0100	40101	B Phase Current Phase	0~360.0	0.1	°	16-bit Signed	
0101	40102	C Phase Current Phase	0~360.0	0.1	°	16-bit Signed	
0102	40103	N Wire Current Phase	0~360.0	0.1	°	16-bit Signed	
0103	40104	A Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0104	40105						
0105	40106	B Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0106	40107						
0107	40108	C Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0108	40109						
0109	40110	Total Active Power	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0110	40111						

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0111	40112	A Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0112	40113						
0113	40114	B Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0114	40115						
0115	40116	C Phase Active Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0116	40117						
0117	40118	Total Active Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0118	40119						
0119	40120	A Phase Apparent Power	-2,147,483,648~2,147,483,647	0.1	kVA	32-bit Signed	
0120	40121						
0121	40122	B Phase Apparent Power	-2,147,483,648~2,147,483,647	0.1	kVA	32-bit Signed	
0122	40123						
0123	40124	C Phase Apparent Power	-2,147,483,648~2,147,483,647	0.1	kVA	32-bit Signed	
0124	40125						
0125	40126	Total Apparent Power	-2,147,483,648~2,147,483,647	0.1	kVA	32-bit Signed	
0126	40127						
0127	40128	A Phase Power Factor	-100~100	0.01	CosΦ	16-bit Signed	
0128	40129	B Phase Power Factor	-100~100	0.01	CosΦ	16-bit Signed	
0129	40130	C Phase Power Factor	-100~100	0.01	CosΦ	16-bit Signed	
0130	40131	Average Power Factor	-100~100	0.01	CosΦ	16-bit Signed	
0131	40132	/					
0132	40133	/					
0133	40134	Unbalanced Current	0~65535	0.1	A	16-bit Unsigned	
0134	40135	Mains Current	0~65535	0.1	A	16-bit Unsigned	
0135	40136	/					
0136	40137	/					
0137	40138	/					
0138	40139	/					
0139	40140	/					

