



BE1-700

Digital Protective Relay

Modbus Protocol® Instruction Manual



 **WARNING:** California's Proposition 65 requires special warnings for products that may contain chemicals known to the state of California to cause cancer, birth defects or other reproductive harm. Please note that by posting this Proposition 65 warning, we are notifying you that one or more of the Proposition 65 listed chemicals may be present in products we sell to you. For more information about the specific chemicals found in this product, please visit <https://www.basler.com/Prop65>.

Preface

This instruction manual provides detailed information about the BE1-700 Digital Protective Relay with the Modbus® protocol.

Disclaimer of Liability and Warranty

Basler Electric provides links to third-party Web sites as a convenience in locating relative information and services for our users. The existence of these links is not to be construed as an endorsement by Basler Electric of the content of any of these third-party sites. **BASLER ELECTRIC MAKES NO EXPRESS, IMPLIED OR STATUTORY WARRANTY, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY, WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE,** warranty of non-infringement or the like, or warranty of title. Basler Electric makes no representation of freedom from computer viruses or of the accuracy of the information and/or the quality of products or services provided by or advertised on these third-party Web sites. **Basler Electric disclaims, to the fullest extent permissible by applicable law, any and all liability, and responsibility for any claims or damage that may arise as a result of use of any Web sites maintained by third parties and linked to the Basler Electric Web site.** Basler Electric advises site visitors that links to Web sites not controlled by Basler Electric are not subject to the privacy notice associated with the Basler Electric Web site and, therefore, are advised to read the privacy policies of any third-party sites accessed through this site.

Conventions Used in this Manual

Important safety and procedural information is emphasized and presented in this manual through warning, caution, and note boxes. Each type is illustrated and defined as follows.

Warning!

Warning boxes call attention to conditions or actions that may cause personal injury or death.

Caution

Caution boxes call attention to operating conditions that may lead to equipment or property damage.

Note

Note boxes emphasize important information pertaining to installation or operation.



12570 State Route 143
Highland IL 62249-1074 USA

www.basler.com

info@basler.com

Tel: +1 618.654.2341

Fax: +1 618.654.2351

© 2024 by Basler Electric

All rights reserved

First printing: April 2024

Warning!

READ THIS MANUAL. Read this manual before installing, operating, or maintaining the BE1-700. Note all warnings, cautions, and notes in this manual as well as on the product. Keep this manual with the product for reference. Only qualified personnel should install, operate, or service this system. Failure to follow warning and cautionary labels may result in personal injury or property damage. Exercise caution at all times.

Caution

Installing previous versions of firmware may result in compatibility issues causing the inability to operate properly and may not have the enhancements and resolutions to issues that more recent versions provide. Basler Electric highly recommends using the latest version of firmware at all times. Using previous versions of firmware is at the user's risk and may void the warranty of the unit.

Basler Electric does not assume any responsibility to compliance or noncompliance with national code, local code, or any other applicable code. This manual serves as reference material that must be well understood prior to installation, operation, or maintenance.

For terms of service relating to this product and software, see the *Commercial Terms of Products and Services* document available at www.basler.com/terms.

This publication contains confidential information of Basler Electric Company, an Illinois corporation. It is loaned for confidential use, subject to return on request, and with the mutual understanding that it will not be used in any manner detrimental to the interests of Basler Electric Company and used strictly for the purpose intended.

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. Over time, improvements and revisions may be made to this publication. Before performing any of the following procedures, contact Basler Electric for the latest revision of this manual.

The English-language version of this manual serves as the only approved manual version.

Revision History

Historical changes made to this instruction manual are provided below. Revisions are listed in reverse chronological order.

Instruction Manual Revision History

Revision and Date	Change
—, 04/2024	<ul style="list-style-type: none"><li data-bbox="444 491 643 520">• Initial release.



Contents

General Information	1-1
Register Table	2-1
Register Details	3-1



1 • General Information

This document describes the Modbus® communications protocol employed by BE1-700 relays and how to exchange information with BE1-700 relays over a Modbus network.

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.

Modbus communications use a client-server technique in which only the client can initiate a transaction. This transaction is called a query. When appropriate, a server (BE1-700) responds to the query. When a Modbus client communicates with a server, information is provided or requested by the client. Information residing in the BE1-700 is generally 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 = R W
- 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 BE1-700, one of which may be selected as active using SBO commands.

When a server receives a query, the server responds by either supplying the requested data to the client or performing the requested action. A server device never initiates communications on the Modbus and will always generate a response to the query unless certain error conditions occur. The BE1-700 is designed to communicate on the Modbus network only as a server device.

Message Structure

Device Address Field

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

The device address (between 1 and 247) 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 server. 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 in length.

The BE1-700 maps all available data into the 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 server to perform the requested function. The response data block contains data collected by the server 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 server to validate the integrity of the query message contents and allows the client to confirm the validity of response message contents. This field is 2 bytes.

Modbus[®] Modes of Operation

A standard Modbus network offers one of two possible transmission modes for communication: remote terminal unit (RTU) or Modbus/TCP. RTU is available on all styles. The BE1-700 relay may support the Modbus/TCP mode, depending on communication options for the relay.

Modbus[®] RTU

This is a serial transmission interface.

A client can query servers individually or universally. A universal ("broadcast") query, when allowed, evokes no response from any server device. If a query to an individual server device requests actions unable to be performed by the server, the server 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

Client-initiated queries and BE1-700 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) |

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 BE1-700 Modbus supported baud rates are 2400, 4800, 9600, 19200, 38400, 57600 and 115200. The factory default baud rate is 19200.

Message Framing and Timing Considerations

When receiving a message via the RS-485 communication port, the BE1-700 requires an inter-byte latency of 3.5 character times before considering the message complete.

Once a valid query is received, the BE1-700 waits a specified amount of time before responding. This time delay is set as the response delay in the Modbus Settings. This parameter contains a value from 10 to 10,000 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 (ms)	Message Tx Time(s)	
		128 Bytes	256 Bytes
2400	16.04	0.59	1.17
4800	8.021	0.29	0.59
9600	4.0104	0.15	0.29
19200	2.0052	0.07	0.15

Error Handling and Exception Responses

Any query received that contains a non-existent device address, a framing error or CRC error is ignored. No response is transmitted. Queries addressed to a BE1-700 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 BE1-700 are provided in Table 1-2.

Table 1-2. Supported Exception Response Codes

Code	Name	Description
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

RTU Communication Requirements

The BE1-700 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 BE1-700 Instruction Manual for further details.

Ethernet Communication Requirements

The BE1-700 Ethernet port (RJ-45) is used with the Ethernet communication option. The relay supports 10/100BaseT using Cat 5 / Cat 5e shielded twisted pair. Refer to the BE1-700 Instruction Manual for further details.

Detailed Message Query and Response

A detailed description of BE1-700 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 (value does not matter)

Data Lo = xx (value does not matter)

CRC Hi error check

CRC Lo error check

Restart Communications Option

This query causes the remote communications function of the BE1-700 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 BE1-700 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 (value does not matter)
 Data Lo = xx (value does not matter)
 CRC Hi error check
 CRC Lo error check

Listen Only Mode

This query forces the addressed BE1-700 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 BE1-700 continues to monitor all queries. The BE1-700 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 BE1-700 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 (value does not matter)
 Data Lo = xx (value does not matter)
 CRC Hi error check
 CRC Lo error check

Preset Multiple Registers

A preset multiple registers query could address multiple registers in one server or multiple servers. 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 BE1-700 will perform the write when the device address is the same as the BE1-700's 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 BE1-700 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 BE1-700 will perform the write when the device address is the same as the BE1-700's remote address.

