INSTRUCTION MANUAL

FOR

GENERATOR PROTECTION SYSTEM BE1-GPS100

MODBUS® PROTOCOL

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INTRODUCTION

This instruction manual provides detailed information about the BE1-GPS100 Generator Protection System with the Modbus® protocol.

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It is not the intention of this manual to cover all details and variations in equipment, nor does this manual provide data for every possible contingency regarding installation or operation. The availability and design of all features and options are subject to modification without notice. Should further information be required, contact Basler Electric.

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REVISION HISTORY

The following information provides a historical summary of the changes made to this instruction manual (9318700991). Revisions are listed in reverse chronological order.

Manual Revision and Date	Change
D, 08/17	• Added caution box about nonvolatile memory in Section 1. • Minor text edits throughout manual.
C, 04/08	• Added manual part number and revision to footers. • Split manual into sections.
B, 11/03	• Added generator fault and bus frequency points for “most recent” and “selected” faults to Register Table (table 4) and *Register Details* section.
A, 03/01	• Added Password Security features and corrected Floating Point Data Format text and Table 3.
—, 05/00	• Initial release.

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SECTION 1 • GENERAL INFORMATION

Introduction

This document describes the Modbus® communications protocol employed by BE1-GPS100 relays, and how to exchange information with BE1-GPS100 relays over a Modbus network. The BE1-GPS100 communicates by emulating a subset of the Modicon 984 Programmable Controller.

CAUTION

This product contains one or more *nonvolatile memory* devices. Nonvolatile memory is used to store information (such as settings) that needs to be preserved when the product is power-cycled or otherwise restarted. Established nonvolatile memory technologies have a physical limit on the number of times they can be erased and written. In this product, the limit is 100,000 erase/write cycles. During product application, consideration should be given to communications, logic, and other factors that may cause frequent/repeated writes of settings or other information that is retained by the product. Applications that result in such frequent/repeated writes may reduce the useable product life and result in loss of information and/or product inoperability.

Functional Description

Modbus communications use a master-slave technique in which only the master can initiate a transaction. This transaction is called a query. When appropriate, a slave (BE1-GPS100) responds to the query. When a Modbus master communicates with a slave, information is provided or requested by the master. Information residing in the BE1-GPS100 is grouped categorically as follows:

Category

Session Parameters
Global Parameters
Control Parameters (Select Before Operate)
Setting Parameters
Report Parameters
Metering Parameters

All supported data can be read as specified in the register table. Abbreviations are used in the *Register Table* to indicate the register type. Register types are:

Read/Write = RW
Read Only = R -

Select Before Operate (SBO) functions are used to change active settings groups and control outputs. There are two settings groups in the BE1-GPS100, one of which may be selected as active using SBO commands.

When a slave receives a query, the slave responds by either supplying the requested data to the master or performing the requested action. A slave device never initiates communications on the Modbus, and will always generate a response to the query unless certain error conditions occur. The BE1-GPS100 is designed to communicate on the Modbus only as a slave device.

A master can query slaves individually or universally. A universal (“broadcast”) query, when allowed, evokes no response from any slave device. If a query to an individual slave device requests actions unable to be performed by the slave, the slave response message contains an exception response code defining the error detected. Exception response codes are quite often enhanced by the information found in the “Error Details” block of holding registers.

Message Structure

Master initiated queries and BE1-GPS100 responses share the same message structure. Each message is comprised of four message fields. They are:

- Device Address (1 byte)
- Function Code (1 byte)
- Data Block (n bytes)
- Error Check field (2 bytes)

Device Address Field

The device address field contains the unique Modbus® address of the slave being queried. The addressed slave repeats the address in the device address field of the response message. This field is 1 byte.

Although Modbus protocol limits a device address from 1 - 247, a BE1-GPS100 can be assigned a device address in the range of 1 - 65534. The address is user-selectable at installation, and can be altered during real-time operation.

Function Code Field

The function code field in the query message defines the action to be taken by the addressed slave. This field is echoed in the response message, and is altered by setting the most significant bit (MSB) of the field to 1 if the response is an error response. This field is 1 byte.

The BE1-GPS100 maps all available data into the Modicon 984 holding register address space (4XXXX) and supports the following function codes.

- Function 03 (03 hex) - read holding registers
- Function 06 (06 hex) - preset single register (write single holding register)
- Function 08 (08 hex), subfunction 00 - diagnostics: return query data
- Function 08 (08 hex), subfunction 01 - diagnostics: restart communications option
- Function 08 (08 hex), subfunction 04 - diagnostics: force listen only mode
- Function 16 (10 hex) - preset multiple registers, non-broadcast and broadcast

Data Block Field

The query data block contains additional information needed by the slave to perform the requested function. The response data block contains data collected by the slave for the queried function. An error response will substitute an exception response code for the data block. The length of this field varies with each query. See the paragraphs on *Register Definitions* in this manual for interpretation of data.

Error Check Field

The error check field provides a method for the slave to validate the integrity of the query message contents and allows the master to confirm the validity of response message contents. This field is 2 bytes.

Serial Transmission Details

A standard Modbus network offers two transmission modes for communication: ASCII or remote terminal unit (RTU). The BE1-GPS100 supports only the RTU mode.

Each 8-bit byte in a message contains two 4-bit hexadecimal characters. The message is transmitted in a continuous stream with the LSB of each byte of data transmitted first. Transmission of each 8-bit data byte occurs with one start bit and either one or two stop bits. Parity checking is performed, when enabled, and can be either odd or even. The transmission baud rate is user-selectable, and can be set at installation and altered during real-time operation. The BE1-GPS100 Modbus supported baud rates are 2400, 4800, 9600, and 19200. The factory default baud rate is 9600.

BE1-GPS100 supports both RS-232 and RS-485 compatible serial interfaces. Both interfaces are accessible from the rear panel of the BE1-GPS100. The RS-232 interfaces (front and rear) are configured for ASCII command mode while the RS-485 interface is configured for Modbus communication, when this option is installed. The sixth character of the relay style number must be ‘1’ for the relay to be configured for Modbus.

Message Framing and Timing Considerations

When receiving a message, the BE1-GPS100 requires an inter-byte latency of 3.5 character times before considering the message complete.

Once a valid query is received, the BE1-GPS100 waits a specified amount of time before responding. This time delay is set in the remote delay time parameter with the SG-COM ASCII command. This parameter contains a value from 10 - 200 milliseconds. The default value is 10 milliseconds.

Table 1-1 provides the response message transmission time (in seconds) and 3.5 character times (in milliseconds) for various message lengths and baud rates.

Table 1-1. Timing Considerations

Baud Rate	3.5 character Time (msec)	Message TX Time (Sec.)	
		128 Bytes	256 Bytes
2400	16.04	0.59	1.17
4800	8.021	0.29	0.59
9600	4.0104	0.15	0.29
19200	2.0052	0.07	0.15

Error Handling and Exception Responses

Any query received that contains a non-existent device address, a framing error, or CRC error is ignored. No response is transmitted. Queries addressed to a BE1-GPS100 with an unsupported function or illegal values in the data block result in an error response message with an exception response code. The exception response codes supported by the BE1-GPS100 are provided in Table 1-2.

Table 1-2. Supported Exception Response Codes

Code	Name	Meaning
01	Illegal Function	The query Function/Subfunction Code is unsupported; query read of more than 125 registers; query preset of more than 100 registers
02	Illegal Data Address	A register referenced in the data block does not support queried read/write; query preset of a subset of a numerical register group.
03	Illegal Data Value	A preset register data block contains an incorrect number of bytes or one or more data values out of range.

Communications Hardware Requirements

The BE1-GPS100 RS-485 physical interface is three positions of a terminal strip with locations for Send/Receive A (A), Send/Receive B (B) and Signal Ground (C). Refer to the BE1-GPS100 Instruction Manual (9318700990) for further details.

Detailed Message Query and Response

A detailed description of BE1-GPS100 supported message queries and responses is provided in the following paragraphs.

Read Holding Registers

Query

This query message requests a register or block of registers to be read. The data block contains the starting register address and the quantity of registers to be read. A register address of N will read holding register N+1. If the query is a broadcast (device address = 0), no response message is returned.

Device Address
Function Code = 03 (hex)
Starting Address Hi

Starting Address Lo
No. of Registers Hi
No. of Registers Lo
CRC Hi error check
CRC Lo error check

The number of registers cannot exceed 125 without causing an error response with the exception code for an illegal function.

Response

The response message contains the data queried. The data block contains the block length in bytes followed by the data (one Data Hi byte and one Data Lo byte) for each requested register.

Reading an unassigned holding register returns a value of zero.

Device Address
Function Code = 03 (hex)
Byte Count
Data Hi (For each requested register, there is one Data Hi and one Data Lo.)
Data Lo
.
.
Data Hi
Data Lo
CRC Hi error check
CRC Lo error check

Return Query Data

This query contains data to be returned (looped back) in the response. The response and query messages should be identical. If the query is a broadcast (device address = 0), no response message is returned.

Device Address
Function Code = 08 (hex)
Subfunction Hi = 00 (hex)
Subfunction Lo = 00 (hex)
Data Hi = xx (don't care)
Data Lo = xx (don't care)
CRC Hi error check
CRC Lo error check

Restart Communications Option

This query causes the remote communications function of the BE1-GPS100 to restart, terminating an active listen only mode of operation. No effect is made upon primary relay operations. Only the remote communications function is affected. If the query is a broadcast (device address = 0), no response message is returned.

If the BE1-GPS100 receives this query while in the listen only mode, no response message is generated. Otherwise, a response message identical to the query message is transmitted prior to the communications restart.

Device Address
Function Code = 08 (hex)
Subfunction Hi = 00 (hex)
Subfunction Lo = 01 (hex)
Data Hi = xx (don't care)
Data Lo = xx (don't care)
CRC Hi error check
CRC Lo error check

Listen Only Mode

This query forces the addressed BE1-GPS100 to the listen only mode for Modbus communications, isolating it from other devices on the network. No responses are returned.

While in the listen only mode, the BE1-GPS100 continues to monitor all queries. The BE1-GPS100 does not respond to any other query until the listen only mode is removed. All write requests with a query to Preset Multiple Registers (Function Code = 16) are also ignored. When the BE1-GPS100 receives the restart communications query, the listen only mode is removed.

Device Address	
Function Code =	08 (hex)
Subfunction Hi =	00 (hex)
Subfunction Lo =	04 (hex)
Data Hi =	xx (don't care)
Data Lo =	xx (don't care)
CRC Hi error check	
CRC Lo error check	

Preset Multiple Registers

A preset multiple registers query could address multiple registers in one slave or multiple slaves. If the query is a broadcast (device address = 0), no response message is returned.

Query

A Preset Multiple Register query message requests a register or block of registers to be written. The data block contains the starting address and the quantity of registers to be written, followed by the Data Block byte count and data. The BE1-GPS100 will perform the write when the device address is the same as the BE1-GPS100 remote address or when the device address is 0. A device address is 0 for a broadcast query.

A register address of N will write Holding Register N+1.

Data will cease to be written if any of the following exceptions occur.

- Queries to write to Read Only registers result in an error response with Exception Code of “Illegal Data Address”.
- Queries attempting to write more than 100 registers cause an error response with Exception Code “Illegal Function”.
- An incorrect Byte Count will result in an error response with Exception Code of “Illegal Data Value”.
- There are several instances of registers that are grouped together to collectively represent a single numerical BE1-GPS100 data value (i.e. - floating point data and 32-bit integer data). A query to write a subset of such a register group will result in an error response with Exception Code “Illegal Data Address”.
- A query to write a not allowed value (out of range) to a register results in an error response with Exception Code of “Illegal Data Value”.

Device Address	
Function Code =	10 (hex)
Starting Address Hi	
Starting Address Lo	
No. of Registers Hi	
No. of Registers Lo	
Byte Count	
Data Hi	
Data Lo	
.	
.	
Data Hi	
Data Lo	
CRC Hi error check	
CRC Lo error check	

Response

The response message echoes the starting address and the number of registers. There is no response message when the query is a broadcast (device address = 0).

Device Address
Function Code = 10 (hex)
Starting Address Hi
Starting Address Lo
No. of Registers Hi
No. of Registers Lo
CRC Hi Error Check
CRC Lo Error Check

Preset Single Register (Write Single Holding Register)

A Preset Single Register query message requests a single register to be written. The BE1-GPS100 will perform the write when the device address is the same as the BE1-GPS100 remote address.

Query

Data will cease to be written if any of the following exceptions occur.

- Queries to write to Read Only registers result in an error response with Exception Code of “Illegal Data Address”.
- A query to write an unallowed value (out of range) to a register results in an error response with Exception Code of “Illegal Data Value”.

Device Address
Function Code = 06 (hex)
Address Hi
Address Lo
Data Hi
Data Lo
CRC Hi error check
CRC Lo error check

Response

The response message echoes the Query message after the register has been altered.

Data Formats

BE1-GPS100 data varies from one to four bytes in length. Single byte data resides in the holding register least-significant byte with the most-significant byte set to zero. Floating point data and long integer data (each 32-bit in length) place the two most-significant bytes in the higher holding register address of the associated register pair.

Floating Point Data Format (FP)

The Modbus floating point data format uses two consecutive holding registers to represent a data value. The first register contains the low-order 16 bits of the following 32 bit format:

- MSB is the sign bit for the floating point value (0 = positive).
- The next 8 bits are the exponent biased by 127 decimal.
- The 23 LSBs comprise the normalized mantissa. The most-significant bit of the mantissa is always assumed to be 1 and is not explicitly stored, yielding an effective precision of 24 bits.

The value of the floating point number is obtained by multiplying the binary mantissa times two raised to the power of the unbiased exponent. The assumed bit of the binary mantissa has the value of 1.0, with the remaining 23 bits providing a fractional value. Table 1-3 shows the floating point format.

Table 1-3. Floating Point Format

Sign	Exponent + 127	Mantissa
1 Bit	8 Bits	23 Bits

The floating point format allows for values ranging from approximately $8.43X10^{-37}$ to $3.38X10^{38}$. A floating point value of all zeroes is the value zero. A floating point value of all ones (not a number) signifies a value currently not applicable or disabled.

Example: The value 95,800 represented in floating point format is hexadecimal 47BB1C00. This number will read from two consecutive holding registers as follows:

Holding Register	Value
K (Hi Byte)	hex 1C
K (Lo Byte)	hex 00
K+1 (Hi Byte)	hex 47
K+1 (Lo Byte)	hex BB

The same byte alignments are required to write.

Long Integer Data Format (LI)

The Modbus long integer data format uses two consecutive holding registers to represent a 32 bit data value. The first register contains the low-order 16 bits and the second register contains the high-order 16 bits.

Example: The value 95,800 represented in long integer format is hexadecimal 0x00017638. This number will read from two consecutive holding registers as follows:

Holding Register	Value
K (Hi Byte)	hex 76
K (Lo Byte)	hex 38
K+1 (Hi Byte)	hex 00
K+1 (Lo Byte)	hex 01

The same byte alignments are required to write.

Integer Data Format (INT)

The Modbus integer data format uses a single holding register to represent a 16 bit data value.

Example: The value 4660 represented in integer format is hexadecimal 0x1234. This number will read from a holding register as follows:

Holding Register	Value
K (Hi Byte)	hex 12
K (Lo Byte)	hex 34

The same byte alignments are required to write.

Short Integer Data Format (SI)

The Modbus short integer data format uses a single holding register to represent an 8 bit data value. The holding register high byte will always be zero.

Example: The value 132 represented in short integer format is hexadecimal 0x84. This number will read from a holding register as follows:

Holding Register	Value
K (Hi Byte)	hex 00
K (Lo Byte)	hex 84

The same byte alignments are required to write.

ASCII Character Data Format (ASC (1))

The Modbus ASCII character data format uses a single holding register to represent a single character value. The holding register high byte will always be zero with the ASCII character code in the low byte.

Example: The character 'D' represented in ASCII character format is hexadecimal 44. This number will read from a holding register as follows:

Holding Register		Value
K	(Hi Byte)	hex 00
K	(Lo Byte)	hex 44

The same byte alignments are required to write.

ASCII String Data Format (ASC(x))

The Modbus ASCII string data format uses one or more holding registers to represent a sequence, or string, of character values. If the string contains a single character, the holding register high byte will contain the ASCII character code and the low byte will be zero.

Example: The string "PASSWORD" represented in ASCII string format will read as follows:

Holding Register		Value
K	(Hi Byte)	'P'
K	(Lo Byte)	'A'
K+1	(Hi Byte)	'S'
K+1	(Lo Byte)	'S'
K+2	(Hi Byte)	'W'
K+2	(Lo Byte)	'O'
K+3	(Hi Byte)	'R'
K+3	(Lo Byte)	'D'

Example: If the above string is changed to "P", the new string will read as follows:

Holding Register		Value
K	(Hi Byte)	'P'
K	(Lo Byte)	hex 00
K+1	(Hi Byte)	hex 00
K+1	(Lo Byte)	hex 00
K+2	(Hi Byte)	hex 00
K+2	(Lo Byte)	hex 00
K+3	(Hi Byte)	hex 00
K+3	(Lo Byte)	hex 00

The same byte alignments are required to write.

Bit Mapped Data Format (BM(x))

The bit mapped data format uses two or more holding registers to represent a sequence of bit values. The Modbus Bit Map data format can represent an 8 bit, 16 bit, 32 bit, or 64 bit value.

Example: The Bit Map value of the hexadecimal number 0x123456789ABCDEF0 using a BM64 format will read as follows:

Holding Register		Value
K	(Hi Byte)	0x12

K	(Lo Byte)	0x34
K+1	(Hi Byte)	0x56
K+1	(Lo Byte)	0x78
K+2	(Hi Byte)	0x9A
K+2	(Lo Byte)	0xBC
K+3	(Hi Byte)	0xDE
K+3	(Lo Byte)	0xF0

CRC Error Check

This field contains a two-byte CRC value for transmission error detection. The master first calculates the CRC and appends it to the query message. The BE1-GPS100 recalculates the CRC value for the received query and performs a comparison to the query CRC value to determine if a transmission error has occurred. If so, no response message is generated. If no transmission error has occurred, the slave calculates a new CRC value for the response message and appends it to the message for transmission.

The CRC calculation is performed using all bytes of the device address, function code, and data block fields. A 16-bit CRC-register is initialized to all 1's. Then each eight-bit byte of the message is used in the following algorithm:

First, exclusive-OR the message byte with the low-order byte of the CRC-register. The result, stored in the CRC-register, will then be right-shifted eight times. The CRC-register MSB is zero-filled with each shift. After each shift, the CRC-register LSB is examined. If the LSB IS a 1, the CRC-register is then exclusive-ORed with the fixed polynomial value A001 (hex) prior to the next shift. Once all bytes of the message have undergone the above algorithm, the CRC-register will contain the message CRC value to be placed in the error check field.

Session Access Registers

The ACCESS REQUEST and the EXIT registers are used to access and release write privileges while changing relay settings, resetting report registers, or using control commands through the Modbus® port. This feature is important because it prevents changes from being made concurrently from two areas. For example, a user cannot make changes from COM0 at the same time a remote user is making changes via Modbus from COM2.

Changing the settings through the Modbus port requires that the operator write to the ACCESS REQUEST register to obtain programming access. This must follow writing the ACCESS PASSWORD register(s) with a password to obtain access to change settings associated with the password. Different passwords give the ability or access to perform different operations. The relay will deny access if an invalid password is entered or if another user has already been granted programming access through another serial port or at the front panel. Only one user can have access at any one time.

