INSTRUCTION MANUAL

FOR

CURRENT DIFFERENTIAL SYSTEM
BE1-CDS220

MODBUS® PROTOCOL

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INTRODUCTION

This instruction manual provides detailed information about the BE1-CDS220 Current Differential System with the Modbus® Protocol.

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

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REVISION HISTORY

The following information provides a historical summary of the changes made to this instruction manual (9313900991). Revisions are listed in reverse chronological order.

Manual Revision and Date	Change
E, 09/17	• Added caution box about nonvolatile memory.
D, 10/09	• Changed registers 40036-40040 to Read Only. • Added bits 1 and 2 to register 47520 for 62/162 functions. • Split manual into sections 1-4. • Added manual part number and revision to footers. • Updated front cover drawing.
C, 04/06	• Removed “write” capability from some registers. • Renumbered *System Labels and ID Setting Parameters.*
B, 03/01	• Added Password Security features and corrected Floating Point Data Format text and Table 3.
A, 04/00	• Changed the publication number of this manual from 9313900992 to 9313900991 to coordinate the manual number with the published bulletin and the AS400 database. • Changed the front cover to show Publication 9313900991, Revision A. • Added *Revision History* to the introduction. • Changed 47274-77, ASC(8) to 47275-78, ASC(10).
—, 11/99	• Initial release.

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SECTION 1 • GENERAL INFORMATION

Introduction

This document describes the Modbus® communications protocol employed by BE1-CDS220 relays and how to exchange information with BE1-CDS220 relays over a Modbus® network. The BE1-CDS220 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-CDS220) 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-CDS220 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-CDS220, 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-CDS220 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-CDS220 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-CDS220 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-CDS220 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-CDS220 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-CDS220 Modbus supported baud rates are 2400, 4800, 9600 and 19200. The factory default baud rate is 9600.

BE1-CDS220 supports both RS-232-C and RS-485 compatible serial interfaces. Both interfaces are accessible from the rear panel of the BE1-CDS220. 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-CDS220 requires an inter-byte latency of 3.5 character times before considering the message complete.

Once a valid query is received, the BE1-CDS220 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
1200	32.1	1.17	2.35
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-CDS220 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-CDS220 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-CDS220 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-CDS220 Instruction Manual (9313900990) for further details.

Detailed Message Query and Response

A detailed description of BE1-CDS220 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-CDS220 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-CDS220 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-CDS220 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-CDS220 continues to monitor all queries. The BE1-CDS220 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-CDS220 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-CDS220 will perform the write when the device address is the same as the BE1-CDS220 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-CDS220 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-CDS220 will perform the write when the device address is the same as the BE1-CDS220 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-CDS220 data varies from one to four bytes in length. Single byte data resides in the holding register least-significant byte with the most-significant byte set to zero. Floating-point data and long integer data (each 32-bit in length) place the two most-significant bytes in the higher holding register address of the associated register pair.

Floating Point Data Format (FP)

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

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

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

Table 1-3. Floating Point Format

Sign	Exponent + 127	Mantissa
1 bit	8 bits	23 bits

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

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

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

The same byte alignments are required to write.

Long Integer Data Format (LI)

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

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

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

The same byte alignments are required to write.

Integer Data Format (INT)

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

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

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

The same byte alignments are required to write.

Short Integer Data Format (SI)

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

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

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

The same byte alignments are required to write.

ASCII Character Data Format (ASC (1))

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

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

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

The same byte alignments are required to write.

ASCII String Data Format (ASC (x))

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

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

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

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

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

The same byte alignments are required to write.

Bit Mapped Data Format (BM (x))

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

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

Holding Register	Value
K (Hi Byte)	0x12
K (Lo Byte)	0x34
K+1 (Hi Byte)	0x56
K+1 (Lo Byte)	0x78
K+2 (Hi Byte)	0x9A
K+2 (Lo Byte)	0xBC
K+3 (Hi Byte)	0xDE
K+3 (Lo Byte)	0xF0

CRC Error Check

This field contains a two-byte CRC value for transmission error detection. The master first calculates the CRC and appends it to the query message. The BE1-CDS220 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-CDS220 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.

The BE1-CDS220 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-CDS220 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-CDS220 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 12 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-CDS220 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 it’s corresponding assignment register 40746), reading register 49876 and 77 for the Time (as specified in their corresponding assignment registers 40747 and 48), reading register 49878 for the Fault Indicator (as specified in it’s corresponding assignment register 40749) and reading register 49879 for the Breaker Status (as specified in it’s corresponding assignment register 40750).

Exception Code Enhancement Registers

When a BE1-CDS220 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-CDS220 Parameters into Modicon Holding Register Address Space

General

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

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

Conventions

The *Data Format* column uses the following abbreviations:

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

The Notes column uses the following abbreviations:

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

Register Table - Ordered by Register Number

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Session Parameters				
40001	Exit	R W	ASC(1)	PS
40002-05	Access Password	R W	ASC(8)	PS
40006	Access Request	R W	BM(16)	PS
Template Parameters				
40036	Settings Group Selection	R –	SI	
40038	Fault Selection	R –	SI	
40039	Report Selection	R –	SI	
40040	Report Focus	R –	INT	
Global Parameters				
40080-83	Global Password	R –	ASC(8)	PW
40084	Global Path	R –	BM(8)	PW
40085-88	Setting Password	R –	ASC(8)	PW
40089	Setting Path	R –	BM(8)	PW
40090-93	Control Password	R –	ASC(8)	PW
40094	Control Path	R –	BM(8)	PW
40095-98	Report Password	R –	ASC(8)	PW
40099	Report Path	R –	BM(8)	PW
Control Parameters				
40117	Select Group	R W	ASC(1)	
40118	Operate Group	R W	ASC(1)	
40119	Select Virtual Selector Switch 43	R W	ASC(1)	
40120	Operate Virtual Selector Switch 43	R W	ASC(1)	
40121	Select Virtual Selector Switch 143	R W	ASC(1)	
40122	Operate Virtual Selector Switch 143	R W	ASC(1)	
40123	Select Virtual Selector Switch 243	R W	ASC(1)	
40124	Operate Virtual Selector Switch 243	R W	ASC(1)	
40125	Select Virtual Selector Switch 343	R W	ASC(1)	
40126	Operate Virtual Selector Switch 343	R W	ASC(1)	
40127	Select Virtual Selector Switch 443	R W	ASC(1)	
40128	Operate Virtual Selector Switch 443	R W	ASC(1)	
40129	Select Virtual Selector Switch 543	R W	ASC(1)	
40130	Operate Virtual Selector Switch 543	R W	ASC(1)	
40131	Select Virtual Selector Switch 643	R W	ASC(1)	
40132	Operate Virtual Selector Switch 643	R W	ASC(1)	
40133	Select Virtual Selector Switch 743	R W	ASC(1)	
40134	Operate Virtual Selector Switch 743	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)	
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)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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)	
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)	
Group Setting Parameters				
40269-70	50TP Pickup	R –	FP	GRP
40271-72	50TP Time Delay	R –	LI	GRP
40273-74	50TN Pickup	R –	FP	GRP
40275-76	50TN Time Delay	R –	LI	GRP
40277-78	50TQ Pickup	R –	FP	GRP
40279-80	50TQ Time Delay	R –	LI	GRP
40281-82	150TP Pickup	R –	FP	GRP
40283-84	150TP Time Delay	R –	LI	GRP
40285-86	150TN Pickup	R –	FP	GRP
40287-88	150TN Time Delay	R –	LI	GRP
40289-90	150TQ Pickup	R –	FP	GRP
40291-92	150TQ Time Delay	R –	LI	GRP
40293-94	250TP Pickup	R –	FP	GRP
40295-96	250TP Time Delay	R –	LI	GRP
40297-98	250TN Pickup	R –	FP	GRP
40299-300	250TN Time Delay	R –	LI	GRP
40301-02	250TQ Pickup	R –	FP	GRP
40303-04	250TQ Time Delay	R –	LI	GRP
40305-06	51P Pickup	R –	FP	GRP
40307-08	51P Time Dial	R –	FP	GRP
40309-10	51P Curve Type	R –	ASC(3)	GRP
40311-12	51N Pickup	R –	FP	GRP
40313-14	51N Time Dial	R –	FP	GRP
40315-16	51N Curve Type	R –	ASC(3)	GRP
40317-18	51Q Pickup	R –	FP	GRP
40319-20	51Q Time Dial	R –	FP	GRP
40321-22	51Q Curve Type	R –	ASC(3)	GRP
40323-24	151P Pickup	R –	FP	GRP
40325-26	151P Time Dial	R –	FP	GRP
40327-28	151P Curve Type	R –	ASC(3)	GRP
40329-30	151N Pickup	R –	FP	GRP
40331-32	151N Time Dial	R –	FP	GRP
40333-34	151N Curve Type	R –	ASC(3)	GRP
40335-36	151Q Pickup	R –	FP	GRP
40337-38	151Q Time Dial	R –	FP	GRP
40339-40	151Q Curve Type	R –	ASC(3)	GRP
40341-42	251P Pickup	R –	FP	GRP
40343-44	251P Time Dial	R –	FP	GRP
40345-46	251P Curve Type	R –	ASC(3)	GRP