Query

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

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

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

Response

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

Data Formats

BE1-700 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-bits 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 by two raised to the power of the unbiased exponent. The assumed bit of the binary mantissa has the value of 1.0, with the remaining 23 bits providing a fractional value. Table 1-3 shows the floating point format.

Table 1-3. Floating Point Format

Sign	Exponent +127	Mantissa
1 bit	8 bits	23 bits

The floating point format allows for values ranging from approximately 8.43×10^{-37} to 3.38×10^{38} . A floating point value of all zeroes is the value zero. A floating point value of all ones (not a number) signifies a value currently not applicable or disabled.

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

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

The same byte alignments are required to write.

Long Integer Data Format (LI)

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

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

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

The same byte alignments are required to write.

Integer Data Format (INT)

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

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

<u>Holding Register</u>	<u>Value</u>
K (Hi Byte)	hex 12
K (Lo Byte)	hex 34

The same byte alignments are required to write.

Short Integer Data Format (SI)

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

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

<u>Holding Register</u>	<u>Value</u>
K (Hi Byte)	hex 00
K (Lo Byte)	hex 84

The same byte alignments are required to write.

ASCII Character Data Format (ASC(1))

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

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

<u>Holding Register</u>	<u>Value</u>
K (Hi Byte)	hex 00
K (Lo Byte)	hex 44

The same byte alignments are required to write.

ASCII String Data Format (ASC(x))

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

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

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

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

<u>Holding Register</u>	<u>Value</u>
K (Hi Byte)	'P'
K (Lo Byte)	hex 00
K+1 (Hi Byte)	hex 00
K+1 (Lo Byte)	hex 00

K+2	(Hi Byte)	hex 00
K+2	(Lo Byte)	hex 00
K+3	(Hi Byte)	hex 00
K+3	(Lo Byte)	hex 00

The same byte alignments are required to write.

Bit Mapped Data Format (BM(x))

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

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

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

CRC Error Check

This field contains a 2-byte CRC value for transmission error detection. The client first calculates the CRC and appends it to the query message. The BE1-700 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 server 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 8-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.

Registers

The following sections describe how to gain access to settings and data using registers.

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 USB at the same time a remote user is making changes via Modbus.

Changing the settings through the Modbus port requires that the operator write to the ACCESS REQUEST register to obtain programming access. This must follow writing the ACCESS PASSWORD register(s) with a password to obtain access to change settings associated with the password. Different passwords give the ability or access to perform different operations. The relay will deny access if an

invalid password is entered or if another user has already been granted programming access through another serial port or at the front panel. Only one user can have access at any one time.

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

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

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

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

Template Registers

The BE1-700 uses a template. A template is a block of holding registers to which the user assigns one of a number of similar groups of parameters, and it is used for settings groups. Modbus Template Register 40036 (Settings Group Selection) does not require any Write Password Access level before it can be written to.

The BE1-700 has two settings groups. The GRP template is assigned the parameters of a settings group. Therefore, before reading or writing settings group values, a user must first specify which settings group is to be associated with the template. This is accomplished by writing the desired settings group number (0 or 1) into the SETTINGS GROUP SELECTION Template holding register.

Contiguous Poll Block Registers

The user may allocate up to 125 holding registers to the Contiguous Poll Block (49875-49999). 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 (40746-40870). 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 and Time (47365-47366), Fault Indicator (47512) and Breaker Status (47390) Holding Registers, you would first configure the Contiguous Poll Block Registers by writing the desired register address values 7365, 7366, 7512 and 7390 into the Contiguous Poll Block Assignment registers 40746 thru 40749, respectively. You may now begin monitoring the specified registers by reading the first 4 locations in the Contiguous Poll Block; i.e., reading register 49875 and 49876 for the Date and Time (as specified in the corresponding assignment registers 40746 and 40747), reading register 49877 for the Fault Indicator (as specified in its corresponding assignment register 40748) and reading register 49878 for the Breaker Status (as specified in its corresponding assignment register 40749).

2 • Register Table

Mapping BE1-700 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

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 W	SI	
40038-40	Reserved			

Global Parameters

40080-83	Global Password	R W	ASC(8)	PW
40084	Reserved			
40085-88	Setting Password	R W	ASC(8)	PW
40089	Reserved			
40090-93	Control Password	R W	ASC(8)	PW
40094	Reserved			
40095-98	Report Password	R W	ASC(8)	PW
40099	Reserved			

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
Control Parameters				
40117	Select Group	R W	ASC(1)	
40118	Operate Group	R W	ASC(1)	
40119	Select Virtual Selector Switch 43-1	R W	ASC(1)	
40120	Operate Virtual Selector Switch 43-1	R W	ASC(1)	
40121	Select Virtual Selector Switch 43-2	R W	ASC(1)	
40122	Operate Virtual Selector Switch 43-2	R W	ASC(1)	
40135	Select 101 Virtual Breaker Control Switch	R W	ASC(1)	
40136	Operate 101 Virtual Breaker Control Switch	R W	ASC(1)	
40137	Select All Outputs	R W	ASC(1)	
40138	Operate All Outputs	R W	ASC(1)	
40139	Select Output A	R W	ASC(1)	
40140	Operate Output A	R W	ASC(1)	
40141	Select Output 1	R W	ASC(1)	
40142	Operate Output 1	R W	ASC(1)	
40143	Select Output 2	R W	ASC(1)	
40144	Operate Output 2	R W	ASC(1)	
40145	Select Output 3	R W	ASC(1)	
40146	Operate Output 3	R W	ASC(1)	
40147	Select Output 4	R W	ASC(1)	
40148	Operate Output 4	R W	ASC(1)	
40149	Select Output 5	R W	ASC(1)	
40150	Operate Output 5	R W	ASC(1)	

Group Setting Parameters

The following is the Group Template (GRP)

40259-335	Reserved			
40359-60	62-1 Time Delay 1	R W	LI	GRP
40361-62	62-1 Time Delay 2	R W	LI	GRP
40363-64	62-2 Time Delay 1	R W	LI	GRP
40365-66	62-2 Time Delay 2	R W	LI	GRP
40406-07	79 First Automatic Reclose Delay	R W	LI	GRP
40408-09	79 Second Automatic Reclose Delay	R W	LI	GRP
40410-11	79 Third Automatic Reclose Delay	R W	LI	GRP
40412-13	79 Fourth Automatic Reclose Delay	R W	LI	GRP
40414-15	79 Reset Time Delay	R W	LI	GRP
40416-17	79 Reclose Fail Time Delay	R W	LI	GRP
40418-19	79 Maximum Reclose Time	R W	LI	GRP
40420-21	79 Pilot Time Delay	R W	LI	GRP
40422-23	79 Block Output	R W	LI	GRP
40429-31	Reserved			
40432-33	47-1 Pickup	R W	FP	GRP
40434-35	47-1 Time Delay	R W	LI	GRP
40436-37	59P-1 Pickup	R W	FP	GRP
40438-39	59P-1 Time Delay	R W	LI	GRP
40440-41	59X-1 Pickup	R W	FP	GRP

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
40442-43	59X-1 Time Delay	R W	LI	GRP
40444-45	59P-2 Pickup	R W	FP	GRP
40446-47	59P-2 Time Delay	R W	LI	GRP
40448-49	59X-2 Pickup	R W	FP	GRP
40450-51	59X-2 Time Delay	R W	LI	GRP
40460-61	81-1 Pickup	R W	FP	GRP
40462-63	81-1 Time Delay	R W	LI	GRP
40464	81-1 Mode	R W	ASC(1)	GRP
40465-66	81-2 Pickup	R W	FP	GRP
40467-68	81-2 Time Delay	R W	LI	GRP
40469	81-2 Mode	R W	ASC(1)	GRP
40470-71	81-3 Pickup	R W	FP	GRP
40472-73	81-3 Time Delay	R W	LI	GRP
40474	81-3 Mode	R W	ASC(1)	GRP
40475-76	81-4 Pickup	R W	FP	GRP
40477-78	81-4 Time Delay	R W	LI	GRP
40479	81-4 Mode	R W	ASC(1)	GRP
40480-81	81-5 Pickup	R W	FP	GRP
40482-83	81-5 Time Delay	R W	LI	GRP
40484	81-5 Mode	R W	ASC(1)	GRP
40485-86	81-6 Pickup	R W	FP	GRP
40487-88	81-6 Time Delay	R W	LI	GRP
40489	81-6 Mode	R W	ASC(1)	GRP
40490-91	81-1 Phase A Voltage Inhibit Setting	R W	FP	GRP
40492-97	Reserved			
40498-99	27P-1 Pickup	R W	FP	GRP
40500-01	27P-1 Time Delay	R W	LI	GRP
40502-03	27P-1 Inhibit Voltage	R W	FP	GRP
40504-05	27X-1 Pickup	R W	FP	GRP
40506-07	27X-1 Time Delay	R W	LI	GRP
40508-09	27X-1 Inhibit Voltage	R W	FP	GRP
40510-11	27P-2 Pickup	R W	FP	GRP
40512-13	27P-2 Time Delay	R W	LI	GRP
40514-15	27P-2 Inhibit Voltage	R W	FP	GRP
40516-17	24 Inverse Time	R W	FP	GRP
40518-19	24 Time Dial	R W	FP	GRP
40520-21	24 Reset Time Dial	R W	FP	GRP
40522-23	24 Definite Timer 1 Pickup	R W	FP	GRP
40524-25	24 Definite Timer 1 Time Delay	R W	LI	GRP
40526-27	24 Definite Timer 2 Pickup	R W	FP	GRP
40528-29	24 Definite Timer 2 Time Delay	R W	LI	GRP
40530-31	24 Curve Exponent	R W	ASC(3)	GRP

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
40532-33	25 Volts	R W	FP	GRP
40534-35	25 Angle	R W	FP	GRP
40536-37	25 Slip	R W	FP	GRP
40538	25 Mode	R W	INT	GRP
40539-40	25VM Live Volts	R W	FP	GRP
40541-42	25VM Dead Volts	R W	FP	GRP
40543-44	25VM Time Delay	R W	LI	GRP
40545-46	25VM Mode1	R W	ASC(3)	GRP
40547-48	25 Angle Compensation	R W	INT	GRP
Global Setting Parameters				
40602-03	Power System Nominal Voltage	R W	FP	
40604-17	Reserved			
40618	Input 1 Contact Recognition Time Delay	R W	SI	
40619	Input 1 Contact Debounce Time Delay	R W	SI	
40620	Input 2 Contact Recognition Time Delay	R W	SI	
40621	Input 2 Contact Debounce Time Delay	R W	SI	
40622	Input 3 Contact Recognition Time Delay	R W	SI	
40623	Input 3 Contact Debounce Time Delay	R W	SI	
40624	Input 4 Contact Recognition Time Delay	R W	SI	
40625	Input 4 Contact Debounce Time Delay	R W	SI	
40746-870	Contiguous Poll Block Assignments	R W	INT	
40871	Setting Group Control On Time	R W	INT	
40872	Setting Group 1 Automatic Control Switch Time	R W	SI	
40873	Setting Group 1 Automatic Control Switch Level	R W	SI	
40874	Setting Group 1 Automatic Control Time	R W	SI	
40875	Setting Group 1 Automatic Control Return Level	R W	SI	
40876	Setting Group 1 Tracking Element	R W	INT	
40887-92	79 Zone-Sequence Logic Mask	R W	BM(96)	
40895-900	79 Zone-Sequence Logic Term	R W	BM(96)	
40903-04	Reserved			
40905-06	60FL Loss of Potential Volt. Auto Block Setting	R W	ASC(3)	
Serial Port Setting Parameters				
40962-66	Reserved			
40980	Serial Port 2 Baud Rate	R W	INT	
40981	Serial Port 2 Relay Address	R W	INT	
40986	Serial Port 2 Modbus Parity	R W	SI	
40987	Serial Port 2 Modbus Remote Delay	R W	INT	
40988	Serial Port 2 Modbus Stop Bits	R W	SI	
40989	Password Security	R W	SI	
System Data Setting Parameters				
41018	System Frequency	R W	SI	
41019-20	Phase Rotation	R W	ASC(3)	
41021-22	Reserved			

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41033-34	Phase VT Ratio	R W	FP	
41035-36	27/59 Voltage Sensing Mode	R W	ASC(3)	
41037-38	Reserved			
41039-40	VT Connection	RW	ASC(3)	
41041-42	Auxiliary VT Ratio	R W	FP	
41043-44	VT Auxiliary Connection	RW	ASC(3)	
41046-139	Reserved			
Relay Data Setting Parameters				
41247	Volts / Hertz Alarm Pickup Level	R W	INT	
41248-49	Volts / Hertz Alarm Time Delay	R W	LI	
41251-64	Reserved			
41265-66	Major Alarm Mask	R W	BM(32)	
41267-68	Minor Alarm Mask	R W	BM(32)	
41269-70	Logic Alarm Mask	R W	BM(32)	
41272	Clock Format - Date	R W	ASC(1)	
41273	Clock Format - Time	R W	SI	
41274	Clock Format - Daylight Savings	R W	SI	
41275-81	Reserved			
41284	Output Hold Mask	R W	BM(8)	
41285-90	Target Mask	R W	BM(96)	
41291-432	Reserved			
Custom Logic Setting Parameters				
41465-773	Reserved			
41809	Programmable 62-1 Timer Logic Mode	R W	INT	
41810-39	Reserved			
41842	Programmable 62-2 Timer Logic Mode	R W	INT	
41843-72	Reserved			
41875	Programmable 27P-1 Logic Mode	R W	INT	
41876-89	Reserved			
41892	Programmable 27X-1 Logic Mode	R W	INT	
41893-906	Reserved			
41909	Programmable 27P-2 Logic Mode	R W	INT	
41910-23	Reserved			
41943	Programmable 59P-1 Logic Mode	R W	INT	
41944-57	Reserved			
41960	Programmable 59X-1 Logic Mode	R W	INT	
41961-74	Reserved			
41977	Programmable 59P-2 Logic Mode	R W	INT	
41978-91	Reserved			