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0140	40141	/					
0141	40142	Speed	0~32767	1	r/min	16-bit Signed	
0142	40143	Battery Voltage	-32768~32767	0.1	V	16-bit Signed	
0143	40144	Charger Voltage	-32768~32767	0.1	V	16-bit Signed	
0144	40145						
0145	40146	/					
0146	40147	/					
0147	40148	/					
0148	40149	/					
0149	40150	Generator Temp.	-50~10000	1	℃	16-bit Signed	
0150	40151	/					
0151	40152	Oil Pressure	0~10000	1	kPa	16-bit Signed	
0152	40153	/					
0153	40154	Fuel Level	0~200	1	%	16-bit Signed	
0154	40155	/					
0155	40156	Sensor 4 Value	-32768~32767	1		16-bit Signed	
0156	40157	/					
0157	40158	Sensor 5 Value	-32768~32767	1		16-bit Signed	
0158	40159	/					
0159	40160	Sensor 6 Value	-32768~32767	1		16-bit Signed	
0160	40161	/					
0161	40162	Load Percentage	-100~100	1	%	16-bit Signed	Signed, it is reserved when engine is non-ECU.
0162	40163	Coolant Level	0~200	1	%	16-bit Signed	
0163	40164	Engine Oil Temperature	-32768~32767	1	℃	16-bit Signed	
0164	40165	Coolant Pressure	0~32767	1	kPa	16-bit Signed	
0165	40166	Fuel Pressure	0~32767	1	kPa	16-bit Signed	
0166	40167	Fuel Temperature	-32768~32767	1	℃	16-bit Signed	
0167	40168	Inlet Temp.	-32768~32767	1	℃	16-bit Signed	
0168	40169	Exhaust Temp.	-32768~32767	1	℃	16-bit Signed	
0169	40170	Turbo Pressure	0~32767	1	kPa	16-bit Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0170	40171	Fuel Consumption	0~32767	0.1	L/h	16-bit Signed	
0171	40172	Accumulated Fuel Consumption	0~99999999	1	L	32-bit Signed	
0172	40173						
0173	40174	Throttle Percentage 1	-32768~32767	0.1	%	16-bit Signed	
0174	40175	Post-Valve Gas Pressure	-32768~32767	1	kPa	16-bit Signed	
0175	40176	Pre-Valve Gas Pressure	-32768~32767	1	kPa	16-bit Signed	
0176	40177						
0177	40178						
0178	40179	ECU Battery Voltage	-32768~32767	0.1	V	16-bit Signed	
0179	40180	/					
0180	40181	Current Mains Active Percentage	-32768~32767	0.1	%	16-bit Signed	
0181	40182	Current Mains Reactive Percentage	-32768~32767	0.1	%	16-bit Signed	
0182	40183	Active Power	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0183	40184						
0184	40185	Reactive Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0185	40186						
0186	40187	Apparent Power	-2,147,483,648~2,147,483,647	0.1	kVA	32-bit Signed	
0187	40188						
0188	40189	Power Factor	-100~100	0.01	CosΦ	16-bit Signed	
0189	40190	Generator Status		No		Generator Status	
0190	40191	Delay Value		1	s	16-bit Unsigned	
0191	40192	Remote Start Status		No		Remote Start Status	
0192	40193	Delay Value		1	s	16-bit Unsigned	
0193	40194	Gen ATS Status		No		ATS Status	
0194	40195	Delay Value		1	s	16-bit Unsigned	
0195	40196	Mains Status		No		Mains Status	
0196	40197	Delay Value		1	s	16-bit Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0197	40198	Mains ATS Status		No		ATS Status	
0198	40199	Delay Value				16-bit Unsigned	
0199	40200	Accum. Run Hours	0~65535	1	h	16-bit Unsigned	
0200	40201	Accum. Run Minutes	0~59	1	min	16-bit Unsigned	
0201	40202	Accum. Run Seconds	0~59	1	s	16-bit Unsigned	
0202	40203	Accum. Start Times	0~65535	1	times	16-bit Unsigned	
0203	40204	Accum. Energy kWh	0~99999999	0.1	kWh	32-bit Signed	
0204	40205						
0205	40206	Accum. Energy kvarh	0~99999999	0.1	kvarh	32-bit Signed	
0206	40207						
0207	40208	Accum. Energy kVAh	0~99999999	0.1	kVAh	32-bit Signed	
0208	40209						
0209	40210	/					
0210	40211						
0211	40212	Maint. Left Hours	0~65535	1	h	16-bit Unsigned	
0212	40213	Maint. Left Minutes	0~59	1	min	16-bit Unsigned	
0213	40214	Maint. Left Seconds	0~59	1	s	16-bit Unsigned	
0214	40215	Multi-set Total Reactive Power	-2,147,483,648~2,147,483,647	0.1	kvar	32-bit Signed	
0215	40216						
0216	40217	/					
0217	40218	Controller Model		1		16-bit Unsigned	
0218	40219	Software Version		0.1		16-bit Unsigned	
0219	40220	Hardware Version		0.1		16-bit Unsigned	
0220	40221	Release Year	0~99	1	year	16-bit Unsigned	
0221	40222	Release Month	1~12	1	month	16-bit Unsigned	
0222	40223	Release Day	1~31	1	day	16-bit Unsigned	
0223	40224	/					
0224	40225	/					