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
40347-48	251N Pickup	R –	FP	GRP
40349-50	251N Time Dial	R –	FP	GRP
40351-52	251N Curve Type	R –	ASC(3)	GRP
40353-54	251Q Pickup	R –	FP	GRP
40355-56	251Q Time Dial	R –	FP	GRP
40357-58	251Q Curve Type	R –	ASC(3)	GRP
40359-60	62 Time Delay 1	R –	LI	GRP
40361-62	62 Time Delay 2	R –	LI	GRP
40363-64	162 Time Delay 1	R –	LI	GRP
40365-66	162 Time Delay 2	R –	LI	GRP
40375-76	87T Minimum Pickup	R –	FP	GRP
40377	87T Restraint Slope	R –	INT	GRP
40378-79	87T 2nd Harmonic Threshold	R –	FP	GRP
40380-81	87T 5th Harmonic Threshold	R –	FP	GRP
40382	87T Unrestrained Pickup	R –	INT	GRP
40383	87T 2nd Harmonic Sharing	R –	INT	GRP
40384-85	87ND CT CKT G Tap	R –	FP	GRP
40386-87	87ND Calculated Neutral Tap	R –	FP	GRP
40388-89	87ND Minimum Pickup	R –	FP	GRP
40390	87ND Restraint Slope	R –	INT	GRP
40391	87ND Restraint Time Delay	R –	INT	GRP
40392-93	Transformer MVA Rating	R –	FP	GRP
40394-95	87T CT CKT #1 Tap	R –	FP	GRP
40396-97	Transformer Tap 1 KV Rating	R –	FP	GRP
40398-99	87T CT CKT #2 Tap	R –	FP	GRP
40400-01	Transformer Tap 2 KV Rating	R –	FP	GRP
Global Setting Parameters				
40606-07	Breaker Fail Time Delay	R –	LI	
40608-09	Programmable 51 Curve Constant A	R –	FP	
40610-11	Programmable 51 Curve Constant B	R –	FP	
40612-13	Programmable 51 Curve Constant C	R –	FP	
40614-15	Programmable 51 Curve Constant N	R –	FP	
40616-17	Programmable 51 Curve Constant R	R –	FP	
40618	Input 1 Contact Recognition Time Delay	R –	SI	
40619	Input 1 Contact Debounce Time Delay	R –	SI	
40620	Input 2 Contact Recognition Time Delay	R –	SI	
40621	Input 2 Contact Debounce Time Delay	R –	SI	
40622	Input 3 Contact Recognition Time Delay	R –	SI	
40623	Input 3 Contact Debounce Time Delay	R –	SI	
40624	Input 4 Contact Recognition Time Delay	R –	SI	
40625	Input 4 Contact Debounce Time Delay	R –	SI	
40626	Input 5 Contact Recognition Time Delay	R –	SI	
40627	Input 5 Contact Debounce Time Delay	R –	SI	
40628	Input 6 Contact Recognition Time Delay	R –	SI	
40629	Input 6 Contact Debounce Time Delay	R –	SI	
40630	Input 7 Contact Recognition Time Delay	R –	SI	
40631	Input 7 Contact Debounce Time Delay	R –	SI	
40632	Input 8 Contact Recognition Time Delay	R –	SI	
40633	Input 8 Contact Debounce Time Delay	R –	SI	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Contiguous Poll Block				
40746-870	Contiguous Poll Block Assignments	R W	INT	
Setting Group Control				
40871	Setting Group Control On Time	R –	INT	
40872	Setting Group 1 Automatic Control Switch Time	R –	SI	
40873	Setting Group 1 Automatic Control Switch Level	R –	SI	
40874	Setting Group 1 Automatic Control Return Time	R –	SI	
40875	Setting Group 1 Automatic Control Return Level	R –	SI	
40876	Setting Group 1 Tracking Element	R –	INT	
40877	Setting Group 2 Automatic Control Switch Time	R –	SI	
40878	Setting Group 2 Automatic Control Switch Level	R –	SI	
40879	Setting Group 2 Automatic Control Return Time	R –	SI	
40880	Setting Group 2 Automatic Control Return Level	R –	SI	
40881	Setting Group 2 Tracking Element	R –	INT	
40882	Setting Group 3 Automatic Control Switch Time	R –	SI	
40883	Setting Group 3 Automatic Control Switch Level	R –	SI	
40884	Setting Group 3 Automatic Control Return Time	R –	SI	
40885	Setting Group 3 Automatic Control Return Level	R –	SI	
40886	Setting Group 3 Tracking Element	R –	INT	
Serial Port Setting Parameters				
40962	Serial Port 0 Baud Rate	R –	INT	
40964	Serial Port 0 Software Flow Control	R –	SI	
40965	Serial Port 0 Page Length	R –	SI	
40966	Serial Port 0 Acknowledgement Format	R –	SI	
40971	Serial Port 1 Baud Rate	R –	INT	
40972	Serial Port 1 Relay Address	R –	INT	
40973	Serial Port 1 Software Flow Control	R –	SI	
40974	Serial Port 1 Page Length	R –	SI	
40975	Serial Port 1 Acknowledgement Format	R –	SI	
40980	Serial Port 2 Baud Rate	R –	INT	
40981	Serial Port 2 Relay Address	R –	INT	
40986	Serial Port 2 Modbus™ Parity	R –	SI	
40987	Serial Port 2 Modbus™ Remote Delay	R –	SI	
40988	Serial Port 2 Modbus™ Stop Bits	R –	SI	
40989	Modbus™ Password Security	R –	SI	
System Data Setting Parameters				
41019	System Frequency	R –	SI	
41020	Phase Rotation	R –	SI	
41021	Phase CT Ratio CKT #1	R –	INT	
41022	Ground CT Ratio	R –	INT	
41023	Phase CT Ratio CKT #2	R –	INT	
41025	CT Connection, CT CKT #1	R –	INT	
41026	CT Connection, CT CKT #2	R –	INT	
41028	TX Connection CKT #1	R –	INT	
41029	TX Connection CKT #2	R –	INT	
41031	Ground Source CKT #1	R –	INT	
41032	Ground Source CKT #2	R –	INT	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Breaker Duty Setting Parameters				
41092	Breaker Duty Type	R –	SI	
41093-94	Maximum Breaker Duty	R –	FP	
41095	Breaker Duty CT CKT Number	R –	SI	
41096	Programmable Breaker Alarm #1 Mode	R –	INT	
41097-98	Programmable Breaker Alarm #1 Limit	R –	FP	
41099	Programmable Breaker Alarm #2 Mode	R –	INT	
41100-01	Programmable Breaker Alarm #2 Limit	R –	FP	
41102	Programmable Breaker Alarm #3 Mode	R –	INT	
41103-04	Programmable Breaker Alarm #3 Limit	R –	FP	
41110-15	Breaker Block Logic Mask	R –	BM(96)	
41118-23	Breaker Block Logic Term	R –	BM(96)	
41126-31	Breaker Close Logic Mask	R –	BM(96)	
41134-39	Breaker Close Logic Term	R –	BM(96)	
41142-49	Breaker Label	R –	ASC(16)	
Transformer Duty Setting Parameters				
41184	Transformer Duty Mode	R –	SI	
41185-86	Maximum Transformer Duty	R –	FP	
41187	Transformer Duty CT CKT Number	R –	SI	
41188	Programmable Transformer Alarm #1 Mode	R –	INT	
41189-90	Programmable Transformer Alarm #1 Limit	R –	FP	
41191	Programmable Transformer Alarm #2 Mode	R –	INT	
41192-93	Programmable Transformer Alarm #2 Limit	R –	FP	
41194	Programmable Transformer Alarm #3 Mode	R –	INT	
41195-96	Programmable Transformer Alarm #3 Limit	R –	FP	
41197-202	Transformer Block Logic Mask	R –	BM(96)	
41205-10	Transformer Block Logic Term	R –	BM(96)	
Relay Data Setting Parameters				
41259-60	Phase Demand Alarm Level	R –	FP	
41261-62	Neutral Demand Alarm Level	R –	FP	
41263-64	Negative-Sequence Demand1 Alarm Level	R –	FP	
41265-66	Major Alarm Mask	R –	BM(32)	
41267-68	Minor Alarm Mask	R –	BM(32)	
41269-70	Logic Alarm Mask	R –	BM(32)	
41271	87T Differential Alarm	R –	INT	
41272	Clock Format - Date	R –	ASC(1)	
41273	Clock Format - Time	R –	SI	
41274	Clock Format - Daylight Savings	R –	SI	
41275	Phase Demand Interval	R –	SI	
41276	Neutral Demand Interval	R –	SI	
41277	Negative-Sequence Demand Interval	R –	SI	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41278	Phase Demand Calculation Method	R –	ASC(1)	
41279	Neutral Demand Calculation Method	R –	ASC(1)	
41280	Negative-Sequence Demand Calculation Method	R –	ASC(1)	
41281	Phase Demand CT CKT Number	R –	ASC(1)	
41282	Neutral Demand CT CKT Number	R –	ASC(1)	
41283	Negative-Sequence Demand CT CKT Number	R –	ASC(1)	
41284	Output Hold Mask	R –	BM(8)	
41286	Load Profile Interval	R –	SI	
41287-90	Target Mask	R –	BM(64)	
41291-94	Programmable Screen #1	R –	ASC(7)	
41295-98	Programmable Screen #2	R –	ASC(7)	
41299-302	Programmable Screen #3	R –	ASC(7)	
41303-06	Programmable Screen #4	R –	ASC(7)	
41307-10	Programmable Screen #5	R –	ASC(7)	
41311-14	Programmable Screen #6	R –	ASC(7)	
41315-18	Programmable Screen #7	R –	ASC(7)	
41319-22	Programmable Screen #8	R –	ASC(7)	
41323-26	Programmable Screen #9	R –	ASC(7)	
41327-30	Programmable Screen #10	R –	ASC(7)	
41331-34	Programmable Screen #11	R –	ASC(7)	
41335-38	Programmable Screen #12	R –	ASC(7)	
41339-42	Programmable Screen #13	R –	ASC(7)	
41343-46	Programmable Screen #14	R –	ASC(7)	
41347-50	Programmable Screen #15	R –	ASC(7)	
41351-54	Programmable Screen #16	R –	ASC(7)	
41355-60	Fault Record Trigger (Trip) Logic Mask	R –	BM(96)	
41363-68	Fault Record Trigger (Trip) Logic Term	R –	BM(96)	
41371-76	Fault Record Trigger (Pickup) Logic Mask	R –	BM(96)	
41379-84	Fault Record Trigger (Pickup) Logic Term	R –	BM(96)	
41387-92	Fault Record Trigger (Logic) Logic Mask	R –	BM(96)	
41395-400	Fault Record Trigger (Logic) Logic Term	R –	BM(96)	
41403-08	Reset Target Logic Mask	R –	BM(96)	
41411-16	Reset Target Logic Term	R –	BM(96)	
41419-24	Reset Alarm Logic Mask	R –	BM(96)	
41427-32	Reset Alarm Logic Term	R –	BM(96)	
Custom Logic Setting Parameters				
41465-68	User Custom Logic Name	R –	ASC(8)	
41469-72	Current Active Logic Scheme	R –	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)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41505	Programmable 50TP Logic Mode	R –	INT	
41506-11	Programmable 50TP Block Logic Mask	R –	BM(96)	
41514-19	Programmable 50TP Block Logic Term	R –	BM(96)	
41522	Programmable 50TN Logic Mode	R –	INT	
41523-28	Programmable 50TN Block Logic Mask	R –	BM(96)	
41531-36	Programmable 50TN Block Logic Term	R –	BM(96)	
41539	Programmable 50TQ Logic Mode	R –	INT	
41540-45	Programmable 50TQ Block Logic Mask	R –	BM(96)	
41548-53	Programmable 50TQ Block Logic Term	R –	BM(96)	
41556	Programmable 150TP Logic Mode	R –	INT	
41557-62	Programmable 150TP Block Logic Mask	R –	BM(96)	
41565-70	Programmable 150TP Block Logic Term	R –	BM(96)	
41573	Programmable 150TN Logic Mode	R –	INT	
41574-79	Programmable 150TN Block Logic Mask	R –	BM(96)	
41582-87	Programmable 150TN Block Logic Term	R –	BM(96)	
41590	Programmable 150TQ Logic Mode	R –	INT	
41591-96	Programmable 150TQ Block Logic Mask	R –	BM(96)	
41599-604	Programmable 150TQ Block Logic Term	R –	BM(96)	
41607	Programmable 250TP Logic Mode	R –	INT	
41608-13	Programmable 250TP Block Logic Mask	R –	BM(96)	
41616-21	Programmable 250TP Block Logic Term	R –	BM(96)	
41624	Programmable 250TN Logic Mode	R –	INT	
41625-30	Programmable 250TN Block Logic Mask	R –	BM(96)	
41633-38	Programmable 250TN Block Logic Term	R –	BM(96)	
41641	Programmable 250TQ Logic Mode	R –	INT	
41642-47	Programmable 250TQ Block Logic Mask	R –	BM(96)	
41650-55	Programmable 250TQ Block Logic Term	R –	BM(96)	
41658	Programmable Breaker Failure Logic Mode	R –	INT	
41659-64	Programmable Breaker Failure Initiate Logic Mask	R –	BM(96)	
41667-72	Programmable Breaker Failure Initiate Logic Term	R –	BM(96)	
41675-80	Programmable Breaker Failure Block Logic Mask	R –	BM(96)	
41683-88	Programmable Breaker Failure Block Logic Term	R –	BM(96)	
41691	Programmable 51P Logic Mode	R –	INT	
41692-97	Programmable 51P Block Logic Mask	R –	BM(96)	
41700-05	Programmable 51P Block Logic Term	R –	BM(96)	
41708	Programmable 51N Logic Mode	R –	INT	
41709-14	Programmable 51N Block Logic Mask	R –	BM(96)	
41717-22	Programmable 51N Block Logic Term	R –	BM(96)	
41725	Programmable 51Q Logic Mode	R –	INT	
41726-31	Programmable 51Q Block Logic Mask	R –	BM(96)	
41734-39	Programmable 51Q Block Logic Term	R –	BM(96)	
41742	Programmable 151P Logic Mode	R –	INT	
41743-48	Programmable 151P Block Logic Mask	R –	BM(96)	
41751-56	Programmable 151P Block Logic Term	R –	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41759	Programmable 151N Logic Mode	R –	INT	
41760-65	Programmable 151N Block Logic Mask	R –	BM(96)	
41768-73	Programmable 151N Block Logic Term	R –	BM(96)	
41776	Programmable 151Q Logic Mode	R –	INT	
41777-82	Programmable 151Q Block Logic Mask	R –	BM(96)	
41785-90	Programmable 151Q Block Logic Term	R –	BM(96)	
41793	Programmable 251P Logic Mode	R –	INT	
41794-99	Programmable 251P Block Logic Mask	R –	BM(96)	
41802-07	Programmable 251P Block Logic Term	R –	BM(96)	
41810	Programmable 251N Logic Mode	R –	INT	
41811-16	Programmable 251N Block Logic Mask	R –	BM(96)	
41819-24	Programmable 251N Block Logic Term	R –	BM(96)	
41827	Programmable 251Q Logic Mode	R –	INT	
41828-33	Programmable 251Q Block Logic Mask	R –	BM(96)	
41836-41	Programmable 251Q Block Logic Term	R –	BM(96)	
41844	Programmable 62 Timer Logic Mode	R –	INT	
41845-50	Programmable 62 Timer Start Logic Mask	R –	BM(96)	
41853-58	Programmable 62 Timer Start Logic Term	R –	BM(96)	
41861-66	Programmable 62 Timer Block Logic Mask	R –	BM(96)	
41869-74	Programmable 62 Timer Block Logic Term	R –	BM(96)	
41877	Programmable 162 Timer Logic Mode	R –	INT	
41878-83	Programmable 162 Timer Start Logic Mask	R –	BM(96)	
41886-91	Programmable 162 Timer Start Logic Term	R –	BM(96)	
41894-99	Programmable 162 Timer Block Logic Mask	R –	BM(96)	
41902-07	Programmable 162 Timer Block Logic Term	R –	BM(96)	
41976	Programmable 87 Differential Logic Mode	R –	INT	
41977-82	Programmable 87 Differential Block Logic Mask	R –	BM(96)	
41985-90	Programmable 87 Differential Block Logic Term	R –	BM(96)	
41993	Programmable 87ND Differential Logic Mode	R –	INT	
41994-99	Programmable 87ND Diff. Block Logic Mask	R –	BM(96)	
42002-07	Programmable 87ND Diff. Block Logic Term	R –	BM(96)	
42010	Programmable Settings Group Logic Mode	R –	INT	
42011-16	Programmable Settings Group Block Logic Mask	R –	BM(96)	
42019-24	Programmable Settings Group Block Logic Term	R –	BM(96)	
42027-32	Programmable Settings Grp0 Select Logic Mask	R –	BM(96)	
42035-40	Programmable Settings Grp0 Select Logic Term	R –	BM(96)	
42043-48	Programmable Settings Grp1 Select Logic Mask	R –	BM(96)	
42051-56	Programmable Settings Grp1 Select Logic Term	R –	BM(96)	
42059-64	Programmable Settings Grp2 Select Logic Mask	R –	BM(96)	
42067-72	Programmable Settings Grp2 Select Logic Term	R –	BM(96)	
42075-80	Programmable Settings Grp3 Select Logic Mask	R –	BM(96)	
42083-88	Programmable Settings Grp3 Select Logic Term	R –	BM(96)	
42091	Programmable 43 Virtual Switch Logic Mode	R –	INT	
42092	Programmable 143 Virtual Switch Logic Mode	R –	INT	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42093	Programmable 243 Virtual Switch Logic Mode	R –	INT	
42094	Programmable 343 Virtual Switch Logic Mode	R –	INT	
42095	Programmable 443 Virtual Switch Logic Mode	R –	INT	
42096	Programmable 543 Virtual Switch Logic Mode	R –	INT	
42097	Programmable 643 Virtual Switch Logic Mode	R –	INT	
42098	Programmable 743 Virtual Switch Logic Mode	R –	INT	
42099	Programmable 101 Virtual Breaker Control Logic Mode	R –	INT	
42100	Programmable Circuit Monitor Logic Mode	R –	INT	
42101-06	Programmable Circuit Monitor Logic Mask	R –	BM(96)	
42109-14	Programmable Circuit Monitor Logic Term	R –	BM(96)	
42117-22	Programmable Circuit Monitor Status Logic Mask	R –	BM(96)	
42125-30	Programmable Circuit Monitor Status Logic Term	R –	BM(96)	
42133	Programmable Virtual Output A Term Count	R –	SI	
42134-39	Programmable Virtual Output A Logic Mask 1	R –	BM(96)	
42142-47	Programmable Virtual Output A Logic Term 1	R –	BM(96)	
42150-55	Programmable Virtual Output A Logic Mask 2	R –	BM(96)	
42158-63	Programmable Virtual Output A Logic Term 2	R –	BM(96)	
42166-71	Programmable Virtual Output A Logic Mask 3	R –	BM(96)	
42174-79	Programmable Virtual Output A Logic Term 3	R –	BM(96)	
42182-87	Programmable Virtual Output A Logic Mask 4	R –	BM(96)	
42190-95	Programmable Virtual Output A Logic Term 4	R –	BM(96)	
42198	Programmable Virtual Output 1 Term Count	R –	SI	
42199-204	Programmable Virtual Output 1 Logic Mask 1	R –	BM(96)	
42207-12	Programmable Virtual Output 1 Logic Term 1	R –	BM(96)	
42215-20	Programmable Virtual Output 1 Logic Mask 2	R –	BM(96)	
42223-28	Programmable Virtual Output 1 Logic Term 2	R –	BM(96)	
42231-36	Programmable Virtual Output 1 Logic Mask 3	R –	BM(96)	
42239-44	Programmable Virtual Output 1 Logic Term 3	R –	BM(96)	
42247-52	Programmable Virtual Output 1 Logic Mask 4	R –	BM(96)	
42255-60	Programmable Virtual Output 1 Logic Term 4	R –	BM(96)	
42263	Programmable Virtual Output 2 Term Count	R –	SI	
42264-694	Programmable Virtual Output 2 Logic Mask 1	R –	BM(96)	
42272-77	Programmable Virtual Output 2 Logic Term 1	R –	BM(96)	
42280-85	Programmable Virtual Output 2 Logic Mask 2	R –	BM(96)	
42288-93	Programmable Virtual Output 2 Logic Term 2	R –	BM(96)	
42296-301	Programmable Virtual Output 2 Logic Mask 3	R –	BM(96)	
42304-09	Programmable Virtual Output 2 Logic Term 3	R –	BM(96)	
42312-17	Programmable Virtual Output 2 Logic Mask 4	R –	BM(96)	
42320-25	Programmable Virtual Output 2 Logic Term 4	R –	BM(96)	
42328	Programmable Virtual Output 3 Term Count	R –	SI	
42329-34	Programmable Virtual Output 3 Logic Mask 1	R –	BM(96)	
42337-42	Programmable Virtual Output 3 Logic Term 1	R –	BM(96)	
42345-50	Programmable Virtual Output 3 Logic Mask 2	R –	BM(96)	
42353-58	Programmable Virtual Output 3 Logic Term 2	R –	BM(96)	
42361-66	Programmable Virtual Output 3 Logic Mask 3	R –	BM(96)	