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
41994 41995-42008	Programmable 59X-2 Logic Mode Reserved	R W	INT	
42062 42063-108	Programmable Settings GRP Logic Mode Reserved	R W	INT	
42111 42112	Programmable 43-1 Virtual Switch Logic Mode Programmable 43-2 Virtual Switch Logic Mode	R W R W	INT INT	
42115 42133-3170	Program. 101 Virtual BKR CNTRL Logic Mode Reserved	R W	INT	
43173 43174-233	Programmable 79 Logic Mode Reserved	R W	INT	
43236 43237-50	Programmable 81-1 Logic Mode Reserved	R W	INT	
43253 43254-67	Programmable 81-2 Logic Mode Reserved	R W	INT	
43270 43271-84	Programmable 81-3 Logic Mode Reserved	R W	INT	
43287 43288-301	Programmable 81-4 Logic Mode Reserved	R W	INT	
43304 43305-18	Programmable 81-5 Logic Mode Reserved	R W	INT	
43321 43322-35	Programmable 81-6 Logic Mode Reserved	R W	INT	
43338 43339-52	Programmable 47-1 Logic Mode Reserved	R W	INT	
43355 43356-69	Programmable 24 Logic Mode Reserved	R W	INT	
43372 43373-86	Programmable 25 Logic Mode Reserved	R W	INT	
System Labels and ID Setting Parameters				
43438-52	Relay ID	R W	ASC(30)	
43453-67	Station ID	R W	ASC(30)	
43498-502	Contact Selector Switch 43-1 – Name Label	R W	ASC(10)	
43503-06	Contact Selector Switch 43-1 – True Label	R W	ASC(7)	
43507-10	Contact Selector Switch 43-1 – False Label	R W	ASC(7)	
43511-15	Contact Selector Switch 43-2 – Name Label	R W	ASC(10)	
43516-19	Contact Selector Switch 43-2 – True Label	R W	ASC(7)	
43520-23	Contact Selector Switch 43-2 – False Label	R W	ASC(7)	
43602-06	Contact Output A - Name Label	R W	ASC(10)	
43607-10	Contact Output A - True Label	R W	ASC(7)	
43611-14	Contact Output A - False Label	R W	ASC(7)	

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
43615-19	Contact Output 1 - Name Label	R W	ASC(10)	
43620-23	Contact Output 1 - True Label	R W	ASC(7)	
43624-27	Contact Output 1 - False Label	R W	ASC(7)	
43628-32	Contact Output 2 - Name Label	R W	ASC(10))	
43633-36	Contact Output 2 - True Label	R W	ASC(7)	
43637-40	Contact Output 2 - False Label	R W	ASC(7)	
43641-45	Contact Output 3 - Name Label	R W	ASC(10)	
43646-49	Contact Output 3 - True Label	R W	ASC(7)	
43650-53	Contact Output 3 - False Label	R W	ASC(7)	
43654-58	Contact Output 4 - Name Label	R W	ASC(10)	
43659-62	Contact Output 4 - True Label	R W	ASC(7)	
43663-66	Contact Output 4 - False Label	R W	ASC(7)	
43667-71	Contact Output 5 - Name Label	R W	ASC(10)	
43672-75	Contact Output 5 - True Label	R W	ASC(7)	
43676-79	Contact Output 5 - False Label	R W	ASC(7)	
43680-809	Reserved			
43849-53	Input 1 - Name Label	R W	ASC(10)	
43854-57	Input 1 - True Label	R W	ASC(7)	
43858-61	Input 1 - False Label	R W	ASC(7)	
43862-66	Input 2 - Name Label	R W	ASC(10)	
43867-70	Input 2 - True Label	R W	ASC(7)	
43871-74	Input 2 - False Label	R W	ASC(7)	
43875-79	Input 3 - Name Label	R W	ASC(10)	
43880-83	Input 3 - True Label	R W	ASC(7)	
43884-87	Input 3 - False Label	R W	ASC(7)	
43888-92	Input 4 - Name Label	R W	ASC(10)	
43893-96	Input 4 - True Label	R W	ASC(7)	
43897-900	Input 4 - False Label	R W	ASC(7)	
Report Parameters				
47274-78	Model Number	R –	ASC(10)	
47282-90	Application SW Version # / Date	R –	ASC(18)	
47296-304	Boot SW Version # / Date	R –	ASC(18)	
47310-16	Serial Number	R –	ASC(13)	
47324-34	Style Number	R –	ASC(21)	
47363	COM2 Serial Port Relay Address	R –	INT	
47364	Reserved			
47365-66	Date and Time - seconds	R W	LI	TS
47367-72	System Status	R –	BM(96)	
47373	Current Active Group Setting	R –	SI	
47374	Reserved			

Holding Register	Parameter	Read/Write Supported	Data Format	Notes
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)	
47384-89	Target Status	R W	BM(96)	
47390	Current Breaker Status	R –	ASC(1)	
47391-484	Reserved			
47486	Reset Logic Alarm Information	R W	SI	
47487	Reset Major Alarm Information	R W	SI	
47488	Reset Minor Alarm Information	R W	SI	
47489	Reset Relay Alarm Information	R W	SI	
47491	Reserved			
47492	Trigger Fault Record	R W	SI	
47493	Reserved			
47512	Fault Indicator	R –	SI	
47513-719	Reserved			
Metering Parameters				
49719	Firmware Part Number (Last 4 digits only)	R –	INT	
49720-21	Phase Input Frequency	R –	FP	
49722-23	V _x -V _x • Input Frequency	R –	FP	
49724-25	Slip Frequency	R –	FP	
49726-41	Reserved	R –	FP	
49742-43	Zero-Sequence Voltage	R –	FP	
49744-45	Reserved			
49754-55	Negative-Sequence Voltage	R –	FP	
49756-57	Phase A Voltage	R –	FP	
49758-59	Phase B Voltage	R –	FP	
49760-61	Phase C Voltage	R –	FP	
49762-63	Phase A-B Voltage	R –	FP	
49764-65	Phase B-C Voltage	R –	FP	
49766-67	Phase C-A Voltage	R –	FP	
49768-69	V _x -V _x • 3 rd Harmonic Voltage	R –	FP	
49770-71	V _x -V _x • Input Voltage	R –	FP	
49772-73	Slip Angle	R –	FP	
49835-74	Reserved			
49875-999	Contiguous Poll Block	R –	Mixed	

3 • Register Details

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 BE1-700 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 (that is, the write is ignored).

Logic Settings

Logic settings consist of modes, which are specific to each logic set. The logic "mode" enables or disables the logic equation for that logic block.

The following defines all logic set parameters.