If no password protection is used, it is still necessary to obtain access in order to protect against accidental changes. If password protection is disabled, then writing the ACCESS REQUEST register will be accepted in place of a password. The relay will transmit a valid response message if the access query was received and executed. The relay will respond with an error message if the access query could not be executed.

Changing settings through a Modbus communication port consists of the following sequence:

Step 1. Preset Multiple Registers query to ACCESS PASSWORD register(s) to specify password.
Step 2. Preset Multiple Registers query to ACCESS REQUEST register to access write privileges.
Step 3. Preset Multiple Registers queries to change the current settings.
Step 4. Preset Multiple Registers query to EXIT register to clear access and save.

Changes are not made to the working settings but to a scratch-pad copy of the settings. After the change(s) are made, the new data will be copied to the working settings and saved to non-volatile memory when the EXIT register is written with a ‘Y’. It is important to make all changes to relay parameters before writing the EXIT register. This prevents a partial or incomplete protection scheme from being implemented.

Template Registers

The BE1-GPS100 uses three templates. A template is a block of holding registers to which the user assigns one of a number of similar groups of parameters. Templates are used for settings groups, fault

summaries, and report generation. Modbus Template Registers 40036 (Settings Group Selection), 40038 (Fault Number Selection), 40039 (Report Selection) and 40040 (Report Focus) DO NOT REQUIRE any Write Password Access level before they can be written to.

The BE1-GPS100 has two settings groups. The GRP template is assigned the parameters of a settings group. Therefore, before reading or writing settings group values, a user must first specify which settings group is to be associated with the template. This is accomplished by writing the desired settings group number (0-1) into the SETTINGS GROUP SELECTION Template holding register.

The BE1-GPS100 stores up to 16 faults. Each fault is accessed by its fault number which ranges from 1 to 255. The FLT template is assigned the parameters of a particular fault occurrence. Therefore, before reading fault summary values, a user must first specify which fault number is to be associated with the template. This is accomplished by writing the desired fault number (1-255) into the FAULT SELECTION Template holding register.

The BE1-GPS100 generates 14 ASCII reports. The RPT template is assigned the text of a report. Therefore, before reading report text, a user must first specify which report is to be associated with the template. This is accomplished by writing the desired report number into the REPORT SELECTION Template holding register along with the associated report identifier, if any, into the REPORT FOCUS Template holding register.

Fault Summary Registers

The user can enter any fault number (1 – 255) into the FAULT SELECTION Template holding register to associate summary parameters for that fault number with the FLT Template. The Fault Template Status register (47513) indicates whether or not that fault number specifies a recent fault (one of 16 stored faults). If so, the Fault Template Status register value is the fault number; otherwise, it is zero and all FLT template values will read zero.

The Fault Indicator register (47512) value is the fault number (1 – 255) of the most recent fault. The user may construct his front-end GUI to link this register value into the FAULT SELECTION Template holding register, thereby automatically associating the FLT template with the most recent fault occurrence.

Report Generation Registers

The BE1-GPS100 generates numerous ASCII reports available via serial commands. Several of these reports are available intact via the Modbus communication port. The desired report is first specified by writing the REPORT SELECTION holding register. If the report requires a number to be specified, such as a fault number or number of events, that number is written into the REPORT FOCUS holding register. The report is then available via the RPT template. The report can be read from 1 to 125 registers at a time, with each register containing 2 ASCII characters of information. The report read queries can be interspersed among other query types. The RPT template is continually re-read until the report has completed. Once the report is complete, reading from the RPT template will continually return the ASCII character code of 127 (“7F” hexadecimal). The report cannot be re-read or another report read until the REPORT SELECTION holding register is re-written.

Contiguous Poll Block Registers

The user may allocate up to 125 holding registers to the Contiguous Poll Block (49875-999). This allocation allows dispersed registers which are frequently read to be polled via a single read query. A register is assigned to a position in the Poll Block by writing its address value into the corresponding position in the Contiguous Poll Block Assignments registers (40746-870). Writing a zero value leaves that Poll Block position unassigned. Once assignments are made, the values of the assigned registers may be read by polling the Contiguous Poll Block. Polling an unassigned position will return a value of zero.

For example, if you wanted to continuously monitor the Date (47364), Time (47365-66), Fault Indicator (47512) and Breaker Status (47388) Holding Registers, you would first configure the Contiguous Poll Block Registers by writing the desired register address values 7364, 7365, 7366, 7512 and 7388 into the Contiguous Poll Block Assignment registers 40746 through 40750, respectively. You may now begin monitoring the specified registers by reading the first 5 locations in the Contiguous Poll Block; i.e., reading register 49875 for the Date (as specified in it’s corresponding assignment register 40746), reading register 49876 and 77 for the Time (as specified in their corresponding assignment registers 40747 and 48), reading register 49878 for the Fault Indicator (as specified in it’s corresponding assignment register 40749), and reading register 49879 for the Breaker Status (as specified in it’s corresponding assignment register 40750).

Exception Code Enhancement Registers

When a BE1-GPS100 responds to a Preset Multiple Register query with an error response message, additional information detailing the cause of the error may be available in the ERROR DETAILS block of holding registers (49835-54). The information is in ASCII format and available by reading the message string from the ERROR DETAILS block. The message remains available until the next Preset Multiple Register query is executed unless that query is to the FAULT SELECTION Template holding register. Since this register can be written automatically and randomly in time, the ERROR DETAILS block will not be updated.

The ERROR DETAILS block will also contain the exit status following a Preset Multiple Register query to the EXIT (40001) register. You may clear the ERROR DETAILS message at any time without affecting system operation by sending a Preset Multiple Register query to any unassigned holding register.

SECTION 2 • REGISTER TABLE

Mapping BE1-GPS100 Parameters into Modicon Holding Register Address Space

General

Parameters are mapped into the holding register address space (40001 – 49999) in blocks according to access type.

Any Holding Register not listed in the Register Table is an unassigned Holding Register. A value of zero always results when reading an unassigned Holding Register. Writes to unassigned Holding Registers are legal, but no action will be taken (the write is ignored).

Conventions

The Data Format column uses the following abbreviations.

ASC(x) - ASCII string, where x = the maximum defined string length
BM(x) - Bit-map, where x = the number of related bits
FP - Floating point
INT - Integer (16-bit integer)
LI - Long Integer (32-bit integer)
SI - Short Integer (8-bit integer)

The *Notes* column uses the following abbreviations:

GRP - Group Template Member
FLT - Fault Template Member
RPT - Report Template Member
NS - Not Supported
TS - Time Stamp format: MSEC of the day (0 to 86,400,000 ms) and DAYs since 01/01/1984.
PS - Effective only when the Password Security parameter is enabled. See REGISTER DETAILS for Password Security holding register 40989.
PW - Effective for any communication port active with ASCII protocol and for the Modbus™ port (COM 2) when Password Security is enabled.

Register Table – Ordered by Register Number

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Session Parameters				
40001	Exit			
40002-05	Access Password	R W	ASC(8)	PS
40006	Access Request	R W	BM(16)	PS
Template Parameters				
40036	Settings Group Selection	R W	SI	
40038	Fault Selection	R W	SI	
40039	Report Selection	R W	SI	
40040	Report Focus	R W	INT	
Global Parameters				
40080-83	Global Password	R W	ASC(8)	PW
40084	Global Path	R W	BM(8)	PW
40085-88	Setting Password	R W	ASC(8)	PW
40089	Setting Path	R W	BM(8)	PW
40090-93	Control Password	R W	ASC(8)	PW
40094	Control Path	R W	BM(8)	PW
40095-98	Report Password	R W	ASC(8)	PW
40099	Report Path	R W	BM(8)	PW
Control Parameters				
40117	Select Group	R W	ASC(1)	
40118	Operate Group	R W	ASC(1)	
40119	Select Virtual Selector Switch 43	R W	ASC(1)	
40120	Operate Virtual Selector Switch 43	R W	ASC(1)	
40121	Select Virtual Selector Switch 143	R W	ASC(1)	
40122	Operate Virtual Selector Switch 143	R W	ASC(1)	
40123	Select Virtual Selector Switch 243	R W	ASC(1)	
40124	Operate Virtual Selector Switch 243	R W	ASC(1)	
40125	Select Virtual Selector Switch 343	R W	ASC(1)	
40126	Operate Virtual Selector Switch 343	R W	ASC(1)	
40135	Select 101 Virtual Breaker Control Switch	R W	ASC(1)	
40136	Operate 101 Virtual Breaker Control Switch	R W	ASC(1)	
40137	Select All Outputs	R W	ASC(1)	
40138	Operate All Outputs	R W	ASC(1)	
40139	Select Output A	R W	ASC(1)	
40140	Operate Output A	R W	ASC(1)	
40141	Select Output 1	R W	ASC(1)	
40142	Operate Output 1	R W	ASC(1)	
40143	Select Output 2	R W	ASC(1)	
40144	Operate Output 2	R W	ASC(1)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
40145	Select Output 3	R W	ASC(1)	
40146	Operate Output 3	R W	ASC(1)	
40147	Select Output 4	R W	ASC(1)	
40148	Operate Output 4	R W	ASC(1)	
40149	Select Output 5	R W	ASC(1)	
40150	Operate Output 5	R W	ASC(1)	
Group Setting Parameters				
The following is the Group Template (GRP)				
40250-51	46 Pickup	RW	FP	GRP
40252-53	46 Time Delay	RW	FP	GRP
40254-55	46 Curve Type	RW	ASC(3)	GRP
40256-57	24 Pickup	R W	FP	GRP
40258-59	24 Time Delay	R W	FP	GRP
40260-61	24 Reset Delay	RW	FP	GRP
40262-63	25 Delta Volts	RW	FP	GRP
40264-65	25 Phase Angle	RW	FP	GRP
40266-67	25 Slip Frequency	RW	FP	GRP
40268	25 Mode	RW	INT	GRP
40269-70	50TP Pickup	R W	FP	GRP
40271-72	50TP Time Delay	R W	LI	GRP
40273-74	50TN Pickup	R W	FP	GRP
40275-76	50TN Time Delay	R W	LI	GRP
40305-06	51P Pickup	R W	FP	GRP
40307-08	51P Time Dial	R W	FP	GRP
40309-10	51P Curve Type	R W	ASC(3)	GRP
40311-12	51N Pickup	R W	FP	GRP
40313-14	51N Time Dial	R W	FP	GRP
40315-16	51N Curve Type	R W	ASC(3)	GRP
40329-30	151N Pickup	R W	FP	GRP
40331-32	151N Time Dial	R W	FP	GRP
40333-34	151N Curve Type	R W	ASC(3)	GRP
40359-60	62 Time Delay 1	R W	LI	GRP
40361-62	62 Time Delay 2	R W	LI	GRP
40363-64	162 Time Delay 1	R W	LI	GRP
40365-66	162 Time Delay 2	R W	LI	GRP
40367-68	262 Time Delay 1	R W	LI	GRP
40369-70	262 Time Delay 2	R W	LI	GRP
40371-72	362 Time Delay 1	R W	LI	GRP
40373-74	362 Time Delay 2	R W	LI	GRP
40405-06	27P Pickup	R W	FP	GRP
40407-08	27P Time Delay	R W	LI	GRP

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
40409-10	27X Pickup	R W	FP	GRP
40411-12	27X Time Delay	R W	LI	GRP
40413-14	127P Pickup	R W	FP	GRP
40415-16	127P Time Delay	R W	LI	GRP
40417-18	127X Pickup	R W	FP	GRP
40419-20	127X Time Delay	R W	LI	GRP
40429-30	27R Pickup	R W	FP	GRP
40431	27R Control Mode	R W	ASC(1)	GRP
40432-33	47 Pickup	R W	FP	GRP
40434-35	47 Time Delay	R W	LI	GRP
40436-37	59P Pickup	R W	FP	GRP
40438-39	59P Time Delay	R W	LI	GRP
40440-41	59X Pickup	R W	FP	GRP
40442-43	59X Time Delay	R W	LI	GRP
40444-45	159P Pickup	R W	FP	GRP
40446-47	159P Time Delay	R W	LI	GRP
40448-49	159X Pickup	R W	FP	GRP
40450-51	159X Time Delay	R W	LI	GRP
40452-53	81 Pickup	R W	FP	GRP
40454-55	81 Time Delay	R W	LI	GRP
40456	81 Mode	R W	ASC(1)	GRP
40457-58	181 Pickup	R W	FP	GRP
40459-60	181 Time Delay	R W	LI	GRP
40461	181 Mode	R W	ASC(1)	GRP
40462-63	281 Pickup	R W	FP	GRP
40464-65	281 Time Delay	R W	LI	GRP
40466	281 Mode	R W	ASC(1)	GRP
40467-68	381 Pickup	R W	FP	GRP
40469-70	381 Time Delay	R W	LI	GRP
40471	381 Mode	R W	ASC(1)	GRP
40472-73	81 Inhibit Setting	R W	FP	GRP
40474-75	32 Pickup	R W	FP	GRP
40476-77	32 Time Delay	R W	LI	GRP
40478	32 Mode	R W	ASC(1)	GRP
40479-80	132 Pickup	R W	FP	GRP
40481-82	132 Time Delay	R W	LI	GRP
40483	132 Mode	R W	ASC(1)	GRP
40484-85	40Q Pickup	R W	FP	GRP
40486-87	40Q Time Delay	R W	LI	GRP
40488-89	140Q Pickup	R W	FP	GRP
40490-91	140Q Time Delay	R W	LI	GRP