42369-74	Programmable Virtual Output 3 Logic Term 3	R –	BM(96)	
42377-82	Programmable Virtual Output 3 Logic Mask 4	R –	BM(96)	
42385-90	Programmable Virtual Output 3 Logic Term 4	R –	BM(96)	
42393	Programmable Virtual Output 4 Term Count	R –	SI	
42394-99	Programmable Virtual Output 4 Logic Mask 1	R –	BM(96)	
42402-07	Programmable Virtual Output 4 Logic Term 1	R –	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42410-15	Programmable Virtual Output 4 Logic Mask 2	R –	BM(96)	
42418-23	Programmable Virtual Output 4 Logic Term 2	R –	BM(96)	
42426-31	Programmable Virtual Output 4 Logic Mask 3	R –	BM(96)	
42434-39	Programmable Virtual Output 4 Logic Term 3	R –	BM(96)	
42442-47	Programmable Virtual Output 4 Logic Mask 4	R –	BM(96)	
42450-55	Programmable Virtual Output 4 Logic Term 4	R –	BM(96)	
42458	Programmable Virtual Output 5 Term Count	R –	SI	
42459-64	Programmable Virtual Output 5 Logic Mask 1	R –	BM(96)	
42467-72	Programmable Virtual Output 5 Logic Term 1	R –	BM(96)	
42475-80	Programmable Virtual Output 5 Logic Mask 2	R –	BM(96)	
42483-88	Programmable Virtual Output 5 Logic Term 2	R –	BM(96)	
42491-96	Programmable Virtual Output 5 Logic Mask 3	R –	BM(96)	
42499-504	Programmable Virtual Output 5 Logic Term 3	R –	BM(96)	
42507-12	Programmable Virtual Output 5 Logic Mask 4	R –	BM(96)	
42515-20	Programmable Virtual Output 5 Logic Term 4	R –	BM(96)	
42523	Programmable Virtual Output 6 Term Count	R –	SI	
42524-29	Programmable Virtual Output 6 Logic Mask 1	R –	BM(96)	
42532-37	Programmable Virtual Output 6 Logic Term 1	R –	BM(96)	
42540-45	Programmable Virtual Output 6 Logic Mask 2	R –	BM(96)	
42548-53	Programmable Virtual Output 6 Logic Term 2	R –	BM(96)	
42556-61	Programmable Virtual Output 6 Logic Mask 3	R –	BM(96)	
42564-69	Programmable Virtual Output 6 Logic Term 3	R –	BM(96)	
42572-77	Programmable Virtual Output 6 Logic Mask 4	R –	BM(96)	
42580-85	Programmable Virtual Output 6 Logic Term 4	R –	BM(96)	
42588	Programmable Virtual Output 7 Term Count	R –	SI	
42589-94	Programmable Virtual Output 7 Logic Mask 1	R –	BM(96)	
42597-602	Programmable Virtual Output 7 Logic Term 1	R –	BM(96)	
42605-10	Programmable Virtual Output 7 Logic Mask 2	R –	BM(96)	
42613-18	Programmable Virtual Output 7 Logic Term 2	R –	BM(96)	
42621-26	Programmable Virtual Output 7 Logic Mask 3	R –	BM(96)	
42629-34	Programmable Virtual Output 7 Logic Term 3	R –	BM(96)	
42637-42	Programmable Virtual Output 7 Logic Mask 4	R –	BM(96)	
42645-50	Programmable Virtual Output 7 Logic Term 4	R –	BM(96)	
42653	Programmable Virtual Output 8 Term Count	R –	SI	
42654-59	Programmable Virtual Output 8 Logic Mask 1	R –	BM(96)	
42662-67	Programmable Virtual Output 8 Logic Term 1	R –	BM(96)	
42670-75	Programmable Virtual Output 8 Logic Mask 2	R –	BM(96)	
42678-83	Programmable Virtual Output 8 Logic Term 2	R –	BM(96)	
42686-91	Programmable Virtual Output 8 Logic Mask 3	R –	BM(96)	
42694-99	Programmable Virtual Output 8 Logic Term 3	R –	BM(96)	
42702-07	Programmable Virtual Output 8 Logic Mask 4	R –	BM(96)	
42710-15	Programmable Virtual Output 8 Logic Term 4	R –	BM(96)	
42718	Programmable Virtual Output 9 Term Count	R –	SI	
42719-24	Programmable Virtual Output 9 Logic Mask 1	R –	BM(96)	
42727-32	Programmable Virtual Output 9 Logic Term 1	R –	BM(96)	
42735-40	Programmable Virtual Output 9 Logic Mask 2	R –	BM(96)	
42743-48	Programmable Virtual Output 9 Logic Term 2	R –	BM(96)	
42751-56	Programmable Virtual Output 9 Logic Mask 3	R –	BM(96)	
42759-64	Programmable Virtual Output 9 Logic Term 3	R –	BM(96)	
42767-72	Programmable Virtual Output 9 Logic Mask 4	R –	BM(96)	
42775-80	Programmable Virtual Output 9 Logic Term 4	R –	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
42783	Programmable Virtual Output 10 Term Count	R –	SI	
42784-89	Programmable Virtual Output 10 Logic Mask 1	R –	BM(96)	
42792-97	Programmable Virtual Output 10 Logic Term 1	R –	BM(96)	
42800-05	Programmable Virtual Output 10 Logic Mask 2	R –	BM(96)	
42808-13	Programmable Virtual Output 10 Logic Term 2	R –	BM(96)	
42816-21	Programmable Virtual Output 10 Logic Mask 3	R –	BM(96)	
42824-29	Programmable Virtual Output 10 Logic Term 3	R –	BM(96)	
42832-37	Programmable Virtual Output 10 Logic Mask 4	R –	BM(96)	
42840-45	Programmable Virtual Output 10 Logic Term 4	R –	BM(96)	
42848	Programmable Virtual Output 11 Term Count	R –	SI	
42849-54	Programmable Virtual Output 11 Logic Mask 1	R –	BM(96)	
42857-62	Programmable Virtual Output 11 Logic Term 1	R –	BM(96)	
42865-70	Programmable Virtual Output 11 Logic Mask 2	R –	BM(96)	
42873-78	Programmable Virtual Output 11 Logic Term 2	R –	BM(96)	
42881-86	Programmable Virtual Output 11 Logic Mask 3	R –	BM(96)	
42889-94	Programmable Virtual Output 11 Logic Term 3	R –	BM(96)	
42897-902	Programmable Virtual Output 11 Logic Mask 4	R –	BM(96)	
42905-10	Programmable Virtual Output 11 Logic Term 4	R –	BM(96)	
42913	Programmable Virtual Output 12 Term Count	R –	SI	
42914-19	Programmable Virtual Output 12 Logic Mask 1	R –	BM(96)	
42922-27	Programmable Virtual Output 12 Logic Term 1	R –	BM(96)	
42930-35	Programmable Virtual Output 12 Logic Mask 2	R –	BM(96)	
42938-43	Programmable Virtual Output 12 Logic Term 2	R –	BM(96)	
42946-51	Programmable Virtual Output 12 Logic Mask 3	R –	BM(96)	
42954-59	Programmable Virtual Output 12 Logic Term 3	R –	BM(96)	
42962-67	Programmable Virtual Output 12 Logic Mask 4	R –	BM(96)	
42970-75	Programmable Virtual Output 12 Logic Term 4	R –	BM(96)	
42978	Programmable Virtual Output 13 Term Count	R –	SI	
42979-84	Programmable Virtual Output 13 Logic Mask 1	R –	BM(96)	
42987-92	Programmable Virtual Output 13 Logic Term 1	R –	BM(96)	
42995-3000	Programmable Virtual Output 13 Logic Mask 2	R –	BM(96)	
43003-08	Programmable Virtual Output 13 Logic Term 2	R –	BM(96)	
43011-16	Programmable Virtual Output 13 Logic Mask 3	R –	BM(96)	
43019-24	Programmable Virtual Output 13 Logic Term 3	R –	BM(96)	
43027-32	Programmable Virtual Output 13 Logic Mask 4	R –	BM(96)	
43035-40	Programmable Virtual Output 13 Logic Term 4	R –	BM(96)	
43043	Programmable Virtual Output 14 Term Count	R –	SI	
43044-49	Programmable Virtual Output 14 Logic Mask 1	R –	BM(96)	
43052-57	Programmable Virtual Output 14 Logic Term 1	R –	BM(96)	
43060-65	Programmable Virtual Output 14 Logic Mask 2	R –	BM(96)	
43068-73	Programmable Virtual Output 14 Logic Term 2	R –	BM(96)	
43076-81	Programmable Virtual Output 14 Logic Mask 3	R –	BM(96)	
43084-89	Programmable Virtual Output 14 Logic Term 3	R –	BM(96)	
43092-97	Programmable Virtual Output 14 Logic Mask 4	R –	BM(96)	
43100-05	Programmable Virtual Output 14 Logic Term 4	R –	BM(96)	
43108	Programmable Virtual Output 15 Term Count	R –	SI	
43109-14	Programmable Virtual Output 15 Logic Mask 1	R –	BM(96)	
43117-22	Programmable Virtual Output 15 Logic Term 1	R –	BM(96)	
43125-30	Programmable Virtual Output 15 Logic Mask 2	R –	BM(96)	
43133-38	Programmable Virtual Output 15 Logic Term 2	R –	BM(96)	
43141-46	Programmable Virtual Output 15 Logic Mask 3	R –	BM(96)	
43149-54	Programmable Virtual Output 15 Logic Term 3	R –	BM(96)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43157-62	Programmable Virtual Output 15 Logic Mask 4	R –	BM(96)	
43165-70	Programmable Virtual Output 15 Logic Term 4	R –	BM(96)	
System Labels and ID Setting Parameters				
43438-52	Relay ID	R –	ASC(30)	
43453-67	Station ID	R –	ASC(30)	
43468-82	User ID #1	R –	ASC(30)	
43483-97	User ID #2	R –	ASC(30)	
43498-505	Virtual Selector Switch 43 - Name Label	R –	ASC(10)	
43506-09	Virtual Selector Switch 43 - True Label	R –	ASC(7)	
43510-13	Virtual Selector Switch 43 - False Label	R –	ASC(7)	
43514-21	Virtual Selector Switch 143 - Name Label	R –	ASC(10)	
43522-25	Virtual Selector Switch 143 - True Label	R –	ASC(7)	
43526-29	Virtual Selector Switch 143 - False Label	R –	ASC(7)	
43530-37	Virtual Selector Switch 243 - Name Label	R –	ASC(10)	
43538-41	Virtual Selector Switch 243 - True Label	R –	ASC(7)	
43542-45	Virtual Selector Switch 243 - False Label	R –	ASC(7)	
43546-53	Virtual Selector Switch 343 - Name Label	R –	ASC(10)	
43554-57	Virtual Selector Switch 343 - True Label	R –	ASC(7)	
43558-61	Virtual Selector Switch 343 - False Label	R –	ASC(7)	
43562-69	Virtual Selector Switch 443 - Name Label	R –	ASC(10)	
43570-73	Virtual Selector Switch 443 - True Label	R –	ASC(7)	
43574-77	Virtual Selector Switch 443 - False Label	R –	ASC(7)	
43578-85	Virtual Selector Switch 543 - Name Label	R –	ASC(10)	
43586-89	Virtual Selector Switch 543 - True Label	R –	ASC(7)	
43590-93	Virtual Selector Switch 543 - False Label	R –	ASC(7)	
43594-601	Virtual Selector Switch 643 - Name Label	R –	ASC(10)	
43602-05	Virtual Selector Switch 643 - True Label	R –	ASC(7)	
43606-09	Virtual Selector Switch 643 - False Label	R –	ASC(7)	
43610-17	Virtual Selector Switch 743 - Name Label	R –	ASC(10)	
43618-21	Virtual Selector Switch 743 - True Label	R –	ASC(7)	
43622-25	Virtual Selector Switch 743 - False Label	R –	ASC(7)	
43626-33	Virtual Output A - Name Label	R –	ASC(10)	
43634-37	Virtual Output A - True Label	R –	ASC(7)	
43638-41	Virtual Output A - False Label	R –	ASC(7)	
43642-49	Virtual Output 1 - Name Label	R –	ASC(10)	
43650-53	Virtual Output 1 - True Label	R –	ASC(7)	
43654-57	Virtual Output 1 - False Label	R –	ASC(7)	
43658-65	Virtual Output 2 - Name Label	R –	ASC(10)	
43666-69	Virtual Output 2 - True Label	R –	ASC(7)	
43670-73	Virtual Output 2 - False Label	R –	ASC(7)	
43674-81	Virtual Output 3 - Name Label	R –	ASC(10)	
43682-85	Virtual Output 3 - True Label	R –	ASC(7)	
43686-89	Virtual Output 3 - False Label	R –	ASC(7)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43690-97	Virtual Output 4 - Name Label	R –	ASC(10)	
43698-701	Virtual Output 4 - True Label	R –	ASC(7)	
43702-05	Virtual Output 4 - False Label	R –	ASC(7)	
43706-13	Virtual Output 5 - Name Label	R –	ASC(10)	
43714-17	Virtual Output 5 - True Label	R –	ASC(7)	
43718-21	Virtual Output 5 - False Label	R –	ASC(7)	
43722-29	Virtual Output 6 - Name Label	R –	ASC(10)	
43730-33	Virtual Output 6 - True Label	R –	ASC(7)	
43734-37	Virtual Output 6 - False Label	R –	ASC(7)	
43738-45	Virtual Output 7 - Name Label	R –	ASC(10)	
43746-49	Virtual Output 7 - True Label	R –	ASC(7)	
43750-53	Virtual Output 7 - False Label	R –	ASC(7)	
43754-61	Virtual Output 8 - Name Label	R –	ASC(10)	
43762-65	Virtual Output 8 - True Label	R –	ASC(7)	
43766-69	Virtual Output 8 - False Label	R –	ASC(7)	
43770-77	Virtual Output 9 - Name Label	R –	ASC(10)	
43778-81	Virtual Output 9 - True Label	R –	ASC(7)	
43782-85	Virtual Output 9 - False Label	R –	ASC(7)	
43786-93	Virtual Output 10 - Name Label	R –	ASC(10)	
43794-97	Virtual Output 10 - True Label	R –	ASC(7)	
43798-801	Virtual Output 10 - False Label	R –	ASC(7)	
43802-09	Virtual Output 11 - Name Label	R –	ASC(10)	
43810-13	Virtual Output 11 - True Label	R –	ASC(7)	
43814-17	Virtual Output 11 - False Label	R –	ASC(7)	
43818-25	Virtual Output 12 - Name Label	R –	ASC(10)	
43826-29	Virtual Output 12 - True Label	R –	ASC(7)	
43830-33	Virtual Output 12 - False Label	R –	ASC(7)	
43834-42	Virtual Output 13 - Name Label	R –	ASC(10)	
43843-46	Virtual Output 13 - True Label	R –	ASC(7)	
43847-49	Virtual Output 13 - False Label	R –	ASC(7)	
43850-57	Virtual Output 14 - Name Label	R –	ASC(10)	
43858-61	Virtual Output 14 - True Label	R –	ASC(7)	
43862-65	Virtual Output 14 - False Label	R –	ASC(7)	
43866-73	Virtual Output 15 - Name Label	R –	ASC(10)	
43874-77	Virtual Output 15 - True Label	R –	ASC(7)	
43878-81	Virtual Output 15 - False Label	R –	ASC(7)	
43882-89	Input 1 - Name Label	R –	ASC(10)	
43890-93	Input 1 - True Label	R –	ASC(7)	
43894-97	Input 1 - False Label	R –	ASC(7)	
43899-905	Input 2 - Name Label	R –	ASC(10)	
43906-09	Input 2 - True Label	R –	ASC(7)	
43910-13	Input 2 - False Label	R –	ASC(7)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43914-21	Input 3 - Name Label	R –	ASC(10)	
43922-25	Input 3 - True Label	R –	ASC(7)	
43926-29	Input 3 - False Label	R –	ASC(7)	
43930-37	Input 4 - Name Label	R –	ASC(10)	
43938-41	Input 4 - True Label	R –	ASC(7)	
43942-45	Input 4 - False Label	R –	ASC(7)	
43946-53	Input 5 - Name Label	R –	ASC(10)	
43954-57	Input 5 - True Label	R –	ASC(7)	
43958-61	Input 5 - False Label	R –	ASC(7)	
43962-69	Input 6 - Name Label	R –	ASC(10)	
43970-73	Input 6 - True Label	R –	ASC(7)	
43974-77	Input 6 - False Label	R –	ASC(7)	
43978-85	Input 7 - Name Label	R –	ASC(10)	
43986-89	Input 7 - True Label	R –	ASC(7)	
43990-93	Input 7 - False Label	R –	ASC(7)	
43994-4001	Input 8 - Name Label	R –	ASC(10)	
44002-05	Input 8 - True Label	R –	ASC(7)	
44006-09	Input 8 - False Label	R –	ASC(7)	
Report Parameters				
47274-78	Model Number	R –	ASC(10)	
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)	
47346-53	DSP SW Version # / Date	R –	ASC(16)	
47362	COM1 Serial Port Relay Address	R –	INT	
47363	COM2 Serial Port Relay Address	R W	INT	
47364	Date and Time - Day	R W	INT	TS
47365-66	Date and Time - Milliseconds	R W	LI	TS
47367-72	System Status	R –	BM(96)	
47373	Current Active Group Setting	R –	SI	
47374	Current Group Control Setting	R –	ASC(1)	
47375-76	Current Output Control Settings (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)	
47384-87	Target Status	R –	BM(64)	
47388	Current Breaker Status	R –	ASC(1)	
47389-92	Current Active Logic Scheme	R –	ASC(8)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47394-95	Breaker Contact Duty Log - Phase A	R –	FP	
47396-97	Breaker Contact Duty Log - Phase B	R –	FP	
47398-99	Breaker Contact Duty Log - Phase C	R –	FP	
47400-01	Breaker Operation Counter	R	LI	
47402-03	Transformer Duty Log Settings - Phase A	R –	FP	
47404-05	Transformer Duty Log Settings - Phase B	R –	FP	
47406-07	Transformer Duty Log Settings - Phase C	R –	FP	
47408-09	Transformer Through Faults Counter	R –	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
47460-61	Peak Since Reset Demand Current - Phase A	R –	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 –	FP	
47467	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47468-69	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47470-71	Peak Since Reset Demand Current - Phase C	R –	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 –	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 –	FP	
47482	Peak Since Reset Demand Timestamp - Day	R –	INT	TS
47483-84	Peak Since Reset Demand Timestamp - Millisecond	R –	LI	TS
47485	Trigger Differential Alarm Report	R –	SI	
47486	Reset Logic Alarm Information	R –	SI	
47487	Reset Major Alarm Information	R –	SI	
47488	Reset Minor Alarm Information	R –	SI	
47489	Reset Relay Alarm Information	R –	SI	
47490	Reset Load Profile	R –	SI	
47491	Clear Fault Log	R –	SI	
47492	Trigger Fault Record	R –	SI	
47493	Clear Events Report	R –	SI	
47512	Fault Indicator	R –	SI	
47513	Fault Template Status	R –	SI	
Fault Template (FLT)				
47514	Fault Date and Time - Day	R –	INT	FLT,TS
47515-16	Fault Date and Time - Milliseconds	R –	LI	FLT,TS
47517	Fault Event Type	R –	BM(16)	FLT
47518	Fault Active Group	R –	SI	FLT
47519-22	Fault Targets	R –	BM(64)	FLT
47524	Fault Clearing Time Status	R –	SI	FLT
47525-26	Fault Clearing Time	R –	FP	FLT
47527	Fault Breaker Operate Time Status	R –	SI	FLT
47528-29	Fault Breaker Operate Time	R –	FP	FLT
47530-31	Fault CT CKT #1 Phase A Current Magnitude	R –	FP	FLT
47532	Fault CT CKT #1 Phase A Angle	R –	INT	FLT
47533-34	Fault CT CKT #1 Phase B Current Magnitude	R –	FP	FLT
47535	Fault CT CKT #1 Phase B Angle	R –	INT	FLT
47536-37	Fault CT CKT #1 Phase C Current Magnitude	R –	FP	FLT
47538	Fault CT CKT #1 Phase C Angle	R –	INT	FLT
47539-40	Fault CT CKT #1 Residual Current Magnitude	R –	FP	FLT
47541	Fault CT CKT #1 Residual Angle	R –	INT	FLT
47542-43	Fault CT CKT #1 Negative-Seq Current Magnitude	R –	FP	FLT
47544-45	Fault CT CKT #2 Phase A Current Magnitude	R –	FP	FLT
47546	Fault CT CKT #2 Phase A Angle	R –	INT	FLT
47547-48	Fault CT CKT #2 Phase B Current Magnitude	R –	FP	FLT
47549	Fault CT CKT #2 Phase B Angle	R –	INT	FLT
47550-51	Fault CT CKT #2 Phase C Current Magnitude	R –	FP	FLT
47552	Fault CT CKT #2 Phase C Angle	R –	INT	FLT
47553-54	Fault CT CKT #2 Residual Current Magnitude	R –	FP	FLT
47555	Fault CT CKT #2 Residual Angle	R –	INT	LT
47556-57	Fault CT CKT #2 Negative-Seq Current Magnitude	R –	FP	FLT

