

INSTRUCTION MANUAL

FOR

**ENHANCED OVERCURRENT
PROTECTION SYSTEM**

BE1-851E

MODBUS[®] PROTOCOL



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INTRODUCTION

This instruction manual provides detailed information about the BE1-851E Enhanced Overcurrent Protection System with the Modbus® protocol.

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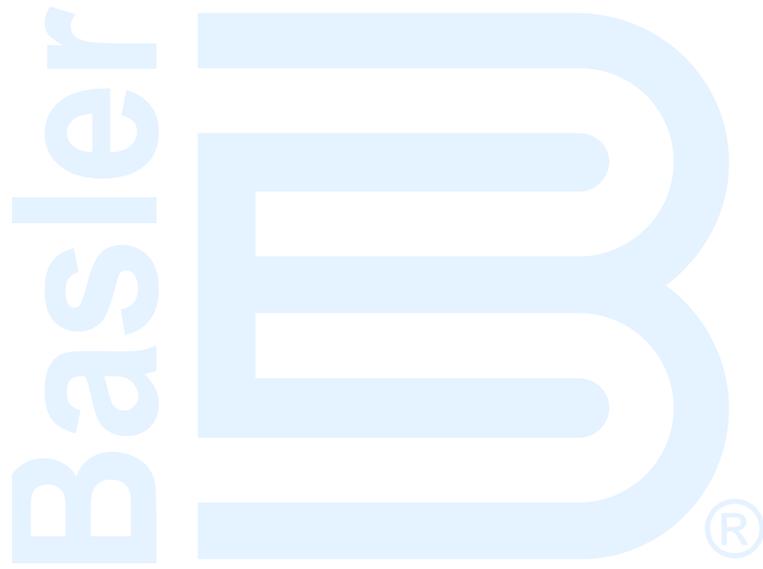
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REVISION HISTORY

The following information provides a historical summary of the changes made to this instruction manual (9289900791). Revisions are listed in reverse chronological order.

Manual Revision and Date	Change
F, 01/17	<ul style="list-style-type: none">• Added caution statement about nonvolatile memory.• Replaced all instances of Modbus™ with Modbus®.• Replaced Helvetica typeface with Arial throughout manual.
E, 10/13	<ul style="list-style-type: none">• Added x50T reset time registers 40323-40334.• Added 3I0 fault register 47545-46.• Added 3I0 current magnitude register 49741-42.• Added 3I0 mode for x50TN registers 41522 and 41573.• Added 3I0 mode for 51N register 49741-42.
D, 06/09	<ul style="list-style-type: none">• Split manual into sections.
C, 03/07	<ul style="list-style-type: none">• Added manual part number and revision to footers.
B, 07/06	<ul style="list-style-type: none">• Added agency markings on drawings.
A, 05/06	<ul style="list-style-type: none">• Minor text edits.
—, 04/06	<ul style="list-style-type: none">• Initial release.



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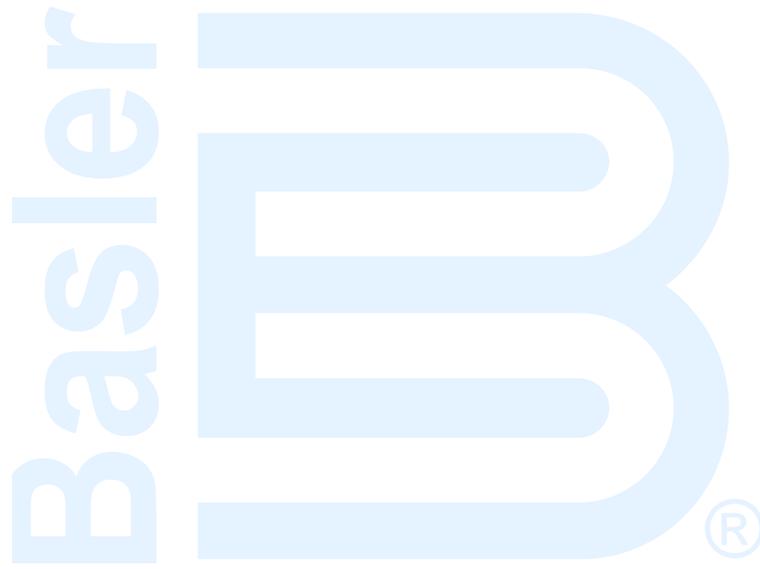
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SECTION 1 • GENERAL INFORMATION

Introduction

This document describes the Modbus® communications protocol employed by BE1-851E relays and how to exchange information with BE1-851E relays over a Modbus® network. The BE1-851E 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 (BE1-851E) responds to the query. When a Modbus® master communicates with a slave, information is provided or requested by the master. Information residing in the BE1-851E is grouped categorically as follows:

- 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 BE1-851E, 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 BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E Modbus® supported baud rates are 2400, 4800, 9600, and 19200. The factory default baud rate is 9600.

BE1-851E supports both RS-232-C and RS-485 compatible serial interfaces. Both interfaces are accessible from the rear panel of the BE1-851E. The RS-232-C 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 eighth 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 BE1-851E requires an inter-byte latency of 3.5 character times before considering the message complete.

Once a valid query is received, the BE1-851E 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 (seconds)	
		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 BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E Instruction Manual (9289900790) for further details.

Detailed Message Query and Response

A detailed description of BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E 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 BE1-851E continues to monitor all queries. The BE1-851E 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 BE1-851E 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 BE1-851E will perform the write when the device address is the same as the BE1-851E 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 BE1-851E 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 BE1-851E will perform the write when the device address is the same as the BE1-851E 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 a value that is not allowed (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

BE1-851E 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 8.43×10^{-37} to 3.38×10^{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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
K	hex 84

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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
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:

<u>Holding Register</u>	<u>Value</u>
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 BE1-851E 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 COM 0 at the same time a remote user is making changes via Modbus® from COM 2.

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:

1. Preset Multiple Registers query to ACCESS PASSWORD register(s) to specify password.
2. Preset Multiple Registers query to ACCESS REQUEST register to access write privileges.
3. Preset Multiple Registers queries to change the current settings.
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 BE1-851E 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 BE1-851E has four 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 - 3) into the SETTINGS GROUP SELECTION Template holding register.

The BE1-851E can store 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 BE1-851E generates 10 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 BE1-851E 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 could 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

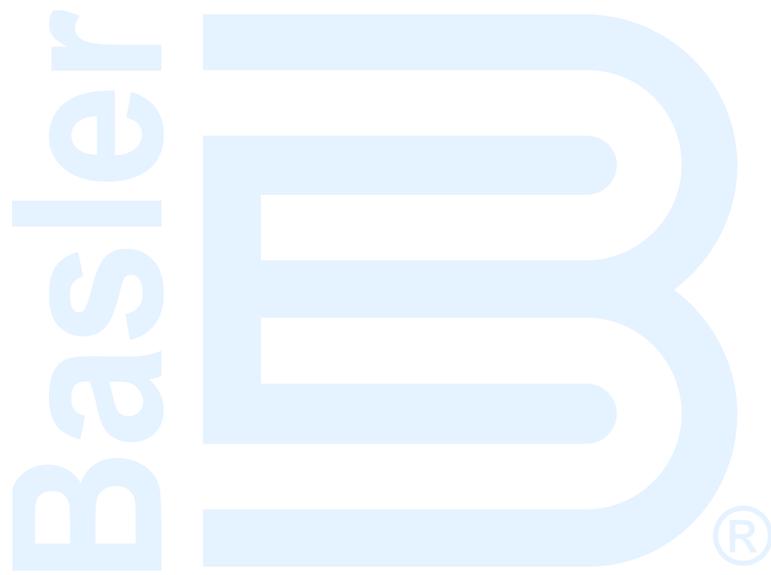
The user may allocate up to 125 holding registers to the Contiguous Poll Block (49875-999). This allocation allows dispersed registers, which are frequently read to be polled via a single read query. A register is assigned to a position in the Poll Block by writing its address value into the corresponding 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 its 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 its corresponding assignment register 40749) and reading register 49879 for the Breaker Status (as specified in its corresponding assignment register 40750).

