ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

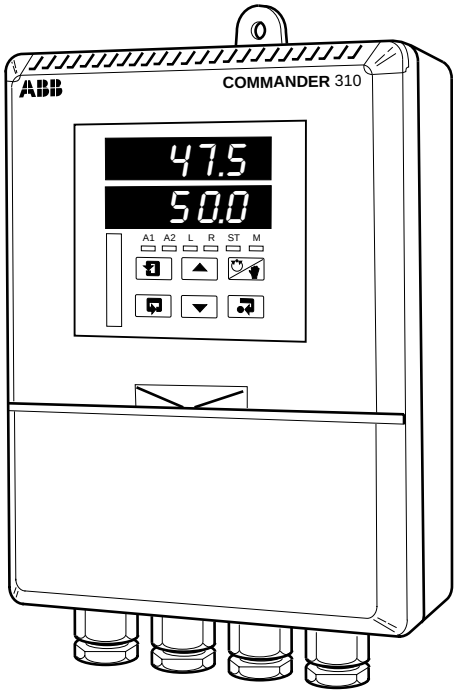
All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *ABB COMMANDER C310/0010/STD* at our website: *Click HERE*

COMMANDER 310
Universal
Process Controller

Operating Guide

MODBUS (RTU)
Communications Option



Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ABB

The Company

We are an established world force in the design and manufacture of instrumentation for industrial process control, flow measurement, gas and liquid analysis and environmental applications.

As a part of ABB, a world leader in process automation technology, we offer customers application expertise, service and support worldwide.

We are committed to teamwork, high quality manufacturing, advanced technology and unrivalled service and support.

The quality, accuracy and performance of the Company's products result from over 100 years experience, combined with a continuous program of innovative design and development to incorporate the latest technology.

The NAMAS Calibration Laboratory No. 0255(B) is just one of the ten flow calibration plants operated by the Company, and is indicative of ABB Instrumentation's dedication to quality and accuracy.

BS EN ISO 9001

Cert. No. Q5907

EN 29001 (ISO 9001)

Lenno, Italy – Cert. No. 9/90A

Stonehouse, U.K. – Cert. No. 0255

Use of Instructions

Warning.
An instruction that draws attention to the risk of injury or death.

Note.
Clarification of an instruction or additional information.

Caution.
An instruction that draws attention to the risk of damage to the product, process or surroundings.

Information.
Further reference for more detailed information or technical details.

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it must be understood that operation of damaged equipment could, under certain operational conditions, result in degraded process system performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Information in this manual is intended only to assist our customers in the efficient operation of our equipment. Use of this manual for any other purpose is specifically prohibited and its contents are not to be reproduced in full or part without prior approval of the Technical Communications Department.

Licensing, Trademarks and Copyrights

MODCELL™ and PC-30™ are trademarks of Asea Brown Boveri, Inc.
Modbus™ is a trademark of Modicon, Inc.
IBM™ and IBM PC AT™ are trademarks of International Business Machines Corp.

Health and Safety
To ensure that our products are safe and without risk to health, the following points must be noted:

1. The relevant sections of these instructions must be read carefully before proceeding.
2. Warning labels on containers and packages must be observed.
3. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
4. Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
5. Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
6. When disposing of chemicals ensure that no two chemicals are mixed.

Safety advice concerning the use of the equipment described in this manual or any relevant hazard data sheets (where applicable) may be obtained from the Company address on the back cover, together with servicing and spares information.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONTENTS

Section **Page**

1 INTRODUCTION 2

2 ELECTRICAL INSTALLATION 2
2.1 Selection of Serial Communication Adaptors for Personal Computers 2
2.2 Recommended OPTO22 Boards 3
2.3 Pull-up and Pull-down Resistors 3
2.4 Termination Resistors 4
2.5 RS485/422 Standard 4
2.6 Serial Connections 5

3 PROGRAMMING 6
3.1 Serial Data Communication Page 7

4 MODBUS PROTOCOL 8
4.1 Introduction to MODBUS Protocol 8
4.1.1 Non-volatile Memory Limitations 8
4.2 MODBUS Function Codes 9

Section **Page**

5 MODBUS FUNCTIONS 10
5.1 Read Coil Status – Function Code 01 10
5.1.1 Read Coil Status Query . 10
5.1.2 Read Coil Status Response 10
5.2 Read Holding Register – Function Code 03 11
5.2.1 Read Holding Register Query 11
5.2.2 Read Holding Register Response 11
5.3 Force Single Coil – Function Code 05 12
5.3.1 Force Single Coil Query . 12
5.3.2 Force Single Coil Response 12
5.4 Preset Single Register – Function Code 06 13
5.4.1 Preset Single Register Query 13
5.4.2 Preset Single Register Response 13
5.5 Loopback Test – Function Code 08 14
5.5.1 Loopback Test Query 14
5.5.2 Loopback Test Response 14
5.6 Write Multiple Coils – Function Code 15 14
5.6.1 Write Multiple Coils Query 14
5.6.2 Write Multiple Coils Response 15
5.7 Write Multiple Registers – Function Code 16 15
5.7.1 Write Multiple Register Query 15
5.7.2 Write Multiple Registers Response 15

6 EXCEPTION RESPONSES 16
6.1 Examples 16

7 MODBUS REGISTERS 17
7.1 Coils 17
7.2 Holding Registers 18
7.3 Controller Settings/Outputs 19
7.4 Alarm Settings 20
7.5 Ramp/Soak Settings 20

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1 INTRODUCTION

Information.