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0225	40226	Controller Time: Year	0~99	1	year	16-bit Unsigned	
0226	40227	Controller Time: Month	1~12	1	month	16-bit Unsigned	
0227	40228	Controller Time: Day	1~31	1	day	16-bit Unsigned	
0228	40229	Controller Time: Week	0~6	1	week	16-bit Unsigned	0: Sun 1~6: Mon ~ Sat.
0229	40230	Controller Time: Hour	0~23	1	h	16-bit Unsigned	
0230	40231	Controller Time: Minute	0~59	1	min	16-bit Unsigned	
0231	40232	Controller Time: Second	0~59	1	s	16-bit Unsigned	
0232	40233	Module MSC ID	0~31	1		16-bit Unsigned	
0233	40234	Module Priority	0~31	1		16-bit Unsigned	
0234	40235	Total Modules	1~245	1		16-bit Unsigned	
0235	40236	Multi-set Power kW	-2,147,483,648~2,147,483,647	0.1	kW	32-bit Signed	
0236	40237						
0237	40238	/					
0238	40239	Expand AIN24-1, Sensor 15		1		16-bit Signed	
0239	40240	Expand AIN24-1, Sensor 16		1		16-bit Signed	
0240	40241	Expand AIN24-1, Sensor 17		1		16-bit Signed	
0241	40242	Expand AIN24-1, Sensor 18		1		16-bit Signed	
0242	40243	Expand AIN24-1, Sensor 19		1		16-bit Signed	
0243	40244	Expand AIN24-1, Sensor 20		1		16-bit Signed	
0244	40245	Expand AIN24-1, Sensor 21		1		16-bit Signed	
0245	40246	Expand AIN24-1, Sensor 22		1		16-bit Signed	
0246	40247	Expand AIN24-1, Sensor 23		1		16-bit Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0247	40248	Expand AIN24-1, Sensor 24		1		16-bit Signed	
0248	40249	Expand AIN24-2, Sensor 15		1		16-bit Signed	
0249	40250	Expand AIN24-2, Sensor 16		1		16-bit Signed	
0250	40251	Expand AIN24-2, Sensor 17		1		16-bit Signed	
0251	40252	Expand AIN24-2, Sensor 18		1		16-bit Signed	
0252	40253	Expand AIN24-2, Sensor 19		1		16-bit Signed	
0253	40254	Expand AIN24-2, Sensor 20		1		16-bit Signed	
0254	40255	Expand AIN24-2, Sensor 21		1		16-bit Signed	
0255	40256	Expand AIN24-2, Sensor 22		1		16-bit Signed	
0256	40257	Expand AIN24-2, Sensor 23		1		16-bit Signed	
0257	40258	Expand AIN24-2, Sensor 24		1		16-bit Signed	
0258	40259	Exhaust Oxygen Content		0.01	%	16-bit Signed	
0259	40260	/					
0260	40261	Fuel Valve Position		0.1	%	16-bit Signed	
0261	40262	Expand 3 Sensor 4 Data		1		16-bit Signed	
0262	40263	/					
0263	40264	Expand 4 Sensor 1 Data		1		16-bit Signed	
0264	40265	/					
0265	40266	Expand 4 Sensor 2 Data		1		16-bit Signed	
0266	40267	/					
0267	40268	Expand 4 Sensor 3 Data		1		16-bit Signed	
0268	40269	/					
0269	40270	Expand 4 Sensor 4 Data		1		16-bit Signed	
0270	40271	A Running Hours	0~65535	1	h	16-bit Unsigned	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0271	40272	A Running Minutes	0~59	1	min	16-bit Unsigned	
0272	40273	A Running Seconds	0~59	1	s	16-bit Unsigned	
0273	40274	A Start Times	0~65535	1	times	16-bit Unsigned	
0274	40275	A Gen kWh	-2,147,483,648~2,147,483,647	1	kWh	32-bit Signed	
0275	40276						
0276	40277	B Running Hours	0~65535	1	h	16-bit Unsigned	
0277	40278	B Running Minutes	0~59	1	min	16-bit Unsigned	
0278	40279	B Running Seconds	0~59	1	s	16-bit Unsigned	
0279	40280	B Start Times	0~65535	1	times	16-bit Unsigned	
0280	40281	B Gen kWh	-2,147,483,648~2,147,483,647	1	kWh	32-bit Signed	
0281	40282						
0282	40283	9560 Module Numbers		1		16-bit Unsigned	
0283	40284	Current Module 9560 ID		1		16-bit Unsigned	
0284	40285	Current Module 9560 PRI		1		16-bit Unsigned	
0285	40286	Expand AIN24-1, Sensor 1		1		16-bit Unsigned	
0286	40287	Expand AIN24-1, Sensor 2		1		16-bit Unsigned	
0287	40288	Expand AIN24-1, Sensor 3		1		16-bit Unsigned	
0288	40289	Expand AIN24-1, Sensor 4		1		16-bit Unsigned	
0289	40290	Expand AIN24-1, Sensor 5		1		16-bit Unsigned	
0290	40291	Expand AIN24-1, Sensor 6		1		16-bit Unsigned	
0291	40292	Expand AIN24-1, Sensor 7		1		16-bit Unsigned	
0292	40293	Expand AIN24-1, Sensor 8		1		16-bit Unsigned	
0293	40294	Expand AIN24-1,		1		16-bit	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
		Sensor 9				Unsigned	
0294	40295	Expand AIN24-1, Sensor 10		1		16-bit Unsigned	
0295	40296	Expand AIN24-1, Sensor 11		1		16-bit Unsigned	
0296	40297	Expand AIN24-1, Sensor 12		1		16-bit Unsigned	
0297	40298	Expand AIN24-1, Sensor 13		1		16-bit Unsigned	
0298	40299	Expand AIN24-1, Sensor 14		1		16-bit Unsigned	
0299	40300	Expand AIN24-2, Sensor 1		1		16-bit Unsigned	
0300	40301	Expand AIN24-2, Sensor 2		1		16-bit Unsigned	
0301	40302	Expand AIN24-2, Sensor 3		1		16-bit Unsigned	
0302	40303	Expand AIN24-2, Sensor 4		1		16-bit Unsigned	
0303	40304	Expand AIN24-2, Sensor 5		1		16-bit Unsigned	
0304	40305	Expand AIN24-2, Sensor 6		1		16-bit Unsigned	
0305	40306	Expand AIN24-2, Sensor 7		1		16-bit Unsigned	
0306	40307	Expand AIN24-2, Sensor 8		1		16-bit Unsigned	
0307	40308	Expand AIN24-2, Sensor 9		1		16-bit Unsigned	
0308	40309	Expand AIN24-2, Sensor 10		1		16-bit Unsigned	
0309	40310	Expand AIN24-2, Sensor 11		1		16-bit Unsigned	
0310	40311	Expand AIN24-2, Sensor 12		1		16-bit Unsigned	
0311	40312	Expand AIN24-2, Sensor 13		1		16-bit Unsigned	
0312	40313	Expand AIN24-2, Sensor 14		1		16-bit Unsigned	
0313	40314	/					
0314	40315	/					
0315	40316	/					
0316	40317	/					