Logic Modes

41505-759	Reserved	
41809	Programmable 62-1 Timer Logic Mode	INT
41842	Programmable 62-2 Timer Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for Pickup / Dropout	
	2 for One-Shot Non-Retriggerable	
	3 for One-Shot Retriggerable	
	4 for Oscillator	
	5 for Integrating	
	6 for Edge Triggered Latch	
41875	Programmable 27P-1 Logic Mode	INT
41909	Programmable 27P-2 Logic Mode	INT
41943	Programmable 59P-1 Logic Mode	INT
41977	Programmable 59P-2 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled - Undervoltage or overvoltage on one or more phases causes pickup	
	2 for enabled - Undervoltage or overvoltage on two or more phases causes pickup	
	3 for enabled - Undervoltage or overvoltage on all three phases causes pickup	
41892	Programmable 27X-1 Logic Mode	INT
41960	Programmable 59X-1 Logic Mode	INT
41994	Programmable 59X-2 Logic Mode	INT
	Read and Write:	
	0 = disabled	
	1 = 3Vo (Phase inputs)	
	2 = Vx Fundamental	
	3 = Vx 3 rd harmonic	
42062	Spare	
42111	Programmable 43-1 Virtual Switch Logic Mode	INT
42112	Programmable 43-2 Virtual Switch Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for on / off / pulse (all)	
	2 for on / off	

	3 for pulse	
	Note 1: If the logic mode is disabled (set to 0), it cannot be written from Modbus.	
42115	Programmable 101 Virtual Breaker Control Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	
	Note 1: If the logic mode is disabled (set to 0), it cannot be written from Modbus.	
43173	Programmable 79 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for power up to lock-out	
	2 for power up to reclose	
43236	Programmable 81-1 Logic Mode	INT
43253	Programmable 81-2 Logic Mode	INT
43270	Programmable 81-3 Logic Mode	INT
43287	Programmable 81-4 Logic Mode	INT
43304	Programmable 81-5 Logic Mode	INT
43321	Programmable 81-6 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for overfrequency	
	2 for underfrequency	
43338	Programmable 47-1 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	
43355	Programmable 24 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	
43372	Programmable 25 Logic Mode	INT
	Read and Write:	
	0 for disabled	
	1 for enabled	

Session Parameters

40001	Exit	ASC(1)
	Read: Always the ASCII character '0' (zero)	
	Write: ASCII characters 'Y' or 'N' ('Y' to save changes, 'N' to ignore changes)	
	Note 1: Writing to this register is effective only when Password Security register 40989 is enabled.	
40002-5	Access Password	ASC(8)
	Read: Always the ASCII string of '*' characters.	
	Write: Access password in ASCII string.	
	Note 1: If password written is less than 8 characters long, a binary zero value must be included following the final password character.	
	Note 2: Writing to this register is effective only when Password Security register 40989 is enabled.	

40006	Access Request	BM(16)
Read: Returns the current write access available to the Modbus user		
Bit 3 is set for Global Access		
Bit 2 is set for Setting Access		
Bit 1 is set for Control Access		
Bit 0 is set for Report Access		
Zero value for Read Only Access		
Write: To request write privileges using the password written into Access Password registers.		
Value written into Access Request register is arbitrary (any value will initiate the request).		
Note 1: If write access is denied, the response message will be an error response message with Illegal Function exception code.		
Step 1. Write the desired password to PASSWORD registers 40002 to 40005		
Step 2. Write any value to ACCESS REQUEST register 40006		
Step 3. Read Access Level from ACCESS REQUEST register 40006		
Note 2: Writing to this register is effective only when Password Security register 40989 is enabled.		

Template Parameters

40036	Settings Group Selection	SI
Read: Returns the current value of Settings Group Selection.		
Write: The desired value to assign a Settings Group to the Group (GRP) Template.		
0 for Settings Group 0		
1 for Settings Group 1		

40038-40 Reserved

Global Parameters

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

40080-83	Global Password	ASC(8)
40085-88	Setting Password	ASC(8)
40090-93	Control Password	ASC(8)
40095-98	Report Password	ASC(8)
Read: If global access granted, password ASCII strings are read. Otherwise, the ASCII string of '*' characters is read.		
Write: Password in ASCII string.		
Note: If password written is less than 8 characters long, a binary zero value must be included following the final password character.		

Control Parameters

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

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

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

40117	Select Group	ASC(1)
Read: To read a value other than ASCII character 'X', the Select Group register must be the most recent control register written AND must have been written within the previous 30 seconds.		
0 if Group 0 selection has been made.		
1 if Group 1 selection has been made.		
L if Logic selection has been made.		

- X if Group control not selected or control timer has expired.
Write: The desired ASCII character.
0 to select Group 0.
1 to select Group 1.
L to select Logic.
- 40118 Operate Group ASC(1)
Read: Current control.
0 if Group 0.
1 if Group 1.
L if Logic.
Write: The desired ASCII character to alter control (corresponding Select register must contain same value, written within previous 30 seconds).
0 to select Group 0.
1 to select Group 1.
L to select Logic.
- 40119 Select Virtual Selector Switch 43-1 ASC(1)
40121 Select Virtual Selector Switch 43-2 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 43-1 ASC(1)
40122 Operate Virtual Selector Switch 43-2 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 internal EEPROM.

Group Setting Parameters

40259-335 Reserved

40359-60	62-1 Time Delay 1	LI
40361-62	62-1 Time Delay 2	LI
40363-64	62-2 Time Delay 1	LI
40365-66	62-2 Time Delay 2	LI

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

Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.

40406-07	79 First Automatic Reclose Delay	LI
40408-09	79 Second Automatic Reclose Delay	LI
40410-11	79 Third Automatic Reclose Delay	LI
40412-13	79 Fourth Automatic Reclose Delay	LI
40414-15	79 Reset Time Delay	LI
40416-17	79 Reclose Fail Time Delay	LI
40418-19	79 Maximum Reclose Time	LI
40420-21	79 Pilot Time Delay	LI

Read and Write: 100 to 600,000 milliseconds, 0 to disable

Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.

40422 79 Sequence Control BM(16)

Read and Write:

Bit 0 to Block Shot #1

Bit 1 to Block Shot #2

Bit 2 to Block Shot #3

Bit 3 to Block Shot #4

Bit 4 to Block Shot #5

40429-31 Reserved

40432-33 47-1 Pickup FP

Read and Write: 1.0 to 300.0

40434-35	47-1 Time Delay	LI
	Read and Write 10 to 600,000 milliseconds	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	
40436-37	59P-1 Pickup	FP
40440-41	59X-1 Pickup	FP
40444-45	59P-2 Pickup	FP
40448-49	59X-2 Pickup	FP
	Read and Write: 1.0 to 300.0	
40438-39	59P-1 Time Delay	LI
40442-43	59X-1 Time Delay	LI
40446-47	59P-2 Time Delay	LI
40450-51	59X-2 Time Delay	LI
	Read and Write: 10 to 600,000 milliseconds	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	
40460-61	81-1 Pickup	FP
40465-66	81-2 Pickup	FP
40470-71	81-3 Pickup	FP
40475-76	81-4 Pickup	FP
40480-81	81-5 Pickup	FP
40485-86	81-6 Pickup	FP
	Read and Write: 20.00 to 70.00 Hz	
40462-63	81-1 Time Delay	LI
40467-68	81-2 Time Delay	LI
40472-73	81-3 Time Delay	LI
40477-78	81-4 Time Delay	LI
40482-83	81-5 Time Delay	LI
40487-88	81-6 Time Delay	LI
	Read and Write: 0 to 600,000 milliseconds	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	
40464	81-1 Mode	ASC(1)
40469	81-2 Mode	ASC(1)
40474	81-3 Mode	ASC(1)
40479	81-4 Mode	ASC(1)
40484	81-5 Mode	ASC(1)
40489	81-6 Mode	ASC(1)
	Read and Write: 0 = disabled, O = overfrequency, U = underfrequency	
40490-91	81-1 Phase A Voltage Inhibit Setting	FP
	Read and Write: 15.0 to 150.0 volts (0 = disabled)	
40492-97	Reserved	
40498-99	27P-1 Pickup	FP
40510-11	27P-2 Pickup	FP
	Read and Write: 1.0 to 300.0 (0 = disabled)	
40504-05	27X-1 Pickup	FP
	Read and Write: 1.0 to 150.0 (0 = disabled)	
40500-01	27P-1 Time Delay	LI
40506-07	27X-1 Time Delay	LI
40512-13	27P-2 Time Delay	LI
	Read and Write: 10 to 600,000 milliseconds	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	