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Global Setting Parameters				
40602-03	Power System Nominal Voltage	R W	FP	
40604-05	Power System Nominal Current	R W	FP	
40606-07	Breaker Fail Time Delay	R W	LI	
40608-09	Programmable 51 Curve Constant A	R W	FP	
40610-11	Programmable 51 Curve Constant B	R W	FP	
40612-13	Programmable 51 Curve Constant C	R W	FP	
40614-15	Programmable 51 Curve Constant N	R W	FP	
40616-17	Programmable 51 Curve Constant R	R W	FP	
40618	Input 1 Contact Recognition Time Delay	R W	SI	
40619	Input 1 Contact Debounce Time Delay	R W	SI	
40620	Input 2 Contact Recognition Time Delay	R W	SI	
40621	Input 2 Contact Debounce Time Delay	R W	SI	
40622	Input 3 Contact Recognition Time Delay	R W	SI	
40623	Input 3 Contact Debounce Time Delay	R W	SI	
40624	Input 4 Contact Recognition Time Delay	R W	SI	
40625	Input 4 Contact Debounce Time Delay	R W	SI	
40746-870	Contiguous Poll Block Assignments	R W	INT	
40871	Setting Group Control On Time	R W	INT	
40903-04	60FL Loss of Potential Current Auto Block Setting	R W	ASC(3)	
40905-06	60FL Loss of Potential Voltage Auto Block Setting	R W	ASC(3)	
Serial Port Setting Parameters				
40962	Serial Port 0 Baud Rate	R W	INT	
40964	Serial Port 0 Software Flow Control	R W	SI	
40965	Serial Port 0 Page Length	R W	SI	
40966	Serial Port 0 Acknowledgement Format	R W	SI	
40971	Serial Port 1 Baud Rate	R W	INT	
40972	Serial Port 1 Relay Address	R W	INT	
40973	Serial Port 1 Software Flow Control	R W	SI	
40974	Serial Port 1 Page Length	R W	SI	
40975	Serial Port 1 Acknowledgement Format	R W	SI	
40980	Serial Port 2 Baud Rate	R W	INT	
40981	Serial Port 2 Relay Address	R W	INT	
40986	Serial Port 2 Modbus™ Parity	R W	SI	
40987	Serial Port 2 Modbus™ Remote Delay	R W	SI	
40988	Serial Port 2 Modbus™ Stop Bits	R W	SI	
40989	Password Security	R W	SI	
System Data Setting Parameters				
41018	System Frequency	R W	SI	
41019-20	Phase Rotation	R W	ASC(3)	
41021	Phase Ratio	R W	INT	
41022	Ground CT Ratio	R W	INT	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41033-34	Phase VT Ratio	R W	FP	
41035-36	VTP 27/59 Voltage Sensing Mode	R W	ASC(3)	
41037-38	51/27R Voltage Sensing Mode	R W	ASC(3)	
41039-40	VT Phase Connection	R W	ASC(3)	
41041-42	Auxiliary VT Ratio	R W	FP	
41043-44	VT Auxiliary Connection	R W	ASC(3)	
Breaker Duty Setting Parameters				
41092	Breaker Duty Type	R W	SI	
41093-94	Maximum Breaker Duty	R W	FP	
41096	Programmable Breaker Alarm #1 Mode	R W	INT	
41097-98	Programmable Breaker Alarm #1 Limit	R W	FP	
41099	Programmable Breaker Alarm #2 Mode	R W	INT	
41100-01	Programmable Breaker Alarm #2 Limit	R W	FP	
41102	Programmable Breaker Alarm #3 Mode	R W	INT	
41103-04	Programmable Breaker Alarm #3 Limit	R W	FP	
41110-15	Breaker Block Logic Mask	R W	BM(96)	
41118-23	Breaker Block Logic Term	R W	BM(96)	
41126-31	Breaker Close Logic Mask	R W	BM(96)	
41134-39	Breaker Close Logic Term	R W	BM(96)	
Relay Data Setting Parameters				
41247	Volts / Hertz alarm settings	R W	INT	
41251-52	Forward Var Demand Alarm	R W	FP	
41253-54	Reverse Var Demand Alarm	R W	FP	
41255-56	Forward Watt Demand Alarm	R W	FP	
41257-58	Reverse Watt Demand Alarm	R W	FP	
41259-60	Phase Demand Alarm Level	R W	FP	
41261-62	Neutral Demand Alarm Level	R W	FP	
41263-64	Negative Sequence Demand Alarm Level	R W	FP	
41265-66	Major Alarm Mask	R W	BM(32)	
41267-68	Minor Alarm Mask	R W	BM(32)	
41269-70	Logic Alarm Mask	R W	BM(32)	
41272	Clock Format – Date	R W	ASC(1)	
41273	Clock Format – Time	R W	SI	
41274	Clock Format – Daylight Savings	R W	SI	
41275	Phase Demand Interval	R W	SI	
41276	Neutral Demand Interval	R W	SI	
41277	Negative Sequence Demand Interval	R W	SI	
41284	Output Hold Mask	R W	BM(8)	
41287-90	Target Mask	R W	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41291-94	Programmable Screen #1	R W	ASC(7)	
41295-98	Programmable Screen #2	R W	ASC(7)	
41299-302	Programmable Screen #3	R W	ASC(7)	
41303-06	Programmable Screen #4	R W	ASC(7)	
41307-10	Programmable Screen #5	R W	ASC(7)	
41311-14	Programmable Screen #6	R W	ASC(7)	
41315-18	Programmable Screen #7	R W	ASC(7)	
41319-22	Programmable Screen #8	R W	ASC(7)	
41323-26	Programmable Screen #9	R W	ASC(7)	
41327-30	Programmable Screen #10	R W	ASC(7)	
41331-34	Programmable Screen #11	R W	ASC(7)	
41335-38	Programmable Screen #12	R W	ASC(7)	
41339-42	Programmable Screen #13	R W	ASC(7)	
41343-46	Programmable Screen #14	R W	ASC(7)	
41347-50	Programmable Screen #15	R W	ASC(7)	
41351-54	Programmable Screen #16	R W	ASC(7)	
41355-60	Fault Record Trigger (Trip) Logic Mask	R W	BM(96)	
41363-68	Fault Record Trigger (Trip) Logic Term	R W	BM(96)	
41371-76	Fault Record Trigger (Pickup) Logic Mask	R W	BM(96)	
41379-84	Fault Record Trigger (Pickup) Logic Term	R W	BM(96)	
41387-92	Fault Record Trigger (Logic) Logic Mask	R W	BM(96)	
41395-400	Fault Record Trigger (Logic) Logic Term	R W	BM(96)	
41403-08	Reset Target Logic Mask	R W	BM(96)	
41411-16	Reset Target Logic Term	R W	BM(96)	
41419-24	Reset Alarm Logic Mask	R W	BM(96)	
41427-32	Reset Alarm Logic Term	R W	BM(96)	
Custom Logic Setting Parameters				
41435-38	User Custom Logic Name	R W	ASC(8)	
41439-42	Current Active Logic Scheme	R –	ASC(8)	
41443-46	Custom Logic Name	R –	ASC(8)	
41447-50	Standard Logic #1 Name	R –	ASC(8)	
41451-54	Standard Logic #2 Name	R –	ASC(8)	
41455-58	Standard Logic #3 Name	R –	ASC(8)	
41459-62	Standard Logic #4 Name	R –	ASC(8)	
41463-66	Standard Logic #5 Name	R –	ASC(8)	
41467-70	Standard Logic #6 Name	R –	ASC(8)	
41475	Programmable 27P Logic Mode	R W	INT	
41476-81	Programmable 27P Block Logic Mask	R W	BM(96)	
41484-89	Programmable 27P Block Logic Term	R W	BM(96)	
41492	Programmable 27X Logic Mode	R W	INT	
41493-98	Programmable 27X Block Logic Mask	R W	BM(96)	
41501-506	Programmable 27X Block Logic Term	R W	BM(96)	
41509	Programmable 127P Logic Mode	R W	INT	
41510-15	Programmable 127P Block Logic Mask	R W	BM(96)	
41518-23	Programmable 127P Block Logic Term	R W	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41526	Programmable 127X Logic Mode	R W	INT	
41527-32	Programmable 127X Block Logic Mask	R W	BM(96)	
41535-40	Programmable 127X Block Logic Term	R W	BM(96)	
41551	Programmable 59P Logic Mode	R W	INT	
41552-57	Programmable 59P Block Logic Mask	R W	BM(96)	
41560-65	Programmable 59P Block Logic Term	R W	BM(96)	
41568	Programmable 59X Logic Mode	R W	INT	
41569-74	Programmable 59X Block Logic Mask	R W	BM(96)	
41577-82	Programmable 59X Block Logic Term	R W	BM(96)	
41585	Programmable 159P Logic Mode	R W	INT	
41586-91	Programmable 159P Block Logic Mask	R W	BM(96)	
41594-99	Programmable 159P Block Logic Term	R W	BM(96)	
41602	Programmable 159X Logic Mode	R W	INT	
41603-08	Programmable 159X Block Logic Mask	R W	BM(96)	
41611-16	Programmable 159X Block Logic Term	R W	BM(96)	
41619	Programmable 50TP Logic Mode	R W	INT	
41620-25	Programmable 50TP Block Logic Mask	R W	BM(96)	
41628-33	Programmable 50TP Block Logic Term	R W	BM(96)	
41636	Programmable 50TN Logic Mode	R W	INT	
41637-42	Programmable 50TN Block Logic Mask	R W	BM(96)	
41645-50	Programmable 50TN Block Logic Term	R W	BM(96)	
41653	Programmable Breaker Fail Logic Mode	R W	INT	
41654-59	Programmable Breaker Fail Initiate Logic Mask	R W	BM(96)	
41662-67	Programmable Breaker Fail Initiate Logic Term	R W	BM(96)	
41670-75	Programmable Breaker Fail Block Logic Mask	R W	BM(96)	
41678-83	Programmable Breaker Fail Block Logic Term	R W	BM(96)	
41686	Programmable 51P Logic Mode	R W	INT	
41687-92	Programmable 51P Block Logic Mask	R W	BM(96)	
41695-700	Programmable 51P Block Logic Term	R W	BM(96)	
41703	Programmable 51N Logic Mode	R W	INT	
41704-09	Programmable 51N Block Logic Mask	R W	BM(96)	
41712-17	Programmable 51N Block Logic Term	R W	BM(96)	
41720	Programmable 151N Logic Mode	R W	INT	
41721-26	Programmable 151N Block Logic Mask	R W	BM(96)	
41729-34	Programmable 151N Block Logic Term	R W	BM(96)	
41737	Programmable 32 Logic Mode	R W	INT	
41738-43	Programmable 32 Block Logic Mask	R W	BM(96)	
41746-51	Programmable 32 Block Logic Term	R W	BM(96)	
41754	Programmable 132 Logic Mode	R W	INT	
41755-60	Programmable 132 Block Logic Mask	R W	BM(96)	
41763-68	Programmable 132 Block Logic Term	R W	BM(96)	
41771	Programmable 40Q Logic Mode	R W	INT	
41772-77	Programmable 40Q Block Logic Mask	R W	BM(96)	
41780-85	Programmable 40Q Block Logic Term	R W	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41788	Programmable 140Q Logic Mode	R W	INT	
41789-94	Programmable 140Q Block Logic Mask	R W	BM(96)	
41797-802	Programmable 140Q Block Logic Term	R W	BM(96)	
41805	Programmable 24 Logic Mode	R W	INT	
41806-11	Programmable 24 Block Logic Mask	R W	BM(96)	
41814-19	Programmable 24 Block Logic Term	R W	BM(96)	
41822	Programmable 25 Logic Mode	R W	INT	
41823-28	Programmable 25 Block Logic Mask	R W	BM(96)	
41831-36	Programmable 25 Block Logic Term	R W	BM(96)	
41844	Programmable 62 Timer Logic Mode	R W	INT	
41845-50	Programmable 62 Timer Start Logic Mask	R W	BM(96)	
41853-58	Programmable 62 Timer Start Logic Term	R W	BM(96)	
41861-66	Programmable 62 Timer Block Logic Mask	R W	BM(96)	
41869-74	Programmable 62 Timer Block Logic Term	R W	BM(96)	
41877	Programmable 162 Timer Logic Mode	R W	INT	
41878-83	Programmable 162 Timer Start Logic Mask	R W	BM(96)	
41886-91	Programmable 162 Timer Start Logic Term	R W	BM(96)	
41894-99	Programmable 162 Timer Block Logic Mask	R W	BM(96)	
41902-07	Programmable 162 Timer Block Logic Term	R W	BM(96)	
41910	Programmable 262 Timer Logic Mode	R W	INT	
41911-16	Programmable 262 Timer Start Logic Mask	R W	BM(96)	
41919-24	Programmable 262 Timer Start Logic Term	R W	BM(96)	
41927-32	Programmable 262 Timer Block Logic Mask	R W	BM(96)	
41935-40	Programmable 262 Timer Block Logic Term	R W	BM(96)	
41943	Programmable 362 Timer Logic Mode	R W	INT	
41944-49	Programmable 362 Timer Start Logic Mask	R W	BM(96)	
41952-57	Programmable 362 Timer Start Logic Term	R W	BM(96)	
41960-65	Programmable 362 Timer Block Logic Mask	R W	BM(96)	
41968-73	Programmable 362 Timer Block Logic Term	R W	BM(96)	
41976	Programmable 46 Logic Mode	R W	INT	
41977-82	Programmable 46 Block Logic Mask	R W	BM(96)	
41985-90	Programmable 46 Block Logic Term	R W	BM(96)	
41993	Programmable 47 Logic Mode	R W	INT	
41994-99	Programmable 47 Block Logic Mask	R W	BM(96)	
42002-07	Programmable 47 Block Logic Term	R W	BM(96)	
42026	Programmable Settings Group Logic Mode	R W	INT	
42027-32	Programmable Settings Group0 Select Logic Mask	R W	BM(96)	
42035-40	Programmable Settings Group0 Select Logic Term	R W	BM(96)	
42043-48	Programmable Settings Group1 Select Logic Mask	R W	BM(96)	
42051-56	Programmable Settings Group1 Select Logic Term	R W	BM(96)	
42091	Programmable 43 Virtual Switch Logic Mode	R W	INT	
42092	Programmable 143 Virtual Switch Logic Mode	R W	INT	
42093	Programmable 243 Virtual Switch Logic Mode	R W	INT	
42094	Programmable 343 Virtual Switch Logic Mode	R W	INT	
42099	Programmable 101 Virtual Breaker Control Logic Mode	R W	INT	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42133	Programmable Virtual Output A Term Count	R W	SI	
42134-39	Programmable Virtual Output A Logic Mask 1	R W	BM(96)	
42142-47	Programmable Virtual Output A Logic Term 1	R W	BM(96)	
42150-55	Programmable Virtual Output A Logic Mask 2	R W	BM(96)	
42158-63	Programmable Virtual Output A Logic Term 2	R W	BM(96)	
42166-71	Programmable Virtual Output A Logic Mask 3	R W	BM(96)	
42174-79	Programmable Virtual Output A Logic Term 3	R W	BM(96)	
42182-87	Programmable Virtual Output A Logic Mask 4	R W	BM(96)	
42190-95	Programmable Virtual Output A Logic Term 4	R W	BM(96)	
42198	Programmable Virtual Output 1 Term Count	R W	SI	
42199-204	Programmable Virtual Output 1 Logic Mask 1	R W	BM(96)	
42207-12	Programmable Virtual Output 1 Logic Term 1	R W	BM(96)	
42215-20	Programmable Virtual Output 1 Logic Mask 2	R W	BM(96)	
42223-28	Programmable Virtual Output 1 Logic Term 2	R W	BM(96)	
42231-36	Programmable Virtual Output 1 Logic Mask 3	R W	BM(96)	
42239-44	Programmable Virtual Output 1 Logic Term 3	R W	BM(96)	
42247-52	Programmable Virtual Output 1 Logic Mask 4	R W	BM(96)	
42255-60	Programmable Virtual Output 1 Logic Term 4	R W	BM(96)	
42263	Programmable Virtual Output 2 Term Count	R W	SI	
42264-69	Programmable Virtual Output 2 Logic Mask 1	R W	BM(96)	
42272-77	Programmable Virtual Output 2 Logic Term 1	R W	BM(96)	
42280-85	Programmable Virtual Output 2 Logic Mask 2	R W	BM(96)	
42288-93	Programmable Virtual Output 2 Logic Term 2	R W	BM(96)	
42296-301	Programmable Virtual Output 2 Logic Mask 3	R W	BM(96)	
42304-09	Programmable Virtual Output 2 Logic Term 3	R W	BM(96)	
42312-17	Programmable Virtual Output 2 Logic Mask 4	R W	BM(96)	
42320-25	Programmable Virtual Output 2 Logic Term 4	R W	BM(96)	
42328	Programmable Virtual Output 3 Term Count	R W	SI	
42329-34	Programmable Virtual Output 3 Logic Mask 1	R W	BM(96)	
42337-42	Programmable Virtual Output 3 Logic Term 1	R W	BM(96)	
42345-50	Programmable Virtual Output 3 Logic Mask 2	R W	BM(96)	
42353-58	Programmable Virtual Output 3 Logic Term 2	R W	BM(96)	
42361-66	Programmable Virtual Output 3 Logic Mask 3	R W	BM(96)	
42369-74	Programmable Virtual Output 3 Logic Term 3	R W	BM(96)	
42377-82	Programmable Virtual Output 3 Logic Mask 4	R W	BM(96)	
42385-90	Programmable Virtual Output 3 Logic Term 4	R W	BM(96)	
42393	Programmable Virtual Output 4 Term Count	R W	SI	
42394-99	Programmable Virtual Output 4 Logic Mask 1	R W	BM(96)	
42402-07	Programmable Virtual Output 4 Logic Term 1	R W	BM(96)	
42410-15	Programmable Virtual Output 4 Logic Mask 2	R W	BM(96)	
42418-23	Programmable Virtual Output 4 Logic Term 2	R W	BM(96)	
42426-31	Programmable Virtual Output 4 Logic Mask 3	R W	BM(96)	
42434-39	Programmable Virtual Output 4 Logic Term 3	R W	BM(96)	
42442-47	Programmable Virtual Output 4 Logic Mask 4	R W	BM(96)	
42450-55	Programmable Virtual Output 4 Logic Term 4	R W	BM(96)	
42458	Programmable Virtual Output 5 Term Count	R W	SI	
42459-64	Programmable Virtual Output 5 Logic Mask 1	R W	BM(96)	
42467-72	Programmable Virtual Output 5 Logic Term 1	R W	BM(96)	
42475-80	Programmable Virtual Output 5 Logic Mask 2	R W	BM(96)	
42483-88	Programmable Virtual Output 5 Logic Term 2	R W	BM(96)	
42491-96	Programmable Virtual Output 5 Logic Mask 3	R W	BM(96)	
42499-504	Programmable Virtual Output 5 Logic Term 3	R W	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42507-12	Programmable Virtual Output 5 Logic Mask 4	R W	BM(96)	
42515-20	Programmable Virtual Output 5 Logic Term 4	R W	BM(96)	
42523	Programmable Virtual Output 6 Term Count	R W	SI	
42524-29	Programmable Virtual Output 6 Logic Mask 1	R W	BM(96)	
42532-37	Programmable Virtual Output 6 Logic Term 1	R W	BM(96)	
42540-45	Programmable Virtual Output 6 Logic Mask 2	R W	BM(96)	
42548-53	Programmable Virtual Output 6 Logic Term 2	R W	BM(96)	
42556-61	Programmable Virtual Output 6 Logic Mask 3	R W	BM(96)	
42564-69	Programmable Virtual Output 6 Logic Term 3	R W	BM(96)	
42572-77	Programmable Virtual Output 6 Logic Mask 4	R W	BM(96)	
42580-85	Programmable Virtual Output 6 Logic Term 4	R W	BM(96)	
42588	Programmable Virtual Output 7 Term Count	R W	SI	
42589-94	Programmable Virtual Output 7 Logic Mask 1	R W	BM(96)	
42597-602	Programmable Virtual Output 7 Logic Term 1	R W	BM(96)	
42605-10	Programmable Virtual Output 7 Logic Mask 2	R W	BM(96)	
42613-18	Programmable Virtual Output 7 Logic Term 2	R W	BM(96)	
42621-26	Programmable Virtual Output 7 Logic Mask 3	R W	BM(96)	
42629-34	Programmable Virtual Output 7 Logic Term 3	R W	BM(96)	
42637-42	Programmable Virtual Output 7 Logic Mask 4	R W	BM(96)	
42645-50	Programmable Virtual Output 7 Logic Term 4	R W	BM(96)	
42653	Programmable Virtual Output 8 Term Count	R W	SI	
42654-59	Programmable Virtual Output 8 Logic Mask 1	R W	BM(96)	
42662-67	Programmable Virtual Output 8 Logic Term 1	R W	BM(96)	
42670-75	Programmable Virtual Output 8 Logic Mask 2	R W	BM(96)	
42678-83	Programmable Virtual Output 8 Logic Term 2	R W	BM(96)	
42686-91	Programmable Virtual Output 8 Logic Mask 3	R W	BM(96)	
42694-99	Programmable Virtual Output 8 Logic Term 3	R W	BM(96)	
42702-07	Programmable Virtual Output 8 Logic Mask 4	R W	BM(96)	
42710-15	Programmable Virtual Output 8 Logic Term 4	R W	BM(96)	
42718	Programmable Virtual Output 9 Term Count	R W	SI	
42719-24	Programmable Virtual Output 9 Logic Mask 1	R W	BM(96)	
42727-32	Programmable Virtual Output 9 Logic Term 1	R W	BM(96)	
42735-40	Programmable Virtual Output 9 Logic Mask 2	R W	BM(96)	
42743-48	Programmable Virtual Output 9 Logic Term 2	R W	BM(96)	
42751-56	Programmable Virtual Output 9 Logic Mask 3	R W	BM(96)	
42759-64	Programmable Virtual Output 9 Logic Term 3	R W	BM(96)	
42767-72	Programmable Virtual Output 9 Logic Mask 4	R W	BM(96)	
42775-80	Programmable Virtual Output 9 Logic Term 4	R W	BM(96)	
42783	Programmable Virtual Output 10 Term Count	R W	SI	
42784-89	Programmable Virtual Output 10 Logic Mask 1	R W	BM(96)	
42792-97	Programmable Virtual Output 10 Logic Term 1	R W	BM(96)	
42800-05	Programmable Virtual Output 10 Logic Mask 2	R W	BM(96)	
42808-13	Programmable Virtual Output 10 Logic Term 2	R W	BM(96)	
42816-21	Programmable Virtual Output 10 Logic Mask 3	R W	BM(96)	
42824-29	Programmable Virtual Output 10 Logic Term 3	R W	BM(96)	
42832-37	Programmable Virtual Output 10 Logic Mask 4	R W	BM(96)	
42840-45	Programmable Virtual Output 10 Logic Term 4	R W	BM(96)	
42848	Programmable Virtual Output 11 Term Count	R W	SI	
42849-54	Programmable Virtual Output 11 Logic Mask 1	R W	BM(96)	
42857-62	Programmable Virtual Output 11 Logic Term 1	R W	BM(96)	
42865-70	Programmable Virtual Output 11 Logic Mask 2	R W	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42873-78	Programmable Virtual Output 11 Logic Term 2	R W	BM(96)	
42881-86	Programmable Virtual Output 11 Logic Mask 3	R W	BM(96)	
42889-94	Programmable Virtual Output 11 Logic Term 3	R W	BM(96)	
42897-902	Programmable Virtual Output 11 Logic Mask 4	R W	BM(96)	
42905-10	Programmable Virtual Output 11 Logic Term 4	R W	BM(96)	
42913	Programmable Virtual Output 12 Term Count	R W	SI	
42914-19	Programmable Virtual Output 12 Logic Mask 1	R W	BM(96)	
42922-27	Programmable Virtual Output 12 Logic Term 1	R W	BM(96)	
42930-35	Programmable Virtual Output 12 Logic Mask 2	R W	BM(96)	
42938-43	Programmable Virtual Output 12 Logic Term 2	R W	BM(96)	
42946-51	Programmable Virtual Output 12 Logic Mask 3	R W	BM(96)	
42954-59	Programmable Virtual Output 12 Logic Term 3	R W	BM(96)	
42962-67	Programmable Virtual Output 12 Logic Mask 4	R W	BM(96)	
42970-75	Programmable Virtual Output 12 Logic Term 4	R W	BM(96)	
42978	Programmable Virtual Output 13 Term Count	R W	SI	
42979-84	Programmable Virtual Output 13 Logic Mask 1	R W	BM(96)	
42987-92	Programmable Virtual Output 13 Logic Term 1	R W	BM(96)	
42995-3000	Programmable Virtual Output 13 Logic Mask 2	R W	BM(96)	
43003-08	Programmable Virtual Output 13 Logic Term 2	R W	BM(96)	
43011-16	Programmable Virtual Output 13 Logic Mask 3	R W	BM(96)	
43019-24	Programmable Virtual Output 13 Logic Term 3	R W	BM(96)	
43027-32	Programmable Virtual Output 13 Logic Mask 4	R W	BM(96)	
43035-40	Programmable Virtual Output 13 Logic Term 4	R W	BM(96)	
43043	Programmable Virtual Output 14 Term Count	R W	SI	
43044-49	Programmable Virtual Output 14 Logic Mask 1	R W	BM(96)	
43052-57	Programmable Virtual Output 14 Logic Term 1	R W	BM(96)	
43060-65	Programmable Virtual Output 14 Logic Mask 2	R W	BM(96)	
43068-73	Programmable Virtual Output 14 Logic Term 2	R W	BM(96)	
43076-81	Programmable Virtual Output 14 Logic Mask 3	R W	BM(96)	
43084-89	Programmable Virtual Output 14 Logic Term 3	R W	BM(96)	
43092-97	Programmable Virtual Output 14 Logic Mask 4	R W	BM(96)	
43100-05	Programmable Virtual Output 14 Logic Term 4	R W	BM(96)	
43108	Programmable Virtual Output 15 Term Count	R W	SI	
43109-14	Programmable Virtual Output 15 Logic Mask 1	R W	BM(96)	
43117-22	Programmable Virtual Output 15 Logic Term 1	R W	BM(96)	
43125-30	Programmable Virtual Output 15 Logic Mask 2	R W	BM(96)	
43133-38	Programmable Virtual Output 15 Logic Term 2	R W	BM(96)	
43141-46	Programmable Virtual Output 15 Logic Mask 3	R W	BM(96)	
43149-54	Programmable Virtual Output 15 Logic Term 3	R W	BM(96)	
43157-62	Programmable Virtual Output 15 Logic Mask 4	R W	BM(96)	
43165-70	Programmable Virtual Output 15 Logic Term 4	R W	BM(96)	
43236	Programmable 81 Logic Mode	R W	INT	
43237-42	Programmable 81 Block Logic Mask	R W	BM(96)	
43245-50	Programmable 81 Block Logic Term	R W	BM(96)	
43253	Programmable 181 Logic Mode	R W	INT	
43254-59	Programmable 181 Block Logic Mask	R W	BM(96)	
43262-67	Programmable 181 Block Logic Term	R W	BM(96)	
43270	Programmable 281 Logic Mode	R W	INT	
43271-76	Programmable 281 Block Logic Mask	R W	BM(96)	
43279-84	Programmable 281 Block Logic Term	R W	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43287	Programmable 381 Logic Mode	R W	INT	
43288-93	Programmable 381 Block Logic Mask	R W	BM(96)	
43296-301	Programmable 381 Block Logic Term	R W	BM(96)	
System Labels and Id Setting Parameters				
43438-42	Relay ID	R W	ASC(10)	
43443-57	Station ID	R W	ASC(30)	
43498-502	Virtual Selector Switch 43 – Name Label	R W	ASC(10)	
43503-06	Virtual Selector Switch 43 – True Label	R W	ASC(7)	
43507-10	Virtual Selector Switch 43 – False Label	R W	ASC(7)	
43511-15	Virtual Selector Switch 143 – Name Label	R W	ASC(10)	
43516-19	Virtual Selector Switch 143 – True Label	R W	ASC(7)	
43520-23	Virtual Selector Switch 143 – False Label	R W	ASC(7)	
43524-28	Virtual Selector Switch 243 – Name Label	R W	ASC(10)	
43529-32	Virtual Selector Switch 243 – True Label	R W	ASC(7)	
43533-36	Virtual Selector Switch 243 – False Label	R W	ASC(7)	
43537-41	Virtual Selector Switch 343 – Name Label	R W	ASC(10)	
43542-45	Virtual Selector Switch 343 – True Label	R W	ASC(7)	
43546-49	Virtual Selector Switch 343 – False Label	R W	ASC(7)	
43602-06	Virtual Output a – Name Label	R W	ASC(10)	
43607-10	Virtual Output a – True Label	R W	ASC(7)	
43611-14	Virtual Output a – False Label	R W	ASC(7)	
43615-19	Virtual Output 1 – Name Label	R W	ASC(10)	
43620-23	Virtual Output 1 - True Label	R W	ASC(7)	
43624-27	Virtual Output 1 – False Label	R W	ASC(7)	
43628-32	Virtual Output 2 – Name Label	R W	ASC(10))	
43633-36	Virtual Output 2 – True Label	R W	ASC(7)	
43637-40	Virtual Output 2 – False Label	R W	ASC(7)	
43641-45	Virtual Output 3 – Name Label	R W	ASC(10)	
43646-49	Virtual Output 3 – True Label	R W	ASC(7)	
43650-53	Virtual Output 3 – False Label	R W	ASC(7)	
43654-58	Virtual Output 4 – Name Label	R W	ASC(10)	
43659-62	Virtual Output 4 – True Label	R W	ASC(7)	
43663-66	Virtual Output 4 – False Label	R W	ASC(7)	
43667-71	Virtual Output 5 – Name Label	R W	ASC(10)	
43672-75	Virtual Output 5 – True Label	R W	ASC(7)	
43676-79	Virtual Output 5 – False Label	R W	ASC(7)	
43680-84	Virtual Output 6 – Name Label	R W	ASC(10)	
43685-88	Virtual Output 6 – True Label	R W	ASC(7)	
43689-92	Virtual Output 6 – False Label	R W	ASC(7)	
43693-97	Virtual Output 7 – Name Label	R W	ASC(10)	
43698-701	Virtual Output 7 – True Label	R W	ASC(7)	
43702-05	Virtual Output 7 – False Label	R W	ASC(7)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43706-10	Virtual Output 8 – Name Label	R W	ASC(10)	
43711-14	Virtual Output 8 – True Label	R W	ASC(7)	
43715-18	Virtual Output 8 – False Label	R W	ASC(7)	
43719-23	Virtual Output 9 – Name Label	R W	ASC(10)	
43724-27	Virtual Output 9 – True Label	R W	ASC(7)	
43728-31	Virtual Output 9 – False Label	R W	ASC(7)	
43732-36	Virtual Output 10 – Name Label	R W	ASC(10)	
43737-40	Virtual Output 10 – True Label	R W	ASC(7)	
43741-44	Virtual Output 10 – False Label	R W	ASC(7)	
43745-49	Virtual Output 11 – Name Label	R W	ASC(10)	
43750-53	Virtual Output 11 – True Label	R W	ASC(7)	
43754-57	Virtual Output 11 – False Label	R W	ASC(7)	
43758-62	Virtual Output 12 – Name Label	R W	ASC(10)	
43763-66	Virtual Output 12 – True Label	R W	ASC(7)	
43767-70	Virtual Output 12 – False Label	R W	ASC(7)	
43771-75	Virtual Output 13 – Name Label	R W	ASC(10)	
43776-79	Virtual Output 13 – True Label	R W	ASC(7)	
43780-83	Virtual Output 13 – False Label	R W	ASC(7)	
43784-88	Virtual Output 14 – Name Label	R W	ASC(10)	
43789-92	Virtual Output 14 – True Label	R W	ASC(7)	
43793-96	Virtual Output 14 – False Label	R W	ASC(7)	
43797-801	Virtual Output 15 – Name Label	R W	ASC(10)	
43802-05	Virtual Output 15 – True Label	R W	ASC(7)	
43806-09	Virtual Output 15 – False Label	R W	ASC(7)	
43849-53	Input 1 – Name Label	R W	ASC(10)	
43854-57	Input 1 – True Label	R W	ASC(7)	
43858-61	Input 1 – False Label	R W	ASC(7)	
43862-66	Input 2 – Name Label	R W	ASC(10)	
43867-70	Input 2 – True Label	R W	ASC(7)	
43871-74	Input 2 – False Label	R W	ASC(7)	
43875-79	Input 3 – Name Label	R W	ASC(10)	
43880-83	Input 3 – True Label	R W	ASC(7)	
43884-87	Input 3 – False Label	R W	ASC(7)	
43888-92	Input 4 – Name Label	R W	ASC(10)	
43893-96	Input 4 – True Label	R W	ASC(7)	
43897-900	Input 4 – False Label	R W	ASC(7)	
Report Parameters				
47194-95	Pk Demand Vars	R W	FP	
47196	Pk Demand Vars Timestamp - Day	R –	INT	TS
47197-98	Pk Demand Vars Timestamp - Millisecond	R –	LI	TS
47199-200	Pk Demand Reverse Vars	R W	FP	
47201	Pk Demand Reverse Vars Timestamp - Day	R –	INT	TS
47202-03	Pk Demand Reverse Vars Timestamp - ms	R –	LI	TS