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
47572-73	Fault Ground Current Magnitude	R –	FP	FLT
47574	Fault Ground Angle	R –	INT	FLT
Report Template (RPT)				
47595-719	Report Text	R –	ASC(250)	RPT
Metering Parameters				
49720	Part Number	R –	INT	
49721-22	Measured Frequency	R –	FP	
49723-24	Ground Current Magnitude	R –	FP	
49725	Ground Angle	R –	INT	
49726-27	CT CKT #1 Phase A Current Magnitude	R –	FP	
49728	CT CKT #1 Phase A Angle	R –	INT	
49729-30	CT CKT #1 Phase B Current Magnitude	R –	FP	
49731	CT CKT #1 Phase B Angle	R –	INT	
49732-33	CT CKT #1 Phase C Current Magnitude	R –	FP	
49734	CT CKT #1 Phase C Angle	R –	INT	
49735-36	CT CKT #1 Residual Current Magnitude	R –	FP	
49737	CT CKT #1 Residual Angle	R –	INT	
49738-39	CT CKT #1 Negative-Sequence Current Magnitude	R –	FP	
49740-41	CT CKT #2 Phase A Current Magnitude	R –	FP	
49742	CT CKT #2 Phase A Angle	R –	INT	
49743-44	CT CKT #2 Phase B Current Magnitude	R –	FP	
49745	CT CKT #2 Phase B Angle	R –	INT	
49746-47	CT CKT #2 Phase C Current Magnitude	R –	FP	
49748	CT CKT #2 Phase C Angle	R –	INT	
49749-50	CT CKT #2 Residual Current Magnitude	R –	FP	
49751	CT CKT #2 Residual Angle	R –	INT	
49752-53	CT CKT #2 Negative-Sequence Current Magnitude	R –	FP	
49782-83	CT CKT #1 Differential per Unit Phase A Current	R –	FP	
49784	CT CKT #1 Phase A Diff. Compensation Angle	R –	INT	
49785-86	CT CKT #2 Differential per Unit Phase A Current	R –	FP	
49787	CT CKT #2 Phase A Diff. Compensation Angle	R –	INT	
49791-92	Phase A Differential Operating Current	R –	FP	
49793-94	CT CKT #1 Differential per Unit Phase B Current	R –	FP	
49795	CT CKT #1 Phase B Diff. Compensation Angle	R –	INT	
49796-97	CT CKT #2 Differential per Unit Phase B Current	R –	FP	
49798	CT CKT #2 Phase B Diff. Compensation Angle	R –	INT	
49802-03	Phase B Differential Operating Current	R –	FP	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
49804-05	CT CKT #1 Differential per Unit Phase C Current	R –	FP	
49806	CT CKT #1 Phase C Diff. Compensation Angle	R –	INT	
49807-08	CT CKT #2 Differential per Unit Phase C Current	R –	FP	
49809	CT CKT #2 Phase C Diff. Compensation Angle	R –	INT	
49813-14	Phase C Differential Operating Current	R –	FP	
49815-16	Differential per Unit Ground Current	R –	FP	
49817	Ground Differential Compensation Angle	R –	INT	
49818-19	CT CKT #1 Differential per Unit Residual Current	R –	FP	
49820	CT CKT #1 Residual Differential Compensation Angle	R –	INT	
49821-22	CT CKT #2 Differential per Unit Residual Current	R –	FP	
49823	CT CKT #2 Residual Differential Compensation Angle	R –	INT	
49827-28	Ground Differential Operating Current	R –	FP	
49829	Phase A Differential Second Harmonic Percentage	R –	INT	
49830	Phase B Differential Second Harmonic Percentage	R –	INT	
49831	Phase C Differential Second Harmonic Percentage	R –	INT	
49832	Phase A Differential Fifth Harmonic Percentage	R –	INT	
49833	Phase B Differential Fifth Harmonic Percentage	R –	INT	
49834	Phase C Differential Fifth Harmonic Percentage	R –	INT	
49835-54	Error Details	R –	ASC(40)	
49875-999	Contiguous Poll Block	R –	Mixed	

SECTION 3 • REGISTER DETAILS

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Tables

SECTION 3 • REGISTER DETAILS

Introduction

This section details the register formats and data ranges of the previous section. The two sections combined provide all information necessary to communicate with the BE1-CDS220 Modbus™ Holding Registers.

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

Logic Settings

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

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

The logic “mask” corresponds to the System Status bits to be evaluated. These bits are referenced in the desired logic equation and are set to 1 (non-used bits masked out as 0‘s).

The logic “term” corresponds to the System Status bit’s TRUE or FALSE state referenced in the desired logic equation where only the TRUE bits in the equation are set to 1.

The logic “term count” may be of one of four logic types which are NONE (logic disabled), OR only (a + b + c), AND only (a ∗ b ∗ c) or MIXED (a ∗ b + b ∗ c).

The following defines all logic set parameters:

Logic Modes

41505	Programmable 50TP Block Logic Mode	INT
41522	Programmable 50TN Block Logic Mode	INT
41539	Programmable 50TQ Block Logic Mode	INT
41556	Programmable 150TP Block Logic Mode	INT
41573	Programmable 150TN Block Logic Mode	INT
41590	Programmable 150TQ Block Logic Mode	INT
41607	Programmable 250TP Block Logic Mode	INT
41624	Programmable 250TN Block Logic Mode	INT
41641	Programmable 250TQ Block Logic Mode Read: 0 for disabled 1 for winding 1 2 for winding 2 3 for ground CT (only for element ‘N’)	INT
41658	Programmable Breaker Failure Logic Mode Read: 0 for disabled 1 for winding 1 2 for winding 2	INT
41691	Programmable 51P Logic Mode	INT
41708	Programmable 51N Logic Mode	INT
41725	Programmable 51Q Logic Mode	INT
41742	Programmable 151P Logic Mode	INT
41759	Programmable 151N Logic Mode	INT
41776	Programmable 151Q Logic Mode	INT
41793	Programmable 251P Logic Mode	INT
41810	Programmable 251N Logic Mode	INT
41827	Programmable 251Q Logic Mode	INT

Read:
0 for disabled
1 for winding 1
2 for winding 2
3 for ground CT (only for element ‘N’)

41844	Programmable 62 Timer Logic Mode	INT
41877	Programmable 162 Timer Logic Mode	INT

Read:
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

41976	Programmable 87 Differential Logic Mode	INT

Read:
0 for disabled
1 for enabled all windings

41993	Programmable 87ND Differential Logic Mode	INT

Read:
0 for disabled
1 for winding 1
2 for winding 2

42010	Programmable Settings Group Logic Mode	INT

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

42091	Programmable 43 Virtual Switch Logic Mode	INT
42092	Programmable 143 Virtual Switch Logic Mode	INT
42093	Programmable 243 Virtual Switch Logic Mode	INT
42094	Programmable 343 Virtual Switch Logic Mode	INT
42095	Programmable 443 Virtual Switch Logic Mode	INT
42096	Programmable 543 Virtual Switch Logic Mode	INT
42097	Programmable 643 Virtual Switch Logic Mode	INT
42098	Programmable 743 Virtual Switch Logic Mode	INT

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

42099	Programmable 101 Virtual Breaker Control Logic Mode	INT

Read:
0 for disabled
1 for enabled

42100	Programmable Circuit Monitor Logic Mode	INT

Read:
0 for disabled
1 for enabled

Logic Mask and Terms

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

Mask and Term - 1st Register (Logic Var 0 to 15) BM(16)
Read only:

- Bit 15 - 51Q tripped
- Bit 14 - 251N tripped
- Bit 13 - 151N tripped
- Bit 12 - 51N tripped
- Bit 11 - 251P tripped
- Bit 10 - 151P tripped
- Bit 9 - 51P tripped
- Bit 8 - 250TQ tripped
- Bit 7 - 150TQ tripped
- Bit 6 - 50TQ tripped
- Bit 5 - 250TN tripped
- Bit 4 - 150TN tripped
- Bit 3 - 50TN tripped
- Bit 2 - 250TP 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 - Setting Group 3 active
- Bit 13 - Setting Group 2 active
- Bit 12 - Setting Group 1 active
- Bit 11 - Setting Group 0 active
- Bit 10 - 162 tripped
- Bit 9 - 62 tripped
- Bit 8 - <unassigned>
- Bit 7 - 87 5th harmonic
- Bit 6 - 87 2nd harmonic
- Bit 5 - 87 unrestrained trip
- Bit 4 - 87 restrained trip
- Bit 3 - 87ND trip
- Bit 2 - BF tripped
- Bit 1 - 251Q tripped
- Bit 0 - 151Q tripped

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 - 101 slip contact
Bit 14 - 101 close
Bit 13 - 101 trip
Bit 12 - Output circuit trip coil monitor
Bit 11 - Alarm logic
Bit 10 - Alarm minor
Bit 9 - Alarm major
Bit 8 - <unassigned>
Bit 7 - Input 8 status
Bit 6 - Input 7 status
Bit 5 - Input 6 status
Bit 4 - Input 5 status
Bit 3 - Input 4 status
Bit 2 - Input 3 status
Bit 1 - Input 2 status
Bit 0 - Input 1 status

Mask and Term - 5th Register (Logic Var 64 to 79) BM(16)
Read only:

Bit 15 - 51Q picked-up
Bit 14 - 251 neutral picked-up
Bit 13 - 151 neutral picked-up
Bit 12 - 51 neutral picked-up
Bit 11 - 251 phase picked-up
Bit 10 - 151 phase picked-up
Bit 9 - 51 phase picked-up
Bit 8 - 250TQ picked-up
Bit 7 - 150TQ picked-up
Bit 6 - 50TQ picked-up
Bit 5 - 250TN picked-up
Bit 4 - 150TN picked-up
Bit 3 - 50TN picked-up
Bit 2 - 250TP picked-up
Bit 1 - 150TP picked-up
Bit 0 - 50TP picked-up

Mask and Term - 6th Register (Logic Var 80 to 95) BM(16)
Read only:

Bit 15 - Serial controlled switch 743
Bit 14 - Serial controlled switch 643
Bit 13 - Serial controlled switch 543
Bit 12 - Serial controlled switch 443
Bit 11 - Serial controlled switch 343
Bit 10 - Serial controlled switch 243
Bit 9 - Serial controlled switch 143
Bit 8 - Serial controlled switch 43
Bit 7 - Target reset key
Bit 6 - Alarm reset key
Bit 5 - <unassigned>
Bit 4 - 87 restrained pickup
Bit 3 - 87ND pickup
Bit 2 - BF picked-up
Bit 1 - 251Q picked-up
Bit 0 - 151Q picked-up

Logic Term Count

Term Count Register

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)
Note: ERROR DETAIL block (49835-54) contains Exit status message following a write.

40002-5 Access Password ASC(8)
Read: Always the ASCII string of '*' characters.
Write: access password in ASCII string.
Note: If password written is less than 8 characters long, a binary zero value must be included following the final password character.

40006 Access Request BM(16)
Read: Returns the current write access available to the Modbus™ user
Bit 3 is set for Global Access
Bit 2 is set for Setting Access
Bit 1 is set for Control Access
Bit 0 is set for Report Access
Zero value for Read Only Access
Write: To request write privileges using the password written into Access Password registers. Value written into Access Request register is arbitrary (any value will initiate the request).
Note: If write access is denied, the response message will be an error response message with Illegal Function exception code.

Template Parameters

40036 Settings Group Selection SI
Read: returns the current value of Settings Group Selection.
O 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.
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.

40040 Report Focus INT
Read: Returns the current value of Report Focus.

Table 3-1. Report

Report Text 47595-719	Report Selection 40039	Report Focus 40040
RA-DIFF Report	0	Not used
RA-LGC Report	1	Not used
RA-MAJ Report	2	Not used
RA-MIN Report	3	Not used
RA-REL Report	4	Not used
RD-LOG	5	Not used
RD-L#	6	Value of # (non-zero)
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)
RS-ALM or RA-SER	14	Not used
RS-IO	15	Not used
RS-LGC	16	Not used

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 strings are read. Otherwise, the ASCII string of '*' characters is read.

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.
Bit 2 is set for COM 2 access.
Bit 1 is set for COM1 access.
Bit 0 is set for COM0 / FP access.

Control Parameters

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

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

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

40117 Select Group ASC(1)

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

0 if Group 0 selection has been made.
1 if Group 1 selection has been made.
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)
40127 Select Virtual Selector Switch 443 ASC(1)
40129 Select Virtual Selector Switch 543 ASC(1)
40131 Select Virtual Selector Switch 643 ASC(1)
40133 Select Virtual Selector Switch 743 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)
40128 Operate Virtual Selector Switch 443 ASC(1)
40130 Operate Virtual Selector Switch 443 ASC(1)
40132 Operate Virtual Selector Switch 443 ASC(1)
40134 Operate Virtual Selector Switch 443 ASC(1)

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

40135 Select 101 Virtual Breaker Control Switch ASC(1)
Read: To read a value other than ASCII character 'X', the Select 101 Virtual Breaker Control Switch register must be the most recent control register written AND must have been written within the previous 30 seconds.
C if Close selection has been made.
T if Trip selection has been made.
X if 101 Virtual Breaker Control Switch control not selected or control timer has expired
Write: The desired ASCII character.
C to select Closing the Switch.
T to select Tripping the Switch.

40136 Operate 101 Virtual Breaker Control Switch ASC(1)
Read: Current control.
C if Close Switch.
T if Trip Switch.
Write: The desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).
C to Close Switch.
T to Trip Switch.

40137 Select All Outputs ASC(1)
Read: To read a value other than ASCII character 'X', the Select All Output register must be the most recent control register written AND must have been written within the previous 30 seconds.
P if Pulse All Outputs selection has been made.
0 if Latch All Outputs at 0 selection has been made.
1 if Latch All Outputs at 1 selection has been made.
L if programmable Logic selection has been made.
E if Enable All Outputs override control has been set.
D if Disable All Outputs override control has been set.
X if All Outputs control not selected or control timer has expired.

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

40138 Operate All Outputs ASC(1)
Read: Current control.
E if All Outputs override control Enabled.
D if All Outputs override control Disabled.

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

0 to Latch All Outputs at 0.
1 to Latch All Outputs at 1.
L to select programmable Logic.
E to Enable All Outputs override control. *
D to Disable All Outputs override control. *

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

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

P if Pulse Output selection has been made.
0 if Latch Output at 0 selection has been made.
1 if Latch Output at 1 selection has been made.
L if programmable Logic selection has been made.
E if Enable All Outputs serial control has been made.
D if Disable All Outputs serial control has been made.
X if Output control not selected or control timer has expired

Write: The desired ASCII character.

P to select Pulsing Output.
0 to select Latching Output at 0.
1 to select Latching Output at 1.
L to select programmable Logic.
E to select Enabling All Outputs override control.
D to select Disabling All Outputs override control.

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

Read: Current control.

P to Pulse Output.
0 to Latch Output at 0.
1 to Latch Output at 1.
L to select programmable Logic.
D if All Outputs override control Disabled

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

P to Pulse Output.
0 to Latch Output at 0.
1 to Latch Output at 1.
L to select programmable Logic.
E to Enable All Outputs override control. ∗
D to Disable All Outputs override control. ∗

∗ Requires an additional write of 'Y' to Exit register 40001 to allow these control settings to be saved to the relay's internal EEPROM (if Modbus™ password security is enabled).

Group Setting Parameters

40269-70	50TP Pickup	
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

40293-94	250TP Pickup	FP
40297-98	250TN Pickup	FP
40301-02	250TQ Pickup	FP
	Read only: 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
40295-96	250TP Time Delay	LI
40299-300	250TN Time Delay	LI
40303-04	250TQ Time Delay	LI
	Read only: 0 to 60,000 milliseconds	
40305-06	51P Pickup	FP
40311-12	51N Pickup	FP
40317-18	51Q Pickup	FP
40323-24	151P Pickup	FP
40329-30	151N Pickup	FP
40335-36	151Q Pickup	FP
40341-42	251P Pickup	FP
40347-48	251N Pickup	FP
40353-54	251Q Pickup	FP
	Read only: 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
40325-26	151P Time Dial	FP
40331-32	151N Time Dial	FP
40337-38	151Q Time Dial	FP
40343-44	251P Time Dial	FP
40349-50	251N Time Dial	FP
40355-56	251Q Time Dial	FP
	Read only: 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)
40327-28	151P Curve Type	ASC(3)
40333-34	151N Curve Type	ASC(3)
40339-40	151Q Curve Type	ASC(3)
40345-46	251P Curve Type	ASC(3)
40351-52	251N Curve Type	ASC(3)
40357-58	251Q 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 only: 0 to 999,000 milliseconds	

40375-76	87T Minimum Pickup Read only: 0.00 to 1.00 amps	FP
40377	87T Restraint Slope Read only: 15 to 60	INT
40378-79	87T 2nd Harmonic Threshold	FP
40380-81	87T 5th Harmonic Threshold Read only: 5.0 to 75.0	FP
40382	87T Unrestrained Pickup Read only: 0 to 21	INT
40383	87T 2nd Harmonic Sharing Read only: 0 to 1	INT
40384-85	87ND CT CKT G Tap	FP
40386-87	87ND Calculated Neutral Tap Read Only: 2.00 to 20.00 amps	FP
40388-89	87ND Minimum Pickup Read only: 0.00 to 1.00 amps	FP
40390	87ND Restraint Slope Read only: 15 to 60	INT
40391	87ND Restraint Time Delay Read only: 50 to 60,000 milliseconds	INT
40392-93	Transformer MVA Rating Read only: 0, 0.5 to 1000.0	FP
40394-95	87T CT CKT #1 Tap	FP
40398-99	87T CT CKT #2 Tap Read only: 0.40 to 4.00 (1A units) 2.00 to 20.00 (5A units)	FP
40396-97	Transformer Tap 1 KV Rating	FP
40400-01	Transformer Tap 2 KV Rating Read only: 0, 0.01 to 1000.00	FP

Global Settings Parameters

40606-07	Breaker Fail Time Delay Read only: 100 to 999 milliseconds	LI
40608-09	Programmable 51 Curve Constant A Delay Read only: 0.0000 to 600.0000	FP
40610-11	Programmable 51 Curve Constant B Delay	FP

	Read only: 0.0000 to 25.0000	
40612-13	Programmable 51 Curve Constant C Delay Read only: 0.0000 to 1.0000	FP
40614-15	Programmable 51 Curve Constant N Delay Read only: 0.5000 to 2.5000	FP
40616-17	Programmable 51 Curve Constant R Delay Read only: 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	SI
40626	Input 5 Contact Recognition Time Delay	SI
40627	Input 5 Contact Debounce Time Delay	SI
40628	Input 6 Contact Recognition Time Delay	SI
40629	Input 6 Contact Debounce Time Delay	SI
40630	Input 7 Contact Recognition Time Delay	SI
40631	Input 7 Contact Debounce Time Delay	SI
40632	Input 8 Contact Recognition Time Delay	SI
40633	Input 8 Contact Debounce Time Delay Read only: 4 to 255 milliseconds	SI
40746-870	Contiguous Poll Block Assignments Read only: 0 if unassigned 1 to 9874: Holding Register 40001 to 49874	INT
40871	Setting Group Control On Time Read only: 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 only: 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 only: 0 to 150%	SI

40876	Setting Group 1 Tracking Element	INT
40881	Setting Group 2 Tracking Element	INT
40886	Setting Group 3 Tracking Element	INT
	Read only: 0 to 8	

Serial Port Setting Parameters

40962	Serial Port 0 Baud Rate	INT
40971	Serial Port 1 Baud Rate	INT
40980	Serial Port 2 Baud Rate	INT
	Read 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 3 - 2400 baud 4 - 4800 baud 5 - 9600 baud 6 - 19K baud	
40963	Serial Port 0 Relay Address	INT
	Read only: 0 only	
40972	Serial Port 1 Relay Address	INT
40981	Serial Port 2 Relay Address	INT
	Read only: 0 to 65,534	
40964	Serial Port 0 Software Flow Control	SI
40973	Serial Port 1 Software Flow Control	SI
	Read only: 0 if XON / XOFF Control is disabled 1 if XON / XOFF Control is enabled	
40965	Serial Port 0 Page Length	SI
40974	Serial Port 1 Page Length	SI
	Read only: 0 for disabled 1 to 40 for number of lines / page	
40966	Serial Port 0 Acknowledgement Format	SI
40975	Serial Port 1 Acknowledgement Format	SI
	Read only: 0 if No acknowledge 1 if Acknowledge enabled	
40986	Serial Port 2 Modbus™ Parity	SI
	Read only: 0 for No parity 1 for Even parity 2 for Odd parity	
40987	Serial Port 2 Modbus™ Remote Delay	SI
	Read only: 1 to 20: 10 to 200 milliseconds	
40988	Serial Port 2 Modbus™ Stop Bits	SI
	Read only: 1 for One stop bit 2 for Two stop bits	
40989	Serial Port 2 Modbus™ Password Security	SI

Read only:
0 for Disable Password
1 for Enable Password

System Data Setting Parameters

41019	System Frequency Read only: 50 for 50 hertz 60 for 60 hertz	SI
41020	Phase Rotation Read only: 1 for ABC rotation 2 for ACB rotation	SI
41021	Phase CT Ratio CKT #1	INT
41022	Ground CT Ratio Read only: 1 to 50,000	INT
41023	Phase CT Ratio, CT CKT #2 Read only: 1 to 50,000	INT
41025	CT Connection, CT CKT #1	INT
41026	CT Connection, CT CKT #2 Read only: 0 to 2	INT
41028	TX Connection, CT CKT #1	INT
41029	TX Connection, CT CKT #2 Read only: 0 to 3	INT
41031	Ground Source, CT CKT #1	INT
41032	Ground Source, CT CKT #2 Read only: 0 to 1	INT

Breaker Duty Setting Parameters

41092	Breaker Duty Type Read only: 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 only: 0 to 4.29E+09 amps	FP
41095	Breaker Duty CT CKT Number Read only: 1 for Ckt #1 2 for Ckt #2	SI
41096	Programmable Breaker Alarm #1 Mode	INT
41099	Programmable Breaker Alarm #2 Mode	INT
41102	Programmable Breaker Alarm #3 Mode Read only: 0 for Disabled	INT

1 for Percent duty
2 for Breaker operations
3 for Clearing time

41097-98	Programmable Breaker Alarm #1 Limit	FP
41100-01	Programmable Breaker Alarm #2 Limit	FP
41103-04	Programmable Breaker Alarm #3 Limit	FP

Read only:
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

41105-09	Breaker Label	ASC (10)

Transformer Duty Setting Parameters

41184	Transformer Duty Mode	SI

Read :
0 for Off
1 for Sum I, primary amps
2 for Sum I^2, primary amps

41185-86	Maximum Transformer Duty	FP

Read only:
0 to 4.29E+09 primary amps

41187	Transformer Duty CT CKT Number	SI

Read only:
1 for Ckt #1, 2 for Ckt #2

41188	Programmable Transformer Alarm #1 Mode	INT
41191	Programmable Transformer Alarm #2 Mode	INT
41194	Programmable Transformer Alarm #3 Mode	INT

Read only:
0 for Disabled
1 for Percent duty
2 for Through faults

41189-90	Programmable Transformer Alarm #1 Limit	FP
41192-93	Programmable Transformer Alarm #2 Limit	FP
41195-96	Programmable Transformer Alarm #3 Limit	FP

Read only:
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

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	FP

Read only:
0 to 16.0 amps

41265	Major Alarm Mask MSBs	BM(16)
41267	Minor Alarm Mask MSBs	BM(16)
41269	Logic Alarm Mask MSBs	BM(16)

Read only:
Bits 15 to 12 - Spare
Bit 11 - Logic = None alarm
Bit 10 - Transformer Alarm 3
Bit 9 - Transformer Alarm 2

Bit 8 - Transformer Alarm 1
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

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 - Password access lost alarm
Bit 2 - Differential alarm
Bit 1 - Breaker fail alarm
Bit 0 - Circuit Monitor alarm

41271	87T Differential Alarm	INT

Read only:
50 to 100%

41272	Clock Format - Date	ASC(1)

Read only:
M for mm/dd/yy format
D for dd/mm/yy format

41273	Clock Format - Time	SI

Read only:
12 for 12 hour clock
24 for 24 hour clock

41274	Clock Format - Daylight Savings	SI

Read only:
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 only:
1 to 60 minutes
0 to disable

41278	Phase Demand Calculation Method	ASC(1)
41279	Neutral Demand Calculation Method	ASC(1)
41280	Negative-Sequence Demand Calculation Method	ASC(1)

Read only:
ASCII character 'T'

41281 Phase Demand 1 CT CKT Number ASC(1)

41283 Negative-Sequence Demand CT CKT Number ASC(1)

Read only:

ASCII character ‘1’
ASCII character ‘2’

41282 Neutral Demand CT CKT Number ASC(1)

Read only:

ASCII character ‘1’
ASCII character ‘2’
ASCII character ‘3’

41284 Output Hold Mask BM(8)

Read only:

Bit 7 - Spare
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

41286 Load Profile Interval SI

Read only:

1 to 60

41287 Target Mask MSBs BM(16)

Read only:

Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
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

41288 Target Mask 2nd MSBs BM(16)

Read only:

Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - 250TQ
Bit 11 - 250TN
Bit 10 - 250TC
Bit 9 - 250TB
Bit 8 - 250TA
Bit 7 - Spare
Bit 6 - Spare
Bit 5 - Spare
Bit 4 - Spare
Bit 3 - Spare

Bit 2 - Spare
Bit 1 - Spare
Bit 0 - BF

41289	Target Mask 3rd MSBs 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 Bit 7 - Spare Bit 6 - Spare Bit 5 - Spare Bit 4 - 151Q Bit 3 - 151N Bit 2 - 151C Bit 1 - 151B Bit 0 - 151A	BM(16)
41290	Target Mask LSBs Read only: Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 251Q Bit 11 - 251N Bit 10 - 251C Bit 9 - 251B Bit 8 - 251A Bit 7 - Spare Bit 6 - 87ND Bit 5 - 87RC Bit 4 - 87RB Bit 3 - 87RA Bit 2 - 87UC Bit 1 - 87UB Bit 0 - 87UA	BM(16)
41291-97	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 Read only: Screen identifier. For example, the Output Status Screen would be 1.5.2	ASC(7)

Custom Logic Setting Parameters

41465-68	User Custom Logic Name Read only: If programming, reads custom logic name; otherwise, reads active standard logic name.	ASC(8)
41469-72	Current Active Logic Scheme Read only: Current active logic name.	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 with the exception of Relay ID, Station ID, User ID #1, and User ID # 2, which are Read only.