40502-03	27P-1 Inhibit Voltage	FP
40514-15	27P-2 Inhibit Voltage	FP
	Read and Write: 1.0 to 300.0 (0 = disabled)	
40508-09	27X-1 Inhibit Voltage	FP
	Read and Write: 1.0 to 150.0 (0 = disabled)	
40516-17	24 Pickup	FP
	Read and Write: 0.50 to 6.00 (0 = disabled)	
40518-19	24 Time Dial	FP
40520-21	24 Reset Time Dial	FP
	Read and Write: 0 to 9.9	
40522-23	24 Definite Timer 1 Pickup	FP
40526-27	24 Definite Timer 2 Pickup	FP
	Read and Write: 0.50 to 6.00 (0 = disabled)	
40524-25	24 Definite Timer 1 Time Delay	LI
40528-29	24 Definite Timer 2 Time Delay	LI
	Read and Write: 50 to 600,000 milliseconds	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	
40530-31	24 Curve Exponent	ASC(3)
	Read and Write: 0.5, 1 or 2	
40532-33	25 Delta Volts	FP
	Read and Write: 1.0 to 50.0	
40534-35	25 Phase Angle	FP
	Read and Write: 1 to 99	
40536-37	25 Slip Frequency	FP
	Read and Write: 0.01 to 0.50 Hz	
40538	25 Mode	INT
	Read and Write: 0 = disabled, 1 = enabled	
40539-40	25 VM Live Volts	FP
40541-42	25 VM Dead Volts	FP
	Read and Write: 10.0 to 90.0% (0 = disabled)	
40543-44	25 VM Time Delay	LI
	Read and Write: 50 to 60,000 milliseconds (0 = disabled)	
	Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.	
40545-46	25 VM Mode 1	ASC(3)
	Read and Write: 1,2, and/or 3, DIS	
40547-48	25 Angle Compensation	INT
	Read and Write: 0 to 359 degrees	
Global Setting Parameters		
40602-03	Power System Nominal Voltage	FP
	Read and Write: 50 to 250	
40604-17	Reserved	

40618	Input 1 Contact Recognition Time Delay	SI
40619	Input 1 Contact Debounce Time Delay	SI
40620	Input 2 Contact Recognition Time Delay	SI
40621	Input 2 Contact Debounce Time Delay	SI
40622	Input 3 Contact Recognition Time Delay	SI
40623	Input 3 Contact Debounce Time Delay	SI
40624	Input 4 Contact Recognition Time Delay	SI
40625	Input 4 Contact Debounce Time Delay	SI
	Read and Write: 4 to 255 milliseconds	
40746-870	Contiguous Poll Block Assignments	INT
	Read and Write:	
	0 if Unassigned	
	1 to 9874: Holding Register 40001 to 49874	
40871	Setting Group Control On Time	INT
	Read and Write: 0 to 10 seconds	
40872-75	Spare	
40876	Setting Group 1 Tracking Element	INT
	Read and Write: 0 to 8 (0 to 3 = Spare, 4 = 791, 5 = 792, 6 = 793, 7 = 794, 8 = 60FL)	
40903-04	Reserved	
40905-06	60FL Loss of Voltage Auto Block Setting	ASC(3)
	Read and Write: DIS/ PNQ/ PN/ PQ/ NQ/ P/ N/ Q	
Serial Port Setting Parameters		
40962	Reserved	
40980	Serial Port 2 Baud Rate	INT
	Read and Write:	
	2 - 1200 Baud	
	3 - 2400 Baud	
	4 - 4800 Baud	
	5 - 9600 Baud	
	6 - 19.2K Baud	
	7 - 38.4K Baud	
	8 - 57.6K Baud	
	9 - 115.2K Baud	
40981	Serial Port 2 Relay Address	INT
	Read and Write: 0 to 65,534	
40964-66	Reserved	
40986	Serial Port 2 Modbus Parity	SI
	Read and Write: 0 for No parity, 1 for Even parity, 2 for Odd parity	
40987	Serial Port 2 Modbus Remote Delay	INT
	Read and Write: 1 to 1000: 10 to 10,000 milliseconds	
40988	Serial Port 2 Modbus Stop Bits	SI
	Read and Write: 1 for One stop bit, 2 for Two stop bits	

40989	<p>Password Security</p> <p>Read and Write: Default value is disabled, 1 to enable Password Security.</p> <p>When Password Security is enabled, relay parameters can be changed via Modbus only if access is obtained via the Access Password and Access Request holding registers and released via the Exit register with value 89 (ASCII character "Y").</p> <p>0 to disable Password Security.</p> <p>When Password Security is disabled, no access is required (Access Password, Access Request, and Exit holding registers have no effect) and no password protection is used. Global Parameters, holding registers 40080 - 40099 (ASCII command GS-PW) have no effect on the Modbus serial port, COM2.</p>	SI
-------	--	----

System Data Setting Parameters

41018	<p>System Frequency</p> <p>Read and Write: 50 for 50 hertz, 60 for 60 hertz</p>	SI
41019-20	<p>Phase Rotation</p> <p>Read and Write: ABC for ABC rotation, ACB for ACB rotation</p>	ASC(3)
41021-22	Reserved	
41033-34	Phase VT Ratio	FP
41041-42	<p>Auxiliary VT Ratio</p> <p>Read and Write: 1.00 to 10000</p>	FP
41035-36	27/59 Voltage Sensing Mode	ASC(3)
41037-38	<p>Reserved</p> <p>Read and Write: PP for Line, PN for Phase</p>	
41039-40	<p>VT Connection</p> <p>Read and Write:</p> <p>3W for 3W</p> <p>4W for 4W</p> <p>AB for AB</p> <p>BC for BC</p> <p>CA for CA</p> <p>AN for AN</p> <p>BN for BN</p> <p>CN for CN</p>	ASC(3)
41043-44	<p>VT Auxiliary Connection</p> <p>Read and Write:</p> <p>AB for AB</p> <p>BC for BC</p> <p>CA for CA</p> <p>AN for AN</p> <p>BN for BN</p> <p>CN for CN</p> <p>GR for GR</p>	ASC(3)
41092-104	Reserved	

Relay Data Setting Parameters

41247	<p>Volts / Hertz alarm settings</p> <p>Read and Write: 0 to 120 percent</p>	INT
41248-49	<p>Volts/Hertz alarm time delay</p> <p>Read and Write: 50 to 600,000 milliseconds</p> <p>Note 1: A setting value higher than 9,999 will be rounded to the nearest 4 significant digits.</p>	LI

41259-64	Reserved	
41265	Major Alarm Mask MSBs	BM(16)
41267	Minor Alarm Mask MSBs	BM(16)
41269	Logic Alarm Mask MSBs	BM(16)
	Read and Write:	
	Bit 15 - Spare	
	Bit 14 - Volts per Hertz alarm	
	Bit 13 - 60 Fuse Loss alarm	
	Bit 12 - Changes Lost alarm	
	Bit 11 - Freq Range alarm	
	Bit 10 - Spare	
	Bit 9 - Spare	
	Bit 8 - Logic = None alarm	
	Bit 7 - Flt Rpt Timeout alarm	
	Bit 6 - Spare	
	Bit 5 - Spare	
	Bit 4 - Spare	
	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 - Spare	
41266	Major Alarm Mask LSBs	BM(16)
41268	Minor Alarm Mask LSBs	BM(16)
41270	Logic Alarm Mask LSBs	BM(16)
	Read and Write:	
	Bit 15 - User settings changed ('EXIT' with 'Y')	
	Bit 14 - Power reset alarm, hard reset of MPU	
	Bit 13 - Clock problem, real time clock has not been set	
	Bit 12 - Communicating failure alarm, read error on serial port	
	Bit 11 - Operating System Overload detected alarm	
	Bit 10 - Setting group override in effect	
	Bit 9 - Spare	
	Bit 8 - Spare	
	Bit 7 - Spare	
	Bit 6 - Spare	
	Bit 5 - Spare	
	Bit 4 - Spare	
	Bit 3 - Recloser Lockout	
	Bit 2 - Recloser Fail	
	Bit 1 - Spare	
	Bit 0 - Out 1 CKT Open alarm	
41272	Clock Format - Date	ASC(1)
	Read and Write: M for mm/dd/yyyy format, D for dd/mm/yyyy format, Y for yyyy/mm/dd format	
41273	Clock Format - Time	SI
	Read and Write: 12 for 12-hour clock, 24 for 24-hour clock	
41274	Clock Format - Daylight Savings	SI
	Read and Write: 0 for disabling Daylight Savings, 1 for enabling Daylight Savings with floating dates, 2 for enabling Daylight Savings with fixed dates	
41275-81	Reserved	

41284	Output Hold Mask Read and Write: Bits 7 to 6 - Spare Bit 5 - Output 5 Status Bit 4 - Output 4 Status Bit 3 - Output 3 Status Bit 2 - Output 2 Status Bit 1 - Output 1 Status Bit 0 - Output A Status	BM(8)
41285	Target Mask MSBs Read and Write: Bits 15 to 0 - Spare	BM(16)
41286	Target Mask Second MSBs Read and Write: Bit 15 - Spare Bit 14 - 47-1 Bit 13 - Spare Bit 12 - Spare Bit 11 - Spare Bit 10 - Spare Bit 9 - Spare Bit 8 - Spare Bit 7 - 27X-1 Bit 6 - 27P-2C Bit 5 - 27P-2B Bit 4 - 27P-2A Bit 3 - 27P-1C Bit 2 - 27P-1B Bit 1 - 27P-1A Bit 0 - 24	BM(16)
41287	Target Mask Third MSBs Read and Write: Bit 15 - 81-6 Bit 14 - 81-5 Bit 13 - 81-4 Bit 12 - 81-3 Bit 11 - 81-2 Bit 10 - 81-1 Bits 9 to 0 - Spare	BM(16)
41288	Target Mask Fourth MSBs Read and Write: Bits 15 to 8 - Spare Bit 7 - 62-2 Bit 6 - 62-1 Bit 5 - 60FL Bit 4 - 59X-2 Bit 3 - 59X-1 Bit 2 - 59P-1C Bit 1 - 59P-1B Bit 0 - 59P-1A	BM(16)
41289	Target Mask Fifth MSBs Read and Write: Bits 15 to 0 - Spare	BM(16)

41290 Target Mask LSBs BM(16)
 Read and Write:
 Bits 15 to 3 - Spare
 Bit 2 - 59P-2C
 Bit 1 - 59P-2B
 Bit 0 - 59P-2A

41291-504 Reserved

System Labels and ID Setting Parameters

All are Read and Write of ASCII strings.

Report Parameters

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

47363 COM2 Serial Port Relay Address INT
 Read and Write: 1 to 247

47364 Reserved
 47365-66 Date and Time - seconds since midnight UTC/GMT on LI
 Jan. 1, 1970
 Read and Write: 0 to 4,294,967,295 seconds

47367 System Status (Logic Var 0 to 15) BM(16)
 Read only:
 Bits 15 to 0 - Spare

47368 System Status (Logic Var 16 to 31) BM(16)
 Read only:
 Bit 15 - Logic always FALSE
 Bit 14 - Spare
 Bit 13 - 79SCB
 Bit 12 - 79RST
 Bit 11 - 79LO
 Bit 10 - 79RNG
 Bit 9 - 79C
 Bit 8 - 79P
 Bit 7 - 43-2
 Bit 6 - 43-1
 Bits 5 to 0 - Spare

47369 System Status (Logic Var 32 to 47) BM(16)
 Read only:
 Bits 15 to 0 - Spare

47370 System Status (Logic Var 48 to 63) BM(16)
 Read only:
 Bit 15 - Target Reset key
 Bit 14 - Output circuit monitor
 Bit 13 - Alarm minor
 Bit 12 - Alarm major
 Bit 11 - Alarm logic
 Bit 10 - 101 SC

	<ul style="list-style-type: none"> Bit 9 - 101C Bit 8 - 101T Bit 7 - 27X-1 picked-up Bit 6 - 27X-1 tripped Bit 5 - 62-2 Bit 4 - 62-1 Bit 3 - Input 4 status Bit 2 - Input 3 status Bit 1 - Input 2 status Bit 0 - Input 1 status 	
47371	<p>System Status (Logic Var 64 to 79)</p> <p>Read only:</p> <ul style="list-style-type: none"> Bit 15 - 59P-1 phase tripped Bit 14 - Spare Bit 13 - Spare Bit 12 - 24 picked up Bit 11 - 24 tripped Bit 10 - 47-1 picked-up Bit 9 - 47-1 tripped Bit 8 - 27P-2 phase picked-up Bit 7 - 27P-1 phase picked-up Bit 6 - 27P-2 phase tripped Bit 5 - 27P-1 phase tripped Bit 4 - 59P-2 phase picked-up Bit 3 - 59P-1 phase picked-up Bit 2 - Settings Group 1 Bit 1 - Settings Group 0 Bit 0 - Alarm Reset key 	BM(16)
47372	<p>System Status (Logic Var 80 to 95)</p> <p>Read only:</p> <ul style="list-style-type: none"> Bits 15 to 14 - Spare Bit 13 - 25 tripped Bit 12 - 25 Voltage Monitor 1 Bit 11 - 60FL Bit 10 - 81-6 tripped Bit 9 - 81-5 tripped Bit 8 - 81-4 tripped Bit 7 - 81-3 tripped Bit 6 - 81-2 tripped Bit 5 - 81-1 tripped Bit 4 - 59X-2 picked-up Bit 3 - 59X-1 picked-up Bit 2 - 59X-2 tripped Bit 1 - 59X-1 tripped Bit 0 - 59P-2 phase tripped 	BM(16)
47373	<p>Current Active Group Setting</p> <p>Read only: 0 or 1</p>	SI
47374	Reserved	
47375	<p>Current Output Control Settings (OutputPulse0) MSBs</p> <p>Read only:</p> <ul style="list-style-type: none"> Bits 15 to 6 - Spare Bit 5 - Output 5 pulse low Bit 4 - Output 4 pulse low Bit 3 - Output 3 pulse low 	BM(16)