Exception Code Enhancement Registers

When a BE1-851E 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 BE1-851E 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
<u><i>Session Parameters</i></u>				
40001	Exit	R W	ASC(1)	PS
40002-05	Access Password	R W	ASC(8)	PS
40006	Access Request	R W	BM(16)	PS
<u><i>Template Parameters</i></u>				
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	
<u><i>Global Parameters</i></u>				
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
<u><i>Control Parameters</i></u>				
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)	
40145	Select Output 3	R W	ASC(1)	
40146	Operate Output 3	R W	ASC(1)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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)	
40151	Select Output 6	R W	ASC(1)	
40152	Operate Output 6	R W	ASC(1)	
40153	Select Output 7	R W	ASC(1)	
40154	Operate Output 7	R W	ASC(1)	
 <i><u>Group Setting Parameters</u></i>				
40269-70	50TP Pickup	R W	FP	GRP
40271-72	50TP Time Delay	R W	LI	GRP
40323-24	50TP Reset Time	R W	LI	GRP
40273-74	50TN Pickup	R W	FP	GRP
40275-76	50TN Time Delay	R W	LI	GRP
40325-26	50TN Reset Time	R W	LI	GRP
40277-78	50TQ Pickup	R W	FP	GRP
40279-80	50TQ Time Delay	R W	LI	GRP
40327-28	50TQ Reset Time	R W	LI	GRP
40281-82	150TP Pickup	R W	FP	GRP
40283-84	150TP Time Delay	R W	LI	GRP
40329-30	150TP Reset Time	R W	LI	GRP
40285-86	150TN Pickup	R W	FP	GRP
40287-88	150TN Time Delay	R W	LI	GRP
40331-32	150TN Reset Time	R W	LI	GRP
40289-90	150TQ Pickup	R W	FP	GRP
40291-92	150TQ Time Delay	R W	LI	GRP
40333-34	150TQ Reset Time	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
40317-18	51Q Pickup	R W	FP	GRP
40319-20	51Q Time Dial	R W	FP	GRP
40321-22	51Q 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
40406-07	79 First Automatic Reclose Delay	R W	LI	GRP
40408-09	79 Second Automatic Reclose Delay	R W	LI	GRP
40410-11	79 Third Automatic Reclose Delay	R W	LI	GRP
40412-13	79 Fourth Automatic Reclose Delay	R W	LI	GRP
40414-15	79 Reset Time Delay	R W	LI	GRP
40416-17	79 Reclose Fail Time Delay	R W	LI	GRP
40418-19	79 Maximum Reclose Time	R W	LI	GRP
40420	79 Sequence Control	R W	BM(16)	GRP
 <i><u>Global Setting Parameters</u></i>				
40606-07	Breaker Fail Time Delay	R W	LI	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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	
<u><i>Contiguous Poll Block</i></u>				
40746-870	Contiguous Poll Block Assignments	R W	INT	
<u><i>Setting Group Control</i></u>				
40871	Setting Group Control On Time	R W	INT	
40872	Setting Group 1 Automatic Control Switch Time	R W	SI	
40873	Setting Group 1 Automatic Control Switch Level	R W	SI	
40874	Setting Group 1 Automatic Control Return Time	R W	SI	
40875	Setting Group 1 Automatic Control Return Level	R W	SI	
40876	Setting Group 1 Tracking Element	R W	INT	
40877	Setting Group 2 Automatic Control Switch Time	R W	SI	
40878	Setting Group 2 Automatic Control Switch Level	R W	SI	
40879	Setting Group 2 Automatic Control Return Time	R W	SI	
40880	Setting Group 2 Automatic Control Return Level	R W	SI	
40881	Setting Group 2 Tracking Element	R W	INT	
40882	Setting Group 3 Automatic Control Switch Time	R W	SI	
40883	Setting Group 3 Automatic Control Switch Level	R W	SI	
40884	Setting Group 3 Automatic Control Return Time	R W	SI	
40885	Setting Group 3 Automatic Control Return Level	R W	SI	
40886	Setting Group 3 Tracking Element	R W	INT	
<u><i>Serial Port Setting Parameters</i></u>				
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	Modbus Password Security	R W	SI	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
<u><i>System Data Setting Parameters</i></u>				
41019	System Frequency	R W	SI	
41020	Phase Rotation	R W	SI	
41021	Phase CT Ratio	R W	INT	
41022	Neutral CT Ratio	R W	INT	
<u><i>Breaker Duty Setting Parameters</i></u>				
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	
41110-13	Breaker Block Logic Mask	R W	BM(64)	
41118-21	Breaker Block Logic Term	R W	BM(64)	
41126-29	Breaker Close Logic Mask	R W	BM(64)	
41134-37	Breaker Close Logic Term	R W	BM(64)	
<u><i>Relay Data Setting Parameters</i></u>				
41259-60	Phase Demand Alarm Level	R W	FP	
41261-62	Neutral Demand Alarm Level	R W	FP	
41263-64	Negative-Sequence Demand1 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	
41278	Phase Demand Calculation Method	R W	ASC(1)	
41279	Neutral Demand Calculation Method	R W	ASC(1)	
41280	Negative-Sequence Demand Calculation Method	R W	ASC(1)	
41284	Output Hold Mask	R W	BM(8)	
41287-88	Target Mask	R W	BM(32)	
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)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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)	
41355-58	Fault Record Trigger (Trip) Logic Mask	R W	BM(64)	
41363-66	Fault Record Trigger (Trip) Logic Term	R W	BM(64)	
41371-74	Fault Record Trigger (Pickup) Logic Mask	R W	BM(64)	
41379-82	Fault Record Trigger (Pickup) Logic Term	R W	BM(64)	
41387-90	Fault Record Trigger (Logic) Logic Mask	R W	BM(64)	
41395-98	Fault Record Trigger (Logic) Logic Term	R W	BM(64)	
41403-06	Reset Target Logic Mask	R W	BM(64)	
41411-14	Reset Target Logic Term	R W	BM(64)	
41419-22	Reset Alarm Logic Mask	R W	BM(64)	
41427-30	Reset Alarm Logic Term	R W	BM(64)	
41435	Filter Type for Phase DSP	R W	ASC(1)	
41436	Filter Type for Neutral DSP	R W	ASC(1)	
<u>Custom Logic Setting Parameters</u>				
41465-68	User Custom Logic Name	R W	ASC(8)	
41469-72	Current Active Logic Scheme	R W	ASC(8)	
41473-76	Custom Logic Name	R –	ASC(8)	
41477-80	Standard Logic #1 Name	R –	ASC(8)	
41481-84	Standard Logic #2 Name	R –	ASC(8)	
41485-88	Standard Logic #3 Name	R –	ASC(8)	
41489-92	Standard Logic #4 Name	R –	ASC(8)	
41493-96	Standard Logic #5 Name	R –	ASC(8)	
41497-500	Standard Logic #6 Name	R –	ASC(8)	
41501-04	Standard Logic #7 Name	R –	ASC(8)	
41505	Programmable 50TP Logic Mode	R W	INT	
41506-09	Programmable 50TP Block Logic Mask	R W	BM(64)	
41514-17	Programmable 50TP Block Logic Term	R W	BM(64)	
41522	Programmable 50TN Logic Mode	R W	INT	
41523-26	Programmable 50TN Block Logic Mask	R W	BM(64)	
41531-34	Programmable 50TN Block Logic Term	R W	BM(64)	
41539	Programmable 50TQ Logic Mode	R W	INT	
41540-43	Programmable 50TQ Block Logic Mask	R W	BM(64)	
41548-51	Programmable 50TQ Block Logic Term	R W	BM(64)	
41556	Programmable 150TP Logic Mode	R W	INT	
41557-60	Programmable 150TP Block Logic Mask	R W	BM(64)	
41565-68	Programmable 150TP Block Logic Term	R W	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41573	Programmable 150TN Logic Mode	R W	INT	
41574-77	Programmable 150TN Block Logic Mask	R W	BM(64)	
41582-85	Programmable 150TN Block Logic Term	R W	BM(64)	
41590	Programmable 150TQ Logic Mode	R W	INT	
41591-94	Programmable 150TQ Block Logic Mask	R W	BM(64)	
41599-602	Programmable 150TQ Block Logic Term	R W	BM(64)	
41658	Programmable Breaker Failure Logic Mode	R W	INT	
41659-62	Programmable Breaker Failure Initiate Logic Mask	R W	BM(64)	
41667-70	Programmable Breaker Failure Initiate Logic Term	R W	BM(64)	
41675-78	Programmable Breaker Failure Block Logic Mask	R W	BM(64)	
41683-86	Programmable Breaker Failure Block Logic Term	R W	BM(64)	
41691	Programmable 51P Logic Mode	R W	INT	
41692-95	Programmable 51P Block Logic Mask	R W	BM(64)	
41700-03	Programmable 51P Block Logic Term	R W	BM(64)	
41708	Programmable 51N Logic Mode	R W	INT	
41709-12	Programmable 51N Block Logic Mask	R W	BM(64)	
41717-20	Programmable 51N Block Logic Term	R W	BM(64)	
41725	Programmable 51Q Logic Mode	R W	INT	
41726-29	Programmable 51Q Block Logic Mask	R W	BM(64)	
41734-37	Programmable 51Q Block Logic Term	R W	BM(64)	
41844	Programmable 62 Timer Logic Mode	R W	INT	
41845-48	Programmable 62 Timer Start Logic Mask	R W	BM(64)	
41853-56	Programmable 62 Timer Start Logic Term	R W	BM(64)	
41861-64	Programmable 62 Timer Block Logic Mask	R W	BM(64)	
41869-72	Programmable 62 Timer Block Logic Term	R W	BM(64)	
41877	Programmable 162 Timer Logic Mode	R W	INT	
41878-81	Programmable 162 Timer Start Logic Mask	R W	BM(64)	
41886-89	Programmable 162 Timer Start Logic Term	R W	BM(64)	
41894-97	Programmable 162 Timer Block Logic Mask	R W	BM(64)	
41902-05	Programmable 162 Timer Block Logic Term	R W	BM(64)	
42010	Programmable Settings Group Logic Mode	R W	INT	
42011-14	Programmable Settings Group Block Logic Mask	R W	BM(64)	
42019-22	Programmable Settings Group Block Logic Term	R W	BM(64)	
42027-30	Programmable Settings Grp0 Select Logic Mask	R W	BM(64)	
42035-38	Programmable Settings Grp0 Select Logic Term	R W	BM(64)	
42043-46	Programmable Settings Grp1 Select Logic Mask	R W	BM(64)	
42051-54	Programmable Settings Grp1 Select Logic Term	R W	BM(64)	
42059-62	Programmable Settings Grp2 Select Logic Mask	R W	BM(64)	
42067-70	Programmable Settings Grp2 Select Logic Term	R W	BM(64)	
42075-78	Programmable Settings Grp3 Select Logic Mask	R W	BM(64)	
42083-86	Programmable Settings Grp3 Select Logic Term	R W	BM(64)	
42133	Programmable Virtual Output A Term Count	R W	SI	
42134-37	Programmable Virtual Output A Logic Mask 1	R W	BM(64)	
42142-45	Programmable Virtual Output A Logic Term 1	R W	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42150-53	Programmable Virtual Output A Logic Mask 2	R W	BM(64)	
42158-61	Programmable Virtual Output A Logic Term 2	R W	BM(64)	
42166-69	Programmable Virtual Output A Logic Mask 3	R W	BM(64)	
42174-77	Programmable Virtual Output A Logic Term 3	R W	BM(64)	
42182-85	Programmable Virtual Output A Logic Mask 4	R W	BM(64)	