Report Parameters

47274-78	Model Number	ASC(10)
47282-89	Application SW Version # / Date	ASC(16)
47296-302	Boot SW Version # / Date	ASC(14)
47310-16	Serial Number	ASC(13)
47324-36	Style Number	ASC(21)
47346-53	DSP SW Version #/Date Read Only: ASCII strings	ASC(16)
47362	COM 1 Serial Port Relay Address	INT
47363	COM 2 Serial Port Relay Address Read and Write: 0 to 65,534	INT

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 - 51Q tripped Bit 14 - 251N tripped Bit 13 - 151N tripped Bit 12 - 51N tripped Bit 11 - 251P tripped Bit 10 - 151P tripped Bit 9 - 51P tripped Bit 8 - 250TQ tripped Bit 7 - 150TQ tripped Bit 6 - 50TQ tripped Bit 5 - 250TN tripped Bit 4 - 150TN tripped Bit 3 - 50TN tripped Bit 2 - 250TP 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 - Setting Group 3 active Bit 13 - Setting Group 2 active Bit 12 - Setting Group 1 active Bit 11 - Setting Group 0 active Bit 10 - 162 tripped Bit 9 - 62 tripped Bit 8 - Spare Bit 7 - Fifth harmonic inhibit Bit 6 - Second harmonic inhibit Bit 5 - 87U tripped Bit 4 - 87R tripped Bit 3 - 87ND tripped Bit 2 - BF tripped Bit 1 - 251Q tripped Bit 0 - 151Q tripped	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) BM(16)
Read only:
Bit 15 - 101 slip contact
Bit 14 - 101 close
Bit 13 - 101 trip
Bit 12 - Output circuit monitor
Bit 11 - Alarm logic
Bit 10 - Alarm minor
Bit 9 - Alarm major
Bit 8 - Spare
Bit 7 - Input 8 status
Bit 6 - Input 7 status
Bit 5 - Input 6 status
Bit 4 - Input 5 status
Bit 3 - Input 4 status
Bit 2 - Input 3 status
Bit 1 - Input 2 status
Bit 0 - Input 1 status

47371 System Status (Logic Var 64 to 79) BM(16)
Read only:
Bit 15 - 51Q picked-up
Bit 14 - 251N picked-up
Bit 13 - 151N picked-up
Bit 12 - 51N picked-up
Bit 11 - 251P picked-up
Bit 10 - 151P picked-up
Bit 9 - 51P picked-up
Bit 8 - 250Q picked-up
Bit 7 - 150Q picked-up
Bit 6 - 50Q picked-up
Bit 5 - 250TN picked-up
Bit 4 - 150TN picked-up
Bit 3 - 50TN picked-up
Bit 2 - 250TP picked-up
Bit 1 - 150TP picked-up
Bit 0 - 50TP picked-up

47372 System Status (Logic Var 80 to 95) BM(16)
Read only:
Bit 15 - 743
Bit 14 - 643
Bit 13 - 543
Bit 12 - 443
Bit 11 - 343
Bit 10 - 243
Bit 9 - 143
Bit 8 - 43
Bit 7 - Target reset key
Bit 6 - Alarm reset key
Bit 5 - Spare
Bit 4 - 87R picked-up
Bit 3 - 87ND picked -up
Bit 2 - BF picked-up
Bit 1 - 251Q picked-up
Bit 0 - 151Q picked-up

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 - 7 Spare Bit 6 - Output 6 pulse low Bit 5 - Output 5 pulse low Bit 4 - Output 4 pulse low Bit 3 - Output 3 pulse low Bit 2 - Output 2 pulse low Bit 1 - Output 1 pulse low Bit 0 - Output A pulse low	BM(16)
47376	Current Output Control Settings (OutputPulse1) LSBs Read only: Bits 15 - 7 Spare Bit 6 - Output 6 pulse high Bit 5 - Output 5 pulse high Bit 4 - Output 4 pulse high Bit 3 - Output 3 pulse high Bit 2 - Output 2 pulse high Bit 1 - Output 1 pulse high Bit 0 - Output A pulse high	BM(16)
47377	Current Output Control Settings (OutputLatch0) MSBs Read only: Bits 15 to 7 - Spare Bit 6 - Output 6 latch low Bit 5 - Output 5 latch low Bit 4 - Output 4 latch low Bit 3 - Output 3 latch low Bit 2 - Output 2 latch low Bit 1 - Output 1 latch low Bit 0 - Output A latch low	BM(16)
47378	Current Output Control Settings (OutputLatch1) LSBs Read only: Bits 15 to 7 - Spare Bit 6 - Output 6 latch high Bit 5 - Output 5 latch high Bit 4 - Output 4 latch high Bit 3 - Output 3 latch high Bit 2 - Output 2 latch high Bit 1 - Output 1 latch high Bit 0 - Output A latch high	BM(16)
47379	Current Output Contact Status Read only: Bits 15 to 7 - Spare Bit 6 - Output 6 Bit 5 - Output 5 Bit 4 - Output 4 Bit 3 - Output 3	BM(16)

Bit 2 - Output 2
Bit 1 - Output 1
Bit 0 - Output A

47380 Active Alarm Flags (SumFlags) MSBs BM(16)
Read only:
Bits 15 to 0 - Spare

47381 Active Alarm Flags (SumFlags) LSBs BM(16)
Read only:
Bits 15 to 11 - Spare
Bit 10 - DSP Failure
Bit 9 - Calibration defaults loaded
Bit 8 - Setting defaults loaded
Bit 7 - Watchdog failure
Bit 6 - Power Supply error
Bit 5 - Calibration error
Bit 4 - Analog failure
Bit 3 - EEPROM Read / Write Fatal error
Bit 2 - MPU Self-test error
Bit 1 - ROM (flash) Failure detected
Bit 0 - RAM Failure detected

47382 Active Alarm Flags (ProgAlarms) MSBs BM(16)
Read Only:
Bits 15 to 12 - Spare
Bit 11 - Logic = None alarm
Bit 10 - Transformer alarm 3
Bit 9 - Transformer alarm 2
Bit 8 - Transformer alarm 1
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

47383 Active Alarm Flags (ProgAlarms) 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 - 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 - Password access lost alarm
Bit 2 - Differential alarm
Bit 1 - Breaker fail alarm
Bit 0 - Circuit Monitor alarm

47384 Target Status MSBs BM(16)
Read Only:
Bit 15 - Spare
Bit 14 - Spare

Bit 13 - Spare
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

47385 Target Status 2nd MSBs BM(16)
Read Only:
Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - 250TQ
Bit 11 - 250TN
Bit 10 - 250TC
Bit 9 - 250TB
Bit 8 - 250TA
Bits 7 to 1 - Spare
Bit 0 - BF

47386 Target Status 3rd MSBs BM(16)
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
Bit 7 - Spare
Bit 6 - Spare
Bit 5 - Spare
Bit 4 - 151Q
Bit 3 - 151N
Bit 2 - 151C
Bit 1 - 151B
Bit 0 - 151A

47387 Target Status LSBs BM(16)
Read Only:
Bit 15 - Spare
Bit 14 - Spare
Bit 13 - Spare
Bit 12 - 251Q
Bit 11 - 251N
Bit 10 - 251C
Bit 9 - 251B
Bit 8 - 251A
Bit 7 - Spare
Bit 6 - 87ND
Bit 5 - 87RC
Bit 4 - 87RB

Bit 3 - 87RA
Bit 2 - 87UC
Bit 1 - 87UB
Bit 0 - 87UA

47388	Current Breaker Status Read only: O for Open C for Closed D for Disabled (off)	ASC(1)
47389-92	Current Active Logic Scheme Read Only: Current active logic name.	ASC(8)
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 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%.	FP
47400-01	Breaker Operations Count Read only: 0 to 99,999	LI
47402-02	Transformer Duty Log Settings - Phase A	FP
47404-05	Transformer Duty Log Settings - Phase B	FP
47406-07	Transformer Duty Log Settings - Phase C Read: If Transformer Duty Mode = Off or Maximum Transformer Duty = 0, reads undefined floating point value of 0xFFFFFFFF. Otherwise, reads 0.00 to 200.00%.	FP
47408-09	Transformer Through Faults Counter Read only: 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 Read only: Any value (amps)	FP
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 Read only: Any value (days since 01/01/1984).	INT
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 Read only: 0 to 86,399,999 milliseconds.	LI

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
47485	Trigger Differential Alarm Report	SI
47486	Reset Logic Alarm Information	SI
47487	Reset Major Alarm Information	SI
47488	Reset Minor Alarm Information	SI
47489	Reset Relay Alarm Information	SI
47490	Reset Load Profile	SI
47491	Clear Fault Log	SI
47492	Trigger Fault Record	SI
47493	Clear Events Report	SI
	Read only: 0	
47512	Fault Indicator	SI
	Read only: Most recent fault number (1 - 255)	

47513	Fault Template Status 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.	SI

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 - Spare Bit 14 - Spare Bit 13 - Spare 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 2nd MSBs Read only: Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 250TQ Bit 11 - 250TN Bit 10 - 250TC Bit 9 - 250TB Bit 8 - 250TA Bits 7 to 3 - Spare Bit 2 - 162 Bit 1 - 62 Bit 0 - BF	BM(16)

47521	Fault Targets 3rd MSBs 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 Bit 7 - Spare Bit 6 - Spare Bit 5 - Spare Bit 4 - 151Q Bit 3 - 151N Bit 2 - 151C Bit 1 - 151B Bit 0 - 151A	BM(16)
47522	Fault Targets LSBs Read only: Bit 15 - Spare Bit 14 - Spare Bit 13 - Spare Bit 12 - 251Q Bit 11 - 251N Bit 10 - 251C Bit 9 - 251B Bit 8 - 251A Bit 7 - Spare Bit 6 - 87ND Bit 5 - 87RC Bit 4 - 87RB Bit 3 - 87RA Bit 2 - 87UC Bit 1 - 87UB Bit 0 - 87UA	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 47985-92) value 1 if Unknown 2 if N/A; Out of range 3 if No operation 4 if Disabled	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 CT CKT #1 Phase A Current Magnitude	FP
47533-34	Fault CT CKT #1 Phase B Current Magnitude	FP
47536-37	Fault CT CKT #1 Phase C Current Magnitude	FP
47539-40	Fault CT CKT #1 Residual Current Magnitude	FP
47542-43	Fault CT CKT #1 Neg-Seq. Current Magnitude	FP
47544-45	Fault CT CKT #2 Phase A Current Magnitude	FP
47547-48	Fault CT CKT #2 Phase B Current Magnitude	FP
47550-51	Fault CT CKT #2 Phase C Current Magnitude	FP
47553-54	Fault CT CKT #2 Residual Current Magnitude	FP
47556-57	Fault CT CKT #2 Neg-Seq. Current Magnitude	FP
47572-73	Fault Ground Current Magnitude Read only: Value in amps	FP
47532	Fault CT CKT #1 Phase A Angle	INT
47535	Fault CT CKT #1 Phase B Angle	INT
47538	Fault CT CKT #1 Phase C Angle	INT
47541	Fault CT CKT #1 Residual Angle	INT
47546	Fault CT CKT #2 Phase A Angle	INT
47549	Fault CT CKT #2 Phase C Angle	INT
47552	Fault CT CKT #2 Phase C Angle	INT
47555	Fault CT CKT #2 Residual Angle	INT
47574	Fault Ground Angle Read only: 0 to 359 degrees	INT

Report Template (RPT)

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

Metering Parameters

49720	Part Number Read only: 0 to 999	INT
49721-22	Measured Frequency Read only: Value in Hertz	FP
49723-24	Ground Current Magnitude	FP
49726-27	CT CKT #1 Phase A Current Magnitude	FP
49729-30	CT CKT #1 Phase B Current Magnitude	FP
49732-33	CT CKT #1 Phase C Current Magnitude	FP
49735-36	CT CKT #1 Residual Current Magnitude	FP
49738-39	CT CKT #1 Neg-Seq Current Magnitude	FP
49740-41	CT CKT #2 Phase A Current Magnitude	FP
49743-44	CT CKT #2 Phase B Current Magnitude	FP
49746-47	CT CKT #2 Phase C Current Magnitude	FP
49749-50	CT CKT #2 Residual Current Magnitude	FP
49752-53	CT CKT #2 Neg-Seq Current Magnitude Read only: Value in amps. If not applicable, reads undefined floating point value of 0xFFFFFFFF.	FP