Modbus Address	PLC Address	Item		Range (Decimal)	Ratio	Unit	Description	Remark
0317	40318	/						
0318	40319	/						
0319	40320	/						
0320	40321	/						
0321	40322	/						
0322	40323	/						
0323	40324	/						
0324	40325	/						
0325	40326	/						
0326	40327	/						
0327	40328	/						
0328	40329	/						
0329	40330	/						
0330	40331	/						
0331	40332	/						
0332	40333	/						
0333	40334	Actual Air-Fuel Ratio			0.01		16-bit Signed	
0334	40335	Throttle 2 Percentage			0.1	%	16-bit Signed	
0335	40336	Ignition Timing			0.01	deg	16-bit Signed	
0336	40337	DM1 Alarm Type			1		16-bit Unsigned	
0337	40338	DM1 Total Alarms			1		16-bit Unsigned	
0338	40339	DM1 Alarm SPN1	SPN					
0339	40340							
0340	40341		FMI					
0341	40342		OC					
0342	40343	DM1 Alarm SPN2	SPN					
0343	40344							
0344	40345		FMI					
0345	40346		OC					
0346	40347	DM1 Alarm SPN3						
0347	40348							
0348	40349							
0349	40350							
0350	40351	DM1 Alarm SPN4						
0351	40352							
0352	40353							
0353	40354							
0354	40355	DM1 Alarm SPN5						
0355	40356							

Modbus Address	PLC Address	Item		Range (Decimal)	Ratio	Unit	Description	Remark
0356	40357							
0357	40358							
0358	40359	DM1 Alarm SPN6						
0359	40360							
0360	40361							
0361	40362							
0362	40363	DM1 Alarm SPN7						
0363	40364							
0364	40365							
0365	40366							
0366	40367	DM1 Alarm SPN8						
0367	40368							
0368	40369							
0369	40370							
0370	40371	DM1 Alarm SPN9						
0371	40372							
0372	40373							
0373	40374							
0374	40375	DM1 Alarm SPN10						
0375	40376							
0376	40377							
0377	40378							
0378	40379	DM2 Alarm Type			1		16-bit Unsigned	
0379	40380	DM2 Total Alarms			1		16-bit Unsigned	
0380	40381	DM2 Alarm SPN1	SPN					
0381	40382							
0382	40383		FMI					
0383	40384		OC					
0384	40385	DM2 Alarm SPN2	SPN					
0385	40386							
0386	40387		FMI					
0387	40388		OC					
0388	40389	DM2 Alarm SPN3						
0389	40390							
0390	40391							
0391	40392							
0392	40393	DM2 Alarm SPN4						
0393	40394							
0394	40395							
0395	40396							
0396	40397	DM2 Alarm SPN5						

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0397	40398						
0398	40399						
0399	40400						
0400	40401	DM2 Alarm SPN6					
0401	40402						
0402	40403						
0403	40404						
0404	40405	DM2 Alarm SPN7					
0405	40406						
0406	40407						
0407	40408						
0408	40409	DM2 Alarm SPN8					
0409	40410						
0410	40411						
0411	40412						
0412	40413	DM2 Alarm SPN9					
0413	40414						
0414	40415						
0415	40416						
0416	40417	DM2 Alarm SPN10					
0417	40418						
0418	40419						
0419	40420						
0420	40421	Exhaust Gas Temperature 1		1	℃	16-bit Signed	
0421	40422	Exhaust Gas Temperature 2		1	℃	16-bit Signed	
0422	40423	Exhaust Gas Temperature 3		1	℃	16-bit Signed	
0423	40424	Exhaust Gas Temperature 4		1	℃	16-bit Signed	
0424	40425	Exhaust Gas Temperature 5		1	℃	16-bit Signed	
0425	40426	Exhaust Gas Temperature 6		1	℃	16-bit Signed	
0426	40427	Exhaust Gas Temperature 7		1	℃	16-bit Signed	
0427	40428	Exhaust Gas Temperature 8		1	℃	16-bit Signed	
0428	40429	Exhaust Gas Temperature 9		1	℃	16-bit Signed	
0429	40430	Exhaust Gas Temperature 10		1	℃	16-bit Signed	