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47204-05	Pk Demand Watts	R W	FP	
47206	Pk Demand Watts Timestamp - Day	R –	INT	TS
47207-08	Pk Demand Watts Timestamp - ms	R –	LI	TS
47209-10	Pk Demand Reverse Watts	R W	FP	
47211	Pk Demand Reverse Watts Timestamp - Day	R –	INT	TS
47212-13	Pk Demand Reverse Watts Timestamp - ms	R –	LI	TS
47214-15	Today's Demand Vars	R –	FP	
47216	Today's Demand Vars Timestamp - Day	R –	INT	TS
47217-18	Today's Demand Vars Timestamp - Millisecond	R –	LI	TS
47219-20	Today's Demand Reverse Vars	R –	FP	
47221	Today's Demand Rev Vars Timestamp – Day	R –	INT	TS
47222-23	Today's Demand Rev Vars Timestamp – ms	R –	LI	TS
47224-25	Today's Demand Watts	R –	FP	
47226	Today's Demand Watts Timestamp – Day	R –	INT	TS
47227-28	Today's Demand Watts Timestamp - ms	R –	LI	TS
47229-30	Today's Demand Reverse Watts	R –	FP	
47231	Today's Demand Rev Watts Timestamp – Day	R –	INT	TS
47232-33	Today's Demand Rev Watts Timestamp – ms	R –	LI	TS
47234-35	Yesterday's Demand Vars	R –	FP	
47236	Yesterday's Demand Vars Timestamp - Day	R –	INT	TS
47237-38	Yesterday's Demand Vars Timestamp - ms	R –	LI	TS
47239-40	Yesterday's Demand Reverse Vars	R –	FP	
47241	Yesterday's Demand Reverse Vars Tmstp - Day	R –	INT	TS
47242-43	Yesterday's Demand Reverse Vars Tmstp – ms	R –	LI	TS
47244-45	Yesterday's Demand Watts	R –	FP	
47246	Yesterday's Demand Watts Tmstp - Day	R –	INT	TS
47247-48	Yesterday's Demand Watts Tmstp - ms	R –	LI	TS
47249-50	Yesterday's Demand Reverse Watts	R –	FP	
47251	Yesterday's Demand Rev Watts Tmstp – Day	R –	INT	TS
47252-53	Yesterday's Demand Rev Watts Tmstp – ms	R –	LI	TS
47254-55	3 Phase Var Hours	R W	FP	
47256-57	3 Phase Reverse Var Hours	R W	FP	
47258-59	3 Phase Watt Hours	R W	FP	
47260-61	3 Phase Reverse Watt Hours	R W	FP	
47274-78	Model Number	R –	ASC(10)	
47282-90	Application SW Version # / Date	R –	ASC(18)	
47296-304	Boot SW Version # / Date	R –	ASC(18)	
47310-16	Serial Number	R –	ASC(13)	
47324-34	Style Number	R –	ASC(21)	
47362	COM0 Serial Port Relay Address	R	INT	
47363	COM1 Serial Port Relay Address	R W	INT	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47364	Date and Time – Day	R W	INT	TS
47365-66	Date and Time – ms	R W	LI	TS
47367-72	System Status	R –	BM(96)	
47373	Current Active Group Setting	R –	SI	
47374	Current Group Control Setting	R –	ASC(1)	
47375-76	Current Output Control Settings (OutputPulse)	R –	BM(32)	
47377-78	Current Output Control Settings (OutputLatch)	R –	BM(32)	
47379	Current Output Contact Status	R –	BM(16)	
47380-81	Active Alarm Flags (SumFlags)	R –	BM(32)	
47382-83	Active Alarm Flags (ProgAlarms)	R –	BM(32)	
47384-87	Target Status	R W	BM(64)	
47388	Current Breaker Status	R –	ASC(1)	
47389-92	Current Active Logic	R –	ASC(8)	
47394-95	Breaker Contact Duty Log – Phase A	R W	FP	
47396-97	Breaker Contact Duty Log – Phase B	R W	FP	
47398-99	Breaker Contact Duty Log – Phase C	R W	FP	
47400-01	Breaker Operation Counter	R W	LI	
47410-11	Yesterday's Pk Demand Current – Phase A	R –	FP	
47412	Yesterday's Pk Demand Timestamp - Day	R –	INT	TS
47413-14	Yesterday's Pk Demand Timestamp – ms	R –	LI	TS
47415-16	Yesterday's Pk Demand Current – Phase B	R –	FP	
47417	Yesterday's Pk Demand Timestamp - Day	R –	INT	TS
47418-19	Yesterday's Pk Demand Timestamp – ms	R –	LI	TS
47420-21	Yesterday's Pk Demand Current – Phase C	R –	FP	
47422	Yesterday's Pk Demand Timestamp - Day	R –	INT	TS
47423-24	Yesterday's Pk Demand Timestamp – ms	R –	LI	TS
47425-26	Yesterday's Pk Demand Current – Neutral	R –	FP	
47427	Yesterday's Pk Demand Timestamp - Day	R –	INT	TS
47428-29	Yesterday's Pk Demand Timestamp – ms	R –	LI	TS
47430-31	Yesterday's Pk Demand Current – Neg. Seq	R –	FP	
47432	Yesterday's Pk Demand Timestamp - Day	R –	INT	TS
47433-34	Yesterday's Pk Demand Timestamp – ms	R –	LI	TS
47435-36	Today's Pk Demand Current – Phase A	R –	FP	
47437	Today's Pk Demand Timestamp - Day	R –	INT	TS
47438-39	Today's Pk Demand Timestamp – ms	R –	LI	TS
47440-41	Today's Pk Demand Current – Phase B	R –	FP	
47442	Today's Pk Demand Timestamp - Day	R –	INT	TS
47443-44	Today's Pk Demand Timestamp – ms	R –	LI	TS
47445-46	Today's Pk Demand Current – Phase C	R –	FP	
47447	Today's Pk Demand Timestamp - Day	R –	INT	TS
47448-49	Today's Pk Demand Timestamp – ms	R –	LI	TS
47450-51	Today's Pk Demand Current – Neutral	R –	FP	
47452	Today's Pk Demand Timestamp - Day	R –	INT	TS
47453-54	Today's Pk Demand Timestamp – ms	R –	LI	TS

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47455-56	Today's Pk Demand Current – Negative Seq	R –	FP	
47457	Today's Pk Demand Timestamp - Day	R –	INT	TS
47458-59	Today's Pk Demand Timestamp – ms	R –	LI	TS
47460-61	Pk Demand Current Since Reset – Phase A	R W	FP	
47462	Pk Demand Since Reset Timestamp - Day	R –	INT	TS
47463-64	Pk Demand Since Reset Timestamp – ms	R –	LI	TS
47465-66	Pk Demand Current Since Reset – Phase B	R W	FP	
47467	Pk Demand Since Reset Timestamp - Day	R –	INT	TS
47468-69	Pk Demand Since Reset Timestamp – ms	R –	LI	TS
47470-71	Pk Demand Current Since Reset – Phase C	R W	FP	
47472	Pk Demand Since Reset Timestamp - Day	R –	INT	TS
47473-74	Pk Demand Since Reset Timestamp – ms	R –	LI	TS
47475-76	Pk Demand Current Since Reset – Neutral	R W	FP	
47477	Pk Demand Since Reset Timestamp - Day	R –	INT	TS
47478-79	Pk Demand Since Reset Timestamp – ms	R –	LI	TS
47480-81	Pk Demand Current Since Reset – Neg Seq	R W	FP	
47482	Pk Demand Since Reset Timestamp - Day	R –	INT	TS
47483-84	Pk Demand Since Reset Timestamp – ms	R –	LI	TS
47486	Reset Logic Alarm Information	R W	SI	
47487	Reset Major Alarm Information	R W	SI	
47488	Reset Minor Alarm Information	R W	SI	
47489	Reset Relay Alarm Information	R W	SI	
47491	Clear Fault Log	R W	SI	
47492	Trigger Fault Record	R W	SI	
47493	Clear Events Report	R W	SI	
47512	Fault Indicator	R –	SI	
47513	Fault Template Status	R –	SI	

The following is the Fault Template (FLT)

47514	Fault Date and Time – Day	R –	INT	FLT,TS
47515-16	Fault Date and Time – Milliseconds	R –	LI	FLT,TS
47517	Fault Event Type	R –	BM(16)	FLT
47518	Fault Active Group	R –	SI	FLT
47519-22	Fault Targets	R –	BM(64)	FLT
47524	Fault Clearing Time Status	R –	SI	FLT
47525-26	Fault Clearing Time	R –	FP	FLT
47527	Fault Breaker Operate Time Status	R –	SI	FLT
47528-29	Fault Breaker Operate Time	R –	FP	FLT
47530-31	Fault Phase A Current Magnitude	R –	FP	FLT
47533-34	Fault Phase B Current Magnitude	R –	FP	FLT
47536-37	Fault Phase C Current Magnitude	R –	FP	FLT
47539-40	Fault Ground Current Magnitude	R –	FP	FLT
47542-43	Fault Negative Seq. Current Magnitude	R –	FP	FLT
47544-45	Fault Phase A Voltage Magnitude	R –	FP	FLT
47546-47	Fault Phase B Voltage Magnitude	R –	FP	FLT
47548-49	Fault Phase C Voltage Magnitude	R –	FP	FLT
47550-51	Fault Vx Voltage Magnitude	R –	FP	FLT

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47556-57	Fault Generator Frequency	R –	FP	FLT
47558-59	Fault Bus Frequency	R –	FP	FLT

The following is the Report Template (RPT)

47595-719	Report Text	R –	ASC(250)	RPT

Metering Parameters

49720	Part Number	R –	INT	
49726-27	Phase A Current Magnitude	R –	FP	
49729-30	Phase B Current Magnitude	R –	FP	
49732-33	Phase C Current Magnitude	R –	FP	
49738-39	Negative Sequence Current Magnitude	R –	FP	
49740-41	Neutral Current Magnitude	R –	FP	
49742-43	Vx Voltage	R –	FP	
49744-45	Ground Current Magnitude	R –	FP	
49746-47	3 Phase Watts	R –	FP	
49748-49	Zero Sequence Voltage	R –	FP	
49750-51	3 Phase Vars	R –	FP	
49752-53	3 Phase VA	R –	FP	
49754-55	Negative Sequence Voltage	R –	FP	
49756-57	Phase A Voltage	R –	FP	
49758-59	Phase B Voltage	R –	FP	
49760-61	Phase C Voltage	R –	FP	
49762-63	Phase A-B Voltage	R –	FP	
49764-65	Phase B-C Voltage	R –	FP	
49766-67	Phase C-A Voltage	R –	FP	
49768-69	V3x Voltage	R –	FP	
49770-71	Power Factor	R –	FP	
49772-73	Generator Frequency	R –	FP	
49774-75	Vx Frequency	R –	FP	
49776-77	Slip Frequency	R –	FP	
49778-79	Slip Angle	R –	FP	

SECTION 3 • REGISTER DETAILS

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Tables

SECTION 3 • REGISTER DETAILS

Introduction

This section details the register formats and data ranges of the previous section. The two sections combined provide all information necessary to communicate with the BE1-GPS100 Modbus® Holding Registers.

Any Holding Register not listed in the Register Table is an unassigned Holding Register. A value of zero always results when reading an unassigned Holding Register. Writes to unassigned Holding Registers are legal, but no action will be taken (the write is ignored).

Logic Settings

Logic settings consist of a combination of modes, masks, terms, and term counts. Logic modes are specific to each logic set, while the masks, terms, and term counts have value definitions consistent throughout all logic sets. A single logic equation consists of a “mask” and “term” pair. The logic “term count” is used only in VOA, VO1-VO15 virtual output logic blocks.

The logic “mode” enables or disables the logic equation for that logic block.

