

MODBUS Network Communication

The IP3416 and IP99 use the MODBUS™ protocol, originally standardized by Modicon and is used widely in the PLC industry. For instance, many graphic interface packages available in the market support the MODBUS™ protocol. The protocol is nonproprietary and detailed specifications are available from the AEG/Modicon Company. The IP3416 supports both the ASCII and RTU modes of the MODBUS™ protocol and the IP99 supports the RTU protocol.

The following MODBUS™ functions are supported:

- Function 01 : Read output status
- Function 02 : Read input status
- Function 03 : Read output registers
- Function 04 : Read input registers
- Function 05 : Force single coil
- Function 06 : Preset single register
- Function 15 : Force multiple coils
- Function 16 : Force single register

The ASCII mode has the following packet format, `:iiffaaaaddddccCRLF`, where,

- `ii` slave identification (1...F7 hex or 1...247 decimal)
- `ff` function code
- `aaaa` start address of data
- `dddd` # of points to retrieve or data to set register to
- `cc` packet checksum
- `CR` carriage return
- `LF` line feed

The colon indicates the start of the packet and a carriage return and line feed pair indicates the end of the packet. All characters are ASCII characters of hexadecimal numbers.

- i.e. `:010100000001FD CRLF`
regular text characters

The RTU mode has the following format, `ifaaddcc`, where,

- `i` slave identification (1...F7 hex).
- `f` function code.
- `aa` start address of data minus 1.
- `dd` # of points to retrieve or data to set register to.
- `cc` packet checksum.

The packet data is in pure binary form.

- i.e. `010100000001FDCA`
hexadecimal numerals

Read Output Status Function

This function allows the user to obtain the ON/OFF status of all the outputs, Y0, ..., Y15, of the IP3416. The address for the discrete outputs is,

Registers	Address
Y0, ..., Y15	00001

The function format is as follows,

Master Query: AA 01 0000 0001 CC

AA slave identification
CC checksum

Slave Response: AA 01 01 JJJJ CC

AA slave identification
JJJJ status of Y0, ..., Y15

The returned status is in the following format,

BIT 15 BIT 0
Y7 Y6 Y5 Y4 Y3 Y2 Y1 Y0 Y15 Y14 Y13 Y12 Y11 Y10 Y9 Y8

Read Input Status Function

This function allows the user to obtain the ON/OFF status of all the discrete inputs of the IP3416. The addresses for the discrete inputs, X0, ..., X47, are,

Registers	Addresses
X0, ..., X15	10001
X16, ..., X31	10016
X32, ..., X47	10031

The function format is as follows,

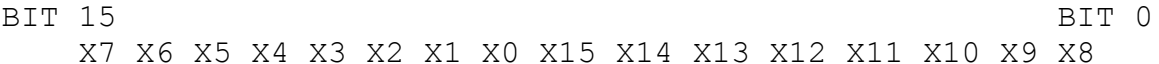
Master Query: AA 02 aaaa nnnn CC

AA slave identification
aaaa starting address minus 10001 in hexadecimal format
nnnn number of data points to retrieve
CC checksum

Slave Response: AA 02 BB JJJJ KKKK LLLL MMMM CC

AA slave identification
BB number of data bytes sent
JJJJ first 16 inputs
•
•
MMMM last 16 inputs
CC checksum

The returned status is in the following format,



Read Output/Input Status Function

This function allows the user to obtain the contents of the IP3416 internal registers. The user may obtain a maximum of 8 consecutive registers. The addresses for the internal registers are,

Registers	Addresses
T0, ..., T31	40001...40032
C0, ..., C31	40033...40064
D0, ..., D31	40065...40096
R0, ..., R255	40097...40112 (in blocks of 16)
A24, ..., A31	40121...40128

The function format is as follows,

Master Query: AA 03 aaaa nnnn CC

AA slave identification
 aaaa starting address minus 40001 in hexadecimal format
 nnnn number of data points to retrieve
 CC checksum

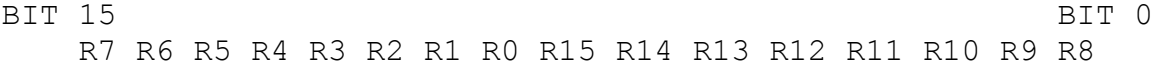
Slave Response: AA 03 BB JJJJ KKKK LLLL MMMM CC

AA slave identification
 BB number of data bytes sent
 JJJJ first register value
 •
 •
 MMMM last register value
 CC checksum

The IP3416 also supports function 4 and the only difference between function 3 and 4 are the addresses. The addresses for function 4 are as follows,

Registers	Addresses
T0, ..., T31	30001...30032
C0, ..., C31	30033...30064
D0, ..., D31	30065...30096
R0, ..., R255	30097...30112 (in blocks of 16)
A24, ..., A31	30121...30128

The returned status for the internal relays is in the following format,



and a numerical value from 0 to 32767 for all others.

Force a Single Output Function

This function allows the user to turn ON or OFF a single discrete output. The addresses for the outputs are,

Registers	Addresses
Y0, ..., Y15	00001...00016

The function format is as follows,

Master Query: AA 05 aaaa nnnn CC

 AA slave identification

 aaaa starting address minus 00001 in hexadecimal format.

 nnnn FF00 forces output ON and 0000 forces output OFF

 CC checksum

Slave Response: slave will respond with the master query packet.

Write to a Register Function

This function allows the user to write a value to the IP3416 internal registers. The addresses for the internal registers are,

Registers	Addresses
T0, ..., T31	00001...00032
C0, ..., C31	00033...00064
D0, ..., D31	00065...00096
R0, ..., R255	00097...00112 (in blocks of 16)
A24, ..., A31	00121...00128

The function format is as follows,

Master Query: AA 06 aaaa nnnn CC

 AA slave identification

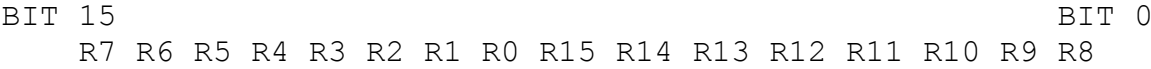
 aaaa starting address minus 00001 in hexadecimal format.

 nnnn value to write to register

 CC checksum

Slave Response: slave will respond with the master query packet.

The format for setting the internal relays is,



and a numerical value from 0 to 32767 should be used for all others.

Force Multiple Outputs Function

This function allows the user to turn ON or OFF multiple discrete outputs. The address for the outputs is,

Registers	Address
Y0, ..., Y15	00001

The function format is as follows,

Master Query: AA 0F 0000 0001 02 nnnn CC

AA slave identification
 nnnn 1 is ON and 0 is OFF, in the format of Y7, ..., Y0, Y15, ..., Y8
 CC checksum

Slave Response: AA 0F 0000 JJJJ CC

AA slave identification
 JJJJ new status of outputs
 CC checksum

Write to Multiple Registers Function

This function allows the user to write data to multiple registers of the IP3416 at the same time. The addresses for the internal registers are,

Registers	Addresses
T0, ..., T31	00001...00032
C0, ..., C31	00033...00064
D0, ..., D31	00065...00096
R0, ..., R255	00097...00112 (in blocks of 16)
A24, ..., A31	00121...00128

The function format is as follows,

Master Query: AA 10 aaaa nnnn dddd gggg CC

AA slave identification
 aaaa starting address minus 00001 in hexadecimal format of registers to change
 nnnn quantity of register to set
 dddd new values to set into registers
 •
 •
 gggg new values to set into registers
 CC checksum

Slave Response: slave will respond with the master query packet.