Modbus Address	PLC Address	Item	Range (Decimal)	Ratio	Unit	Description	Remark
0430	40431	Exhaust Gas Temperature 11		1	℃	16-bit Signed	
0431	40432	Exhaust Gas Temperature 12		1	℃	16-bit Signed	
0432	40433	Exhaust Gas Temperature 13		1	℃	16-bit Signed	
0433	40434	Exhaust Gas Temperature 14		1	℃	16-bit Signed	
0434	40435	Exhaust Gas Temperature 15		1	℃	16-bit Signed	
0435	40436	Exhaust Gas Temperature 16		1	℃	16-bit Signed	
0436	40437	Exhaust Gas Temperature 17		1	℃	16-bit Signed	
0437	40438	Exhaust Gas Temperature 18		1	℃	16-bit Signed	
0438	40439	Exhaust Gas Temperature 19		1	℃	16-bit Signed	
0439	40440	Exhaust Gas Temperature 20		1	℃	16-bit Signed	
0440	40441	Throttle Opening Order		0.0001	%	32-bit Signed	
0441	40442						
0442	40443	Engine Running Time		0.1	h	32-bit Signed	
0443	40444						
0444	40445	/					
0445	40446	/					
0446	40447	/					
0447	40448	/					
0448	40449	/					
0449	40450	/					
0450	40451	/					
0451	40452	/					
0452	40453	/					
0453	40454	/					

NOTE1: Actual value=received data*ratio. Take the frequency as the example, if received data is 5000(1388H), ratio is 0.01Hz, then actual frequency value is 50.00Hz(5000*0.01Hz).

NOTE2: For 4-byte data, actual value=received data*65536+receied data LSB.

NOTE3: When received data is 32766, it means no normal data, "###" will be displayed.

NOTE4: Definition of signed number. Take received data 8000H as the example, transfer it to binary 1000 0000 0000 0000b, the MSB is 1, which is a negative number. One's complement is obtained by subtracting 1 from it, which is inverted to obtain the absolute value of the negative number. Then transfer it to -32768 in decimal

Example:

Read "A Phase Active Power (Current is 123456)", firstly get its addresses are 0103 and 0104 by

checking the table, then it is known that 2-byte data needs to be read.

Assume the slave address is 01, the master request command is as following:

Table 7 Master Request Command

Slave Address	Function Code	Starting Address (0103)		Request Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**03**	**00**	**67**	**00**	**02**	**75**	**D4**

The slave response command is as following: Slave Response Command

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 0103	Data LSB of Address 0103	Data MSB of Address 0104	Data LSB of Address 0104	LSB	MSB
01	**03**	**04**	**E2**	**40**	**00**	**01**	**0C**	**5F**

Fill the received data into the corresponding address, as shown in the table below:

Table 8 Data Analysis

Address	Received Data (Hex)	After Combination (Hex)	A Phase Active Power (Decimal)
0103	E240H	0001E240H	123456
0104	0001H		

3.4 FUNCTION CODE 05H MAPPING REMOTE COIL FIELD

Table 9 Remote Coil Field

Modbus Address	PLC Address	Item	Description
0000	0001	Remote Start Key	Only send FF00H for active
0001	0002	Remote Stop Key	Only send FF00H for active
0002	0003	Reserved	Only send FF00H for active
0003	0004	Remote Auto Key	Only send FF00H for active
0004	0005	Remote Manual Key	Only send FF00H for active
0005	0006	HGM9510, HGM9530: Remote Gen Open Key HGM9520: Remote Mains Close/Open Key	Only send FF00H for active
0006	0007	HGM9510, HGM9530: Remote Gen Close Key HGM9520: Remote Gen Close/Open Key	Only send FF00H for active
0007	0008	Remote Up Key	Only send FF00H for active
0008	0009	Remote Down Key	Only send FF00H for active
0009	0010	Remote Left Key	Only send FF00H for active
0010	0011	Remote Right Key	Only send FF00H for active
0011	0012	Remote Confirm Key	Only send FF00H for active
0012	0013	Remote Mute Key	Only send FF00H for active
0013	0014	Reserved	

Modbus Address	PLC Address	Item	Description
0014	0015	Reserved	
0015	0016	Remote Oil Engine Fast Stop	Only send FF00H for active
0016	0017	Reserved	
0017	0018	Reserved	
0018	0019	Reserved	
0019	0020	Reserved	
0020	0021	Remote Output 1 Active	Send FF00H for active, 0000H for inactive
0021	0022	Remote Output 2 Active	Send FF00H for active, 0000H for inactive
0022	0023	Remote Output 3 Active	Send FF00H for active, 0000H for inactive
0023	0024	Remote Output 4 Active	Send FF00H for active, 0000H for inactive
0024	0025	Remote Output 5 Active	Send FF00H for active, 0000H for inactive
0025	0026	Remote Output 6 Active	Send FF00H for active, 0000H for inactive
0026	0027	Reserved	
0027	0028	Reserved	
0028	0029	Reserved	

NOTE1: The above remote command only can be sent once only.

NOTE2: Modbus communication is used for 05 function code: send FF00H to make corresponding to position 1, send 0000H to make corresponding to position 0; when PLC communication is used: send 1 to position 1, send 0 to position 0.

Example:

Get the address of remote manual key is 0004 by checking the table.

Assume the slave address is 01, the master request command is as following:

Table 10 Master Request Command

Slave Address	Function Code	Remote Address (0004)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**04**	**FF**	**00**	**CD**	**FB**

The slave response command is as following:

Table 11 Slave Response Command

Slave Address	Function Code	Remote Address (0004)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**05**	**00**	**04**	**FF**	**00**	**CD**	**FB**

3.5 FUNCTION CODE 06H MAPPING DATA FIELD

Table 12 Data Field

Modbus Address	PLC Address	Item	Description
4351	44352	Load Mode Control	0: Gen Control Mode; 1: Mains Control Mode; 2: Load Reception
4352	44353	Load Parallel Output Active Power Percentage	Data range: 0-1000 Corresponding percentage: 0.0%-100.0%
4353	44354	Load Parallel Output Reactive Power Percentage	Set it to genset output power percentage in Gen Control Mode; Set it to mains clipping percentage in Mains Control Mode.

Table 13 Master Request Command

Slave Address	Function Code	Load Mode Control (4351)		Load Mode Control		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**06**	**10**	**FF**	**00**	**00**	**BD**	**3A**

Table 14 Slave Response Command

Slave Address	Function Code	Load Mode Control (4351)		Load Mode Control		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	**06**	**10**	**FF**	**00**	**00**	**BD**	**3A**

3.6 ERROR HANDLING

When device detects other errors except the CRC code, the slave must send information to the master. The function code MSB is 1, which means the response function code by slave should add 128 on the basis of the function code. The following codes show unexpected errors have occurred.

The device will ignore CRC error received from master.

Table 15 CRC Error Format of Slave Response (CRC excluded)

Type	Byte
Address Code	1-byte
Function Code	1-byte (MSB is 1)
Error Code	1-byte
CRC Code	2-byte

Error Code:

01 illegal function code

The function code received in the query is not an allowable action for the slave.

02 illegal data address

The data address received in the query is not an allowable address for the slave.

03 illegal data value

A value contained in the query data field is not an allowable value for the slave.

3.7 ERROR CHECK CODE (CRC)

Error Check Code allows master or slave to detect whether a received packet goes wrong or not. Sometimes, because of electronic noise, or other disturbance, information will get changed in certain way in the transmission process. CRC code ensures master or slave will not respond to the wrong information in the process, which promotes system safety and efficiency. CRC applies CRC-16 calibration method.

For 2-byte CRC, low-order byte is in front, and high-order byte is in the back.

NOTE: All information frame formats are the same: address code, function code, data field and CRC code.

CRC contains 2 bytes, 16-bit binary value. CRC is calculated by issuing terminal and placed at the end of transmitted information. The receiving device again calculates whether it is the same as the received information. If they are different, then something goes wrong.

CRC calculation method: first pre-set 16-register to 1. Then gradually deal with 8-bit data information. Only 8-bit data is used in CRC calculation and starting bit and stop bit are not calculated.

In the process of CRC calculation, 8-bit data Exclusive OR with register data, and make the result move 1 bit in the direction of LSB with 0 filled into MSB. Then check LSB, if it is 1, then make register contents Exclusive OR with pre-set value; if LSB is 0, do not Exclusive OR. Repeat the process for many times. After 8 times move, next 8-bit Exclusive OR with current register contents; Like this repeat for 8 times as last time. After all data information is done, the last register content is CRC value.

CRC-16 code calculation steps:

1) Set a 16-bit CRC register to FFFF hex;
2) Exclusive OR 8-bit data with the low–order 8-bit of the CRC register, and put the result in the CRC register.
3) Move CRC content to right 1 bit with 0 filled into MSB, and check the moved out bit.
4) If LSB was 0: Repeat Step 3 (another shift).

If LSB was 1: Exclusive OR CRC register with the polynomial value A001 hex.

5) Repeat Step 3 and Step 4 and move right for 8 times; In this way all 8-bit data are processed.
6) Repeat Step 2 to Step 5 and process next data.
7) The final result is CRC register value. In process transmission lower-order 8 bits is transmitted first and high-order 8 bits at last.

NOTE: The calculating of CRC code starts from <slave address> except for all bytes of <CRC code>.

3.8 GENERATOR STATUS

Table 16 Generator Status

No.	Item	Description
0	Standby	No delay value for this status
1	Preheat	
2	Fuel Output	No delay value for this status
3	Crank	
4	Crank Rest	
5	Safety Run	
6	Start Idle	
7	High Speed Warming Up	
8	Wait for Load	No delay value for this status
9	Normal Running	No delay value for this status
10	High Speed Cooling	
11	Stop Idle	
12	ETS	
13	Wait for Stop	
14	Stop Failure	No delay value for this status
15	After Stop	

3.9 REMOTE START STATUS

Table 17 Remote Start Status

Value (No.)	Item	Description
0	No Delay	No delay value for this status
1	Start Delay	
2	Stop Delay	

3.10 ATS STATUS

Table 18 ATS Status

Value (No.)	Item	Description
0	Synchronizing	No delay value for this status
1	Close Delay	
2	Wait for Closing	No delay value for this status
3	Closed	No delay value for this status
4	Unloading	No delay value for this status
5	Open Delay	
6	Wait for Opening	No delay value for this status
7	Opened	No delay value for this status

3.11 MAINS STATUS

Table 19 Mains Status

Value (No.)	Item	Description
0	Mains Normal	No delay value for this status
1	Mains Normal Delay	
2	Mains Abnormal	No delay value for this status
3	Mains Abnormal Delay	

4. REMOTE START & STOP PROCEDURES

Start procedures:

1) Make controller switch to Manual Mode through sending “Remote Manual Key” command of 05 function code;
2) Read 0000 address’s data through 03 function code, then controller current mode can be obtained, next confirm whether controller is in manual mode; if not, repeat step 1 and 2;
3) When controller is in Manual Mode, send “Remote Start Key” command of 05 function code;
4) Controller enters start procedure after receiving the command, then generator start procedure can be obtained by reading the generator status data corresponding to “Generator Status Table” via 03 function code;
5) If generator status is between 1 (Preheat) to 8 (Wait for Load) of “Generator Status Table”, generator will start, otherwise, it can’t start, then repeat step 3 and 4;
6) If generator is normally running, send “Remote Gen Close/Open Key” command of 05 function code;
7) Controller will close the generator breaker after receiving the command, then it can obtain gen close procedure by reading gen ATS status corresponding to “ATS Status Table” via 03 function code;
8) If gen ATS status is between 0 (Synchronizing) to 2 (Wait for Closing) of “ATS Status Table”, it will close the breaker, otherwise, it can’t close, then repeat step 6 and 7;
9) When generator is normally running and gen breaker is closed, generator takes the load and runs.

Stop method 1:

1) Make controller switch to Manual Mode through sending “Remote Manual Key” command of 05 function code;
2) Read 0000 address’s data through 03 function code, then controller current mode can be obtained, next confirm whether controller is in manual mode; if not, repeat step 1 and 2;
3) When controller is in Manual Mode, send “Remote Gen Close/Open Key” command of 05 function code;
4) Controller opens the generator after receiving the command, then generator open procedure can be obtained by reading the generator ATS status data corresponding to “ATS Status Table” via 03 function code;
5) If generator ATS status is between 4 (Unloading) to 6 (Wait for Opening) of “ATS Status Table”, generator will open, otherwise, it can’t open, then repeat step 3 and 4;
6) When generator is opened, then it opens successfully, send “Remote Stop Key” command of 05 function code;
7) Controller enters stop procedure after receiving the command, generator stop procedure can be obtained by reading generator status data corresponding to “Generator Status Table” via 03 function code;
8) If generator status is between 10 (High Speed Warming Up” to 13 (Wait for Stop) of “Generator Status Table”, it enters stop procedure, otherwise, it can’t stop, then repeat step 6 and 7;
9) When generator is in standby and breaker is opened, generator stops.

Stop method 2 (active for auto or manual mode):

1) Make controller switch to Stop Mode through sending “Remote Stop Key” command of 05 function code;
2) Read 0000 address’s data through 03 function code, then controller current mode can be obtained, next confirm whether controller is in stop mode; if not, repeat step 1 and 2;
3) When controller is in Stop Mode, generator enters stop procedure;
4) Gen open procedure can be obtained by reading generator ATS status corresponding to “ATS Status Table” via 03 function code, gen stop procedure can be obtained by reading generator status corresponding to “Generator Status Table”;
5) When generator is in standby and breaker is opened, generator stops.

NOTE1: Only once for each time to send remote key command of 05 function code.

NOTE2: When generator is starting, if controller receives “Remote Start Key” command or press start key, it will jump to next status and enter gen on-load running status quickly.

NOTE3: When generator is stopping, if controller receives “Remote Stop Key” command or press stop key, it will jump to next status and enter stop status quickly.

5. COMMUNICATION PARAMETER VIEWING AND CONFIGURATION

1) Press Enter for over 3s to enter menu interface in the homepage of main interface;

2) Press Down key to select “Parameter Setting”, then press Enter to enter parameter password interface;

3) Input correct password (default 0318) , then press Enter key to enter parameter main interface;

4) Select “Module Setting” via ▲, ▼ key, parameter editing function is available after pressing Enter key, corresponding parameters will be in the selected status;

5) Set the current selected content via ▲, ▼ key, then press Enter key to confirm, after editing, then the selected status will disappear;

6) Press Esc key to return the main interface.

NOTE: After parameter setting is completed, the configuration takes effect.

6. FAQ

6.1 COMMUNICATION LINE SHIELDING LAYER GROUNDED

In order to prevent coupled interference signal on communication line, its single end needs to be grounded.

6.2 TERMINAL RESISTOR

At both ends of the linear network (on the two communication ports furthest apart), it is necessary to connect 120Ω terminal resistor in parallel on a pair of communication lines. According to the transmission line theory, the terminal resistor can absorb reflected waves on the network, effectively enhancing the signal strength. The value of two terminal resistors in parallel should be approximately equal to the characteristic impedance of the transmission line at the communication frequency.

A regular RS485 network usually uses terminal resistor. It can also be not used in the case of network connection line is very short, temporary or laboratory test.

6.3 RS485 TO USB COMMUNICATION ADAPTOR

PC can communicate with SG72A module produced by our company.

6.4 EXTENDED COMMUNICATION DISTANCE

Long distance (up to 10km) communication can be realized by a pair of SGCAN300 fiber optical relay modules.

Fig.3 SGCAN300 Application Diagram

6.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 or network cable is correctly connected; check whether the RS485 converter (if configured) is normal;
2) Check whether the terminal resistor is correctly connected;
3) Check whether the communication parameter in parameter setting is correct, for example, baud rate, data bit, parity bit and stop bit must meet the controller requirements;
4) Check whether the COM port corresponds to USB port where the RS485 converter is connected to the computer;
5) Check whether the controller communication address is correct, which is defaulted as 01;
6) When using 03 function code, note that the maximum length of data read each time is 120 addresses, and the last address read cannot exceed the maximum Modbus communication address; note that the write function of 06 function code mapping value data field can only write data to one address at a time;
7) If there is offset address in Modbus communication address, the original base address plus the offset address is required to be the correct Modbus communication address for the item;
8) Modbus communication for 05 function code: although 1 for active and 0 for inactive, FF00H must be sent to make the corresponding bit be 1 and 0000H to make the corresponding bit be 0. PLC communication: Send 1 to position 1, send 0 to position 0;
9) Check whether CRC-16 low-order byte is in front, and high-order byte is in the back;
10) Do not read controller data too quickly for multiple times. It is recommended that the interval be more than 500ms;
11) Please set each controller's communication module address before networking. Same module address is inhibited in the same network;
12) Because Modbus serial port does not support multiple masters, multiple software cannot communicate with controller at the same time;
13) Disconnect the connection line of controller's RS485, measure the voltage difference of RS485's A and B terminal. If the difference is between ±200mV, it means communication port has abnormal situation;
14) If signal is weak caused by too long communication distance, you can replace the cable with a better quality or add a relay in the middle of communication cable;
15) It is recommended to download third-party communication software such as modscan32, modbus poll to check whether communication is normal.