- Serial data communication option designed for use with SCADA systems.
- RS422/485 Communication standard.
- MODBUS RTU protocol – for master (host computer) to slave (COMMANDER 310) system.
- Isolated (500V) from rest of instrument.
- 5-wire communication supported.
- Baud rate – from 1200 to 9600.
- Parity-checking – odd, even or none.

2 ELECTRICAL INSTALLATION

2.1 Selection of Serial Communication Adaptors for Personal Computers

Information.

- An RS422/485 communication board is required in the host PC.
- Observe the limitations outlined in the *Installation Guide* – the maximum serial data transmission line length for both RS422 and RS485 systems is 1200m.

An RS422/485 communications adaptor is required for serial links. It is strongly recommended that the card used has galvanic isolation to protect the computer from lightning damage and increase immunity from noise pick-up.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.2 Recommended OPTO22 Boards

The following OPTO22 boards are recommended:

Part No.	Computer Type
AC24 AT	AT Bus IBM PC compatible
AC34	Microchannel IBM PC

2.3 Pull-up and Pull-down Resistors – Fig. 2.1

To prevent false triggering of the slave wall-/ pipe-mounted controller by the presence of noise when the master (host computer) is inactive, 1.8K pull-up and pull-down resistors must be fitted to the RS422/485 adaptor card – see Fig. 2.1.

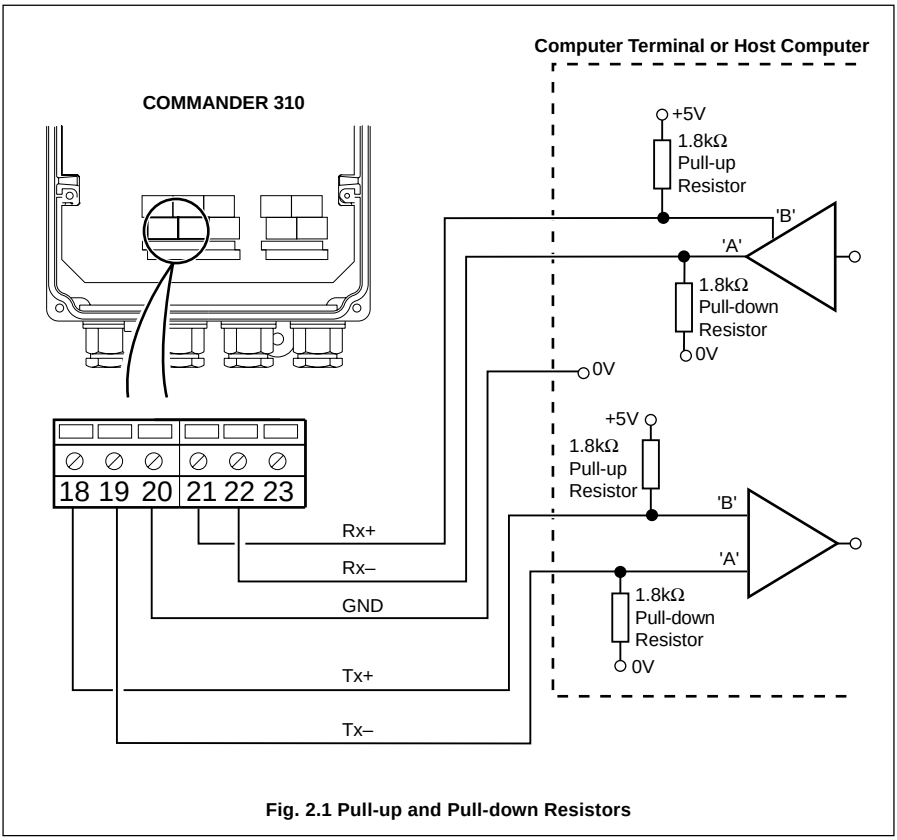


Fig. 2.1 Pull-up and Pull-down Resistors

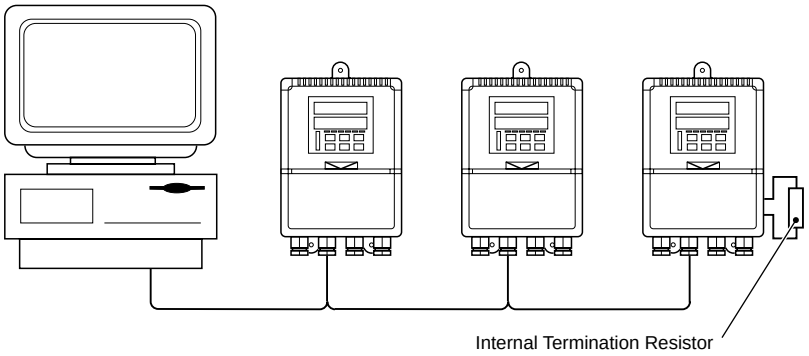
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.4 Termination Resistors – Fig. 2.2