49725	Ground Angle	INT
49728	CT CKT #1 Phase A Angle	INT
49731	CT CKT #1 Phase B Angle	INT
49734	CT CKT #1 Phase C Angle	INT
49737	CT CKT #1 Residual Angle	INT
49742	CT CKT #2 Phase A Angle	INT
49745	CT CKT #2 Phase B Angle	INT
49748	CT CKT #2 Phase C Angle	INT
49751	CT CKT #2 Residual Angle	INT
	Read only: 0 to 359 degrees	
49782-83	CT CKT #1 Differential per Unit Phase A Current	FP
49785-86	CT CKT #2 Differential per Unit Phase A Current	FP
49791-92	Phase A Differential Operating Current	FP
49793-94	CT CKT #1 Differential per Unit Phase B Current	FP
49796-97	CT CKT #2 Differential per Unit Phase B Current	FP
49802-03	Phase B Differential Operating Current	FP
49804-05	CT CKT #1 Differential per Unit Phase C Current	FP
49807-08	CT CKT #2 Differential per Unit Phase C Current	FP
49813-14	Phase C Differential Operating Current	FP
49815-16	Differential per Unit Ground Current	FP
49818-19	CT CKT #1 Differential per Unit Residual Current	FP
49821-22	CT CKT #2 Differential per Unit Residual Current	FP
49827-28	Ground Differential Operating Current	FP
	Read only: Value in Amps XTAP. If not applicable, reads undefined floating-point value of 0xFFFFFFFF.	
49784	CT CKT #1 Phase A Differential Compensation Angle	INT
49787	CT CKT #2 Phase A Differential Compensation Angle	INT
49795	CT CKT #1 Phase B Differential Compensation Angle	INT
49798	CT CKT #2 Phase B Differential Compensation Angle	INT
49806	CT CKT #1 Phase C Differential Compensation Angle	INT
49809	CT CKT #2 Phase C Differential Compensation Angle	INT
49817	Ground Differential Compensation Angle	INT
49820	CT CKT #1 Residual Differential Compensation Angle	INT
49823	CT CKT #2 Residual Differential Compensation Angle	INT
	Read only: 0 to 359 degrees	
49829	Phase A Differential Second Harmonic Percentage	INT
49830	Phase B Differential Second Harmonic Percentage	INT
49831	Phase C Differential Second Harmonic Percentage	INT
49832	Phase A Differential Fifth Harmonic Percentage	INT
49833	Phase B Differential Fifth Harmonic Percentage	INT
49834	Phase C Differential Fifth Harmonic Percentage	INT
	Read only: Values in % IOP	
49835-54	Error Details	ASC(40)
	Read only: ASCII string	
49875-999	Contiguous Poll Block	Mixed
	Read only: Mixed values	

SECTION 4 • ASCII CROSS REFERENCE

ASCII Command Versus Modbus™ Register Cross-Reference

ASCII Command	Modbus™ Registers
A=<password>	40002-40005
CO-101	40136
CO-43	40120
CO-143	40122
CO-243	40124
CO-343	40126
CO-443	40128
CO-543	40130
CO-643	40132
CO-743	40134
CO-GROUP=<settings group>	40118
CO-OUT1	40142
CO-OUT2	40144
CO-OUT3	40146
CO-OUT4	40148
CO-OUT5	40150
CO-OUT6	40152
CO-OUTA	40140
CO-OUTALL	40138
CS-101	40135
CS-43	40119
CS-143	40121
CS-243	40123
CS-343	40125
CS-443	40127
CS-543	40129
CS-643	40131
CS-743	40133
CS-GROUP=<settings group>	40117
CS-OUT1	40141
CS-OUT2	40143
CS-OUT3	40145
CS-OUT4	40147
CS-OUT5	40149
CS-OUT6	40151
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
M1-IA	49726-49727,49728
M1-IB	49729-49730,49731
M1-IC	49732-49733,49734
M1-IN	49735-49736,49737
M1-IQ	49738-49739
M2-IA	49740-49741,49742
M2-IB	49743-49744,49745
M2-IC	49746-49747,49748

ASCII Command	Modbus™ Registers
M2-IN	49749-49750,49751
M2-IQ	49752-49753
M-FREQ	49721-49722
M-IG	49723-49724,49725
MD-IA1COMP	49782-49783,49784
MD-IA2COMP	49785-49786,49787
MD-IAOP	49791-49792
MD-IB1COMP	49793-49794,49795
MD-IB2COMP	49796-49797,49798
MD-IBOP	49802-49803
MD-IC1COMP	49804-49805,49806
MD-IC2COMP	49807-49808,49809
MD-ICOP	49813-49814
MD-IGCOMP	49815-49816,49817
MD-IN1COMP	49818-49819,49820
MD-IN2COMP	49821-49822,49823
MD-INOP	49827-49828
MD-IA2ND	49829
MD-IA5TH	49832
MD-IB2ND	49830
MD-IB5TH	49833
MD-IC2ND	49831
MD-IC5TH	49834
RA-MAJ	47595-47719,40039
RA-MAJ=0	47487
RA-LGC	47595-47719,40039
RA-LGC=0	47486
RA-MIN	47595-47719,40039
RA-MIN=0	47488
RA-REL	47595-47719,40039
RA-REL=0	47489
RB-DUTYA=<% of duty>	47394-47395
RB-DUTYB=<% of duty>	47396-47397
RB-DUTYC=<% of duty>	47398-47399
RB-OPCNTR=<number of operations>	47400-47401
RD-PIA	47460-47461,47463-47464,47462
RD-PIB	47465-47466,47468-47469,47467
RD-PIC	47470-47471,47473-47474,47472
RD-PIN	47475-47476,47478-47479,47477
RD-PIQ	47480-47481,47483-47484,47482
RD-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

ASCII Command	Modbus™ Registers
RG-TARG	47384-47385
RG-TIME=<time>	47365-47366
RG-VER	47274-47278,47324-47334,47282-47289,47296-47302,47310-47316
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#-50TN=<pickup>,<time delay>	40273-40274,40275-40276
S#-50TP=<pickup>,<time delay>	40269-40270,40271-40272
S#-50TQ=<pickup>,<time delay>	40277-40278,40279-40280
S#-150TN=<pickup>,<time delay>	40285-40286,40287-40288
S#-150TP=<pickup>,<time delay>	40281-40282,40283-40284
S#-150TQ=<pickup>,<time delay>	40289-40290,40291-40292
S#-250TN=<pickup>,<time delay>	40297-40298,40299-40300
S#-250TP=<pickup>,<time delay>	40293-40294,40295-40296
S#-250TQ=<pickup>,<time delay>	40301-40302,40303-40304
S#-51N=<pickup>,<time dial>,<curve>	40311-40312,40313-40314,40315-40316
S#-51P=<pickup>,<time dial>,<curve>	40305-40306,40307-40308,40309-40310
S#-51Q=<pickup>,<time dial>.<curve>	40317-40318,40319-40320,40321-40322
S#-151N=<pickup>,<time dial>.<curve>	40329-40330,40331-40332,40333,40334
S#-151P=<pickup>,<time dial>.<curve>	40323-40324,40325-40326,40327-40328
S#-151Q=<pickup>,<time dial>.<curve>	40335-40336,40337-40338,40339-40340
S#-251N=<pickup>,<time dial>.<curve>	43047-40348,40379-40350,40351,40352
S#-251P=<pickup>,<time dial>.<curve>	40341-40342,40343-40344,40345-40346
S#-251Q=<pickup>,<time dial>.<curve>	40353-40354,40355-40356,40357-40358
S#-TAP87	40392-49393,40394-40395,40396-40397,40398-40399,40400-40401
S#-87	40375-40376,40377,40378-40379,40380-40381,40382,40383
S#-87ND	40384-40385,40386-40387,40388-40389,40390,40391
S#-62=<time delay 1>,<time delay 2>	40359-40360,40361-40362
S#-162=<time delay 1>,<time delay 2>	40363-40364,40365-40366
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
SA-DIFF	47485
SA-TX1	41188,41189-41190
SA-TX2	41191,41192-41193
SA-TX3	41194,41195-41196

ASCII Command	Modbus™ Registers
ST-DUTY=<mode>,<dmax>,<CT circuit #>,<blk txfrmr logic>	41184,41185-41186,41187,41197-41202,41205-41210
SB-DUTY=<mode>,<dmax.>,<CT circuit #>,<blk bkr logic>	41092,41093-41094,41095,41110-41115,41118-41123
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-CT1=<ratio>,<CT connection>,<TX connection>,<ground source>	41021,41025,41028,41031
SG-CT2=<ratio>,<CT connection>,<TX connection>,<ground source>	41023,41026,41029,41032
SG-CTG=<ratio>	41022
SG-DIN=<alarm interval>,<calculation method>,<CT circuit number>	41276,41279,41282
SG-DIP=<alarm interval>,<calculation method>,<CT circuit number>	41275,41278,41281
SG-DIQ=<alarm interval>,<calculation method>,<CT circuit number>	41277,41280,41283
SG-DSPN=<filter>	41436
SG-DSPP=<filter>	41435
SG-FREQ=<frequency>	41019
SG-HOLD=<output hold enable>	41284
SG-ID1=<relay ID>	43438-43452
SG-ID2=<station ID>	43453-43467
SG-ID3=<station ID>	43476-43482
SG-ID4=<station ID>	43482-43497
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-IN5=<input recognition>,<input debounce >	40626,40627
SG-IN6=<input recognition>,<input debounce >	40628,40629
SG-IN7=<input recognition>,<input debounce >	40630,40631
SG-IN8=<input recognition>,<input debounce >	40632,40633
SG-PHROT=<rotation sequence>	41020
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

ASCII Command	Modbus™ Registers
SG-SCREEN8=<menu screen>	41319-41322
SG-SCREEN9=<menu screen>	41323-41326
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-443=<mode>	42095
SL-543=<mode>	42096
SL-643=<mode>	42097
SL-743=<mode>	42098
SL-101=<mode>	42099
SL-CKTMON=<mode><monitor logic>, <status logic>	42100,42101-42106,42109-42114,42117-42122,42125-42130
SL-87=<mode>,<block logic equation>	41976,41977-41982,41985-41990
SL-87ND=<mode>,<block logic equation>	41993,41994-41999,42002-42007
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-250TN=<mode>,<block logic equation>	41624,41625-41630,41633-41638
SL-250TP=<mode>,<block logic equation>	41607,41608-41613,41616-41621
SL-250TQ=<mode>,<block logic equation>	41641,41642-41647,41650-41655
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-151N=<mode>,<block logic equation>	41759,41760-41765,41768-41773
SL-151P=<mode>,<block logic equation>	41742,41743-41748,41751-41756
SL-151Q=<mode>,<block logic equation>	41776,41777-41782,41785-41790
SL-251N=<mode>,<block logic equation>	41810,41811-41816,41819-41824
SL-251P=<mode>,<block logic equation>	41793,41794-41799,41802-41807
SL-251Q=<mode>,<block logic equation>	41827,41828-41833,41836-41841
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

ASCII Command	Modbus™ Registers
SL-VO3=<boolean logic equation>	42328,42329-42334,42337-42342,42345-42350, 42353-42358,42361-42366,42369-42374,42377-42382,42385-42390
SL-VO4=<boolean logic equation>	42393,42394-42399,42402-42407,42410-42415, 42418-42423,42426-42431,42434-42439,42442-42447,42450-42455
SL-VO5=<boolean logic equation>	42458,42459-42464,42467-42472,42475-42480, 42483-42488,42491-42496,42499-42504,42507-42512,42515-42520
SL-VO6=<boolean logic equation>	42523,42524-42529,42532-42537,42540-42545, 42548-42553,42556-42561,42564-42569,42572-42577,42580-42585
SL-VO7=<boolean logic equation>	42588,42589-42594,42597-42602,42605-42610, 42613-42618,42621-42626,42629-42634,42637-42642,42645-42650
SL-VO8=<boolean logic equation>	42653,42654-42659,42662-42667,42670-42675, 42678-42683,42686-42691,42694-42699,42702-42707,42710-42715
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-443=<name>,<true label>,<false label>	43550-43554,43555-43558,43559-43562
SN-543=<name>,<true label>,<false label>	43563-43567,43568-43571,43572-43575
SN-643=<name>,<true label>,<false label>	43576-43580,43581-43584,43585-43588
SN-743=<name>,<true label>,<false label>	43589-43593,43594-43597,43598-43601
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-IN5=<name>,<true label>,<false label>	43901-43905,43906-43909,43910-43913
SN-IN6=<name>,<true label>,<false label>	43914-43918,43919-43922,43923-43926
SN-IN7=<name>,<true label>,<false label>	43927-43931,43932-43935,43936-43939
SN-IN8=<name>,<true label>,<false label>	43940-43944,43945-43948,43949-43952

ASCII Command	Modbus™ Registers
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-BF=<time delay>	40606-40607
SP-CURVE=<a>,<b>,<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
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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