42190-93	Programmable Virtual Output A Logic Term 4	R W	BM(64)	
42198	Programmable Virtual Output 1 Term Count	R W	SI	
42199-202	Programmable Virtual Output 1 Logic Mask 1	R W	BM(64)	
42207-10	Programmable Virtual Output 1 Logic Term 1	R W	BM(64)	
42215-18	Programmable Virtual Output 1 Logic Mask 2	R W	BM(64)	
42223-26	Programmable Virtual Output 1 Logic Term 2	R W	BM(64)	
42231-34	Programmable Virtual Output 1 Logic Mask 3	R W	BM(64)	
42239-42	Programmable Virtual Output 1 Logic Term 3	R W	BM(64)	
42247-50	Programmable Virtual Output 1 Logic Mask 4	R W	BM(64)	
42255-58	Programmable Virtual Output 1 Logic Term 4	R W	BM(64)	
42263	Programmable Virtual Output 2 Term Count	R W	SI	
42264-67	Programmable Virtual Output 2 Logic Mask 1	R W	BM(64)	
42272-75	Programmable Virtual Output 2 Logic Term 1	R W	BM(64)	
42280-83	Programmable Virtual Output 2 Logic Mask 2	R W	BM(64)	
42288-91	Programmable Virtual Output 2 Logic Term 2	R W	BM(64)	
42296-99	Programmable Virtual Output 2 Logic Mask 3	R W	BM(64)	
42304-07	Programmable Virtual Output 2 Logic Term 3	R W	BM(64)	
42312-15	Programmable Virtual Output 2 Logic Mask 4	R W	BM(64)	
42320-23	Programmable Virtual Output 2 Logic Term 4	R W	BM(64)	
42328	Programmable Virtual Output 3 Term Count	R W	SI	
42329-32	Programmable Virtual Output 3 Logic Mask 1	R W	BM(64)	
42337-40	Programmable Virtual Output 3 Logic Term 1	R W	BM(64)	
42345-48	Programmable Virtual Output 3 Logic Mask 2	R W	BM(64)	
42353-56	Programmable Virtual Output 3 Logic Term 2	R W	BM(64)	
42361-64	Programmable Virtual Output 3 Logic Mask 3	R W	BM(64)	
42369-72	Programmable Virtual Output 3 Logic Term 3	R W	BM(64)	
42377-80	Programmable Virtual Output 3 Logic Mask 4	R W	BM(64)	
42385-88	Programmable Virtual Output 3 Logic Term 4	R W	BM(64)	
42393	Programmable Virtual Output 4 Term Count	R W	SI	
42394-97	Programmable Virtual Output 4 Logic Mask 1	R W	BM(64)	
42402-05	Programmable Virtual Output 4 Logic Term 1	R W	BM(64)	
42410-13	Programmable Virtual Output 4 Logic Mask 2	R W	BM(64)	
42418-21	Programmable Virtual Output 4 Logic Term 2	R W	BM(64)	
42426-29	Programmable Virtual Output 4 Logic Mask 3	R W	BM(64)	
42434-37	Programmable Virtual Output 4 Logic Term 3	R W	BM(64)	
42442-45	Programmable Virtual Output 4 Logic Mask 4	R W	BM(64)	
42450-53	Programmable Virtual Output 4 Logic Term 4	R W	BM(64)	
42458	Programmable Virtual Output 5 Term Count	R W	SI	
42459-62	Programmable Virtual Output 5 Logic Mask 1	R W	BM(64)	
42467-70	Programmable Virtual Output 5 Logic Term 1	R W	BM(64)	
42475-78	Programmable Virtual Output 5 Logic Mask 2	R W	BM(64)	
42483-86	Programmable Virtual Output 5 Logic Term 2	R W	BM(64)	
42491-94	Programmable Virtual Output 5 Logic Mask 3	R W	BM(64)	
42499-502	Programmable Virtual Output 5 Logic Term 3	R W	BM(64)	
42507-10	Programmable Virtual Output 5 Logic Mask 4	R W	BM(64)	
42515-18	Programmable Virtual Output 5 Logic Term 4	R W	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42523	Programmable Virtual Output 6 Term Count	R W	SI	
42524-27	Programmable Virtual Output 6 Logic Mask 1	R W	BM(64)	
42532-35	Programmable Virtual Output 6 Logic Term 1	R W	BM(64)	
42540-43	Programmable Virtual Output 6 Logic Mask 2	R W	BM(64)	
42548-51	Programmable Virtual Output 6 Logic Term 2	R W	BM(64)	
42556-59	Programmable Virtual Output 6 Logic Mask 3	R W	BM(64)	
42564-67	Programmable Virtual Output 6 Logic Term 3	R W	BM(64)	
42572-75	Programmable Virtual Output 6 Logic Mask 4	R W	BM(64)	
42580-83	Programmable Virtual Output 6 Logic Term 4	R W	BM(64)	
42588	Programmable Virtual Output 7 Term Count	R W	SI	
42589-92	Programmable Virtual Output 7 Logic Mask 1	R W	BM(64)	
42597-600	Programmable Virtual Output 7 Logic Term 1	R W	BM(64)	
42605-08	Programmable Virtual Output 7 Logic Mask 2	R W	BM(64)	
42613-16	Programmable Virtual Output 7 Logic Term 2	R W	BM(64)	
42621-24	Programmable Virtual Output 7 Logic Mask 3	R W	BM(64)	
42629-32	Programmable Virtual Output 7 Logic Term 3	R W	BM(64)	
42637-40	Programmable Virtual Output 7 Logic Mask 4	R W	BM(64)	
42645-48	Programmable Virtual Output 7 Logic Term 4	R W	BM(64)	
42653	Programmable Virtual Output 8 Term Count	R W	SI	
42654-57	Programmable Virtual Output 8 Logic Mask 1	R W	BM(64)	
42662-65	Programmable Virtual Output 8 Logic Term 1	R W	BM(64)	
42670-73	Programmable Virtual Output 8 Logic Mask 2	R W	BM(64)	
42678-81	Programmable Virtual Output 8 Logic Term 2	R W	BM(64)	
42686-89	Programmable Virtual Output 8 Logic Mask 3	R W	BM(64)	
42694-97	Programmable Virtual Output 8 Logic Term 3	R W	BM(64)	
42702-05	Programmable Virtual Output 8 Logic Mask 4	R W	BM(64)	
42710-13	Programmable Virtual Output 8 Logic Term 4	R W	BM(64)	
42718	Programmable Virtual Output 9 Term Count	R W	SI	
42719-22	Programmable Virtual Output 9 Logic Mask 1	R W	BM(64)	
42727-30	Programmable Virtual Output 9 Logic Term 1	R W	BM(64)	
42735-38	Programmable Virtual Output 9 Logic Mask 2	R W	BM(64)	
42743-46	Programmable Virtual Output 9 Logic Term 2	R W	BM(64)	
42751-54	Programmable Virtual Output 9 Logic Mask 3	R W	BM(64)	
42759-62	Programmable Virtual Output 9 Logic Term 3	R W	BM(64)	
42767-70	Programmable Virtual Output 9 Logic Mask 4	R W	BM(64)	
42775-78	Programmable Virtual Output 9 Logic Term 4	R W	BM(64)	
42783	Programmable Virtual Output 10 Term Count	R W	SI	
42784-87	Programmable Virtual Output 10 Logic Mask 1	R W	BM(64)	
42792-95	Programmable Virtual Output 10 Logic Term 1	R W	BM(64)	
42800-03	Programmable Virtual Output 10 Logic Mask 2	R W	BM(64)	
42808-11	Programmable Virtual Output 10 Logic Term 2	R W	BM(64)	
42816-19	Programmable Virtual Output 10 Logic Mask 3	R W	BM(64)	
42824-27	Programmable Virtual Output 10 Logic Term 3	R W	BM(64)	
42832-35	Programmable Virtual Output 10 Logic Mask 4	R W	BM(64)	
42840-43	Programmable Virtual Output 10 Logic Term 4	R W	BM(64)	
42848	Programmable Virtual Output 11 Term Count	R W	SI	
42849-52	Programmable Virtual Output 11 Logic Mask 1	R W	BM(64)	
42857-60	Programmable Virtual Output 11 Logic Term 1	R W	BM(64)	
42865-69	Programmable Virtual Output 11 Logic Mask 2	R W	BM(64)	
42873-76	Programmable Virtual Output 11 Logic Term 2	R W	BM(64)	
42881-84	Programmable Virtual Output 11 Logic Mask 3	R W	BM(64)	
42889-92	Programmable Virtual Output 11 Logic Term 3	R W	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42897-900	Programmable Virtual Output 11 Logic Mask 4	R W	BM(64)	
42905-08	Programmable Virtual Output 11 Logic Term 4	R W	BM(64)	
42913	Programmable Virtual Output 12 Term Count	R W	SI	
42914-17	Programmable Virtual Output 12 Logic Mask 1	R W	BM(64)	
42922-25	Programmable Virtual Output 12 Logic Term 1	R W	BM(64)	
42930-33	Programmable Virtual Output 12 Logic Mask 2	R W	BM(64)	
42938-41	Programmable Virtual Output 12 Logic Term 2	R W	BM(64)	
42946-49	Programmable Virtual Output 12 Logic Mask 3	R W	BM(64)	
42954-57	Programmable Virtual Output 12 Logic Term 3	R W	BM(64)	
42962-65	Programmable Virtual Output 12 Logic Mask 4	R W	BM(64)	
42970-73	Programmable Virtual Output 12 Logic Term 4	R W	BM(64)	
42978	Programmable Virtual Output 13 Term Count	R W	SI	
42979-82	Programmable Virtual Output 13 Logic Mask 1	R W	BM(64)	
42987-90	Programmable Virtual Output 13 Logic Term 1	R W	BM(64)	
42995-98	Programmable Virtual Output 13 Logic Mask 2	R W	BM(64)	
43003-06	Programmable Virtual Output 13 Logic Term 2	R W	BM(64)	
43011-14	Programmable Virtual Output 13 Logic Mask 3	R W	BM(64)	
43019-22	Programmable Virtual Output 13 Logic Term 3	R W	BM(64)	
43027-30	Programmable Virtual Output 13 Logic Mask 4	R W	BM(64)	
43035-38	Programmable Virtual Output 13 Logic Term 4	R W	BM(64)	
43043	Programmable Virtual Output 14 Term Count	R W	SI	
43044-47	Programmable Virtual Output 14 Logic Mask 1	R W	BM(64)	
43052-55	Programmable Virtual Output 14 Logic Term 1	R W	BM(64)	
43060-63	Programmable Virtual Output 14 Logic Mask 2	R W	BM(64)	
43068-71	Programmable Virtual Output 14 Logic Term 2	R W	BM(64)	
43076-79	Programmable Virtual Output 14 Logic Mask 3	R W	BM(64)	
43084-87	Programmable Virtual Output 14 Logic Term 3	R W	BM(64)	
43092-95	Programmable Virtual Output 14 Logic Mask 4	R W	BM(64)	
43100-03	Programmable Virtual Output 14 Logic Term 4	R W	BM(64)	
43108	Programmable Virtual Output 15 Term Count	R W	SI	
43109-12	Programmable Virtual Output 15 Logic Mask 1	R W	BM(64)	
43117-20	Programmable Virtual Output 15 Logic Term 1	R W	BM(64)	
43125-28	Programmable Virtual Output 15 Logic Mask 2	R W	BM(64)	
43133-36	Programmable Virtual Output 15 Logic Term 2	R W	BM(64)	
43141-44	Programmable Virtual Output 15 Logic Mask 3	R W	BM(64)	
43149-52	Programmable Virtual Output 15 Logic Term 3	R W	BM(64)	
43157-60	Programmable Virtual Output 15 Logic Mask 4	R W	BM(64)	
43165-69	Programmable Virtual Output 15 Logic Term 4	R W	BM(64)	
43173	Programmable 79 Logic Mode	R W	INT	
43174-77	Programmable Reclose Initiate Logic Mask	R W	BM(64)	
43182-85	Programmable Reclose Initiate Logic Term	R W	BM(64)	
43190-93	Programmable Reclose Status Logic Mask	R W	BM(64)	
43198-201	Programmable Reclose Status Logic Term	R W	BM(64)	
43206-09	Programmable Reclose Wait Logic Mask	R W	BM(64)	
43214-17	Programmable Reclose Wait Logic Term	R W	BM(64)	
43222-25	Programmable Reclose DTL Logic Mask	R W	BM(64)	
43230-33	Programmable Reclose DTL Logic Term	R W	BM(64)	
<u>System Labels and ID Setting Parameters</u>				
43438-42	Relay ID	R W	ASC(10)	
43453-67	Station ID	R W	ASC(30)	