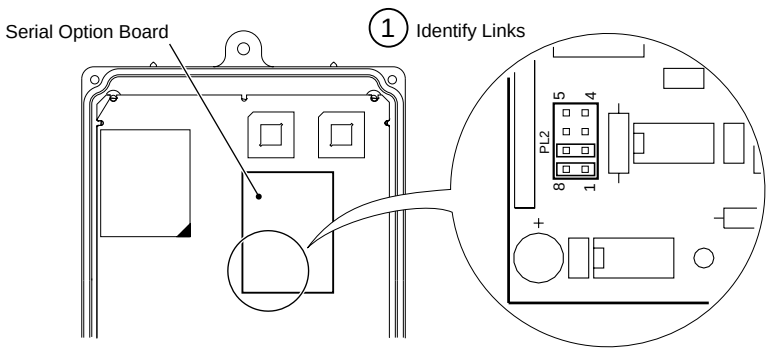
For long transmission lines, termination resistors are required on the last slave in the chain – see Fig. 2.2A. The slave termination resistors are selected using plug-in links (PL2) on the serial option board – see Fig. 2.2B.

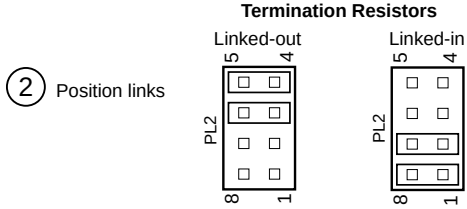
2.5 RS485/422 Standard

The RS485 standard quotes connection of thirty two slaves maximum, to any single driver (computer terminal or host computer); the RS422 standard quotes connection of up to ten slaves. However, these numbers can be increased if the driver's serial port permits.



A – Schematic Diagram





B – Termination Resistor Link Positions

Fig. 2.2 Selecting the Slave Termination Resistor

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.6 Serial Connections – Fig. 2.3

Information.

- Up to **10 slaves** can be connected to a single **RS422** adaptor card on a PC.
- Up to **32 slaves** can be connected to a single **RS485** adaptor card on a PC.
- The maximum serial data transmission line length for both **RS422** and **RS485** systems is 1200m.

All connections, apart from those for serial data communication, are made as shown in *Section 4 of the Installation Guide*.

Make serial data connections as shown in Fig. 2.3. The type of cable used is dependent on the cable length:

Up to 6m – standard screened or twisted pair cable.

Up to 300m – twin twisted pair with overall foil screen and an integral drain wire, e.g. Belden 9502 or equivalent.

Up to 1200m – twin twisted pair with separate foil screens and integral drain wires for each pair, e.g. Belden 9729 or equivalent.