The logic “mask” corresponds to the System Status bits to be evaluated. These bits are referenced in the desired logic equation and are set to 1 (non-used bits masked out as 0‘s).
The logic “term” corresponds to the System Status bit’s TRUE or FALSE state, referenced in the desired logic equation where only the TRUE bits in the equation are set to 1.
The logic “term count” may be of one of four logic types which are NONE (logic disabled), OR only (a + b + c), AND only (a∗b∗c) or MIXED (a∗b + b∗c).

The following defines all logic set parameters.

Logic Modes

41475 Programmable 27P Logic Mode INT
41509 Programmable 127P Logic Mode INT
41551 Programmable 59P Logic Mode INT
41585 Programmable 159P Logic Mode INT

Read and Write:

0 for disabled
1 for enabled – Undervoltage or overvoltage on one or more phases causes pickup.
2 for enabled – Undervoltage or overvoltage on two or more phases causes pickup.
3 for enabled – Undervoltage or overvoltage on all three phases causes pickup.

41492 Programmable 27X Logic Mode INT
41526 Programmable 127X Logic Mode INT
41568 Programmable 59X Logic Mode INT
41602 Programmable 159X Logic Mode INT

Read and Write:

0 for disabled
1 for enabled – Fundamental Vx input
2 for enabled – 3Vo phase Input
3 for enabled – 3rd harmonic, Vx input

41619 Programmable 50TP Logic Mode INT
41686 Programmable 51P Logic Mode INT

Read and Write:

0 for disabled
1 for enabled

41636 Programmable 50TN Logic Mode INT
41703 Programmable 51N Logic Mode INT
41720 Programmable 151N Logic Mode INT
Read and Write:
0 for disabled
1 for enabled - 3 Phase Input Neutral
2 for enabled - Ground Input

41653 Programmable Breaker Fail Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41737 Programmable 32 Logic Mode INT
41754 Programmable 132 Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41771 Programmable 40Q Logic Mode INT
41788 Programmable 140Q Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41805 Programmable 24 Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41822 Programmable 25 Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41844 Programmable 62 Timer Logic Mode INT
41877 Programmable 162 Timer Logic Mode INT
41910 Programmable 262 Timer Logic Mode INT
41943 Programmable 362 Timer Logic Mode INT
Read and Write:
0 for disabled
1 for Pickup / Dropout
2 for One-Shot Non-Retriggerable
3 for One-Shot Retriggerable
4 for Oscillator
5 for Integrating
6 for Edge Triggered Latch

41976 Programmable 46 Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

41993 Programmable 47 Logic Mode INT
Read and Write:
0 for disabled
1 for enabled

42026 Programmable Settings Group Logic Mode INT

Read and Write:

0 for all setting groups disabled except group 0
1 for selecting setting group via pulsed input logic
2 for selecting setting group via sustained input logic

42091 Programmable 43 Virtual Switch Logic Mode INT
42092 Programmable 143 Virtual Switch Logic Mode INT
42093 Programmable 243 Virtual Switch Logic Mode INT
42094 Programmable 343 Virtual Switch Logic Mode INT

Read and Write:

0 for disabled
1 for on / off / pulse (all)
2 for on / off
3 for pulse

42099 Programmable 101 Virtual Breaker Control Logic Mode INT

Read and Write:

0 for disabled
1 for enabled

43236 Programmable 81 Logic Mode INT
43253 Programmable 181 Logic Mode INT
43270 Programmable 281 Logic Mode INT
43287 Programmable 381 Logic Mode INT

Read and Write:

0 for disabled
1 for phase-enabled

Logic Mask and Terms

Each set bit in the "mask" parameter indicates a significant variable in the equation. A corresponding bit in the "term" parameter indicates that the variable must be TRUE / 1 if set or FALSE / 0 if not set.

Mask and Term – First Register (Logic Var 0 to 15) BM (16)

Bit 15 - 162
Bit 14 - 62
Bit 13 - 46 picked-up
Bit 12 - 151N picked-up
Bit 11 - 51N picked-up
Bit 10 - 51P picked-up
Bit 9 - BF picked-up
Bit 8 - 50TN picked-up
Bit 7 - 50TP picked-up
Bit 6 - 46 tripped
Bit 5 - 151N tripped
Bit 4 - 51N tripped
Bit 3 - 51P tripped
Bit 2 - BF tripped
Bit 1 - 50TN tripped
Bit 0 - 50TP tripped

Mask and Term – Second Register (Logic Var 16 to 31) BM (16)

Bit 15 - Logic always false
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - 140Q picked up
Bit 11 - 40Q picked up
Bit 10 - 140Q tripped
Bit 9 - 40Q tripped
Bit 8 - 25
Bit 7 - 24 picked up

Bit 6 - 24 tripped
Bit 5 - 343
Bit 4 - 243
Bit 3 - 143
Bit 2 - 43
Bit 1 - 362
Bit 0 - 262

Mask and Term – Third Register (Logic Var 32 to 47) BM (16)

Read only:

Bit 15 - Virtual Output 15 status
Bit 14 - Virtual Output 14 status
Bit 13 - Virtual Output 13 status
Bit 12 - Virtual Output 12 status
Bit 11 - Virtual Output 11 status
Bit 10 - Virtual Output 10 status
Bit 9 - Virtual Output 9 status
Bit 8 - Virtual Output 8 status
Bit 7 - Virtual Output 7 status
Bit 6 - Virtual Output 6 status
Bit 5 - Virtual Output 5 status
Bit 4 - Virtual Output 4 status
Bit 3 - Virtual Output 3 status
Bit 2 - Virtual Output 2 status
Bit 1 - Virtual Output 1 status
Bit 0 - Virtual Output A status

Mask and Term – Fourth Register (Logic Var 48 to 63) BM (16)

Read only:

Bit 15 - Alarm reset key
Bit 14 - Target reset key
Bit 13 - Settings Group 1
Bit 12 - Settings Group 0
Bit 11 - Output Monitor
Bit 10 - Alarm minor
Bit 9 - Alarm major
Bit 8 - Alarm logic
Bit 7 - Spare
Bit 6 - 101SC
Bit 5 - 101C
Bit 4 - 101 tripped
Bit 3 - Input 4 status
Bit 2 - Input 3 status
Bit 1 - Input 2 status
Bit 0 - Input 1 status

Mask and Term – Fifth Register (Logic Var 64 to 79) BM (16)

Read only:

Bit 15 - 47 picked up
Bit 14 - 47 tripped
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - 132 picked up
Bit 10 - 32 picked-up
Bit 9 - 132 tripped
Bit 8 - 32 tripped
Bit 7 - 127X picked-up
Bit 6 - 27X picked-up
Bit 5 - 127P picked-up
Bit 4 - 27P picked-up
Bit 3 - 127X tripped

Bit 2 - 27X tripped
Bit 1 - 127P tripped
Bit 0 - 27P tripped

Mask and Term – Sixth Register (Logic Var 80 to 95) BM (16)

Read only:
Bit 15 - Spare
Bit 14 - 60FL
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - 381 tripped
Bit 10 - 281 tripped
Bit 9 - 181 tripped
Bit 8 - 81 tripped
Bit 7 - 159X picked-up
Bit 6 - 59X picked-up
Bit 5 - 159P picked-up
Bit 4 - 59P picked-up
Bit 3 - 159X tripped
Bit 2 - 59X tripped
Bit 1 - 159P tripped
Bit 0 - 59P tripped

Logic Term Count

Term Count Register SI

0	means the logic equation is disabled (NONE)
-1	means the logic equation consists of a single term of OR-ed variables
1	means the logic equation consists of a single term of AND-ed variables
2	means the logic equation consists of the OR-ing of 2 terms of AND-ed variables
3	means the logic equation consists of the OR-ing of 3 terms of AND-ed variables
4	means the logic equation consists of the OR-ing of 4 terms of AND-ed variables

Session Parameters

40001 Exit ASC (1)

Read: always the ASCII character ‘0’ (zero)
Write: ASCII characters ‘Y’ or ‘N’ (‘Y’ to save changes, ‘N’ to ignore changes)
Note 1: ERROR DETAIL block (49835-54) contains Exit status message following a write.
Note 2: Writing to this register is effective only when Password Security register 40989 is enabled.

40002-5 Access Password ASC (8)

Read: always the ASCII string of ‘*’ characters.
Write: access password in ASCII string.
Note 1: If password written is less than 8 characters long, a binary zero value must be included following the final password character.
Note 2: Writing to this register is effective only when Password Security register 40989 is enabled.

40006 Access Request BM (16)

Read: returns the current write access available to the Modbus™ user
Bit 3 is set for Global Access
Bit 2 is set for Setting Access
Bit 1 is set for Control Access
Bit 0 is set for Report Access
Zero value for Read Only Access
Write: To request write privileges using the password written into Access Password registers.
Value written into Access Request register is arbitrary (any value will initiate the request).
Note 1: If write access is denied, the response message will be an error response message with Illegal Function exception code.

Step 1. Write the desired password to PASSWORD registers 40002 to 40005
Step 2. Write any value to ACCESS REQUEST register 40006
Step 3. Read Access Level from ACCESS REQUEST register 40006

Note 2: Writing to this register is effective only when Password Security register 40989 is enabled.

Template Parameters

40036 Settings Group Selection SI

Read: returns the current value of Settings Group Selection.
Write: the desired value to assign a Settings Group to the Group (GRP) Template.
O for Settings Group 0
1 for Settings Group 1

40038 Fault Selection SI

Read: returns the current value of Fault Selection.
Write: the desired value to assign a Fault Record to the Fault (FLT) Template.
Allowed values are 0 - 255. 0 for most recent fault.
Note: Refer to Fault Indicator (47512) and Fault Template Status (47513) Registers.

40039 Report Selection SI

Read: returns the current value of Report Selection.
Writing to Report Selection terminates previous report and initializes new report. See table for values.

40040 Report Focus INT

Read: returns the current value of Report Focus.
Write: see table for values.
Note: If an illegal Report Focus value is written, the user is not notified until a read of the Report Text is attempted.
Note: Write to Report Selection and Report Focus to specify the report which will be made available via the Report (RPT) Template. The template is the Report Text Block at 47595-719.

Table 3-1. Report

Report Text 47595-719	Report Selection 40039	Report Focus 40040
RA-LGC Report	0	Not used
RA-MAJ Report	1	Not used
RA-MIN Report	2	Not used
RA-REL Report	3	Not used
RF Report	4	Not used
RF-# Report	5	Value of # (1 – 255)
RF-NEW Report	6	Not used
RS Report	7	Not used
RS-# Report	8	Value of # (1 – 255)
RS-NEW Report	9	Not used
RS-F# Report	10	Value of # (1 – 255)
RS-ALM	11	Not used
RS-IO	12	Not used
RS-LGC	13	Not used

Global Parameters

Global Parameter registers 40080 – 40099 are effective only for serial communication ports active with ASCII protocol and for the Modbus™ serial port, COM2, when Password Security register 40989 is enabled.

40080-83 Global Password ASC (8)
40085-88 Setting Password ASC (8)

40090-93 Control Password ASC (8)
40095-98 Report Password ASC (8)

Read: If global access granted, password ASCII strings are read. Otherwise, The ASCII string of '∗' characters is read.
Write: Password in ASCII string.
Note: If password written is less than 8 characters long, a binary zero value must be included following the final password character.

40084 Global Path BM (8)
40089 Setting Path BM (8)
40094 Control Path BM (8)
40099 Report Path BM (8)

Read: path associated with password.
Write: path associated with password.
Bit 2 is set for COM 2 access.
Bit 1 is set for COM1 access.
Bit 0 is set for COM0 / FP access.

Control Parameters

All values read from and written to Select and Operate registers are ASCII characters. Select registers must be written first, followed by a write to the Operate register. A 30 second window starts after the first write to the Select register. If the second write to the Operate register is not received within the 30 second window, an error response will be returned.

Writes to Operate registers 40138, 40140 – 40150 with ASCII data 'E ' (Enable Output override control) or 'D' (Disable Output override control) requires an additional write of 'Y' to Exit register 40001 to allow these control settings to be saved to the relay internal EEPROM.

NOTE: All values read from and written to Select and Operate registers are ASCII characters.

40117 Select Group ASC (1)

Read: To read a value other than ASCII character 'X', the Select Group register must be the most recent control register written AND must have been written within the previous 30 seconds.
0 if Group 0 selection has been made.
1 if Group 1 selection has been made.
L if Logic selection has been made.
X if Group control not selected or control timer has expired
Write: the desired ASCII character.
0 to select Group 0.
1 to select Group 1.
L to select Logic.

40118 Operate Group ASC (1)

Read: Current control.
0 if Group 0.
1 if Group 1.
L if Logic.
Write: the desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).
0 to select Group 0.
1 to select Group 1.
L to select Logic.

40119 Select Virtual Selector Switch 43 ASC (1)
40121 Select Virtual Selector Switch 143 ASC (1)
40123 Select Virtual Selector Switch 243 ASC (1)
40125 Select Virtual Selector Switch 343 ASC (1)

Read: To read a value other than ASCII character 'X', the Select Virtual Selector Switch register must be the most recent control register written AND must have been written within the previous 30 seconds.
P if Pulse Switch selection has been made.
0 if Latch Switch at 0 selection has been made.

1 if Latch Switch at 1 selection has been made.
X if Virtual Selector Switch control not selected or control timer has expired

Write: the desired ASCII character.
P to select Pulsing the Switch.
0 to select Latching the Switch at 0.
1 to select Latching the Switch at 1.

40120 Operate Virtual Selector Switch 43 ASC (1)
40122 Operate Virtual Selector Switch 143 ASC (1)
40124 Operate Virtual Selector Switch 243 ASC (1)
40126 Operate Virtual Selector Switch 343 ASC (1)

Read: Current control.
P if Pulse Switch.
0 if Latch Switch at 0.
1 if Latch Switch at 1.

Write: the desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).
P to Pulse Switch.
0 to Latch Switch at 0.
1 to Latch Switch at 1.

40135 Select 101 Virtual Breaker Control Switch ASC (1)

Read: To read a value other than ASCII character 'X', the Select 101 Virtual Breaker Control Switch register must be the most recent control register written AND must have been written within the previous 30 seconds.
C if Close selection has been made.
T if Trip selection has been made.
X if 101 Virtual Breaker Control Switch control not selected or control timer has expired
Write: the desired ASCII character.
C to select Closing the Switch.
T to select Tripping the Switch.

40136 Operate 101 Virtual Breaker Control Switch ASC (1)

Read: Current control.
C if Close Switch.
T if Trip Switch.
Write: the desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).
C to Close Switch.
T to Trip Switch.

40137 Select All Outputs ASC (1)

Read: To read a value other than ASCII character 'X', the Select All Output register must be the most recent control register written AND must have been written within the previous 30 seconds.
P if Pulse All Outputs selection has been made.
0 if Latch All Outputs at 0 selection has been made.
1 if Latch All Outputs at 1 selection has been made.
L if programmable Logic selection has been made.
E if Enable All Outputs override control has been set.
D if Disable All Outputs override control has been set.
X if All Outputs control not selected or control timer has expired

Write: the desired ASCII character.
P to select Pulsing All Outputs.
0 to select Latching All Outputs at 0.
1 to select Latching All Outputs at 1.
L to select programmable Logic.
E to select Enabling All Outputs override control.
D to select Disabling All Outputs override control.

40138 Operate All Outputs ASC (1)

Read: Current control.

E if All Outputs override control Enabled.

D if All Outputs override control Disabled.

Write: the desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).

P to Pulse All Outputs.

0 to Latch All Outputs at 0.

1 to Latch All Outputs at 1.

L to select programmable Logic.

E to Enable All Outputs override control. *

D to Disable All Outputs override control. *

40139 Select Output A ASC (1)
40141 Select Output 1 ASC (1)
40143 Select Output 2 ASC (1)
40145 Select Output 3 ASC (1)
40147 Select Output 4 ASC (1)
40149 Select Output 5 ASC (1)

Read: To read a value other than ASCII character 'X', the Select Output register must be the most recent control register written AND must have been written within the previous 30 seconds.

P if Pulse Output selection has been made.

0 if Latch Output at 0 selection has been made.

1 if Latch Output at 1 selection has been made.

L if programmable Logic selection has been made.

E if Enable All Outputs serial control has been made.

D if Disable All Outputs serial control has been made.

X if Output control not selected or control timer has expired

Write: the desired ASCII character.

P to select Pulsing Output.

0 to select Latching Output at 0.

1 to select Latching Output at 1.

L to select programmable Logic.

E to select Enabling All Outputs override control.

D to select Disabling All Outputs override control.

40140 Operate Output A ASC (1)
40142 Operate Output 1 ASC (1)
40144 Operate Output 2 ASC (1)
40146 Operate Output 3 ASC (1)
40148 Operate Output 4 ASC (1)
40150 Operate Output 5 ASC (1)

Read: Current control.

P to Pulse Output.

0 to Latch Output at 0.

1 to Latch Output at 1.

L to select programmable Logic.

D if All Outputs override control Disabled

Write: the desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).

P to Pulse Output.

0 to Latch Output at 0.

1 to Latch Output at 1.

L to select programmable Logic.

E to Enable All Outputs override control. *

D to Disable All Outputs override control. *

* Requires an additional write of 'Y' to Exit register 40001 to allow these control settings to be saved to the relay's internal EEPROM.