	Bit 2 - Output 2 pulse low Bit 1 - Output 1 pulse low Bit 0 - Output A pulse low	
47376	Current Output Control Settings (OutputPulse1) LSBs Read only: Bits 15 to 6 - Spare 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 6 - Spare 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 6 - Spare 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 6 - Spare Bit 5 - Output 5 Bit 4 - Output 4 Bit 3 - Output 3 Bit 2 - Output 2 Bit 1 - Output 1 Bit 0 - Output A	BM(16)
47380	Active Alarm Flags (Sum Flags) MSBs Read only: Bits 15 to 0 - Spare	BM(16)
47381	Active Alarm Flags (Sum Flags) LSBs Read only: Bits 15 to 10 - Spare Bit 9 - Calibration defaults loaded Bit 8 - Spare Bit 7 - Spare Bit 6 - Power Supply error Bit 5 - Calibration error Bit 4 - Spare Bit 3 - Spare Bit 2 - Spare Bit 1 - ROM (flash) Failure detected Bit 0 - Spare	BM(16)

47382	Active Alarm Flags (Prog Alarms) MSBs	BM(16)
	Read only:	
	Bit 15 - Spare	
	Bit 14 - Volts per Hertz alarm	
	Bit 13 - 60 Fuse Loss alarm	
	Bit 12 - Changes Lost alarm	
	Bit 11 - Freq Range alarm	
	Bit 10 - Spare	
	Bit 9 - Spare	
	Bit 8 - Logic = None alarm	
	Bit 7 - Flt Rpt Timeout alarm	
	Bit 6 - Virtual Output 15 alarm	
	Bit 5 - Virtual Output 14 alarm	
	Bit 4 - Virtual Output 13 alarm	
	Bit 3 - Setting Group Change Active alarm	
	Bit 2 - Loss of IRIG-B sync or IRIG-B decode problem	
	Bit 1 - An override is active in one or more outputs	
	Bit 0 - Spare	
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 - Spare	
	Bit 8 - Spare	
	Bit 6 - Spare	
	Bit 6 - Spare	
	Bit 5 - Spare	
	Bit 4 - Spare	
	Bit 3 - Recloser Lockout	
	Bit 2 - Recloser Fail	
	Bit 1 - Spare	
	Bit 0 - Out 1 CKT Open Alarm	
47384	Target Status MSBs	BM(16)
	Read:	
	Bits 15 to 0 - Spare	
	Write any value to any of 6 registers to reset all	
47385	Target Status Second MSBs	BM(16)
	Read:	
	Bit 15 - Spare	
	Bit 14 - 47-1	
	Bit 13 - Spare	
	Bit 12 - Spare	
	Bit 11 - Spare	
	Bit 10 - Spare	
	Bit 9 - Spare	
	Bit 8 - Spare	
	Bit 7 - 27X-1	
	Bit 6 - 27P-2C	
	Bit 5 - 27P-2B	
	Bit 4 - 27P-2A	
	Bit 3 - 27P-1C	

	Bit 2 - 27P-1B	
	Bit 1 - 27P-1A	
	Bit 0 - 24	
	Write any value to any of 6 registers to reset all	
47386	Target Status Third MSBs	BM(16)
	Read:	
	Bit 15 - 81-6	
	Bit 14 - 81-5	
	Bit 13 - 81-4	
	Bit 12 - 81-3	
	Bit 11 - 81-2	
	Bit 10 - 81-1	
	Bits 9 to 0 - Spare	
	Write any value to any of 6 registers to reset all	
47387	Target Status Fourth MSBs	BM(16)
	Read:	
	Bits 15 to 8 - Spare	
	Bit 7 - 62-2	
	Bit 6 - 62-1	
	Bit 5 - 60FL	
	Bit 4 - 59X-2	
	Bit 3 - 59X-1	
	Bit 2 - 59P-1C	
	Bit 1 - 59P-1B	
	Bit 0 - 59P-1A	
	Write any value to any of 6 registers to reset all.	
47388	Target Status Fifth MSBs	BM(16)
	Read:	
	Bits 15 to 0 - Spare	
	Write any value to any of 6 registers to reset all.	
47389	Target Status LSBs	BM(16)
	Read:	
	Bits 15 to 3 - Spare	
	Bit 2 - 59P-2C	
	Bit 1 - 59P-2B	
	Bit 0 - 59P-2A	
	Write any value to any of 6 registers to reset all.	
47390	Current Breaker Status	ASC(1)
	Read only:	
	O for Open	
	C for Closed	
	D for Disabled (off)	
47391-484	Reserved	
47486	Reset Logic Alarm Information	SI
47487	Reset Major Alarm Information	SI
47488	Reset Minor Alarm Information	SI
47489	Reset Relay Alarm Information	SI
47491	Reserved	
47492	Trigger Fault Record	SI
47493	Reserved	
	Read: 0	
	Write: Any value will perform reset / trigger / clear.	

47512	Fault Indicator Read only: Most recent Fault number (1 - 255)	SI
47513-719	Reserved	
Metering Parameters		
49719	Firmware Part Number (Last 4 digits only) Read only: 0001 to 9999	INT
49720-21	Phase Input Frequency	FP
49722-23	Vx-Vx• Input Frequency	FP
49724-25	Slip Frequency Read only: Value in hertz	FP
49726-45	Reserved	
49742-43	Zero-Sequence Voltage	FP
49754-55	Negative-Sequence Voltage	FP
49756-57	Phase A Voltage	FP
49758-59	Phase B Voltage	FP
49760-61	Phase C Voltage	FP
49762-63	Phase A-B Voltage	FP
49764-65	Phase B-C Voltage	FP
49766-67	Phase C-A Voltage	FP
49768-69	Vx-Vx• 3 rd Harmonic Voltage	FP
49770-71	Vx-Vx• Voltage Read only: Value in volts. If not applicable, reads undefined floating point value of 0xFFFFFFFF. * Value in KVA	FP
49772-73	Slip Angle Read only: Value in degrees	FP
49835-74	Reserved	
49875-999	Contiguous Poll Block Read only: Mixed values.	Mixed



Highland, Illinois USA
Tel: +1 618.654.2341
Fax: +1 618.644.2351
email: info@basler.com

Suzhou, P.R. China
Tel: +86 512.8227.2888
Fax: +86 512.8227.2887
email: chinainfo@basler.com