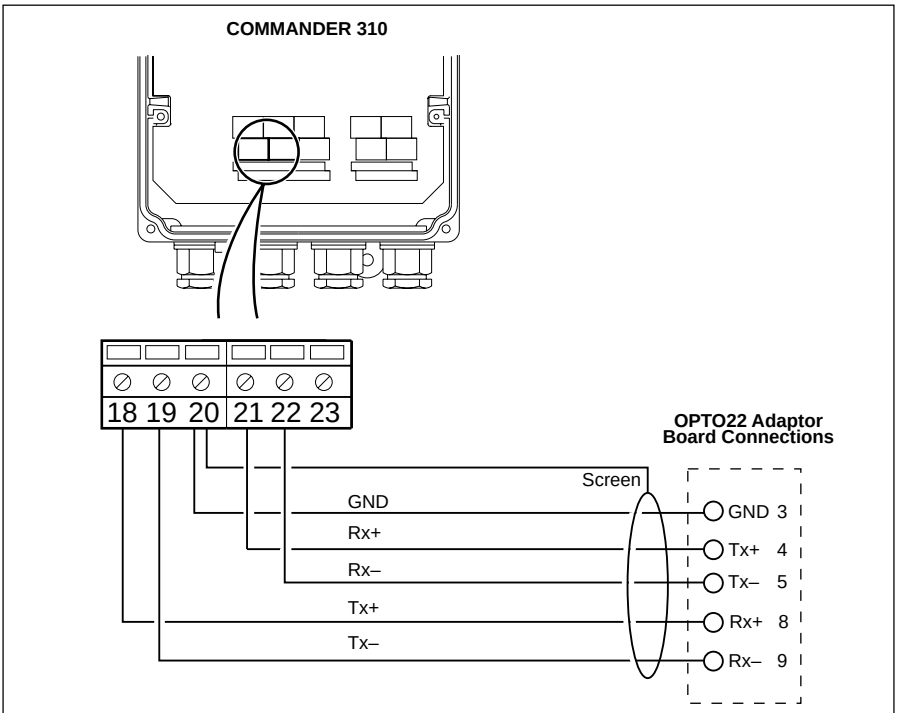


Fig. 2.3 Serial Board Terminal Block Connections

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

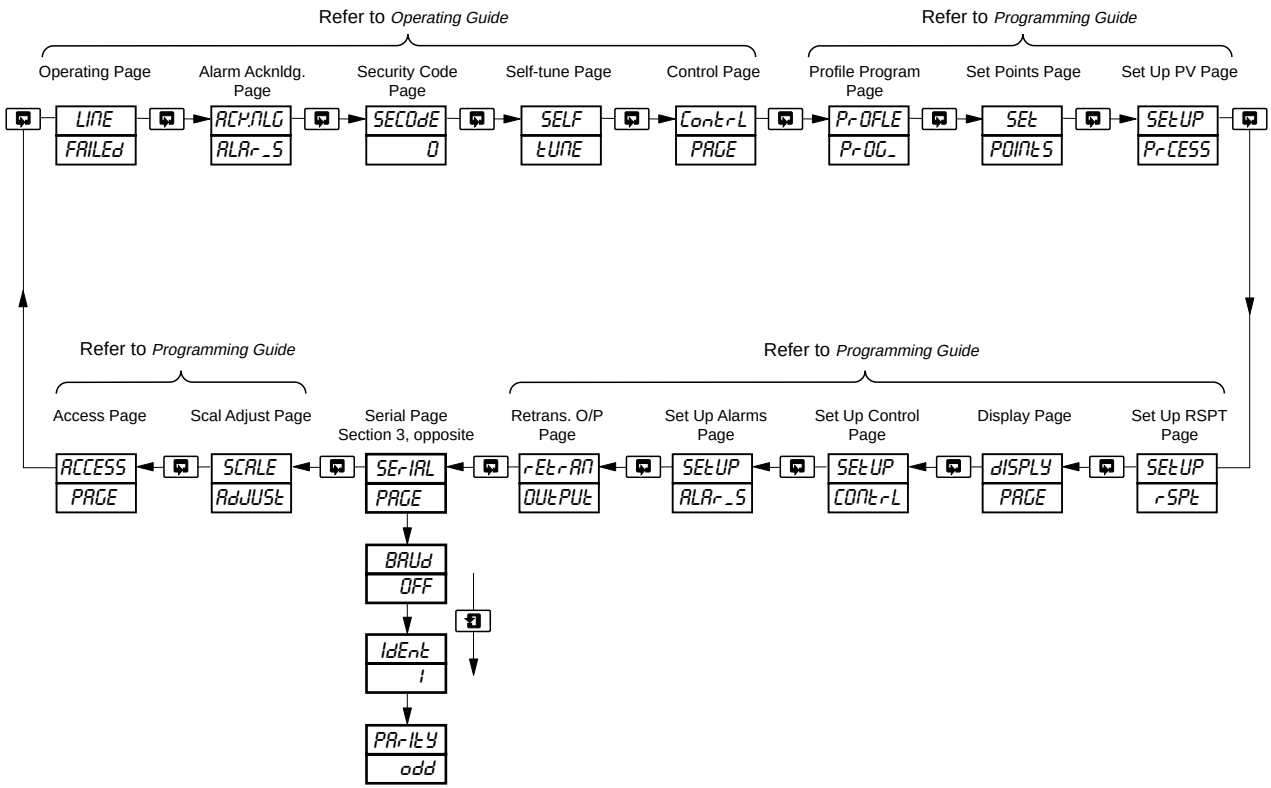


Fig. 3.1 Location of Serial Data (RS485) Communications Page

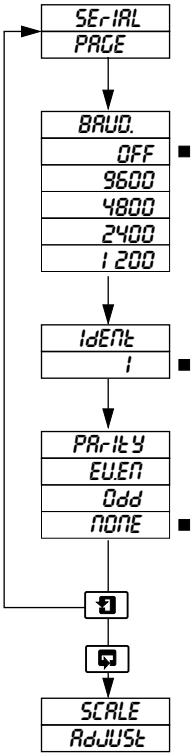
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.1 Serial Data Communication Page

Information.

- Programmable baud rate (1200 to 9600 baud).
- Odd or even parity.

The general programming procedure is as detailed in the *Operating Guide*. In this Section, parameters in the lower display denoted ■ are Company Standard Settings. The instrument is dispatched programmed with these settings.



Page Header – **Serial Page**.

Transmission Rate
Select the transmission rate required (1200 slowest, 9600 fastest).

Select *OFF* to disable Serial Communications.

Controller Identification
Assign the controller an identification number between 1 and 99.

Parity
Select the appropriate parity to match the computer terminal or host computer.

Return to **Serial Page** frame
or
advanced to **Scale Adjust Page** – see *Operating Guide*.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4 MODBUS PROTOCOL

Information.

- Operates as a MODBUS, Remote Terminal Unit (RTU) slave.
- Parity checking – used to detect transmission errors in individual characters.
- Cyclic redundancy checking – used to detect errors in the master messages and slave responses.
- Non-volatile memory save command.

4.1 Introduction to MODBUS Protocol

MODBUS communication is based on a master and a slave arrangement. The master sends a message to one slave at a time and waits for a reply.

The slave cannot accept a new message until the existing message is processed and a reply sent to the master (maximum response time 160 milliseconds). The slave monitors the elapsed time between receipt of characters. If the elapsed time without a new character is $3^{1}/_{2}$ character times, the slave assumes the next character received is the start of a new message.

To allow the master to differentiate between more than one slave in a system, each slave is given a unique identity address (between 1 and 99).

A broadcast address (address zero) can be used to access all slave devices with one command. This is limited to write messages only and there is no slave acknowledgment.

Note. MODBUS RTU requires 1 start bit, 8 data bits, 1 parity bit (optional) and 1 or 2 stop bits.

4.1.1 Non-volatile Memory Limitations

Caution. If the number of write cycles to any particular non-volatile memory register exceeds 10^4 cycles, the data stored may not be retained.

Any changes made to a parameter via the serial link, e.g. Control Set Point value, are stored in a non-volatile memory register assigned to that parameter.

The number of write cycles to a particular register can be reduced by disabling non-volatile memory access when making changes to parameters which do not need to be retained following a power-down. This is done using the **Non-volatile Save State (NV) Coil 181** – see Section 7.1, Coils.