Group Setting Parameters

40250-51 46 Pickup FP
Read and Write: 0.10 to 16.00 Amps
0 to disable

40252-23 46 Time Delay FP
Read and Write: 0.0 to 9.9 when any curve is selected except curve 46. When curve 46 is selected, Read and Write 1.0 to 99

40254-55 46 Curve Type ASC (3)
Read and Write:
S1, S2, L1, L2, D, M, I1, I2, V1, V2, E1, E2, A, B, C, G, F, 46, P, S1R, S2R, L1R, L2R, DR, MR, I1R, I2R, V1R, V2R, E1R, E2R, AR, BR, CR, GR, FR, 46R, PR

40256-57 24 Pickup FP
Read and Write: 0.50 to 6.00 Volts / Hertz

40258-59 24 Time Delay FP
Read and Write: 0.0 to 9.9

40260-61 24 Reset Delay FP
Read and Write: 0.0 to 9.9

40262-63 25 Delta Volts FP
Read and Write: 1.0 to 20.0

40264-65 25 Phase Angle FP
Read and Write: 1.0 to 45.0

40266-67 25 Slip Frequency FP
Read and Write: 0.01 to 0.50

40268 25 Mode INT
Read and Write: 0 or 1

40269-70 50TP Pickup FP
40273-74 50TN Pickup FP
Read and Write: 0.50 to 150 Amps

40271-72 50TP Time Delay LI
40275-76 50TN Time Delay LI
Read and Write: 0 to 60,000 ms

40305-06 51P Pickup FP
40311-12 51N Pickup FP
40329-30 151N Pickup FP
Read and Write: 0.50 to 16.0 Amps

40307-08 51P Time Dial FP
40313-14 51N Time Dial FP
40331-32 151N Time Dial FP
Read and Write: 0.0 to 9.9

40309-10 51P Curve Type ASC (3)
40315-16 51N Curve Type ASC (3)
40333-34 151N Curve Type ASC (3)
Read and Write: one of the following ASCII strings
S1, S2, L1, L2, D, M, I1, I2, V1, V2, E1, E2, A, B, C, G, F, 46, P,
S1R, S2R, L1R, L2R, DR, MR, I1R, I2R, V1R, V2R, E1R, E2R, AR, BR, CR, GR, FR,
46R, PR

40359-60	62 Time Delay 1	LI
40361-62	62 Time Delay 2	LI
40363-64	162 Time Delay 1	LI
40365-66	162 Time Delay 2	LI
40367-68	262 Time Delay 1	LI
40369-70	262 Time Delay 2	LI
40371-72	362 Time Delay 1	LI
40373-74	362 Time Delay 2	LI

Read and Write: 0 to 9,999,000 milliseconds

40405-06	27P Pickup	FP
40413-14	127P Pickup	FP

Read and Write: 10.0 to 300

40409-10	27X Pickup	FP
40417-18	127X Pickup	FP

Read and Write: 1.00 to 150

40407-08	27P Time Delay	FP
40411-12	27X Time Delay	FP
40415-16	127P Time Delay	FP
40419-20	127X Time Delay	FP

Read and Write: 50 to 600,000 milliseconds

40436-37	59 Pickup	FP
40444-45	159 Pickup	FP

Read and Write: 10.0 to 300

40440-41	59X Pickup	FP
40448-49	159X Pickup	FP

Read and Write: 1.00 to 150

40438-39	59 Time Delay	LI
40442-43	59X Time Delay	LI
40446-47	159 Time Delay	LI
40450-51	159X Time Delay	LI

Read and Write 50 to 600,000 milliseconds

40429-30	27R Pickup	FP

Read and Write: 30.0 to 250

40431	27R Control Mode	ASC (1)

Read and Write: R or C

40432-33	47 Pickup	FP

Read and Write: 1.00 to 300

40434-35	47 Time Delay	LI

Read and Write: 50 to 600,000 milliseconds

40452-53	81 Pickup	FP
40457-58	181 Pickup	FP
40462-63	281 Pickup	FP
40467-68	381 Pickup	FP

Read and Write: 40.00 to 70.00

40454-55	81 Time Delay	LI
40459-60	181 Time Delay	LI
40464-65	281 Time Delay	LI
40469-70	381 Time Delay	LI

Read and Write: 0 to 600,000 milliseconds

40456	81 Mode	INT
40461	181 Mode	INT
40466	281 Mode	INT
40471	381 Mode	INT
	Read and Write: O = Over Frequency U = Under Frequency	
40472-73	81 Inhibit Setting	FP
	Read and Write: 15.0 to 300	
40474-75	32 Pickup Setting	FP
40479-80	132 Pickup Setting	FP
	Read and Write: 1.0 to 6000 Watts	
40476-77	32 Time Delay	LI
40481-82	132 Time Delay	LI
	Read and Write: 50 to 600,000 milliseconds	
40478	32 Mode	ASC (1)
40483	132 Mode	ASC (1)
	Read and Write: R or F	
40484-85	40Q Pickup Setting	FP
40488-89	140Q Pickup Setting	FP
	Read and Write: 1 to 6000 Vars	
40486-87	40Q Time Delay Setting	FP
40490-91	140Q Time Delay Setting	FP
	Read and Write: 50 to 600,000 milliseconds	

Global Setting Parameters

40602-03	Power System Nominal Voltage	FP
	Read and Write: 50.0 to 250	
40604-05	Power System Nominal Current	FP
	Read and Write: 0.50 to 10.0	
40606-07	Breaker Fail Time Delay	LI
	Read and Write: 50 to 999 milliseconds	
40608-09	Programmable 51 Curve Constant A Delay	FP
	Read and Write: 0.0000 to 600.0000	
40610-11	Programmable 51 Curve Constant B Delay	FP
	Read and Write: 0.0000 to 25.0000	
40612-13	Programmable 51 Curve Constant C Delay	FP
	Read and Write: 0.0000 to +1.0000	
40614-15	Programmable 51 Curve Constant N Delay	FP
	Read and Write: 0.5000 to 2.5000	
40616-17	Programmable 51 Curve Constant R Delay	FP
	Read and Write: 0.0000 to 30.0000	
40618	Input 1 Contact Recognition Time Delay	SI
40619	Input 1 Contact Debounce Time Delay	SI
40620	Input 2 Contact Recognition Time Delay	SI
40621	Input 2 Contact Debounce Time Delay	SI
40622	Input 3 Contact Recognition Time Delay	SI
40623	Input 3 Contact Debounce Time Delay	SI
40624	Input 4 Contact Recognition Time Delay	SI
40625	Input 4 Contact Debounce Time Delay	SI
	Read and Write: 4 to 255 milli-seconds	

40746-870 Contiguous Poll Block Assignments INT
Read and Write:
0 if Unassigned
1 to 9874: Holding Register 40001 to 49874

40871 Setting Group Control On Time INT
Read and Write: 0 to 10 Seconds

40903-04 60FL Loss of Potential Current Auto Block Setting ASC (3)
Read and Write: ENA for Enable, DIS for Disable

40905-06 60FL Loss of Potential Voltage Auto Block Setting ASC (3)
Read and Write: DIS for Disable, PNQ, PN, PQ, NQ, P, N, Q

Serial Port Setting Parameters

40962 Serial Port 0 Baud Rate INT
40971 Serial Port 1 Baud Rate INT
40980 Serial Port 2 Baud Rate INT
Read and Write:
0 – 300 Baud (Do not select for port 2 Modbus™ communications)
1 – 600 Baud (Do not select for port 2 Modbus™ communications)
2 – 1200 Baud (Do not select for port 2 Modbus™ communications)
3 – 2400 Baud
4 – 4800 Baud
5 – 9600 Baud
6 – 19K Baud

40972 Serial Port 1 Relay Address INT
40981 Serial Port 2 Relay Address INT
Read and Write: 0 to 65,534

40964 Serial Port 0 Software Flow Control SI
40973 Serial Port 1 Software Flow Control SI
Read:
0 if XON / XOFF Control is disabled
1 if XON / XOFF Control is enabled
Write:
0 to disable XON / XOFF Control
1 to 255 to enable XON / XOFF Control

40965 Serial Port 0 Page Length SI
40974 Serial Port 1 Page Length SI
Read and Write:
0 for disabled
1 to 40 for number of lines / page

40966 Serial Port 0 Acknowledgement Format SI
40975 Serial Port 1 Acknowledgement Format SI
Read:
0 if No acknowledge
1 if Acknowledge enabled
Write:
0 for No acknowledge
1 to 255 to enable acknowledge

40986 Serial Port 2 Modbus™ Parity SI
Read and Write:
0 for No parity
1 for Even parity
2 for Odd parity

40987 Serial Port 2 Modbus™ Remote Delay SI
Read and Write:
1 to 20: 10 to 200 ms

40988 Serial Port 2 Modbus™ Stop Bits SI
Read and Write:
1 for One stop bit
2 for Two stop bits

40989 Password Security SI
Read and Write:
Default value is disabled
1 to enable Password Security.
When Password Security is enabled, relay parameters can be changed via Modbus™ only if access is obtained via the Access Password and Access Request holding registers, and released via the Exit register with value 89 (ASCII character 'Y').

0 to disable Password Security.
When Password Security is disabled, no access is required (Access Password, Access Request, and Exit holding registers have no effect) and no password protection is used. Global Parameters, holding registers 40080 – 40099 (ASCII command GF-PW), have no effect on the Modbus™ serial port, COM2.

System Data Setting Parameters

41018 System Frequency SI
Read and Write:
50 for 50 Hertz
60 for 60 Hertz

41019-20 Phase Rotation ASC (3)
Read and Write:
ABC for ABC
ACB for ACB

41021 Phase CT Ratio INT
41022 Ground CT Ratio INT
Read and Write: 1 to 50,000

41033-34 Phase VT Ratio FP
41041-42 Auxiliary VT Ratio INT
Read and Write: 1.00 to 10,000

41035-36 27/59 Voltage Sensing Mode INT
41037-38 51/27R Voltage Sensing Mode INT
Read and Write: 1 to 50,000
PP for Line
PN for Phase

41039-40 VT Phase Connection ASC (3)
Read and Write:
AB for AB
BC for BC
CA for CA
AN for AN
BN for BN
CN for CN
3W for 3W
4W for 4W

41043-44 VT Auxiliary Connection INT
Read and Write:
AB for AB
BC for BC
CA for CA
AN for AN
BN for BN
CN for CN
GR for GR

Breaker Duty Setting Parameters

41092 Breaker Duty Type SI
Read and Write:
0 for Off
1 for Sum I, primary centi-amps
2 for Sum I^2, primary centi-amps

41093-94 Maximum Breaker Duty FP
Read and Write: 0 to 42,900,000 Amps

41096 Programmable Breaker Alarm #1 Mode INT
41099 Programmable Breaker Alarm #2 Mode INT
41102 Programmable Breaker Alarm #3 Mode INT
Read and Write:
0 for Disabled
1 for Percent duty
2 for Breaker operations
3 for Clearing time

41097-98 Programmable Breaker Alarm #1 Limit FP
41100-01 Programmable Breaker Alarm #2 Limit FP
41103-04 Programmable Breaker Alarm #3 Limit FP
Read and Write:
If mode is 0: Reads 0, Any value writes 0
If mode is 1: 0.00 to 100.00%
If mode is 2: 0 to 99,999
If mode is 3: 0, 20 to 1000 milliseconds

Relay Data Setting Parameters

41247 Volts / Hertz alarm settings INT
Read and Write: 0 to 120 percent

41251-52 Forward Var Demand Alarm FP
41253-54 Reverse Var Demand Alarm FP
Read and Write: 0.0 to 8500 Vars

41255-56 Forward Watt Demand Alarm FP
41257-58 Reverse Watt Demand Alarm FP
Read and Write: 0.0 to 8500 Watts

41259-60 Phase Demand Alarm Level FP
41261-62 Neutral Demand Alarm Level FP
41263-64 Negative Sequence Demand Alarm Level FP
Read and Write: 0.00 to 16.00 Amps

41265-66 Major Alarm Mask BM (32)
41267-68 Minor Alarm Mask BM (32)
41269-70 Logic Alarm Mask BM (32)
Read and Write:
Bit 31 - Spare

Bit 30 - Volts per Hertz Alarm
Bit 29 - 60 Fuse Loss alarm
Bit 28 - Changes Lost alarm
Bit 27 - Freq Range alarm
Bit 26 - Watt Demand alarm
Bit 25 - Var Demand alarm
Bit 24 - Logic = None alarm
Bit 23 - Flt Rpt Timeout alarm
Bit 22 - Virtual Output 15 alarm
Bit 21 - Virtual Output 14 alarm
Bit 20 - Virtual Output 13 alarm
Bit 19 - Setting Group Change Active alarm
Bit 18 - Loss of IRIG-B sync or IRIG-B decode problem
Bit 17 - An override is active in one or more outputs
Bit 16 - EEPROM Non fatal error
Bit 15 - Settings changed
Bit 14 - Power reset alarm
Bit 13 - Clock problem
Bit 12 - Communicating failure alarm
Bit 11 - Operating system overload detected alarm
Bit 10 - Setting group override in effect
Bit 9 - Q Demand Alarm
Bit 8 - Neutral Demand Alarm
Bit 7 - Phase Demand Alarm
Bit 6 - Breaker Alarm 3
Bit 5 - Breaker Alarm 2
Bit 4 - Breaker Alarm 1
Bit 3 - Reclose Lockout
Bit 2 - Reclose Fail
Bit 1 - Breaker Fail Alarm
Bit 0 - Circuit Monitor Alarm

41272 Clock Format - Date ASC (1)
Read and Write:
M for mm/dd/yy format
D for dd/mm/yy format

41273 Clock Format - Time SI
Read and Write:
12 for 12 hour clock
24 for 24 hour clock

41274 Clock Format – Daylight Savings SI
Read and Write:
0 for disabling Daylight Savings
1 for enabling Daylight Savings

41275 Phase Demand Interval SI
41276 Neutral Demand Interval SI
41277 Negative Sequence Demand Interval SI
Read and Write: 0 to 60 minutes

41284 Output Hold Mask BM (8)
Read and Write:
Bit 7 - Spare
Bit 6 - Spare
Bit 5 - Output 5 Status
Bit 4 - Output 4 Status
Bit 3 - Output 3 Status
Bit 2 - Output 2 Status
Bit 1 - Output 1 Status
Bit 0 - Output A Status

41287 Target Mask MSBs BM (16)

Read and Write:

Bit 15 - Spare
Bit 14 - 151N
Bit 13 - 51N
Bit 12 - 51C
Bit 11 - 51B
Bit 10 - 51A
Bit 9 - Spare
Bit 8 - Spare
Bit 7 - Spare
Bit 6 - 50TN
Bit 5 - Spare
Bit 4 - Spare
Bit 3 - Spare
Bit 2 - 50TC
Bit 1 - 50TB
Bit 0 - 50TA

41288 Target Mask Second MSBs BM (16)

Read and Write:

Bit 15 - BF
Bit 14 - 47
Bit 13 - 46
Bit 12 - 140Q
Bit 11 - 40Q
Bit 10 - 132
Bit 9 - 32
Bit 8 - 127X
Bit 7 - 27X
Bit 6 - 127C
Bit 5 - 127B
Bit 4 - 127A
Bit 3 - 27C
Bit 2 - 27B
Bit 1 - 27A
Bit 0 - 24

41289 Target Mask Third MSBs BM (16)

Read and Write:

Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - Spare
Bit 10 - Spare
Bit 9 - Spare
Bit 8 - Spare
Bit 7 - Spare
Bit 6 - Spare
Bit 5 - Spare
Bit 4 - 381
Bit 3 - 281
Bit 2 - 181
Bit 1 - 81
Bit 0 - Spare

41290 Target Mask LSBs BM (16)

Read and Write:

Bit 15 - Spare
Bit 14 - Spare

Bit 13 - Spare
Bit 12 - 362
Bit 11 - 262
Bit 10 - 162
Bit 9 - 62
Bit 8 - 60FL
Bit 7 - 159X
Bit 6 - 59X
Bit 5 - 159C
Bit 4 - 159B
Bit 3 - 159A
Bit 2 - 59C
Bit 1 - 59B
Bit 0 - 59A

41291-94	Programmable Screen #1	ASC (7)
41295-98	Programmable Screen #2	ASC (7)
41299-302	Programmable Screen #3	ASC (7)
41303-06	Programmable Screen #4	ASC (7)
41307-10	Programmable Screen #5	ASC (7)
41311-14	Programmable Screen #6	ASC (7)
41315-18	Programmable Screen #7	ASC (7)
41319-22	Programmable Screen #8	ASC (7)
41323-26	Programmable Screen #9	ASC (7)
41327-30	Programmable Screen #10	ASC (7)
41331-34	Programmable Screen #11	ASC (7)
41335-38	Programmable Screen #12	ASC (7)
41339-42	Programmable Screen #13	ASC (7)
41343-46	Programmable Screen #14	ASC (7)
41347-50	Programmable Screen #15	ASC (7)
41351-54	Programmable Screen #16	ASC (7)

Read and Write: screen identifier. For example, the Output Status Screen would be 1.4.2

Custom Logic Setting Parameters

41435-38 User Custom Logic Name ASC (8)

Read: If programming, reads custom logic name; otherwise, reads active standard logic name.
Write: New custom logic name or standard logic name of logic scheme to be copied to custom scheme.

41439-42 Current Active Logic Scheme ASC (8)

Read: Current active logic name.

41443-46 Custom Logic Name ASC (8)

Read: Custom logic name.

41447-50 Standard Logic #1 Name ASC (8)

Read: Standard logic name #1.

41451-54 Standard Logic #2 Name ASC (8)

Read: Standard logic name #2.

41455-58 Standard Logic #3 Name ASC (8)

Read: Standard logic name #3.

41459-62 Standard Logic #4 Name ASC (8)

Read: Standard logic name #4.

41463-66 Standard Logic #5 Name ASC (8)

Read: Standard logic name #5.

41467-70	Standard Logic #6 Name	ASC (8)

Read: Standard logic name #6.

System Labels and ID Setting Parameters

All are Read and Write of ASCII strings.

Report Parameters

47194-95	Pk Demand Vars	
47199-200	Pk Demand Reverse Vars	FP
47214-15	Today's Demand Vars	FP
47219-220	Today's Demand Reverse Vars	FP
47234-35	Yesterday's Demand Vars	FP
47239-40	Yesterday's Demand Reverse Vars	FP

Read only: Any value (Vars)

47204-05	Pk Demand Watts	FP
47209-10	Pk Demand Reverse Watts	FP
47224-25	Today's Demand Watts	FP
47229-30	Today's Demand Reverse Watts	FP
47244-45	Yesterday's Demand Watts	FP
47249-50	Yesterday's Demand Reverse Watts	FP

Read only: Any value (Watts)

47196	Pk Demand Vars Timestamp - Day	INT
47201	Pk Demand Reverse Vars Timestamp - Day	INT
47206	Pk Demand Watts Timestamp - Day	INT
47211	Pk Demand Reverse Watts Timestamp - Day	INT
47216	Today's Demand Vars Timestamp - Day	INT
47221	Today's Demand Reverse Vars Timestamp - Day	INT
47226	Today's Demand Watts Timestamp - Day	INT
47231	Today's Demand Reverse Watts Timestamp - Day	INT
47236	Yesterday's Demand Vars Timestamp - Day	INT
47241	Yesterday's Demand Reverse Vars Timestamp - Day	INT
47246	Yesterday's Demand Watts Timestamp - Day	INT
47251	Yesterday's Demand Reverse Watts Timestamp - Day	INT

Read only: any value (days since 01/01/1984).