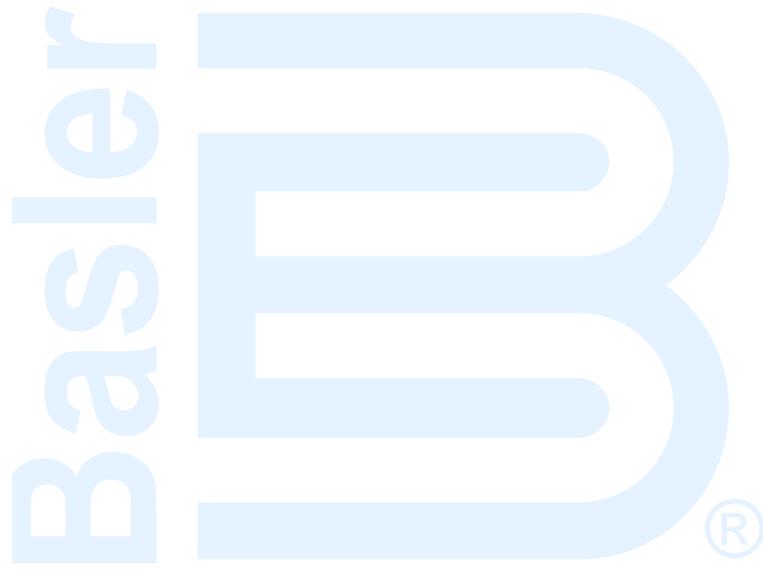
Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43498-502	Virtual Selector Switch 43 - Name Label	R W	ASC(10)	
43503-06	Virtual Selector Switch 43 - True Label	R W	ASC(7)	
43507-10	Virtual Selector Switch 43 - False Label	R W	ASC(7)	
43511-15	Virtual Selector Switch 143 - Name Label	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)	
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)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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)	
<u>Report Parameters</u>				
47274-77	Model Number	R –	ASC(8)	
47282-89	Application SW Version # / Date	R –	ASC(16)	
47296-302	Boot SW Version # / Date	R –	ASC(14)	
47310-16	Serial Number	R –	ASC(13)	
47324-34	Style Number	R –	ASC(21)	
47364	Date and Time - Day	R W	INT	TS
47365-66	Date and Time - Milliseconds	R W	LI	TS
47367-70	System Status	R –	BM(64)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47373	Current Active Group Setting	R –	SI	
47374	Current Group Control Setting	R –	ASC(1)	
47375-76	Current Output Control Settings (Output Pulse)	R –	BM(32)	
47377-78	Current Output Control Settings (Output Latch)	R –	BM(32)	
47379	Current Output Contact Status	R –	BM(16)	
47380-81	Active Alarm Flags (Sum Flags)	R –	BM(32)	
47382-83	Active Alarm Flags (Prog Alarms)	R –	BM(32)	
47384-85	Target Status	R W	BM(32)	
47388	Current Breaker Status	R –	ASC(1)	
47389-92	Current Active Logic Scheme	R –	ASC(8)	
47393	Reclose Status	R –	INT	
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 Peak Demand Current - Phase A	R –	FP	
47412	Yesterday's Peak Demand Timestamp - Day	R –	INT	TS
47413-14	Yesterday's Peak Demand Timestamp - Millisecond	R –	LI	TS
47415-16	Yesterday's Peak Demand Current - Phase B	R –	FP	
47417	Yesterday's Peak Demand Timestamp - Day	R –	INT	TS
47418-19	Yesterday's Peak Demand Timestamp - Millisecond	R –	LI	TS
47420-21	Yesterday's Peak Demand Current - Phase C	R –	FP	
47422	Yesterday's Peak Demand Timestamp - Day	R –	INT	TS
47423-24	Yesterday's Peak Demand Timestamp - Millisecond	R –	LI	TS
47425-26	Yesterday's Peak Demand Current - Neutral	R –	FP	
47427	Yesterday's Peak Demand Timestamp - Day	R –	INT	TS
47428-29	Yesterday's Peak Demand Timestamp - Millisecond	R –	LI	TS
47430-31	Yesterday's Peak Demand Current - Neg-Seq	R –	FP	
47432	Yesterday's Peak Demand Timestamp - Day	R –	INT	TS
47433-34	Yesterday's Peak Demand Timestamp - Millisecond	R –	LI	TS
47435-36	Today's Peak Demand Current - Phase A	R –	FP	
47437	Today's Peak Demand Timestamp - Day	R –	INT	TS
47438-39	Today's Peak Demand Timestamp - Millisecond	R –	LI	TS
47440-41	Today's Peak Demand Current - Phase B	R –	FP	
47442	Today's Peak Demand Timestamp - Day	R –	INT	TS
47443-44	Today's Peak Demand Timestamp - Millisecond	R –	LI	TS
47445-46	Today's Peak Demand Current - Phase C	R –	FP	
47447	Today's Peak Demand Timestamp - Day	R –	INT	TS
47448-49	Today's Peak Demand Timestamp - Millisecond	R –	LI	TS
47450-51	Today's Peak Demand Current - Neutral	R –	FP	
47452	Today's Peak Demand Timestamp - Day	R –	INT	TS
47453-54	Today's Peak Demand Timestamp - Millisecond	R –	LI	TS
47455-56	Today's Peak Demand Current - Neg-Seq	R –	FP	
47457	Today's Peak Demand Timestamp - Day	R –	INT	TS
47458-59	Today's Peak Demand Timestamp - Millisecond	R –	LI	TS

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47460-61	Peak Since Reset Demand Current - Phase A	R W	FP	
47462	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47463-64	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS
47465-66	Peak Since Reset Demand Current - Phase B	R W	FP	
47467	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47468-69	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS
47470-71	Peak Since Reset Demand Current - Phase C	R W	FP	
47472	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47473-74	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS
47475-76	Peak Since Reset Demand Current - Neutral	R W	FP	
47477	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47478-79	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS
47480-81	Peak Since Reset Demand Current - Neg-Seq	R W	FP	
47482	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47483-84	Peak Since Reset Demand Timestamp - Millisecond	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	
47490	Reset Load Profile	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	
<i>Fault Template (FLT)</i>				
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
47519-20	Fault Targets	R –	BM(32)	FLT
47523	Fault Recloser State	R –	BM(16)	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 Neutral Current Magnitude	R –	FP	FLT
47542-43	Fault Negative-Seq Current Magnitude	R –	FP	FLT
47545-46	Fault 3I0 Current Magnitude	R –	FP	FLT
<i>Report Template (RPT)</i>				
47595-719	Report Text	R –	ASC(250)	RPT

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
<i>Metering Parameters</i>				
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	
49735-36	Neutral Current Magnitude (R –	FP	
49738-39	Negative-Sequence Current Magnitude	R –	FP	
49741-42	3I0 Current Magnitude	R –	FP	
49835-74	Error Details	R –	ASC(40)	
49875-999	Contiguous Poll Block	R –	Mixed	



SECTION 3 • REGISTER DETAILS

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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 BE1-851E Modbus™ Holding Registers.

Any Holding Register not listed in *Table 4, 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

41505	Programmable 50TP Block Logic Mode	INT
41539	Programmable 50TQ Block Logic Mode	INT
41556	Programmable 150TP Block Logic Mode	INT
41590	Programmable 150TQ Block Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	
41522	Programmable 50TN Block Logic Mode	INT
41573	Programmable 150TN Block Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for ground input	
	2 for 3I0	
41658	Programmable Breaker Failure Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	
41691	Programmable 51P Logic Mode	INT
41725	Programmable 51Q Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	

41708	Programmable 51N Logic Mode Read and Write: 0 for disabled 1 for ground input (not available on SEF models) 2 for 3I0	INT
41844 41877	Programmable 62 Timer Logic Mode Programmable 162 Timer Logic Mode 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 Latch	INT INT
42010	Programmable Settings Group Logic Mode 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	INT
43173	Programmable 79 Logic Mode Read and Write: 0 for Recloser disabled 1 for Recloser standard power-up operation 2 for Recloser power-up to close operation	INT

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 - 1st Register (Logic Var 0 to 15) BM(16)

Read only:

- Bit 15 - 150TQ picked-up
- Bit 14 - 50TQ picked-up
- Bit 13 - 150TN picked-up
- Bit 12 - 50TN picked-up
- Bit 11 - 150TP picked-up
- Bit 10 - 50TP picked-up
- Bit 9 - 51Q tripped
- Bit 8 - 51N tripped
- Bit 7 - 51P tripped
- Bit 6 - BF tripped
- Bit 5 - 150TQ tripped
- Bit 4 - 50TQ tripped
- Bit 3 - 150TN tripped
- Bit 2 - 50TN tripped
- Bit 1 - 150TP tripped
- Bit 0 - 50TP tripped

Mask and Term - 2nd register (Logic Var 16 to 31) BM(16)

Read only:

- Bit 15 - Logic always false L-VOx=0
- Bit 14 - 79 block output
- Bit 13 - 79 reclose fail
- Bit 12 - 79 lockout
- Bit 11 - 79 enable / active / block tap changer

Bit 10 - 79 close
Bit 9 - Serial controlled switch 343
Bit 8 - Serial controlled switch 243
Bit 7 - Serial controlled switch 143
Bit 6 - Serial controlled switch 43
Bit 5 - 162 tripped
Bit 4 - 62 tripped
Bit 3 - 51Q picked-up
Bit 2 - 51N picked-up
Bit 1 - 51P picked-up
Bit 0 - BF picked-up

Mask and Term - 3rd 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 - 4th Register (Logic Var 48 to 63)

BM(16)

Read only:

Bit 15 - Setting Group 3 active
Bit 14 - Setting Group 2 active
Bit 13 - Setting Group 1 active
Bit 12 - Setting Group 0 active
Bit 11 - Output 1 trip coil monitor
Bit 10 - Alarm minor
Bit 9 - Alarm major
Bit 8 - Alarm logic
Bit 7 - HMI reset key
Bit 6 - 101 slip contact
Bit 5 - 101 close
Bit 4 - 101 trip
Bit 3 - Input 4 status
Bit 2 - Input 3 status
Bit 1 - Input 2 status
Bit 0 - Input 1 status

Logic Term Count

Term Count Register

SI

Read and Write:

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). Note1: ERROR DETAIL block (49835-54) contains Exit status message following a write. Note2: 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. Note1: If password written is less than 8 characters long, a binary zero value must be included following the final password character. Note2: 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). Note1: If write access is denied, the response message will be an error response message with Illegal Function exception code. Step1. Write the desired password to PASSWORD registers 40002 to 40005. Step2. Write any value to ACCESS REQUEST register 40006. Step3. Read Access Level from ACCESS REQUEST register 40006. Note2: 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. 0 for Settings Group 0 1 for Settings Group 1 2 for Settings Group 2 3 for Settings Group 3	
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	1	Not used
RA-MAJ Report	2	Not used
RA-MIN Report	3	Not used
RA-REL Report	4	Not used
RF Report	7	Not used
RF-# Report	8	Value of # (1 - 255)
RF-NEW Report	9	Not used
RS Report	10	Not used
RS-# Report	11	Value of # (1 - 255)
RS-NEW Report	12	Not used
RS-F# Report	13	Value of # (1 - 255)

Global Parameters

Global Parameter registers 40080 - 40099 are 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 characters are read. Otherwise, the ASCII character "*" is read.

Write: Password in ASCII character(s).

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 COM 1 access.

Bit 0 is set for COM 0 / 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's internal EEPROM.

40117	Select Group	ASC(1)
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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.

2 if Group 2 selection has been made.

3 if Group 3 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.
2 to select Group 2.
3 to select Group 3.
L to select Logic.

40118 Operate Group ASC(1)

Read: Current control.

0 if Group 0.
1 if Group 1.
2 if Group 2.
3 if Group 3.
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.
2 to select Group 2.
3 to select Group 3.
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)

40151 Select Output 6 ASC(1)

40153 Select Output 7 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)
40152	Operate Output 6	ASC(1)
40154	Operate Output 7	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 (if Modbus password security is enabled).

Group Setting Parameters

40269-70	50TP Pickup	FP
40273-74	50TN Pickup	FP
40277-78	50TQ Pickup	FP
40281-82	150TP Pickup	FP
40285-86	150TN Pickup	FP
40289-90	150TQ Pickup	FP

Read and Write:

0.50 to 150.00 amps (5A units)

40271-72	50TP Time Delay	LI
40275-76	50TN Time Delay	LI
40279-80	50TQ Time Delay	LI
40283-84	150TP Time Delay	LI
40287-88	150TN Time Delay	LI
40291-92	150TQ Time Delay	LI

Read and Write:

0 to 60,000 milliseconds

40323-24	50TP Reset Time	LI
40325-26	50TN Reset Time	LI
40327-28	50TQ Reset Time	LI
40329-30	150TP Reset Time	LI
40331-32	150TN Reset Time	LI
40333-34	150TQ Reset Time	LI
	Read and Write:	
	0 to 60,000 milliseconds	
40305-06	51P Pickup	FP
40311-12	51N Pickup	FP
40317-18	51Q Pickup	FP
	Read and Write:	
	0.50 to 16.00 amps (5A units)	
40307-08	51P Time Dial	FP
40313-14	51N Time Dial	FP
40319-20	51Q 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)
40321-22	51Q Curve Type	ASC(3)
	Read only: One of the following ASCII strings.	
	S1, S2, L1, L2, D, M, I1, I2, V1, V2, E1, E2, S1R, S2R, L1R, L2R, DR, MR, I1R, I2R, V1R, V2R, E1R, E2R, A, B, C, G, F, P, AR, BR, CR, GR, FR, 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
	Read and Write:	
	0 to 999,000 milliseconds	
40406-07	79 First Automatic Reclose Delay	LI
40408-09	79 Second Automatic Reclose Delay	LI
40410-11	79 Third Automatic Reclose Delay	LI
40412-13	79 Fourth Automatic Reclose Delay	LI
40414-15	79 Reset Time Delay	LI
40416-17	79 Reclose Fail Time Delay	LI
40418-19	79 Maximum Reclose Time	LI
	Read and Write:	
	100 to 600,000 milliseconds	
40420	79 Sequence Control	BM(16)
	Read and Write:	
	Bit 0 to Block Shot #1	
	Bit 1 to Block Shot #2	
	Bit 2 to Block Shot #3	
	Bit 3 to Block Shot #4	
	Bit 4 to Block Shot #5	
Global Settings Parameters		
40606-07	Breaker Fail Time Delay	LI
	Read and Write:	
	100 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 Read and Write: 0.0000 to 1.0000	FP
40614-15	Programmable 51 Curve Constant N Delay Read and Write: 0.5000 to 2.5000	FP
40616-17	Programmable 51 Curve Constant R Delay Read and Write: 0.0000 to 30.0000	FP
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 Read and Write: 4 to 255 milliseconds	SI
40746-870	Contiguous Poll Block Assignments Read and Write: 0 if unassigned 1 to 9874: Holding Register 40001 to 49874 Note: To read the data from the registers programmed in this block, Contiguous Poll Block registers 49875 to 49999 must be read.	INT
40871	Setting Group Control On Time Read and Write: 0 to 10 seconds	INT
40872	Setting Group 1 Automatic Control Switch Time	SI
40874	Setting Group 1 Automatic Control Return Time	SI
40877	Setting Group 2 Automatic Control Switch Time	SI
40879	Setting Group 2 Automatic Control Return Time	SI
40882	Setting Group 3 Automatic Control Switch Time	SI
40884	Setting Group 3 Automatic Control Return Time Read and Write: 0 to 60 minutes	SI
40873	Setting Group 1 Automatic Control Switch Level	SI
40875	Setting Group 1 Automatic Control Return Level	SI
40878	Setting Group 2 Automatic Control Switch Level	SI
40880	Setting Group 2 Automatic Control Return Level	SI
40883	Setting Group 3 Automatic Control Switch Level	SI
40885	Setting Group 3 Automatic Control Return Level Read and Write: 0 to 150%	SI

Serial Port Setting Parameters

40962	Serial Port 0 Baud Rate	INT
40971	Serial Port 1 Baud Rate	INT
40980	Serial Port 2 Baud Rate Read only: 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	INT

4 - 4800 baud
 5 - 9600 baud
 6 - 19K baud

40972	Serial Port 1 Relay Address	INT
40981	Serial Port 2 Relay Address Read and Write: 0 to 65,534	INT
40964	Serial Port 0 Software Flow Control	SI
40973	Serial Port 1 Software Flow Control Read only: 0 if XON / XOFF Control is disabled 1 if XON / XOFF Control is enabled	SI
40965	Serial Port 0 Page Length	SI
40974	Serial Port 1 Page Length Read only: 0 for disabled 1 to 40 for number of lines / page	SI
40966	Serial Port 0 Acknowledgement Format	SI
40975	Serial Port 1 Acknowledgement Format Read: 0 if No acknowledge 1 if Acknowledge enabled Write: 0 for No acknowledge 1 to 255 to enable acknowledge	SI
40986	Serial Port 2 Modbus Parity Read and Write: 0 for No parity 1 for Even parity 2 for Odd parity	SI
40987	Serial Port 2 Modbus Remote Delay Read and Write: 1 to 20: 10 to 200 milliseconds	SI
40988	Serial Port 2 Modbus Stop Bits Read and Write: 1 for One stop bit 2 for Two stop bits	SI
40989	Serial Port 2 Modbus Password Security Read and Write: 0 for Disable Password * 1 for Enable Password †	SI

* When Password Security is disabled, no access is required (Access Password, Access Request, and Exit holding registers has no effect) and no password protection is used. Global Parameters, holding registers 40080 to 40099 (ASCII command GF-PW), have no effect on the Modbus serial port, COM 2.

† 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").

System Data Setting Parameters

41019	System Frequency Read and Write: 50 for 50 hertz 60 for 60 hertz	SI
41020	Phase Rotation Read and Write: 1 for ABC rotation 2 for ACB rotation	SI
41021	Phase CT Ratio	INT
41022	Neutral CT Ratio Read and Write: 1 to 50,000	INT

Breaker Duty Setting Parameters

41092	Breaker Duty Type Read and Write: 0 for Off 1 for Sum I, primary centi-amps 2 for Sum I ² , primary centi-amps	FP
41093-94	Maximum Breaker Duty Read and Write: 0 to 4.29E+09 amps	FP
41096	Programmable Breaker Alarm #1 Mode	INT
41099	Programmable Breaker Alarm #2 Mode	INT
41102	Programmable Breaker Alarm #3 Mode Read and Write: 0 for Disabled 1 for Percent duty 2 for Breaker operations 3 for Clearing time	INT
41097-98	Programmable Breaker Alarm #1 Limit	FP
41100-01	Programmable Breaker Alarm #2 Limit	FP
41103-04	Programmable Breaker Alarm #3 Limit 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	FP

Relay Data Setting Parameters

41259-60	Phase Demand Alarm Level	FP
41261-62	Neutral Demand Alarm Level	FP
41263-64	Negative-Sequence Demand Alarm Level Read and Write: 0 to 16.0 amps	FP
41265	Major Alarm Mask MSBs	BM(16)
41267	Minor Alarm Mask MSBs	BM(16)
41269	Logic Alarm Mask MSBs Read and Write: Bits 15 to 10 - Spare Bit 9 - Changes Lost alarm Bit 8 - Logic=None alarm Bit 7 - Fault Record Time Out	BM(16)

- 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

41266	Major Alarm Mask LSBs	BM(16)
41268	Minor Alarm Mask LSBs	BM(16)
41270	Logic Alarm Mask LSBs	BM(16)
	Read only:	
	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 alarm	
	Bit 2 - Recloser fail alarm	
	Bit 1 - Breaker fail alarm	
	Bit 0 - Trip 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:	
	1 to 60 minutes	
	0 to disable	
41284	Output Hold Mask	BM(8)
	Read and Write:	
	Bit 7 - Output 7 Status	
	Bit 6 - Output 6 Status	
	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 Read and Write: Bit 15 - BF Bit 14 - 162 Bit 13 - 62 Bit 12 - 50TQ Bit 11 - 50TN Bit 10 - 50TC Bit 9 - 50TB Bit 8 - 50TA Bit 7 - Spare Bit 6 - Spare Bit 5 - Spare Bit 4 - 150TQ Bit 3 - 150TN Bit 2 - 150TC Bit 1 - 150TB Bit 0 - 150TA	BM(16)
41288	Target Mask LSBs Read and Write: Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 51Q Bit 11 - 51N Bit 10 - 51C Bit 9 - 51B Bit 8 - 51A Bits 7-0 - Spare	BM(16)
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 1.5.2	
41435	Filter Type for Phase DSP	ASC(1)
41436	Filter Type for Neutral DSP	ASC(1)
	Read and Write: F for Fundamental A for Average R for True RMS	

Custom Logic Setting Parameters

41465-68	User Custom Logic Name 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.	ASC(8)
41469-72	Current Active Logic Scheme Read: Current active logic name. Write: Name of logic scheme to which you desire to change.	ASC(8)
41473-76	Custom Logic Name Read only: Custom logic name.	ASC(8)
41477-80	Standard Logic #1 Name Read only: Standard logic name #1.	ASC(8)
41481-84	Standard Logic #2 Name Read only: Standard logic name #2.	ASC(8)
41485-88	Standard Logic #3 Name Read only: Standard logic name #3.	ASC(8)
41489-92	Standard Logic #4 Name Read only: Standard logic name #4.	ASC(8)
41493-96	Standard Logic #5 Name Read only: Standard logic name #5.	ASC(8)
41497-500	Standard Logic #6 Name Read only: Standard logic name #6.	ASC(8)
41501-04	Standard Logic #7 Name Read only: Standard logic name #7.	ASC(8)

System Labels and ID Setting Parameters

All are Read and Write of ASCII strings.

Report Parameters

47274-77	Model Number	ASC(8)
47282-89	Application SW Version # / Date	ASC(16)
47296-302	Boot SW Version # / Date	ASC(14)
47310-16	Serial Number	ASC(13)
47324-34	Style Number	ASC(21)
	Read Only: ASCII strings	

47364	Date and Time - Day Read and Write: Any value (days since 01/01/1984)	INT
47365-66	Date and Time - milliseconds Read and Write: 0 to 86,399,999 milliseconds	LI
47367	System Status (Logic Var 0 to 15) Read only: Bit 15 - 150TQ picked-up Bit 14 - 50TQ picked-up Bit 13 - 150NT picked-up Bit 12 - 50TN picked-up Bit 11 - 150PT picked-up Bit 10 - 50TP picked-up Bit 9 - 51Q tripped Bit 8 - 51N tripped Bit 7 - 51P tripped Bit 6 - BF tripped Bit 5 - 150TQ tripped Bit 4 - 50TQ tripped Bit 3 - 150TN tripped Bit 2 - 50TN tripped Bit 1 - 150TP tripped Bit 0 - 50TP tripped	BM(16)
47368	System Status (Logic Var 16 to 31) Read only: Bit 15 - Logic always false Bit 14 - 79 block output Bit 13 - 79 reclose fail Bit 12 - 79 lockout Bit 11 - 79 enable / active / block tap changer Bit 10 - 79 close Bit 9 - Serial controlled switch 343 Bit 8 - Serial controlled switch 243 Bit 7 - Serial controlled switch 143 Bit 6 - Serial controlled switch 43 Bit 5 - 162 tripped Bit 4 - 62 tripped Bit 3 - 51Q picked-up Bit 2 - 51N picked-up Bit 1 - 51P picked-up Bit 0 - BF picked-up	BM(16)
47369	System Status (Logic Var 32 to 47) 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	BM(16)

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) Read only: Bit 15 - Setting Group 3 active Bit 14 - Setting Group 2 active Bit 13 - Setting Group 1 active Bit 12 - Setting Group 0 active Bit 11 - Output 1 trip coil monitor Bit 10 - Alarm minor Bit 9 - Alarm major Bit 8 - Alarm logic Bit 7 - HMI reset key Bit 6 - 101 slip contact Bit 5 - 101 close Bit 4 - 101 trip Bit 3 - Input 4 status Bit 2 - Input 3 status Bit 1 - Input 2 status Bit 0 - Input 1 status	BM(16)
47373	Current Active Group Setting Read only: 0 to 3	SI
47374	Current Group Control Setting Read only: ASCII character 0, 1, 2, 3, L	ASC(1)
47375	Current Output Control Settings (OutputPulse0) MSBs Read only: Bits 15 - 8 Spare Bit 7 - Output 7 pulse low 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	BM(16)
47376	Current Output Control Settings (OutputPulse1) LSBs Read only: Bits 15 - 8 Spare Bit 7 - Output 7 pulse high 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	BM(16)
47377	Current Output Control Settings (OutputLatch0) MSBs Read only: Bits 15 to 8 - Spare Bit 7 - Output 7 latch low Bit 6 - Output 6 latch low Bit 5 - Output 5 latch low	BM(16)

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 Read only: Bits 15 to 8 - Spare Bit 7 - Output 7 latch high 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	BM(16)
47379	Current Output Contact Status Read only: Bits 15 to 8 - Spare Bit 7 - Output 7 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	BM(16)
47380	Active Alarm Flags (SumFlags) MSBs Read only: Bits 15 to 0 - Spare	BM(16)
47381	Active Alarm Flags (SumFlags) LSBs Read only: Bits 15 to 10 - Spare 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	BM(16)
47382	Active Alarm Flags (ProgAlarms) MSBs Read Only: Bits 15 to 10 - Spare Bit 9 - Changes Lost alarm Bit 8 - Logic = None alarm Bit 7 - Fault Record Time Out 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	BM(16)

47383	<p>Active Alarm Flags (ProgAlarms) LSBs</p> <p>Read Only:</p> <ul style="list-style-type: none"> 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 - Excessive unbalance alarm, 50TQ unbalance output picked up Bit 8 - Neutral demand alarm, neutral demand maximum exceeded Bit 7 - Phase demand alarm, phase demand maximum exceeded Bit 6 - Breaker alarm #3 Bit 5 - Breaker alarm #2 Bit 4 - Breaker alarm #1 Bit 3 - Recloser lockout alarm Bit 2 - Recloser fail alarm Bit 1 - Breaker fail alarm Bit 0 - Trip Circuit Monitor alarm 	BM(16)
47384	<p>Target Status MSBs</p> <p>Read:</p> <ul style="list-style-type: none"> Bit 15 - BF Bit 14 - 162 Bit 13 - 62 Bit 12 - 50TQ Bit 11 - 50TN Bit 10 - 50TC Bit 9 - 50TB Bit 8 - 50TA Bit 7 - Spare Bit 6 - Spare Bit 5 - Spare Bit 4 - 150TQ Bit 3 - 150TN Bit 2 - 150TC Bit 1 - 150TB Bit 0 - 150TA <p>Write: Any value to either register to reset all.</p>	BM(16)
47385	<p>Target Status LSBs</p> <p>Read:</p> <ul style="list-style-type: none"> Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 51Q Bit 11 - 51N Bit 10 - 51C Bit 9 - 51B Bit 8 - 51A Bits 7-0 - Spare <p>Write: Any value to either register to reset all.</p>	BM(16)
47388	<p>Current Breaker Status</p> <p>Read only:</p> <ul style="list-style-type: none"> O for Open C for Closed D for Disabled (off) 	ASC(1)
47389-92	<p>Current Active Logic Scheme</p> <p>Read Only:</p> <ul style="list-style-type: none"> Current active logic name. 	ASC(8)

47393	Reclose Status Read only: 0 for Off 1 for Timing reclose #1 2 for Timing reclose #2 3 for Timing reclose #3 4 for Timing reclose #4 5 for Wait 6 for Lockout 7 for Reset 8 for Timing fail 9 for Timing reset	
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 to 200%	
47400-01	Breaker Operations Counter Read and Write: 0 to 99,999	LI
47410-11	Yesterday's Peak Demand Current - Phase A	FP
47415-16	Yesterday's Peak Demand Current - Phase B	FP
47420-21	Yesterday's Peak Demand Current - Phase C	FP
47425-26	Yesterday's Peak Demand Current - Neutral	FP
47430-31	Yesterday's Peak Demand Current - Neg-Seq	FP
	Read only: Any value (amps)	
47412	Yesterday's Peak Demand Timestamp - Day	INT
47417	Yesterday's Peak Demand Timestamp - Day	INT
47422	Yesterday's Peak Demand Timestamp - Day	INT
47427	Yesterday's Peak Demand Timestamp - Day	INT
47432	Yesterday's Peak Demand Timestamp - Day	INT
	Read only: Any value (days since 01/01/1984).	
47413-14	Yesterday's Peak Demand Timestamp - Millisecond	LI
47418-19	Yesterday's Peak Demand Timestamp - Millisecond	LI
47423-24	Yesterday's Peak Demand Timestamp - Millisecond	LI
47428-29	Yesterday's Peak Demand Timestamp - Millisecond	LI
47433-34	Yesterday's Peak Demand Timestamp - Millisecond	LI
	Read only: 0 to 86,399,999 milliseconds.	
47435-36	Today's Peak Demand Current - Phase A	FP
47440-41	Today's Peak Demand Current - Phase B	FP
47445-46	Today's Peak Demand Current - Phase C	FP
47450-51	Today's Peak Demand Current - Neutral	FP
47455-56	Today's Peak Demand Current - Neg-Seq	FP
	Read only: Any value (amps)	

47437	Today's Peak Demand Timestamp - Day	INT
47442	Today's Peak Demand Timestamp - Day	INT
47447	Today's Peak Demand Timestamp - Day	INT
47452	Today's Peak Demand Timestamp - Day	INT
47457	Today's Peak Demand Timestamp - Day	INT
	Read only:	
	Any value (days since 01/01/1984).	
47438-39	Today's Peak Demand Timestamp - Millisecond	LI
47443-44	Today's Peak Demand Timestamp - Millisecond	LI
47448-49	Today's Peak Demand Timestamp - Millisecond	LI
47453-54	Today's Peak Demand Timestamp - Millisecond	LI
47458-59	Today's Peak Demand Timestamp - Millisecond	LI
	Read only:	
	0 to 86,399,999 milliseconds.	
47460-61	Peak Since Reset Demand Current - Phase A	FP
47465-66	Peak Since Reset Demand Current - Phase B	FP
47470-71	Peak Since Reset Demand Current - Phase C	FP
47475-76	Peak Since Reset Demand Current - Neutral	FP
47480-81	Peak Since Reset Demand Current - Neg-Seq	FP
	Read only:	
	Any value (amps)	
47462	Peak Since Reset Demand Timestamp - Day	INT
47467	Peak Since Reset Demand Timestamp - Day	INT
47472	Peak Since Reset Demand Timestamp - Day	INT
47477	Peak Since Reset Demand Timestamp - Day	INT
47482	Peak Since Reset Demand Timestamp - Day	INT
	Read only:	
	Any value (days since 01/01/1984).	
47463-64	Peak Since Reset Demand Timestamp - Millisecond	LI
47468-69	Peak Since Reset Demand Timestamp - Millisecond	LI
47473-74	Peak Since Reset Demand Timestamp - Millisecond	LI
47478-79	Peak Since Reset Demand Timestamp - Millisecond	LI
47483-84	Peak Since Reset Demand Timestamp - Millisecond	LI
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.	

Fault Template (FLT)

47514	Fault Date and Time - Day Read only: Any value (days since 01/01/1984).	INT
47515-16	Fault Date and Time - Milliseconds Read only: 0 to 86,399,999 milliseconds	LI
47517	Fault Event Type 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)	BM(16)
47518	Fault Active Group Read only: 0 to 3	SI
47519	Fault Targets MSBs Read only: Bit 15 - BF Bit 14 - 162 Bit 13 - 62 Bit 12 - 50TQ Bit 11 - 50TN Bit 10 - 50TC Bit 9 - 50TB Bit 8 - 50TA Bit 7 - Spare Bit 6 - Spare Bit 5 - Spare Bit 4 - 150TQ Bit 3 - 150TN Bit 2 - 150TC Bit 1 - 150TB Bit 0 - 150TA	BM(16)
47520	Fault Targets LSBs Read only: Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 51Q Bit 11 - 51N Bit 10 - 51C Bit 9 - 51B Bit 8 - 51A Bits 7-0 - Spare	BM(16)
47524	Fault Clearing Time Status Read only: 0 if Valid Fault Clearing Time (Registers 47525-26) value 1 if No pickup 2 if N/A; Out of range	SI

47525-26	Fault Clearing Time 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).	FP
47527	Fault Breaker Operate Time Status 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	SI
47528-29	Fault Breaker Operate Time 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).	FP
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 Neutral Current Magnitude	FP
47542-43	Fault Neg-Seq. Current Magnitude	FP
47545-46	Fault 3I0 Current Magnitude Read only: Value in amps	FP

Report Template (RPT)

47595-719	Report Text Read only: ASCII string (illegal message response generated for invalid Report Focus value).
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Metering Parameters

49720	Part Number Read only: 0 to 999	INT
49726-27	Phase A Current Magnitude	FP
49729-30	Phase B Current Magnitude	FP
49732-33	Phase C Current Magnitude	FP
49735-36	Neutral Current Magnitude	FP
49738-39	Neg-Seq Current Magnitude	FP
49741-42	3I0 Current Magnitude Read only: Value in amps	FP
49835-54	Error Details Read only: ASCII string	ASC(40)
49875-999	Contiguous Poll Block Read only: Mixed values	Mixed



SECTION 4 • ASCII CROSS REFERENCE

ASCII Command Versus Modbus® Register Cross Reference

ASCII Command	Modbus® Registers
A=<password>	40002-40005
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-OUT6	40152
CO-OUT7	40154
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-OUT6	40151
CS-OUT7	40153
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-IN	49735-49736
M-IQ	49738-49739
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

ASCII Command	Modbus® Registers
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-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-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
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-STAT	47367-47383,47388-47392
RG-TARG	47384-47385
RG-TIME=<time>	47365-47366
RG-VER	47274-47277,47324-47334,47282-47289,47296-47302,47310-47316
RG-ADDR1	47362
RG-ADDR2	47363
RG-GRPACTIVE	47373
RG-GRPCNTRL	47374
RG-LOGIC	47389
RG-OUTCNTRL	47375-47376,47377-47378
RG-OUTSTAT	47379
RS	47595-47719,40039
RS-#	47595-47719,40039,40040
RS-F#	47595-47719,40039,40040
RS-NEW	47595-47719,40039
RS=0	47493
S#-50TP=<pickup>,<time delay>,< reset time >	40269-40270,40271-40272,40323-40324
S#-50TN=<pickup>,<time delay>,<reset time>	40273-40274,40275-40276,40325-40326
S#-50TQ=<pickup>,<time delay>,< reset time >	40277-40278,40279-40280,40327-40328
S#-150TP=<pickup>,<time delay>,< reset time >	40281-40282,40283-40284,40329-40330
S#-150TN=<pickup>,<time delay>,< reset time >	40285-40286,40287-40288,40331-40332
S#-150TQ=<pickup>,<time delay>,< reset time >	40289-40290,40291-40292,40333-40334
S#-51P=<pickup>,<time dial>,<curve>	40305-40306,40307-40308,40309-40310
S#-51N=<pickup>,<time dial>,<curve>	40311-40312,40313-40314,40315-40316
S#-51Q=<pickup>,<time dial>.<curve>	40317-40318,40319-40320,40321-40322
S#-62=<time delay 1>,<time delay 2>	40359-40360,40361-40362
S#-162=<time delay 1>,<time delay 2>	40363-40364,40365-40366
S#-791=<first auto reclose delay>	40406-40407
S#-792=<second auto reclose delay>	40408-40409
S#-793=<third auto reclose delay>	40410-40411
S#-794=<fourth auto reclose delay>	40412-40413
S#-79R=<reset time delay>	40414-40415

ASCII Command	Modbus® Registers
S#-79F=<reclose fail time delay>	40416-40417
S#-79M=<max reclose time>	40418-40419
S#-79SCB=<sequence control blocking>	40420
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-DIN=<alarm level>	41261-41262
SA-DIP=<alarm level>	41259-41260
SA-DIQ=<alarm level>	41263-41264
SA-LGC=<alarm number>	41269-41270
SA-MAJ=<alarm number>	41265-41266
SA-MIN=<alarm number>	41267-41268
SA-RESET=<reset Alarm Logic>	41419-41422,41427-41430
SB-DUTY=<mode>,<dmax.>,<blk bkr logic>	41092,41093-41094,41110-41115,41118-41123
SB-LOGIC=<breaker close logic equation>, <breaker label>	41126-41129,41134-41137,41142-41149
SG-CLK=<date format>,<time format><dst enable>	41272,41273,41274
SG-COM0=<baud rate>,<flow control>, <page length>,<ack>	40962,40964,40965,40966
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-DIN=<alarm interval>,<calculation method>	41276,41279
SG-DIP=<alarm interval>,<calculation method>	41275,41278
SG-DIQ=<alarm interval>,<calculation method>	41277,41280
SG-DSPN=<filter>	41436
SG-DSPP=<filter>	41435
SG-FREQ=<frequency>	41019
SG-HOLD=<output hold enable>	41284
SG-ID=<relay ID>,<station ID>	43438-43442,43443-43457
SG-CLK=<date format>,<clock format><daylight savings format>	41272,41273,41274
SG-IN1=<input recognition>,<input debounce >	40619,40620
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>	41021
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-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

ASCII Command	Modbus® Registers
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-150TN=<mode>,<block logic equation>	41573,41574-41579,41582-41587
SL-150TP=<mode>,<block logic equation>	41556,41557-41562,41565-41570
SL-150TQ=<mode>,<block logic equation>	41590,41591-41596,41599-41604
SL-162=<mode>,<ini logic equation>,<block logic equation>	41877,41878-41883,41886-41891,41894-899,41902-41907
SL-50TN=<mode>,<block logic equation>	41522,41523-41528,41531-41536
SL-50TP=<mode>,<block logic equation>	41505,41506-41511,41514-41519
SL-50TQ=<mode>,<block logic equation>	41539,41540-41545,41548-41553
SL-51N=<mode>,<block logic equation>	41708,41709-41714,41717-41722
SL-51P=<mode>,<block logic equation>	41691,41692-41697,41700-41705
SL-51Q=<mode>,<block logic equation>	41725,41726-41731,41734-41739
SL-79=<mode>,<RI logic>,<Status logic>,<Wait logic>,<Lockout logic>	43173,43174-43179,43182-43187,43190-43195,43198-43203,43206-43211,43214-43219,43222-43227,43230-43235
SL-62=<mode>,< ini logic equation>,<block logic equation>	41844,41845-41850,41853-41858,41861-41866,41869-41874
SL-BF=<mode>,<ini logic equation>,<block logic equation>	41658,41659-41664,41667-41672,41675-41680,41683-41688
SL-GROUP=<mode>,<D0 logic equation>,<D1 logic equation>,<D2 logic equation>,<D3 logic equation>,<auto logic equation>	42010,42027-42032,42035-42040,42043-42048,42051-42056,42059-42064,42067-42072,42075-42080,42083-42088,42011-42016,42019-42024
SL-N=<name>	41465-41468
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

ASCII Command	Modbus® Registers
SL-VO8=<boolean logic equation>	42653,42654-42659,42662-42667,42670-42675,42678-42683,42686-42691,42694-42699,42702-42707,42710-42715
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>	42913,42914-42919,42922-42927,42930-42935,42938-42943,42946-42951,42954-42959,42962-42967,42970-42975
SL-VO13=<boolean logic equation>	42978,42979-42984,42987-42992,42995-43000,43003-42008,43011-43016,43019-42024,43027-42032,43035-42040
SL-VO14=<boolean logic equation>	43043,43044-42049,43052-42057,43060-42065,43068-42073,43076-43081,43084-42089,43092-42097,43100-42105
SL-VO15=<boolean logic equation>	43108,43109-42114,43117-42122,43125-42130,43133-42138,43141-43146,43149-42154,43157-42162,43165-42170
SL: <custom logic>,<logic1>,<logic2>,<logic3>,<logic4>,<logic5>,<logic6>,<logic7>	41473-41478,41477-41482,41481-41486,41485-41490,41489-41494,41493-41498,41497-41502,41501-41506
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-79ZONE=<pickup logic>	40887-40892,40895-40900
SP-BF=<time delay>	40606-40607
SP-CURVE=<a>,,<c>,<n>,<r>	40608-40609,40610-40611,40612-40613,40614-40615,40616-40617
SP-GROUP1=<switch time>,<switch level>,<return time>,<return level>,<prot element>	40872,40873,40874,40875,40876

ASCII Command	Modbus® Registers
SP-GROUP2=<switch time>,<switch level>,<return time>,<return level>,,<prot element>	40877,40878,40879,40880,40881
SP-GROUP3=<switch time>,<switch level>,<return time>,<return level>,<prot element>	40882,40883,40884,40885,40886

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