When the **Non-volatile Save State** is set to ‘Enable’, any parameter changes made via the serial link are written to non-volatile memory and are retained on power-down. If the **Non-volatile Save State** is set to ‘Disable’, parameter changes made via the serial link are not retained on power down.

The **Non-volatile Save State** must be adjusted only when necessary and must be reset to the required state each time the instrument is powered down, replaced with another instrument or the host computer is powered down.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2 MODBUS Function Codes

The function code field instructs the addressed slaves what function to perform. Table 4.1 shows the function codes, their meaning, and the action they initiate.

Modbus Function Code	Modbus Mesage Name	C310 Definition
01	Read Coil Status	Read up to 16 consecutive discrete (boolean) points from a specific starting point. The COMMANDER 310 returns zeros for points which do not contain defined data and NAKs* any request for point numbers greater than 200.
03	Read Holding Register	Read up to 8 consecutive registers from a specific starting register. The COMMANDER 310 returns zeros for points which do not contain defined data and NAKs* any request for point numbers greater than 250.
05	Force Single Coil	Write one discrete (boolean) point. The COMMANDER 310 NAKs* this if the point is not currently writeable.
06	Preset Single Register	Write one register. The COMMANDER 310 NAKs* if the register is not currently writeable. This function code also applies to any currently applicable limits the value before storage in the database.
08	Loop Back Diagnostic Test	Echo the message, only ‘Return of Query’ is supported.
15	Force Multiple Coils	Write up to 16 coils from a specified coil. The COMMANDER 310 NAKs* if any of the coils are not currently writeable, but still carries out all the writes which are still valid. This is only available if ‘write to non-volatile memory’ is disabled – see coil number 181.
16	Preset Multiple Registers	Write up to 8 consecutive registers from a specified starting register. The COMMANDER 310 NAKs* if any of the registers are not currently writeable, but still carries out all the writes which are still valid, applying any current applicable limits to the value before storage in the database. This function code is only available if ‘write ot non-volatile memory’ is disabled – see coil number 181.

*NAK = Negative Acknowledgment

Table 4.1 MODBUS Function Codes

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5 MODBUS FUNCTIONS

This section shows typical examples of MODBUS function codes 01, 03, 05, 06, 08, 15 and 16.

5.1 Read Coil Status – Function Code 01

5.1.1 Read Coil Status Query

This function allows the user to obtain the ON/OFF status of logic coils used to control discrete outputs from the addressed slave only. Broadcast mode is not supported with this function code. In addition to the slave address and function fields, the message requires that the information field contain the initial coil offset address to be read (starting address) and the number of locations to be interrogated must obtain status data.

Note. The coil offset address is the coil number minus one, e.g. to start at coil 31 the data start value must be set to 30 (1EH).

Example – a read coil status request to read 16 coils from slave (01) starting at coil 31 (alarm A status) is shown below.

Address	Function	Coil Start Offset High	Coil Start Offset Low	Number of Coils High	Number of Coils Low	Error Check Field	(CRC-1-6)
01	01	00	1E	00	10	5D	C0

5.1.2 Read Coil Status Response

The data is packed one bit for each coil (1 = ON, 0 = OFF). The response includes the slave address, function code, quantity of data characters, the data characters and error checking. The low order bit of the first character contains the first addressed coil and the remainder follow. For coil quantities that are not even multiples of eight, the last characters are filled in with zeros at high order end.

Example – the response to the read coil status query shows the following:

Alarm A status ON
Alarm B status OFF
Alarm C status ON
Alarm D status OFF
Alarm E,F,G,H,J, K status all OFF
Alarm 1 Relay to Alarm 3 Relay status all OFF
Logic Input 1 and 2 status ACTIVE

Address	Function	Byte Count	Data Coil Status 31 to 38	Data Coil Status 39 to 46	Error Check Field	(CRC-16)
01	01	02	05	00	BA	AC

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.2 Read Holding Register – Function Code 03

5.2.1 Read Holding Register Query

The Read holding registers allow the user to obtain the binary contents of holding registers in the addressed slave.

Note. The data start register must contain the offset address of the first register to be accessed, e.g. to start at register 121 the data start register must contain 120 (78H).

Broadcast mode is not allowed.

Example – a read holding register request to read 6 holding registers from slave (01) starting at holding address 121 (alarm A trip value) is shown below.

Address	Function	Register Start Offset High	Register Start Offset High	Data Number of Registers High	Data Number of Registers Low	Error Check Field	(CRC-16)
01	03	00	78	00	06	45	D1

5.2.2 Read Holding Register Response

The addressed slave responds with its address and function code, followed by the information field. The information field contains 1 byte describing the quantity of data bytes to be returned. The contents of each register requested (DATA) is two bytes, the first byte includes the high order bits and the second the low order bits.

Example – the response to the read holding register query shows the following:

Alarm trip A – 150
Alarm trip B – 50
Alarm trip C – 100
Alarm trip D – 400
Alarm trip E – 0
Alarm trip F – 0

Address	Function	Byte Count	Holding Register 121 High	Holding Register 121 Low	Holding Register 122 High	Holding Register 122 Low	Holding Register 123 High	Holding Register 123 Low
01	03	0C	00	96	00	32	00	64

Holding Register 124 High	Holding Register 124 Low	Holding Register 125 High	Holding Register 125 Low	Holding Register 126 High	Holding Register 126 Low	Error Check Field	(CRC-16)
01	90	00	00	00	00	D9	91

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.3 Force Single Coil – Function Code 05

5.3.1 Force Single Coil Query

This message forces a single coil either ON or OFF. The data value 65,280 (FF00 HEX) sets the coil ON and the value zero turns it OFF. All other values are illegal and do not affect the coil.