47197-98	Pk Demand Vars Timestamp - Millisecond	LI
47202-03	Pk Demand Reverse Vars Timestamp - Millisecond	LI
47207-08	Pk Demand Watts Timestamp - Millisecond	LI
47212-13	Pk Demand Reverse Watts Timestamp - Millisecond	LI
47217-18	Today's Demand Vars Timestamp - Millisecond	LI
47222-223	Today's Demand Reverse Vars Timestamp - Millisecond	LI
47227-28	Today's Demand Watts Timestamp - Millisecond	LI
47232-33	Today's Demand Reverse Watts Timestamp - Millisecond	LI
47237-38	Yesterday's Demand Vars Timestamp - Millisecond	LI
47242-43	Yesterday's Demand Reverse Vars Timestamp - Millisecond	LI
47247-48	Yesterday's Demand Watts Timestamp - Millisecond	LI
47252-53	Yesterday's Demand Reverse Watts Timestamp - Millisecond	LI

Read only: 0 to 86,399,999 ms

47254-55	3 Phase Var Hours	FP
47256-57	3 Phase Reverse Var Hours	FP

Read and Write: Any value (K-Hours)

47258-59	3 Phase Watt Hours	FP
47260-61	3 Phase Reverse Watt Hours	FP

Read and Write: Any value (K-Hours)

47274-78	Model Number	ASC (10)
47282-90	Application SW Version # / Date	ASC (18)
47296-304	Boot SW Version # / Date	ASC (18)
47310-16	Serial Number	ASC (13)
47324-34	Style Number	ASC (21)

Read Only: ASCII strings

47362 COM0 Serial Port Relay Address INT
Read Only: 0

47363 COM1 Serial Port Relay Address INT
Read and Write: 0 to 65,534

47364 Date and Time - Day INT
Read and Write: any value (days since 01/01/1984).

47365-66 Date and Time - ms LI
Read and Write: 0 to 86,399,999 ms

47367 System Status (Logic Var 0 to 15) BM (16)
Read only:
- Bit 15 - 162
- Bit 14 - 62
- Bit 13 - 46 picked-up
- Bit 12 - 151N picked-up
- Bit 11 - 51N picked-up
- Bit 10 - 51P picked-up
- Bit 9 - BF picked-up
- Bit 8 - 50TN picked-up
- Bit 7 - 50TP picked-up
- Bit 6 - 46 tripped
- Bit 5 - 151N tripped
- Bit 4 - 51N tripped
- Bit 3 - 51P tripped
- Bit 2 - BF tripped
- Bit 1 - 50TN tripped
- Bit 0 - 50TP tripped

47368 System Status (Logic Var 16 to 31) BM (16)
Read only:
- Bit 15 - Logic always false
- Bit 14 - Spare
- Bit 13 - Spare
- Bit 12 - 140Q picked up
- Bit 11 - 40Q picked up
- Bit 10 - 140T
- Bit 9 - 40T
- Bit 8 - 25
- Bit 7 - 24 picked up
- Bit 6 - 24 tripped
- Bit 5 - 343
- Bit 4 - 243
- Bit 3 - 143
- Bit 2 - 43
- Bit 1 - 362
- Bit 0 - 262

47369 System Status (Logic Var 32 to 47) BM (16)
Read only:
- Bit 15 - Virtual Output 15 status
- Bit 14 - Virtual Output 14 status
- Bit 13 - Virtual Output 13 status

Bit 12 - Virtual Output 12 status
Bit 11 - Virtual Output 11 status
Bit 10 - Virtual Output 10 status
Bit 9 - Virtual Output 9 status
Bit 8 - Virtual Output 8 status
Bit 7 - Virtual Output 7 status
Bit 6 - Virtual Output 6 status
Bit 5 - Virtual Output 5 status
Bit 4 - Virtual Output 4 status
Bit 3 - Virtual Output 3 status
Bit 2 - Virtual Output 2 status
Bit 1 - Virtual Output 1 status
Bit 0 - Virtual Output A status

47370 System Status (Logic Var 48 to 63) BM (16)
Read only:
Bit 15 - Alarm reset key
Bit 14 - Target reset key
Bit 13 - Settings Group 1
Bit 12 - Settings Group 0
Bit 11 - Output Monitor
Bit 10 - Alarm minor
Bit 9 - Alarm major
Bit 8 - Alarm logic
Bit 7 - Spare
Bit 6 - 101SC
Bit 5 - 101C
Bit 4 - 101 tripped
Bit 3 - Input 4 status
Bit 2 - Input 3 status
Bit 1 - Input 2 status
Bit 0 - Input 1 status

47371 System Status (Logic Var 64 to 79) BM (16)
Read only:
Bit 15 - 47 picked up
Bit 14 - 47 tripped
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - 132 picked up
Bit 10 - 32 picked-up
Bit 9 - 132 tripped
Bit 8 - 32 tripped
Bit 7 - 127X picked-up
Bit 6 - 27X picked-up
Bit 5 - 127P picked-up
Bit 4 - 27P picked-up
Bit 3 - 127X tripped
Bit 2 - 27X tripped
Bit 1 - 127P tripped
Bit 0 - 27P tripped

47372 System Status (Logic Var 80 to 95) BM (16)
Read only:
Bit 15 - Spare
Bit 14 - 60FL
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - 381 tripped
Bit 10 - 281 tripped
Bit 9 - 181 tripped

Bit 8 - 81 tripped
Bit 7 - 159X picked-up
Bit 6 - 59X picked-up
Bit 5 - 159P picked-up
Bit 4 - 59P picked-up
Bit 3 - 159X tripped
Bit 2 - 59X tripped
Bit 1 - 159P tripped
Bit 0 - 59P tripped

47373 Current Active Group Setting SI
Read only: 0 to 1

47374 Current Group Control Setting ASC (1)
Read only: ASCII character 0, 1, L

47375 Current Output Control Settings (OutputPulse0) MSBs BM (16)
Read only:
Bits 15 to 7 - Spare
Bit 6 - Output 6 pulse low
Bit 5 - Output 5 pulse low
Bit 4 - Output 4 pulse low
Bit 3 - Output 3 pulse low
Bit 2 - Output 2 pulse low
Bit 1 - Output 1 pulse low
Bit 0 - Output A pulse low

47376 Current Output Control Settings (OutputPulse1) LSBs BM (16)
Read only:
Bits 15 to 7 - Spare
Bit 6 - Output 6 pulse high
Bit 5 - Output 5 pulse high
Bit 4 - Output 4 pulse high
Bit 3 - Output 3 pulse high
Bit 2 - Output 2 pulse high
Bit 1 - Output 1 pulse high
Bit 0 - Output A pulse high

47377 Current Output Control Settings (OutputLatch0) MSBs BM (16)
Read only:
Bits 15 to 7 - Spare
Bit 6 - Output 6 latch low
Bit 5 - Output 5 latch low
Bit 4 - Output 4 latch low
Bit 3 - Output 3 latch low
Bit 2 - Output 2 latch low
Bit 1 - Output 1 latch low
Bit 0 - Output A latch low

47378 Current Output Control Settings (OutputLatch1) LSBs BM (16)
Read only:
Bits 15 to 7 - Spare
Bit 6 - Output 6 latch high
Bit 5 - Output 5 latch high
Bit 4 - Output 4 latch high
Bit 3 - Output 3 latch high
Bit 2 - Output 2 latch high
Bit 1 - Output 1 latch high
Bit 0 - Output A latch high

47379 Current Output Contact Status BM (16)

Read only:

Bits 15 to 7 - Spare
Bit 6 - Output 6
Bit 5 - Output 5
Bit 4 - Output 4
Bit 3 - Output 3
Bit 2 - Output 2
Bit 1 - Output 1
Bit 0 - Output A

47380 Active Alarm Flags (SumFlags) MSBs BM (16)

Read only:

Bits 15 to 0 - Spare

47381 Active Alarm Flags (SumFlags) LSBs BM (16)

Read only:

Bits 15 to 13 – Spare
Bit 12 - Burn in test failure
Bit 11 - Defaults loaded on demand
Bit 10 - Defaults loaded on error
Bit 9 - Calibration defaults loaded
Bit 8 - Setting defaults loaded
Bit 7 - Watchdog failure
Bit 6 - Power Supply error
Bit 5 - Calibration error
Bit 4 - Analog failure
Bit 3 - EEPROM Read / Write Fatal error
Bit 2 - MPU Self-test error
Bit 1 - ROM (flash) Failure detected
Bit 0 - RAM Failure detected

47382 Active Alarm Flags (ProgAlarms) MSBs BM (16)

Read and Write:

Bits 15 - Spare
Bit 14 - Volts per Hertz Alarm
Bit 13 - 60 Fuse Loss alarm
Bit 12 - Changes Lost alarm
Bit 11 - Freq Range alarm
Bit 10 - Watt Demand alarm
Bit 9 - Var Demand alarm
Bit 8 - Logic = None alarm
Bit 7 - Flt Rpt Timeout alarm
Bit 6 - Virtual Output 15 alarm
Bit 5 - Virtual Output 14 alarm
Bit 4 - Virtual Output 13 alarm
Bit 3 - Setting Group Change Active alarm
Bit 2 - Loss of IRIG-B sync or IRIG-B decode problem
Bit 1 - An override is active in one or more outputs
Bit 0 - EEPROM Non fatal error

47383 Active Alarm Flags (ProgAlarms) LSBs BM (16)

Read and Write:

Bit 15 - User settings changed, (‘EXIT’ with ‘Y’)
Bit 14 - Power reset alarm, hard reset of MPU
Bit 13 - Clock problem, real time clock has not been set
Bit 12 - Communicating failure alarm, read error on serial port
Bit 11 - Operating System Overload detected alarm
Bit 10 - Setting group override in effect
Bit 9 - Q demand alarm, excessive negative sequence unbalance
Bit 8 - Neutral demand alarm

Bit 7 - Phase demand alarm
Bit 6 - Breaker alarm #3
Bit 5 - Breaker alarm #2
Bit 4 - Breaker alarm #1
Bit 3 - Recloser Lockout
Bit 2 - Recloser Fail
Bit 1 - Breaker fail alarm
Bit 0 - Out 1 CKT Open alarm

47384 Target Status MSBs BM (16)

Read:

Bit 15 - Spare
Bit 14 - 151N
Bit 13 - 51N
Bit 12 - 51C
Bit 11 - 51B
Bit 10 - 51A
Bit 9 - Spare
Bit 8 - Spare
Bit 7 - Spare
Bit 6 - 50TN
Bit 5 - Spare
Bit 4 - Spare
Bit 3 - Spare
Bit 2 - 50TC
Bit 1 - 50TB
Bit 0 - 50TA

Write any value to any of 4 registers to reset all

47385 Target Status Second MSBs BM (16)

Read:

Bit 15 - BF
Bit 14 - 47
Bit 13 - 46
Bit 12 - 140Q
Bit 11 - 40Q
Bit 10 - 132
Bit 9 - 32
Bit 8 - 127X
Bit 7 - 27X
Bit 6 - 127C
Bit 5 - 127B
Bit 4 - 127A
Bit 3 - 27C
Bit 2 - 27B
Bit 1 - 27A
Bit 0 - 24

Write any value to any of 4 registers to reset all

47386 Target Status Third MSBs BM (16)

Read:

Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - Spare
Bit 11 - Spare
Bit 10 - Spare
Bit 9 - Spare
Bit 8 - Spare
Bit 7 - Spare
Bit 6 - Spare
Bit 5 - Spare

Bit 4 - 381
Bit 3 - 281
Bit 2 - 181
Bit 1 - 81
Bit 0 - Spare

Write any value to any of 4 registers to reset all

47387 Target Status LSBs BM (16)

Read:

Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - 362
Bit 11 - 262
Bit 10 - 162
Bit 9 - 62
Bit 8 - 60FL
Bit 7 - 159X
Bit 6 - 59X
Bit 5 - 159C
Bit 4 - 159B
Bit 3 - 159A
Bit 2 - 59C
Bit 1 - 59B
Bit 0 - 59A

Write any value to any of 4 registers to reset all

47388 Current Breaker Status ASC (1)

Read only:

O for Open
C for Closed
D for Disabled (off)

47389-92 Current Active Logic ASC (8)

Read only: Current active logic name

47394-95 Breaker Contact Duty Log - Phase A FP
47396-97 Breaker Contact Duty Log - Phase B FP
47398-99 Breaker Contact Duty Log - Phase C FP

Read: If Breaker Duty Type = Off or Maximum Breaker Duty = 0, reads undefined floating point value of 0xFFFFFFFF. Otherwise, reads 0.00 to 200.00%.
Write: 0.00 to 200.00%.

47400-01 Breaker Operation Counter LI

Read and Write:

0 to 99,999

47410-11 Yesterday's Pk Demand Current - Phase A FP
47415-16 Yesterday's Pk Demand Current - Phase B FP
47420-21 Yesterday's Pk Demand Current - Phase C FP
47425-26 Yesterday's Pk Demand Current - Neutral FP
47430-31 Yesterday's Pk Demand Current - Negative Seq FP

Read only: Any value (Amps)

47412 Yesterday's Pk Demand Timestamp - Day INT
47417 Yesterday's Pk Demand Timestamp - Day INT
47422 Yesterday's Pk Demand Timestamp - Day INT
47427 Yesterday's Pk Demand Timestamp - Day INT
47432 Yesterday's Pk Demand Timestamp - Day INT

Read only: any value (days since 01/01/1984).

47413-14	Yesterday's Pk Demand Timestamp - Millisecond	LI
47418-19	Yesterday's Pk Demand Timestamp - Millisecond	LI
47423-24	Yesterday's Pk Demand Timestamp - Millisecond	LI
47428-29	Yesterday's Pk Demand Timestamp - Millisecond	LI

Read only: 0 to 86,399,999 ms

47435-36	Today's Pk Demand Current - Phase A	FP
47440-41	Today's Pk Demand Current - Phase B	FP
47445-46	Today's Pk Demand Current - Phase C	FP
47450-51	Today's Pk Demand Current - Neutral	FP
47455-56	Today's Pk Demand Current - Negative Seq	FP

Read only: Any value (Amps)

47437	Today's Pk Demand Timestamp - Day	INT
47442	Today's Pk Demand Timestamp - Day	INT
47447	Today's Pk Demand Timestamp - Day	INT
47452	Today's Pk Demand Timestamp - Day	INT
47457	Today's Pk Demand Timestamp - Day	INT

Read only: any value (days since 01/01/1984).

47438-39	Today's Pk Demand Timestamp - Millisecond	LI
47443-44	Today's Pk Demand Timestamp - Millisecond	LI
47448-49	Today's Pk Demand Timestamp - Millisecond	LI
47453-54	Today's Pk Demand Timestamp - Millisecond	LI
47458-59	Today's Pk Demand Timestamp - Millisecond	LI

Read only: 0 to 86,399,999 ms

47460-61	Pk Demand Current Since Reset - Phase A	FP
47465-66	Pk Demand Current Since Reset - Phase B	FP
47470-71	Pk Demand Current Since Reset - Phase C	FP
47475-76	Pk Demand Current Since Reset - Neutral	FP
47480-81	Pk Demand Current Since Reset - Negative Seq	FP

Read and Write: Any value (Amps)

47462	Pk Demand Since Reset Timestamp - Day	INT
47467	Pk Demand Since Reset Timestamp - Day	INT
47472	Pk Demand Since Reset Timestamp - Day	INT
47477	Pk Demand Since Reset Timestamp - Day	INT
47482	Pk Demand Since Reset Timestamp - Day	INT

Read only: any value (days since 01/01/1984).

47463-64	Pk Demand Since Reset Timestamp - Millisecond	LI
47468-69	Pk Demand Since Reset Timestamp - Millisecond	LI
47473-74	Pk Demand Since Reset Timestamp - Millisecond	LI
47478-79	Pk Demand Since Reset Timestamp - Millisecond	LI
47483-84	Pk Demand Since Reset Timestamp - Millisecond	LI

Read only: 0 to 86,399,999 ms

47486	Reset Logic Alarm Information	SI
47487	Reset Major Alarm Information	SI
47488	Reset Minor Alarm Information	SI
47489	Reset Relay Alarm Information	SI
47491	Clear Fault Log	SI
47492	Trigger Fault Record	SI
47493	Clear Events Report	SI

Read: 0

Write: Any value will perform reset / trigger / clear.

47512	Fault Indicator	SI

Read only: Most recent Fault number (1 - 255)

47513 Fault Template Status SI

Read only:

0: Template not valid for current Fault Selection (Refer to Register 40038). All FLT template values will read 0.

1 to 255: Valid user selected Fault Number.

The following is the Fault Template (RPT).

47514 Fault Date and Time - Day INT

Read only: any value (days since 01/01/1984).

47515-16 Fault Date and Time - mss LI

Read only: 0 to 86,399,999 ms

47517 Fault Event Type BM (16)

Read only:

Bit 0 for Breaker Fail
Bit 1 for Trip
Bit 2 for Logic
Bit 3 for Pickup
Bit 4 for Fault Record Trigger (Refer to Register 47492)

47518 Fault Active Group SI

Read only: 0 to 3

47519 Fault Targets MSBs BM (16)

Read only:

Bit 15 - 51Q
Bit 14 - 151N
Bit 13 - 51N
Bit 12 - 51C
Bit 11 - 51B
Bit 10 - 51A
Bit 9 - 150TQ
Bit 8 - 50TQ
Bit 7 - 150TN
Bit 6 - 50TN
Bit 5 - 150TC
Bit 4 - 150TB
Bit 3 - 150TA
Bit 2 - 50TC
Bit 1 - 50TB
Bit 0 - 50TA

47520 Fault Targets Second MSBs BM (16)

Read only:

Bit 15 - BF
Bit 14 - 49
Bit 13 - 47
Bit 12 - 46
Bit 11 - 40QP
Bit 10 - 132P
Bit 9 - 32P
Bit 8 - 127N
Bit 7 - 27N
Bit 6 - 127C
Bit 5 - 127B
Bit 4 - 127A
Bit 3 - 27C
Bit 2 - 27B
Bit 1 - 27A
Bit 0 - 24

47521 Fault Targets Third MSBs BM (16)

Read only:

Bit 15 - 581
Bit 14 - 481
Bit 13 - 381
Bit 12 - 281
Bit 11 - 181
Bit 10 - 81
Bit 9 - 67TQ
Bit 8 - 167TN
Bit 7 - 67TN
Bit 6 - 67TC
Bit 5 - 67TB
Bit 4 - 67TA
Bit 3 - 167Q
Bit 2 - 67Q
Bit 1 - 167N
Bit 0 - 67N

47522 Fault Targets LSBs BM (16)

Read only:

Bit 15 - 167C
Bit 14 - 167B
Bit 13 - 167A
Bit 12 - 67C
Bit 11 - 67B
Bit 10 - 67A
Bit 9 - 362
Bit 8 - 262
Bit 7 - 162
Bit 6 - 62
Bit 5 - 60FL
Bit 4 - 159N
Bit 3 - 59N
Bit 2 - 59C
Bit 1 - 59B
Bit 0 - 59A

47524 Fault Clearing Time Status SI

Read only:

0 if Valid Fault Clearing Time (Registers 47525-26) value
1 if No pickup
2 if N/A; Out of range

47525-26 Fault Clearing Time FP

Read only:

0 if Fault Clearing Time Status is not 0 (not valid).
Time (xxx.xxx) in Seconds if Fault Clearing Time Status is 0 (valid).

47527 Fault Breaker Operate Time Status SI

Read only:

0 if Valid Fault Breaker Operate Time (Registers 47528-29) value
1 if Unknown
2 if N/A; Out of range
3 if No operation
4 if Disabled

47528-29 Fault Breaker Operate Time FP

Read only:

0 if Fault Breaker Operate Time Status is not 0 (not valid).
Time (xxx.xxx) in Seconds if Fault Breaker Operate Time Status is 0 (valid).

47530-31	Fault Phase A Current Magnitude	FP
47533-34	Fault Phase B Current Magnitude	FP
47536-37	Fault Phase C Current Magnitude	FP
47539-40	Fault Residual Current Magnitude	FP
47542-43	Fault Negative Seq. Current Magnitude	FP

Read only: Value in Amps

47544-45	Fault Phase A Voltage Magnitude	FP
47546-47	Fault Phase B Voltage Magnitude	FP
47548-49	Fault Phase C Voltage Magnitude	FP
47550-51	Fault Neutral Voltage Magnitude	FP

Read only: Value in Volts

47556-57	Fault Generator Frequency	FP
47558-59	Fault Bus Frequency	FP

Read only: Value in Hz

The following is the Report Template (RPT).

47595-719 Report Text

Read only: ASCII string (Illegal message response generated for invalid Report Focus value).

Metering Parameters

49720	Part Number	INT

Read only: 0 to 999

49726-27	Phase A Current Magnitude	FP
49729-30	Phase B Current Magnitude	FP
49732-33	Phase C Current Magnitude	FP
49738-39	Negative Sequence Current Magnitude	FP
49740-41	Neutral Current Magnitude	FP
49744-45	Ground Current Magnitude	FP

Read only: Value in Amps. If not applicable, reads undefined floating point value of 0xFFFFFFFF.

49746-47	3 Phase Watts	FP

Read only: Value in K-Watts. If not applicable, reads undefined floating point value of 0xFFFFFFFF.

49750-51	3 Phase Vars	FP

Read only: Value in K-Vars. If not applicable, reads undefined floating point value of 0xFFFFFFFF.

49752-53	3 Phase VA	FP

Read only: Value in K-VA. If not applicable, reads undefined floating point value of 0xFFFFFFFF.

49742-43	Bus (Aux.) Voltage	FP
49748-49	Zero Sequence Voltage	FP
49754-55	Negative Sequence Voltage	FP
49756-57	Phase A Voltage	FP
49758-59	Phase B Voltage	FP
49760-61	Phase C Voltage	FP
49762-63	Phase A-B Voltage	FP
49764-65	Phase B-C Voltage	FP
49766-67	Phase C-A Voltage	FP
49768-69	V3x Voltage	FP

Read only: Value in Volts. If not applicable, reads undefined floating point value of 0xFFFFFFFF.

49770-71	Power Factor	FP
	Read only: -1.00 to 1.00	
49772-73	Generator Frequency	FP
49774-75	Bus (Aux.) Frequency	FP
49776-77	Slip Frequency	FP
	Read only: Value in Hertz	
49778-79	Slip Angle	FP
	Read only: Value in degrees	
49835-74	Error Details	ASC (40)
	Read only: ASCII string	
49875-999	Contiguous Poll Block	Mixed
	Read Only: Mixed values.	

SECTION 4 • ASCII CROSS REFERENCE

ASCII Command versus Modbus® Register Cross Reference

ASCII Command	Modbus™ Registers
A=<password>	40002-40005, 40006
CO-101	40136
CO-43	40120
CO-143	40122
CO-243	40124
CO-343	40126
CO-GROUP=<settings group>	40118
CO-OUT1	40142
CO-OUT2	40144
CO-OUT3	40146
CO-OUT4	40148
CO-OUT5	40150
CO-OUTA	40140
CO-OUTALL	40138
CS-101	40135
CS-43	40119
CS-143	40121
CS-243	40123
CS-343	40125
CS-GROUP=<settings group>	40117
CS-OUT1	40141
CS-OUT2	40143
CS-OUT3	40145
CS-OUT4	40147
CS-OUT5	40149
CS-OUTA	40139
CS-OUTALL	40137
EXIT	40001
GS-PWC=<Control password>,<Control path>	40090-40093,40094
GS-PWG=<Global password>,<Global path>	40080-40083,40084
GS-PWR=<Report password>,<Report path>	40095-40098,40099
GS-PWS=<Settings password>,<Settings path>	40085-40088,40089
M-IA	49726-49727
M-IB	49729-49730
M-IC	49732-49733
M-IG	49744-49745
M-IQ	49738-49739
M-IN	49740-47741
M-VA	49756-49757
M-VB	49758-49759
M-VC	49760-47761
M-VAB	49762-49763
M-VBC	49764-49465
M-VCA	49766-49767
M-V2	49754-49755
M-VX	49742-49743
M-3VX	49768-49769
M-3V0	49748-49749
M-WATT	49746-49747
M-VAR	49750-49751

ASCII Command	Modbus™ Registers
M-S	49752-49753
M-PF	49770-49771
M-FREQG	49772-49773
M-FREQB	49774-49775
M-FREQS	49776-49777
M-SYNC	49778-49779
RA-MAJ	47595-47719,40039
RA-MAJ=0	47487
RA-LGC	47595-47719,40039
RA-LGC=0	47486
RA-MIN	47595-47719,40039
RA-MIN=0	47488
RA-REL	47595-47719,40039
RA-REL=0	47489
RB-DUTYA=<% of duty>	47394-47395
RB-DUTYB=<% of duty>	47396-47397
RB-DUTYC=<% of duty>	47398-47399
RB-OPCNTR=<number of operations>	47400-47401
RD-PIA	47460-47461,47463-47464,47462
RD-PIB	47465-47466,47468-47469,47467
RD-PIC	47470-47471,47473-47474,47472
RD-PIN	47475-47476,47478-47479,47477
RD-PIQ	47480-47481,47483-47484,47482
RD-PVAR	47194-47195,47196,47197-47198,47199-47200,47201,47202-47203
RD-PWATT	47204-47205,47206,47207-47208,47209-47210,47211,47212-47213
RD-TIA	47435-47436,47438-47439,47437
RD-TIB	47440-47441,47443-47444,47442
RD-TIC	47445-47446,47448-47449,47447
RD-TIN	47450-47451,47453-47454,47452
RD-TIQ	47455-47456,47458-47459,47457
RD-TVAR	47214-47215,47216,47217-47218,47219-47220,47221,47222-47223
RD-TWATT	47224-47225,47226,47227-47228,47229-47230,47231,47232- 47233
RD-YIA	47410-47411,47413-47414,47412
RD-YIB	47415-47416,47418-47419,47417
RD-YIC	47420-47421,47423-47424,47422
RD-YIN	47425-47426,47428-47429,47427
RD-YIQ	47430-47431,47433-47434,47432
RD-YVAR	47234-47235,47236,47237-47238,47239-47240,47241,47242-47243
RD-YWATT	47244-47245,47246,47247-47248,47249-47250,47251,47252-47253
RF	47595-47719,40039
RF-#	47595-47719,40039,40040
RF-NEW	47595-47719,40039
RF=0	47491
RF=TRIG	47492
RG-DATE=<date>	47364
RG-TIME=<time>	47365-47366
RG-STAT	47367-47383,47388-47392
RG-TARG	47384-47387
RG-VER	47274-47277,47324-47334,47282-47289,47296-47302,47310-47316

ASCII Command	Modbus™ Registers
RS	47595-47719,40039
RS-#	47595-47719,40039,40040
RS-F#	47595-47719,40039,40040
RS-NEW	47595-47719,40039
RS=0	47493
S#-46=<pickup>,<time delay>,<curve>	40250-51,40252-53,40254-55
S#-50TN=<pickup>,<time delay>	40273-40274,40275-40276
S#-50TP=<pickup>,<time delay>	40269-40270,40271-40272
S#-24=<pickup>,<time delay>,<reset delay>	40256-40257,40258-59,40260-61
S#-25=<volts>,<angle>,<slip freq>,<mode>	40262-40263,40264-65,40266-40267,40268
S#-51N=<pickup>,<time dial>,<curve>	40311-40312,40313-40314,40315-40316
S#-51P=<pickup>,<time dial>,<curve>	40305-40306,40307-40308,40309-40310
S#-151N=<pickup>,<time dial>.<curve>	40329-40330,40331-40332,40333-40334
S#-27R=<pickup>,<mode>	40429-40430,40431
S#-27P=<pickup>,<time delay>	40405-40406,40407-40408
S#-27X=<pickup>,<time delay>	40409-40410,40411-40412
S#-127P=<pickup>,<time delay>	40413-40414,40415-40416
S#-127X=<pickup>,<time delay>	40417-40418,40419-40420
S#-59P=<pickup>,<time delay>	40436-40437,40438-40439
S#-59X=<pickup>,<time delay>	40440-40441,40442-40443
S#-159P=<pickup>,<time delay>	40444-40445,40446-40447
S#-159X=<pickup>,<time delay>	40448-40449,40450-40451
S#-47=<pickup>,<time delay>	40432-40433,40434-40435
S#-32=<pickup>,<time delay>	40474-40475,40476-40477,40478
S#-132=<pickup>,<time delay>	40479-40480,40481-40482,40483
S#-40Q=<pickup>,<time delay>	40484-40485,40486-40487
S#-140Q=<pickup>,<time delay>	40488-40489,40490-40491
S#-81=<pickup>,<time delay>,<mode>	40452-40453,40454-40455,40456
S#-181=<pickup>,<time delay>,<mode>	40457-40458,40459-40460,40461
S#-281=<pickup>,<time delay>,<mode>	40462-40463,40464-40465,40466
S#-381=<pickup>,<time delay>,<mode>	40467-40468,40469-40470,40471
S#-81INH=<inhibit setting>	4047240473
S#-62=<time delay 1>,<time delay2>	40359-40360,40361-40362
S#-162=<time delay 1>,<time delay2>	40363-40364,40365-40366
S#-262=<time delay 1>,<time delay2>	40367-40368,40369-40370
S#-362=<time delay 1>,<time delay2>	40371-40372,40373-40374
SA-BKR1=<mode>,<alarm limit>	41096,41097-41098
SA-BKR2=<mode>,<alarm limit>	41099,41100-41101
SA-BKR3=<mode>,<alarm limit>	41102,41103-41104
SA-DIP=<alarm level>	41259-41260
SA-DIN=<alarm level>	41261-41262
SA-DIQ=<alarm level>	41263-41264
SA-24 =<alarm level>	41247
SA-MAJ=<alarm number>	41265-41266
SA-MIN=<alarm number>	41267-41268
SA-LGC=<alarm number>	41269-41270
SA-RESET=<reset Alarm Logic>	41419-41424,41427-41432
SA-DVAR=<fwd var alm level>, <rev var alm level>	41251-41252,41253,41254
SA-DWATT=<fwd watt alm level>, <rev watt alm level>	41255-41256,41257-41258
SB-DUTY=<mode>,<dmax.>,<blk bkr logic>	41092,41093-41094,41110-41115,41118-41123
SB-LOGIC=<breaker close logic equation>	41126-41131,41134-41139
SG-CLK=<date format>,<time format><dst enable>	41272,41273,41274
SG-COM0=<baud rate>,<flow control>, <page length>,<ack>	40962,40964,40965,40966

ASCII Command	Modbus™ Registers
SG-COM1=<baud rate>,<relay address>, <flow control>,<page length>,<ack>	40971,40972,40973,40974,40975
SG-COM2=<baud rate>,<relay address>,,,, <parity>,<remote delay>,<stop bits>	40980,40981,40986,40987,40988
SG-CTP=<ratio>	41021
SG-CTG=<ratio>	41022
SG-VTP=<vt ratio>,<connection>, <27/59 mode>,<51/27R mode>	41033-41034,41035,41036,41037-41038
SG-VTX=<vt ratio>,<connection>	41039-41040
SG-NOM=<Nom Volts>,<Nom Amps>	40602-40603,40604-40605
SG-DIP=<alarm interval>	41275
SG-DIN=<alarm interval>	41276
SG-DIQ=<alarm interval>	41277
SG-FREQ=<frequency>	41018
SG-HOLD=<output hold enable>	41284
SG-ID=<relay ID>,<station ID>	43438-43442,43443-43457
SG-IN1=<input recognition>,<input debounce >	40618,40619
SG-IN2=<input recognition>,<input debounce >	40620,40621
SG-IN3=<input recognition>,<input debounce >	40622,40623
SG-IN4=<input recognition>,<input debounce >	40624,40625
SG-PHROT=<rotation sequence>	41019-41020
SG-SCREEN1=<menu screen>	41291-41294
SG-SCREEN2=<menu screen>	41295-41298
SG-SCREEN3=<menu screen>	41299-41302
SG-SCREEN4=<menu screen>	41303-41306
SG-SCREEN5=<menu screen>	41307-41310
SG-SCREEN6=<menu screen>	41311-41314
SG-SCREEN7=<menu screen>	41315-41318
SG-SCREEN8=<menu screen>	41319-41322
SG-SCREEN9=<menu screen>	41323-41326
SG-SCREEN10=<menu screen>	41327-41330
SG-SCREEN11=<menu screen>	41331-41334
SG-SCREEN12=<menu screen>	41335-41338
SG-SCREEN13=<menu screen>	41339-41342
SG-SCREEN14=<menu screen>	41343-41346
SG-SCREEN15=<menu screen>	41347-41350
SG-SCREEN16=<menu screen>	41351-41354
SG-SGCON=<time>	40871
SG-TARG=<target list>,<reset Targ Logic>	41287-41290,41403-41408,41411-41416
SG-TRIG=<trip trigger logic equation>,<pu trigger logic equation>,<logic trigger logic equation>	41355-41360,41363-41368,41371-41376,41379-41384,41387-41392,41395-41400
SL-43=<mode>	42091
SL-143=<mode>	42092
SL-243=<mode>	42093
SL-343=<mode>	42094
SL-101=<mode>	42099
SL-46=<mode>,<block logic equation>	41976,41977-41982,41985-41990
SL-47=<mode>,<block logic equation>	41993,41994-41999,42002-42007
SL-50TN=<mode>,<block logic equation>	41636,41637-41642,41645-41650
SL-50TP=<mode>,<block logic equation>	41619,41620-41625,41628-41633
SL-51N=<mode>,<block logic equation>	41703,41704-41709,41712-41717
SL-51P=<mode>,<block logic equation>	41686,41687-41692,41695-41700
SL-151N=<mode>,<block logic equation>	41720,41721-41726,41729-41734
SL-24 = <mode>, <block logic equation>	41805,41806-41811,41814-41819
SL-25 = <mode>, <block logic equation>	41822,41823-41828,41831-41836
SL-27P=<mode>,<block logic equation>	41475,41476-41481,41484-41489

ASCII Command	Modbus™ Registers
SL-27X = <mode>, <block logic equation>	41492,41493-41498,41501-41506
SL-127P=<mode>,<block logic equation>	41509,41510-41515,41518-41523
SL-127X = <mode>, <block logic equation>	41526,41527-41532,41535-41540
SL-59P=<mode>,<block logic equation>	41551,41552-41557,41560-41565
SL-59X=<mode>,<block logic equation>	41568,41569-41574,41577-41582
SL-159P = <mode>, <block logic equation>	41585,41586-41591,41594-41599
SL-159X = <mode>, <block logic equation>	41602,41603-41608,41611-41616
SL-32 = <mode>, <block logic equation>	41737,41738-41743,41746-41751
SL-132 = <mode>, <block logic equation>	41754,41755-41760,41763-41768
SL-81=<mode>,<block logic equation>	43236,43237-43242,43245-43250
SL-181=<mode>,<block logic equation>	43253,43254-43259,43262-43267
SL-281=<mode>,<block logic equation>	43270,43271-43276,43279-43284
SL-381=<mode>,<block logic equation>	43287,43288-43293,43296-43301
SL-40Q=<mode, <block logic equation>	41771,41772-41777,41780-41785
SL-140Q=<mode, <block logic equation>	41788,41789-41794,41797-41802
SL-62=<mode>,<ini logic equation>, <block logic equation>	41844,41845-41850,41853-41858,41861-41866,41869-41874
SL-162=<mode>,<ini logic equation>, <block logic equation>	41877,41878-41883,41886-41891,41894-41899,41902-41907
SL-262=<mode>,<ini logic equation>, <block logic equation>	41910,41911-41916,41919-41924,41927-41932,41935-41940
SL-362=<mode>,<ini logic equation>, <block logic equation>	41943,41944-41949,41952-41957,41960-41965,41968-41973
SL-BF=<mode>,<ini logic equation>, <block logic equation>	41653,41654-41659,41662-41667,41670-41675,41678-41683
SL-GROUP=<mode>,<D0 logic equation>, <D1 logic equation>	42026,42027-42032,42035-42040,42043-42048,42051-42056
SL-N=<name>	41435-41438
SL-VOA=<boolean logic equation>	42133,42134-42139,42142-42147,42150-42155,42158-42163,42166-42171,42174-42179,42182-42187,42190-42195
SL-VO1=<boolean logic equation>	42198,42199-42204,42207-42212,42215-42220,42223-42228,42231-42236,42239-42244,42247-42252,42255-42260
SL-VO2=<boolean logic equation>	42263,42264-42269,42272-42277,42280-42285,42288-42293,42296-42301,42304-42309,42312-42317,42320-42325
SL-VO3=<boolean logic equation>	42328,42329-42334,42337-42342,42345-42350,42353-42358,42361-42366,42369-42374,42377-42382,42385-42390
SL-VO4=<boolean logic equation>	42393,42394-42399,42402-42407,42410-42415,42418-42423,42426-42431,42434-42439,42442-42447,42450-42455
SL-VO5=<boolean logic equation>	42458,42459-42464,42467-42472,42475-42480,42483-42488,42491-42496,42499-42504,42507-42512,42515-42520
SL-VO6=<boolean logic equation>	42523,42524-42529,42532-42537,42540-42545,42548-42553,42556-42561,42564-42569,42572-42577,42580-42585
SL-VO7=<boolean logic equation>	42588,42589-42594,42597-42602,42605-42610,42613-42618,42621-42626,42629-42634,42637-42642,42645-42650
SL-VO8=<boolean logic equation>	42653,42654-42659,42662-42667,42670-42675,42678-42683,42686-42691,42694-42699,42702-42707,42710-42715

ASCII Command	Modbus™ Registers
SL-VO9=<boolean logic equation>	42718,42719-42724,42727-42732,42735-42740,42743-42748,42751-42756,42759-42764,42767-42772,42775-42780
SL-VO10=<boolean logic equation>	42783,42784-42789,42792-42797,42800-42805,42808-42813,42816-42821,42824-42829,42832-42837,42840-42845
SL-VO11=<boolean logic equation>	42848,42849-42854,42857-42862,42865-42870,42873-42878,42881-42886,42889-42894,42897-42902,42905-42910
SL-VO12=<boolean logic equation>	42913,42914-42919,42922-42927,42930-42935,42938-42943,42946-42GPS,42954-42959,42962-42967,42970-42975
SL-VO13=<boolean logic equation>	42978,42979-42984,42987-42992,42995-43000,43003-43008,43011-43016,43019-43024,43027-42032,43035-43040
SL-VO14=<boolean logic equation>	43043,43044-43049,43052-43057,43060-43065,43068-43073,43076-43081,43084-43089,43092-43097,43100-43105
SL-VO15=<boolean logic equation>	43108,43109-43114,43117-43122,43125-43130,43133-43138,43141-43146,43149-43154,43157-43162,43165-43170
SL: <custom logic>,<logic1>,<logic2>,<logic3>,<logic4>,<logic5>,<logic6>,<logic7>	41439-41442,41447-41450,41451-41454,41455-41458,41459-41462,41463-41466,41467-41470
SN-43=<name>,<true label>,<false label>	43498-43502,43503-43506,43507-43510
SN-143=<name>,<true label>,<false label>	43511-43515,43516-43519,43520-43523
SN-243=<name>,<true label>,<false label>	43524-43528,43529-43532,43533-43536
SN-343=<name>,<true label>,<false label>	43537-43541,43542-43545,43546-43549
SN-IN1=<name>,<true label>,<false label>	43849-43853,43854-43857,43858-43861
SN-IN2=<name>,<true label>,<false label>	43862-43866,43867-43870,43871-43874
SN-IN3=<name>,<true label>,<false label>	43875-43879,43880-43883,43884-43887
SN-IN4=<name>,<true label>,<false label>	43888-43892,43893-43896,43897-43900
SN-VOA=<name>,<true label>,<false label>	43602-43606,43607-43610,43611-43614
SN-VO1=<name>,<true label>,<false label>	43615-43619,43620-43623,43624-43627
SN-VO2=<name>,<true label>,<false label>	43628-43632,43633-43636,43637-43640
SN-VO3=<name>,<true label>,<false label>	43641-43645,43646-43649,43650-43653
SN-VO4=<name>,<true label>,<false label>	43654-43658,43659-43662,43663-43666
SN-VO5=<name>,<true label>,<false label>	43667-43671,43672-43675,43676-43679
SN-VO6=<name>,<true label>,<false label>	43680-43684,43685-43688,43689-43692
SN-VO7=<name>,<true label>,<false label>	43693-43697,43698-43701,43702-43705
SN-VO8=<name>,<true label>,<false label>	43706-43710,43711-43714,43715-43718
SN-VO9=<name>,<true label>,<false label>	43719-43723,43724-43727,43728-43731
SN-VO10=<name>,<true label>,<false label>	43732-43736,43737-43740,43741-43744
SN-VO11=<name>,<true label>,<false label>	43745-43749,43750-43753,43754-43757
SN-VO12=<name>,<true label>,<false label>	43758-43762,43763-43766,43767-43770
SN-VO13=<name>,<true label>,<false label>	43771-43775,43776-43779,43780-43783
SN-VO14=<name>,<true label>,<false label>	43784-43788,43789-43792,43793-43796
SN-VO15=<name>,<true label>,<false label>	43797-43801,43802-43805,43806-43809
SP-60FL=<I_Blk>,<V_Blk>	40903-40904, 40905-40906
SP-BF=<time delay>	40606-40607
SP-CURVE=<a>,<b>,<c>,<n>,<r>	40608-40609,40610-40611,40612-40613,40614-40615,40616-40617

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