Note. To write to a coil the coil offset address must be used, e.g. to write to coil 149, the coil address 148 (94H) is transmitted.

The use of slave address zero (broadcast mode) forces all attached slaves to modify the desired coil.

Example – a force single coil request to switch ON coil address 149 (auto/manual state, channel 1) in slave 01 is shown below.

Addres-s	Function	Coil Offset High	Coil Offset Low	Data Value High	Data Value Low	Error Check Field	(CRC-16)
01	05	00	94	FF	00	CD	D6

5.3.2 Force Single Coil Response

The response is confirmation of the query after the coil state has been altered.

Example:

Address	Function	Coil Offset High	Coil Offset Low	Data Value High	Data Value Low	Error Check Field	(CRC-1-6)
01	05	00	94	FF	00	CD	D6

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.4 Preset Single Register – Function Code 06

5.4.1 Preset Single Register Query

The preset single register allows the user to modify the contents of a holding register.

Note. Function codes 5, 6 and 16 are the only messages that are recognized as valid for broadcast.

Example – a preset single register request to write the value 500 to holding register address 121 (alarm A trip value) in slave 01 is shown below.

Note. To write to a register, the register's offset address must be used, e.g. to write to register 121, the offset address 120 (78H) is transmitted.

Address	Function	Register Offset High	Register Offset Low	Data Value High	Data Value Low	Error Check Field	(CRC-16)
01	06	00	78	01	F4	09	C4

5.4.2 Preset Single Register Response

The normal response to a preset single register request is to retransmit the query message after the register has been altered.

Example:

Address	Function	Register Offset High	Register Offset Low	Data Value High	Data Value Low	Error Check Field	(CRC-16)
01	06	00	78	01	F4	09	C4

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.5 Loopback Test – Function Code 08

5.5.1 Loopback Test Query

The purpose of the loopback test is to test the MODBUS system, it does not affect the content of the controller. Variations in the response may indicate faults in the MODBUS system. The information field contains 2 bytes for the designation of the diagnostic code followed by 2 bytes to designate the action to be taken.

Example:

Address	Function	Data Diagnostic Code High	Data Diagnostic Code Low	Data *	Data *	Error Check Field	(CRC-16)
01	08	00	00	A5	37	DA	8D

*These are considered to be the information fields for diagnostic mode.

5.5.2 Loopback Test Response

The response always echoes the query, only diagnostic code 0 (bytes 3 and 4) can be used.

Example:

Address	Function	Data Diagnostic Code High	Data Diagnostic Code Low	Data	Data	Error Check Field	(CRC-16)
01	08	00	00	A5	37	DA	8D

5.6 Write Multiple Coils – Function Code 15

5.6.1 Write Multiple Coils Query

Coils existing within the controller can have their state changed by this message (a maximum of 16 coils). When used with slave address 0 (broadcast mode) all slave controllers load the selected coil with the contents specified.

Example – a write multiple coil request to force coil 149 (auto/manual state) to ON (manual) and force coil 150 (control action 2) to OFF (direct) in slave 01 is shown below.

Address	Function	Coil Start Address High	Coil Start Address Low	Number of Coils High	Number of Coils Low
01	0F	00	94	00	02

Byte Count	Data Coil Status	Error Check Field	(CRC-16)
01	01	2E	8A

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

5.6.2 Write Multiple Coils Response

The response confirms slave identification, function code, starting coil address and quantity of coils required.

Example:

Address	Function	Coil Start Address High	Coil Start Address Low	Number of Coils High	Number of Coils Low	Error Check Field	(CRC-16)
01	0F	00	94	00	02	95	E6

5.7 Write Multiple Registers – Function Code 16

5.7.1 Write Multiple Registers Query

Holding registers existing within the controller can have their contents changed by this message (a maximum of 8 registers). When used with slave address zero (broadcast mode) all slave controllers load the selected registers with the contents specified.

Example – a write multiple register request to write the value 10 to the register address 121 (alarm A trip value) and the value 100 to the register address 122 (alarm B trip value) in slave 01 is shown below.

Address	Function	Register Start Offset High	Register Start Offset Low	Number of Registers		Byte Count
01	10	00	78	00	02	04

Holding Register 121 High	Holding Register 121 Low	Holding Register 122 High	Holding Register 122 Low	Error Check Field	(CRC-16)
00	0A	00	64	D4	C4

5.7.2 Write Multiple Registers Response

The response confirms slave identification, function code, starting register address and quantity only.

Example:

Address	Function	Register Start Offset High	Register Start Offset Low	Number of Registers			Error Check Field	(CRC-16)
01	10	00	78	00	02	00	10	90

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

6 EXCEPTION RESPONSES

The exception response codes sent by the slave are shown in Table 6.1. When a slave detects one of these errors, it sends a response message to the master consisting of slave address, function code, error code and error check fields.

Exception Response Code	Exception Response Name	Exception Response Definition
01	Illegal Function	The message function received is not an allowable action for the COMMANDER 310.
02	Illegal Data Address	The address reference in the data field is not an allowable address for the COMMANDER 310.
03	Illegal Data Value	The value referenced in the data field is not allowable in the addressed slave location.
07	Negative Acknowledgement	The function just requested cannot be performed.
08	Memory Parity Error	Parity check indicates an error in one or more of the characters received.

Table 6.1 Exception Response Codes

6.1 Examples

A read register request to read holding register address 251 of slave 01 (undefined address for slave, beyond address limit) is shown below.

Address	Function	Register Start Offset High	Register Start Offset Low	Number of Registers High	Number of Registers Low	Error Check Field	(CRC-16)
01	03	00	FA	00	06	E5	F9

The response is an exception response sighting ‘illegal data address’. To indicate that the response is a notification of an error, the most significant bit of the function code is set to 1.

Slave Address	Function	Exception Code	Error Check Field	(CRC-16)
01	83	02	C0	F1

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7 MODBUS REGISTERS

7.1 Coils

Coil Number	Read/Write	Description	Response/Entry
		Input Failure States	
011	R	Process Variable	0 = Active, 1 = Failed
012	R	Position Feedback	
013	R	Remote Set Point	
		Alarm Status	
031	R	Alarm A	0 = Inactive 1 = Active
032	R	Alarm B	
033	R	Alarm C	
034	R	Alarm D	
035	R	Alarm E	
036	R	Alarm F	
037	R	Alarm G	
038	R	Alarm H	
039	R	Alarm J	
040	R	Alarm K	
041	R	Alarm 1 Relay	
042	R	Alarm 2 Relay	
043	R	Alarm 3 Relay	
		Digital Input States	
051	R	Logic Input 1	0 = Active 1 = Inactive
052	R	Logic Input 2	
		Multiple Read Group	
061	R	Alarm A	0 = Inactive 1 = Active
062	R	Alarm B	
063	R	Alarm C	
064	R	Alarm D	
065	R	Alarm E	
066	R	Alarm F	
067	R	Alarm G	
068	R	Alarm H	
069	R	Alarm J	
070	R	Alarm K	
071	R	Logic Input 1	0 = Active, 1 = Inactive
072	R	Logic Input 2	0 = Active, 1 = Inactive
073	R	Control Action	0 = Direct,1 = Reverse
074	R	Auto/Manual	0 = Auto, 1 = Manual
075	R	Control Action for Output 2	0 = Direct,1 = Reverse
076	R	Process Variable Failure	0 = Active, 1 = Failed

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

...7.1 Coils

Coil Number	Read/Write	Description	Response/Entry
		Control States	
148	R/W	Control Action	0 = Direct, 1 = Reverse
149	R/W	Auto/Manual	0 = Auto, 1 = Manual
150	R/W	Control Action for Output 2	0 = Direct, 1 = Reverse
		Save MODBUS	
181	R/W	Enable Writes to Non-Vol Memory	0 = Disable, 1= Enable

7.2 Holding Registers

Information.
Holding registers which have a response entry of 0 to 4095 are numbers scaled over the display range.

Example – scaling process variable to display range:

- Process variable display high = 1000
- Process variable display low = 0
- Process variable response (011) = 2047

$$\text{Scaled value} = \left[\frac{\text{Response}}{4095} \times (\text{Display High} - \text{Display Low})\right] + \text{Display Low}$$

$$\text{Process Variable} = \left[\frac{2047}{4095} \times (1000 - 0)\right] + 0$$

Process Variable = 500

Register No.	Read/Write	Description	Response/Entry
		Process Variable Inputs	
011	R	Process Variable	Scaled 0 to 4095 of Display Range
012	R	Remote Set Point	
013	R	Postion Feedback	
019	R	Process Variable Display Decimal Point Position	0 to 3 Decimal Places
041	R	Process Variable Display Span	–9999 to +9999
042	R	Process Variable Display Zero	
043	R	Remote Set Point High	
044	R	Remote Set Point Low	

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7.3 Controller Settings/Outputs

Register No.	Read/Write	Description	Response/Entry
		Controller Settings	
051	R	Process Variable	
052	R/W	Control Set Point	0 to 4095
053	R/W	Control Output	
054	R	Position Feedback Input	0 to 4095
055	R	Position Feedback Failure State	0 = Active, 1 = Failed
057	R/W	Cycle Time	10 to 3000
058	R/W	Proportional Band	1 to 9999
059	R/W	Integral Action Time	0 to 7201
060	R/W	Manual Reset Value	0 to 4095
061	R/W	Derivative Action Time	1 to 9999
062	R/W	Approach Band	1 to 30
063	R/W	Control Output Heat	0 to 4095
064	R/W	Control Output Cool	0 to 4095
065	R/W	Proportional Band Cool	1 to 9999
066	R/W	Intregral Action Time Cool	0 to 7200
067	R/W	Manual Reset Cool	0 to 4095
068	R/W	Cycle Time Cool	10 to 3000
069	R/W	Crossover Value	0 to 4095
070	R/W	Transition Band	0 to 4095
071	R	Remote Set Point Input	
074	R/W	Ratio Value for Remote Set Point	1 to 9999
075	R/W	Bias Value for Remote Set Point	(Display Range)
		Controller Settings for Position Feedback	
094	R/W	Ratio Value for Position Feedback	1 to 9999
095	R/W	Bias Value for Position Feedback	(Display Range)
		Set Points	
101	R/W	Local Set Point	
102	R/W	Dual Set Point	0 to 4095
103	R/W	Remote Set Point (without Ratio/Bias)	(Display Range)
104	R/W	Remote Set Point (with Ratio/Bias)	
105	R/W	Remote Set Point Failure State	0 = Active, 1= Failed
106	R/W	Set Point Selection	0 = Local,1 = 2nd SP

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

7.4 Alarm Settings

Register No.	Read/Write	Description	Response/Entry
		Alarms	
121	R/W	Alarm A Trip Value	0 to 4095
122	R/W	Alarm B Trip Value	
123	R/W	Alarm C Trip Value	
124	R/W	Alarm D Trip Value	
125	R/W	Alarm E Trip Value	
126	R/W	Alarm F Trip Value	
127	R/W	Alarm G Trip Value	
128	R/W	Alarm H Trip Value	
129	R/W	Alarm J Trip Value	
130	R/W	Alarm K Trip Value	
			0 = Alarm Off
141	R	Alarm A Type	1 = High Process
142	R	Alarm B Type	2 = Low Process
143	R	Alarm C Type	3 = High Deviation
144	R	Alarm D Type	4 = Low Deviation
145	R	Alarm E Type	5 = High Output
146	R	Alarm F Type	6 = Low Output
147	R	Alarm G Type	7 = Fast Rate
148	R	Alarm H Type	8 = Slow Rate
149	R	Alarm J Type	9 = Mode Alarm
150	R	Alarm K Type	10 = Program Event
			11 = Segment Event

7.5 Ramp/Soak Settings

Register No.	Read/Write	Description	Response/Entry
		Ramp Soak Settings	
171	W	Ramp Soak Run State	1 = Run Profile
172	W	Ramp Soak Hold Command	1 = Hold Profile
173	W	Ramp Soak Skip	1 = Skip
175	W	Ramp Soak Reset	1 = Reset Profile
176	R	Profile Status	0 = Stop 1 = Ramp 3 = Soak 4 = Countdown 5 = Operator Hold 6 = Not Used 7 = Manual Hold 8 = Holdback Hold 9 = End
178	R	Remaining Segment Time	0 to 9999
179	R/W	Selected Program	1 to 10

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PRODUCTS & CUSTOMER SUPPORT

A Comprehensive Product Range

Analytical Instrumentation

- ***Transmitters***
  On-line pH, conductivity, and dissolved oxygen transmitters and associated sensing systems.
- ***Sensors***
  pH, redox, selective ion, conductivity and dissolved oxygen.
- ***Laboratory Instrumentation***
  pH and dissolved oxygen meters and associated sensors.
- ***Water Analyzers***
  For water quality monitoring in environmental, power generation and general industrial applications including: pH, conductivity, ammonia, nitrate, phosphate, silica, sodium, chloride, fluoride, dissolved oxygen and hydrazine.
- ***Gas Analyzers***
  Zirconia, paramagnetic, infrared, thermal conductivity.

Controllers & Recorders

- ***Controllers***
  Digital display, electronic, pneumatic. Discrete single-loop and multi-loop controllers which can be linked to a common display station, process computer or personal computer.
- ***Recorders***
  Circular and strip-chart types (single and multi-point) for temperature, pressure, flow and many other process measurements.

Electronic Transmitters

- ***Smart & Analog Transmitters***
  For draft, differential, gauge and absolute pressure measurement. Also, liquid level and temperature.
- ***I to P Converters and Field Indicators***

Flow Metering

- ***Magnetic Flowmeters***
  Electromagnetic, insertion type probes and watermeters.
- ***Turbine Flowmeters***
- ***Wedge Flow Elements***
- ***Mass Flow Meters***
  Transmitters, sensors, controllers and batch/display units.

Level Control

- ***Submersible, Capacitance & Conductivity.***

Pneumatic Instrumentation

- ***Transmitters***
- ***Indicating Controllers***
- ***Recording Controllers***

Customer Support

We provide a comprehensive after sales service via a Worldwide Service Organization. Contact one of the following offices for details on your nearest Service and Repair Centre.

United Kingdom

ABB Limited.
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 217948

United States of America

ABB Inc.
Tel: +1 215 674 6000
Fax: +1 215 674 7183

Client Warranty

Prior to installation, the equipment referred to in this manual must be stored in a clean, dry environment, in accordance with the Company's published specification. Periodic checks must be made on the equipment's condition.

In the event of a failure under warranty, the following documentation must be provided as substantiation:

1. A listing evidencing process operation and alarm logs at time of failure.
2. Copies of operating and maintenance records relating to the alleged faulty unit.

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

ABB has Sales & Customer Support expertise in over 100 countries worldwide

www.abb.com

The Company's policy is one of continuous product improvement and the right is reserved to modify the information contained herein without notice.

© ABB 2002

Printed in UK (07.02)

IM/C310–MOD Issue 3

ABB Limited
Howard Road, St. Neots
Cambridegshire, PE19 8EU
UK
Tel: +44 (0)1480 475 321
Fax: +44 (0)1480 217 948

ABB Inc
125 E. County Line Road
Warminster, PA 18974
USA
Tel: +1 215 674 6000
Fax: +1 215-674 7183

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP