C1900

Circular chart recorder and recorder/controller

MODBUS (RTU) communications option

Measurement made easy

C1900
circular chart recorder
and recorder/controller

For more information

Further publications are available for free download from:

www.abb.com/recorders

or by scanning this code:

	Search for or click on
Data Sheet C1900 Circular chart recorder	DS/C1900R-EN
Data Sheet C1900 Circular chart recorder/controller	DS/C1900RC-EN
Quick Reference Guide C1900 recorders	IM/C1900-QR
Quick Reference Guide C1900 recorder and recorder/controller	IM/C1900-QC

	Search for or click on
Installation Guide C1900 Circular chart recorder and recorder/controller	IM/C1900-INS
Operating Guide C1900 Circular chart recorder	IM/C1900-OGR
Operating Guide C1900 Circular chart recorder/controller	IM/C1900-OGC
Programming Guide C1900 Circular chart recorder	IM/C1900-PGR
Programming Guide C1900 Circular chart recorder/controller	IM/C1900-PGC

Electrical safety

This equipment complies with the requirements of CEI/IEC 61010-1:2001-2 'Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use'. If the equipment is used in a manner NOT specified by the Company, the protection provided by the equipment may be impaired.

Symbols

One or more of the following symbols may appear on the equipment labelling:

	**Warning** – refer to the manual for instructions
	**Caution** – risk of electric shock
	Protective earth (ground) terminal
	Earth (ground) terminal
	Direct current supply only
	Alternating current supply only
	Both direct and alternating current supply
	The equipment is protected through double insulation

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 Publications Department.

Health and safety

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

- The relevant sections of these instructions must be read carefully before proceeding.
- Warning labels on containers and packages must be observed.
- Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the information given.
- Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.
- Chemicals must be stored away from heat, protected from temperature extremes and powders kept dry. Normal safe handling procedures must be used.
- 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.

CONTENTS

1 INTRODUCTION

Information.

- The COMMANDER 1900 Series is extended by the addition of a serial data communication option designed for use with SCADA systems.
- RS422/485 Communication standard.
- Modbus RTU protocol – for master (host computer) to slave (COMMANDER 1900) system.
- Isolated (500V) from rest of instrument.
- 3 and 5 Wire communication supported.
- Baud rate – from 1200 to 9600.
- Parity-checking – of message available.

2 ELECTRICAL INSTALLATION

2.1 Selection of Serial Communication Adaptors for Personal Computers

Information.
- A 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.

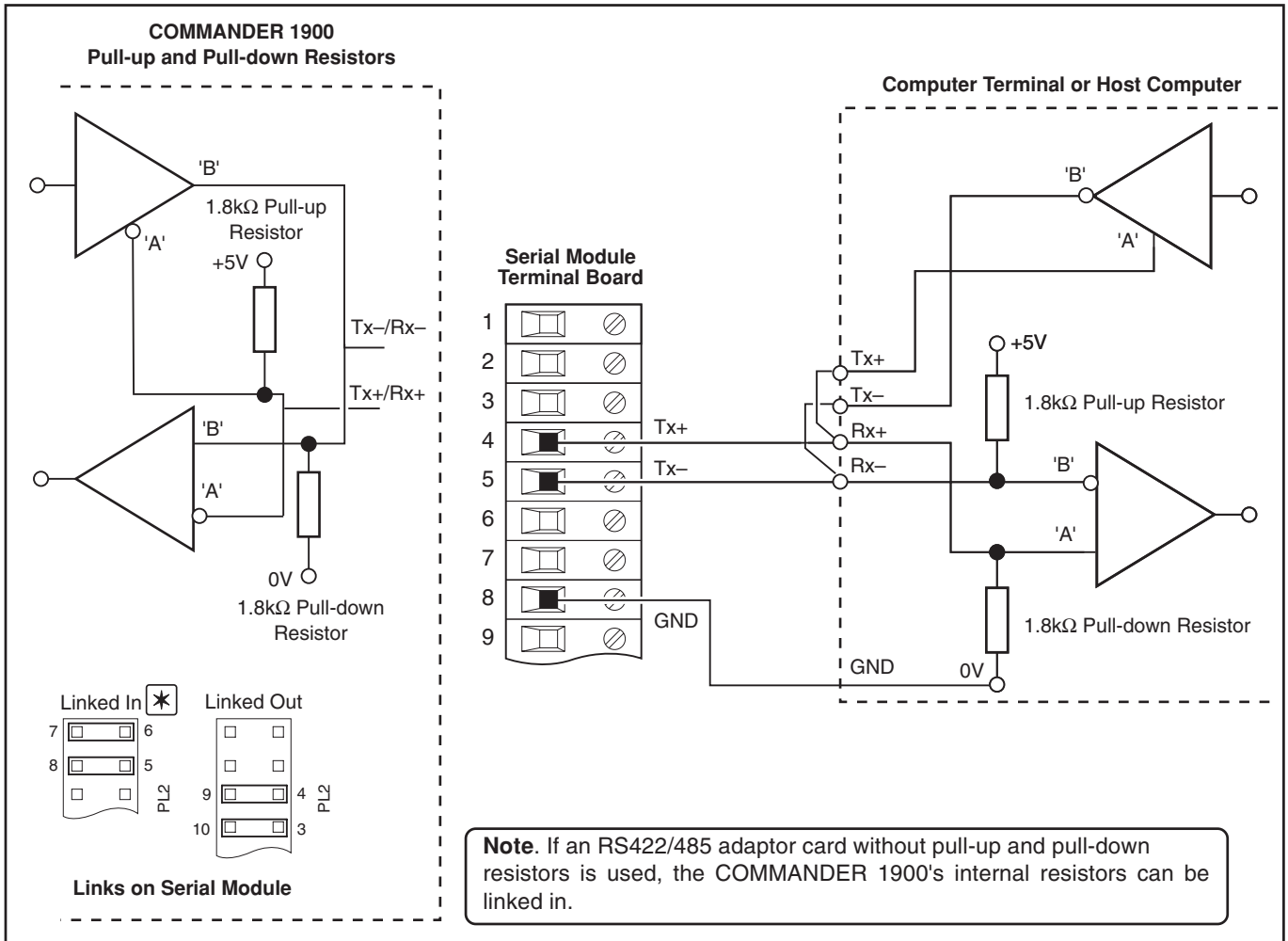
2.2 Recommended OPTO22 Boards

The following OPTO22 boards are recommended for use with the COMMANDER 1900 Series of instruments:

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

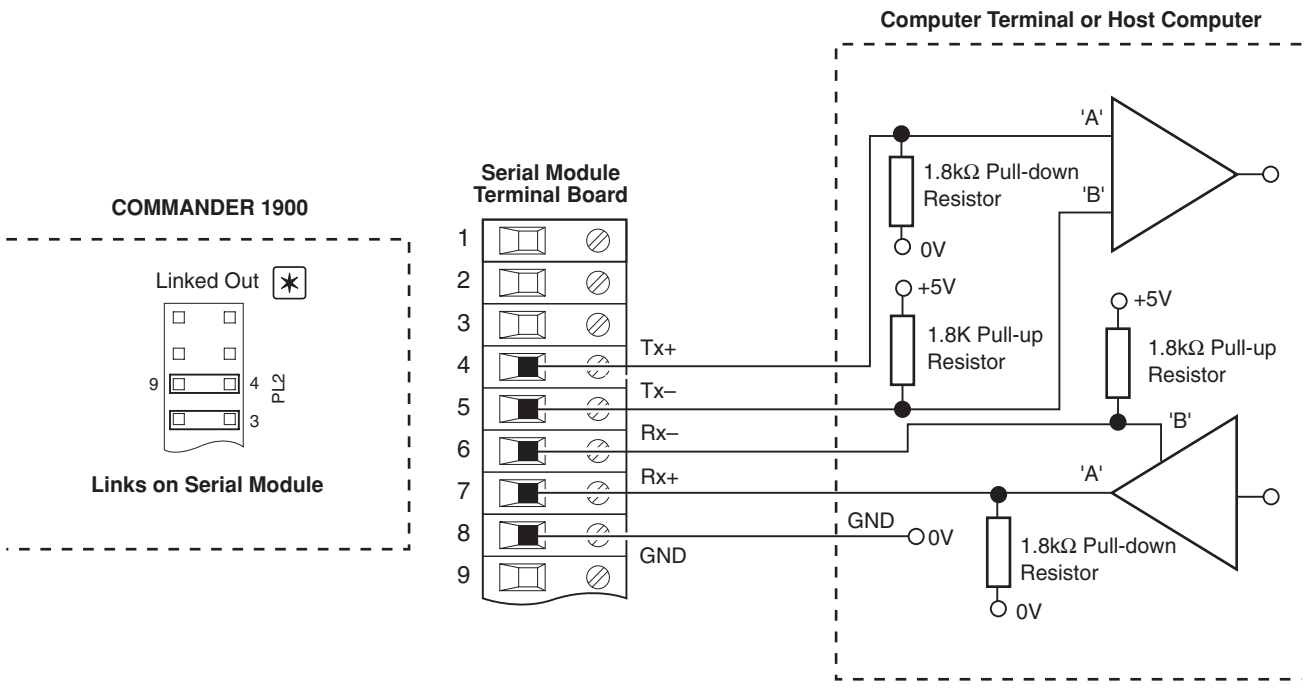
2.3 Pull-up and Pull-down Resistors – Figs. 2.1 and 2.2

To prevent false triggering of the slave (COMMANDER 1900) 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 Figs. 2.1 and 2.2.



Note. If an RS422/485 adaptor card without pull-up and pull-down resistors is used, the COMMANDER 1900's internal resistors can be linked in.

Fig. 2.1 Pull-up and Pull-down Resistors (3-wire Operation)



Note. If an RS422/485 adaptor card without pull-up and pull-down resistors is used, the COMMANDER 1900's internal resistors must be linked out.

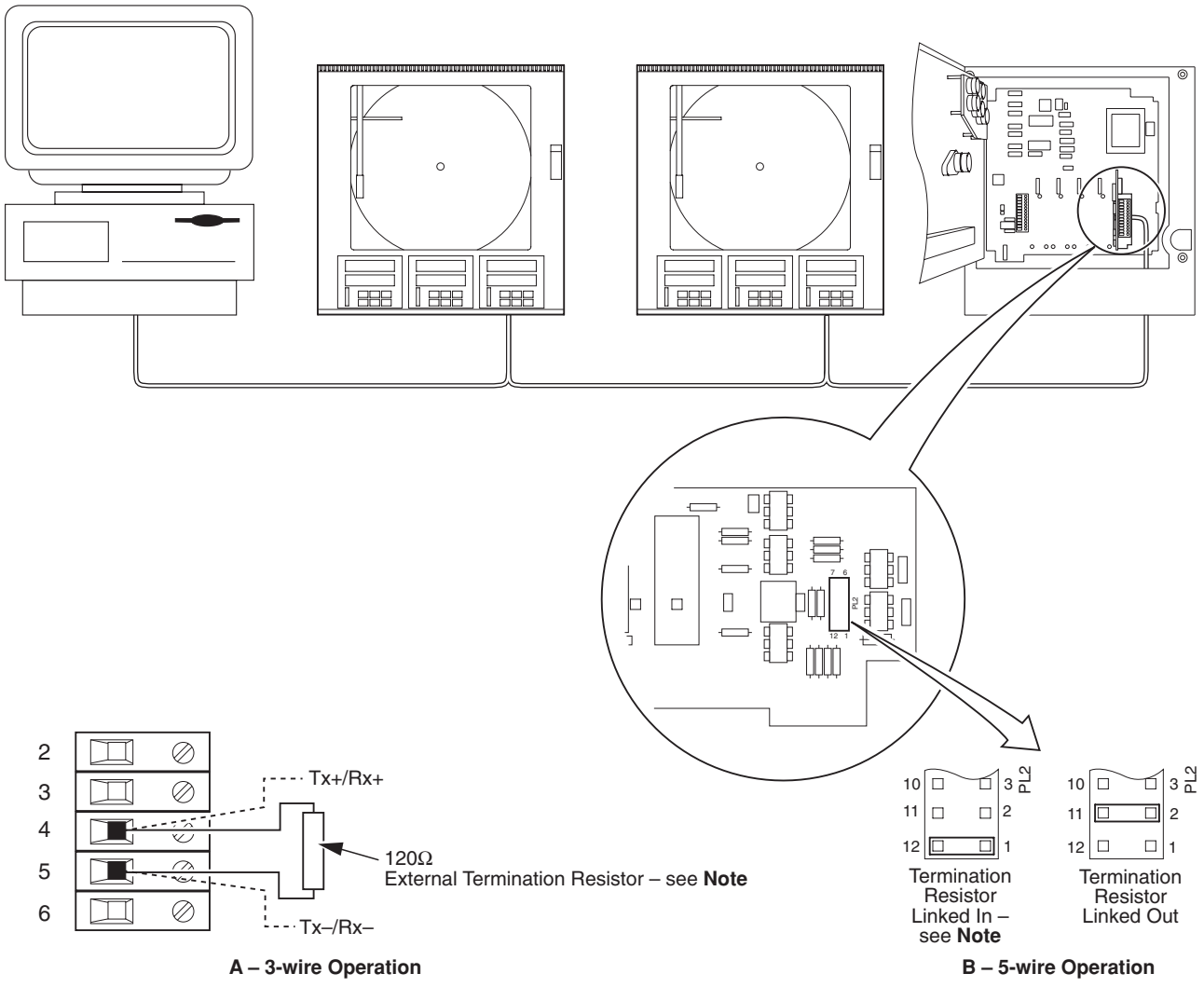
Fig. 2.2 Pull-up and Pull-down Resistors (5-wire Operation)

2.4 Termination Resistors – Fig. 2.3

For long transmission lines, termination resistors are required on the last slave in the chain and the host computer/computer terminal – see Fig. 2.3. Under normal operating conditions the resistors are required at the receive inputs only. For 3-wire operation the slave termination resistor is fitted to the serial module terminal board – see Fig. 2.3A. For 5-wire operation the slave termination resistor is selected using plug-in links on the serial module – see Fig. 2.3B.

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.



Note.

- For **3-wire** operation an external 120Ω resistor must be on the last slave in the chain. The resistor is fitted across terminals 4 and 5 on the serial module terminal board.
- For **5-wire** operation the internal termination resistor on the last slave in the chain must be linked in.

Fig. 2.3 Slave Termination Resistors

2.6 Serial Connections – Fig. 2.4

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.

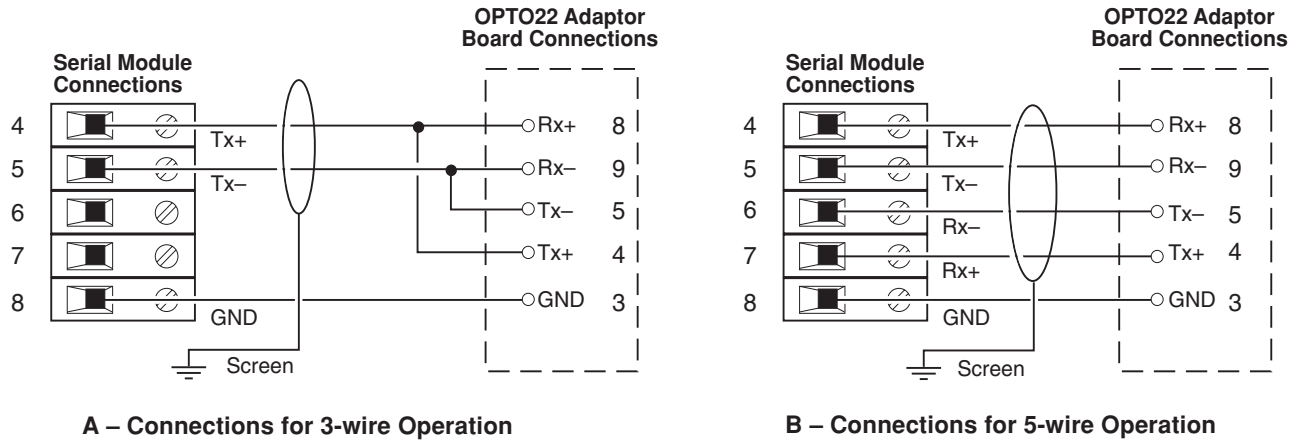
All connections, apart from those for serial data communication, are made as shown in *Section 4 of the Installation Guide*.

Make serial data connections as shown in Fig. 2.4. 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



A – Connections for 3-wire Operation

B – Connections for 5-wire Operation

Fig. 2.4 Serial Module Connections

COMMANDER 1900 Serial Module Terminal Board		OPTO22 Board Pin Identification	
Terminal Number	**Connections**	**Part Number AC24 AT & AC34**	**Connections**
4	TX+	4	TX+
		8	RX+
5	TX–	5	TX–
		9	RX–
8	GND	3	GND

Table 2.1 Terminal and Pin Identification for 3-wire Operation

COMMANDER 1900 Serial Module Terminal Board		OPTO22 Board Pin Identification	
Terminal Number	**Connections**	**Part Number AC24 AT & AC34**	**Connections**
4	TX+	8	RX+
5	TX–	9	RX–
7	RX+	4	TX+
6	RX–	5	TX–
8	GND	3	GND

Table 2.2 Terminal and Pin Identification for 5-wire Operation

3 ADVANCED CONFIGURATION LEVEL

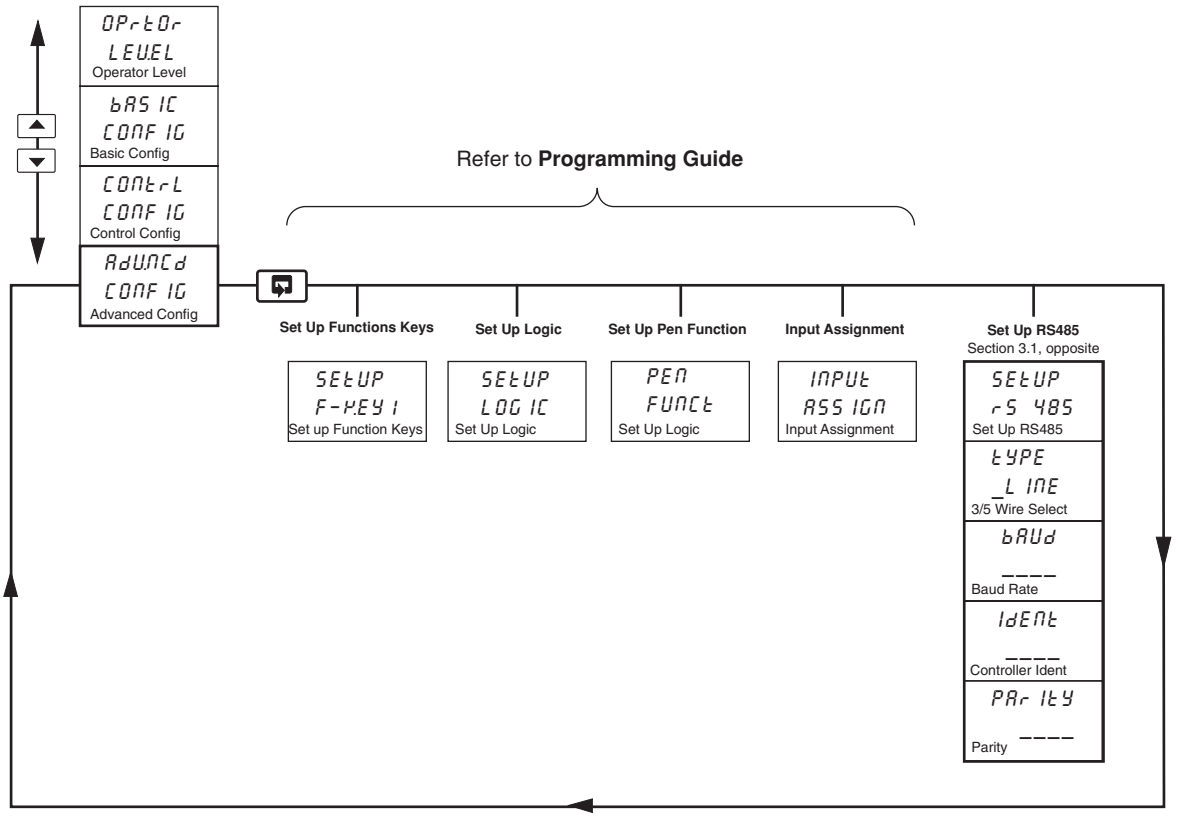
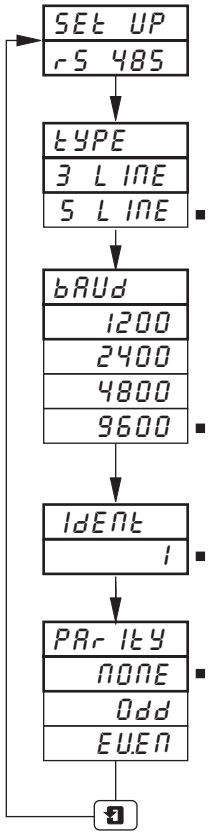


Fig. 3.1 Location of the Serial Data (RS485) Communication Page

3.1 Serial Data Communication Page

Information.
- Programmable for 3 or 5 wire connections.
- 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 – **Set Up RS485**.

Connection Type
Select the required number of transmission wires (3 line, 5 line).

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

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 **Set Up RS485** frame.

4 MODBUS PROTOCOL

Information.
- The COMMANDER 1900 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 250 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

Note. A non-volatile memory is used to store any parameter changes made via the serial link to ensure that the information is retained during mains interruption or power-down. The memory used is rated at 10^4 write cycles per register and each register is assigned a particular parameter, e.g. Alarm trip value, Channel 1. If the number of write cycles to any particular register exceeds this value, the register's contents may not be retained.

To restrict unnecessary use of the non-volatile memory registers the memory enable/disable command is provided (Coil number 181, Section 7.1). The command can be used before parameters which do not need to be stored in the non-volatile memory, e.g. frequently changed parameters or parameters which do not have to be retained on power-down.

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 Message Name	COMMANDER 1900 Definition
01	Read Coil Status	Read up to 16 consecutive discrete (boolean) points from a specific starting point. The COMMANDER 1900 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 1900 returns zeros from registers which do not contain defined data and NAKs any request for register numbers greater than 250.
05	Force Single Coil	Write one discrete (boolean) point. The COMMANDER 1900 NAKs this if the point is not currently writeable.
06	Preset Single Register	Write one register. The COMMANDER 1900 NAKs if the register is not currently writeable. This function code also applies to any currently applicable limits to the value before storage in the database.
08	Loopback Diagnostic Test	Echo the message, only 'Return of Query' is supported.
16	Preset Multiple Registers	Write up to 8 consecutive registers from a specified starting register. The COMMANDER 1900 NAKs if any of the registers are not currently writeable, but still carries out all the writes which are valid, applying any currently applicable limits to the value before storage in the database. This function code is only available if 'write to non-volatile memory' is disabled – see coil number 181.

*NAK = Negative Acknowledgement

Table 4.1 Modbus Function Codes

5 MODBUS FUNCTIONS

This section shows typical examples of Modbus function codes 01, 03, 05, 06, 08 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 channel 1) 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-16)	
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 channel 1 ON
Alarm B status channel 1 OFF
Alarm C status channel 1 ON
Alarm D status channel 1 OFF
Alarm A,B,C,D status channel 2 all OFF
Alarm A,B,C,D status channel 3 all OFF
Alarm A,B,C,D status channel 4 all OFF

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

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 121the 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 trip A1) is shown below.

Address	Function	Register Start Offset High	Register Start Offset Low	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 A1 – 150
Alarm trip B1 – 50
Alarm trip C1 – 100
Alarm trip D1 – 400
Alarm trip A2 – 0
Alarm trip B2 – 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	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	03	0C	00	96	00	32	00	64	01	90	00	00	00	00	D9	91

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.

Address	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-16)	
01	05	00	94	FF	00	CD	D6

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 trip A1) 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

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 Registers – Function Code 16

5.6.1 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 and the value 100 to the register address 122 in slave 01 is shown below.

Address	Function	Register Start Offset High	Register Start Offset Low	Number of Registers		Byte Count	Holding Register 121 High	Holding Register 121 Low	Holding Register 122 High	Holding Register 122 Low	Error Check Field (CRC-16)	
01	10	00	78	00	02	04	00	0A	00	64	D4	C4

5.6.2 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

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 C1900.
02	Illegal Data Address	The address reference in the data field is not an allowable address for the C1900.
03	Illegal Data Value	The value referenced in the data field is not allowable in the addressed slave location.
07	Negative Acknowledgment	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.

Slave 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	CO	F1

7 MODBUS REGISTERS

7.1 Coils

Coil Number	Read/Write	Description	Response/Entry
		Input Failure States	
011	R	Main Input	
012	R	Module 2	
013	R	Module 3	0 = Active
014	R	Module 4	1 = Failed
015	R	Module 5	
		A to D Converter Failure States	
021	R	Main Converter	
022	R	Module 2	
023	R	Module 3	0 = Active
024	R	Module 4	1 = Failed
025	R	Module 5	
		Alarm Status	
031	R	Alarm A Channel 1	
032	R	Alarm B Channel 1	
033	R	Alarm C Channel 1	
034	R	Alarm D Channel 1	
035	R	Alarm A Channel 2	
036	R	Alarm B Channel 2	
037	R	Alarm C Channel 2	
038	R	Alarm D Channel 2	0 = Inactive
039	R	Alarm A Channel 3	1 = Active
040	R	Alarm B Channel 3	
041	R	Alarm C Channel 3	
042	R	Alarm D Channel 3	
043	R	Alarm A Channel 4	
044	R	Alarm B Channel 4	
045	R	Alarm C Channel 4	
046	R	Alarm D Channel 4	
		Digital Input States	
051	R	Main Module Digital Input 1	
052	R	Main Module Digital Input 2	
061	R	Module 2 Digital Input 1	
062	R	Module 2 Digital Input 2	
071	R	Module 3 Digital Input 1	
072	R	Module 3 Digital Input 2	
081	R	Module 4 Digital Input 1	
082	R	Module 4 Digital Input 2	
083	R	Module 4 Digital Input 3	
084	R	Module 4 Digital Input 4	
085	R	Module 4 Digital Input 5	0 = Inactive
086	R	Module 4 Digital Input 6	1 = Active
087	R	Module 4 Digital Input 7	
088	R	Module 4 Digital Input 8	
091	R	Module 5 Digital Input 1	
092	R	Module 5 Digital Input 2	
093	R	Module 5 Digital Input 3	
094	R	Module 5 Digital Input 4	
095	R	Module 5 Digital Input 5	
096	R	Module 5 Digital Input 6	
097	R	Module 5 Digital Input 7	
098	R	Module 5 Digital Input 8	

…7.1 Coils

Coil Number	Read/Write	Description	Response/Entry
		Logic Equation Results	
121	R	Logic Equation 1	0 = Inactive 1 = Active
122	R	Logic Equation 2	
123	R	Logic Equation 3	
124	R	Logic Equation 4	
125	R	Logic Equation 5	
126	R	Logic Equation 6	
127	R	Logic Equation 7	
128	R	Logic Equation 8	
		Real Time States	
131	R	Channel 1	0 = Inactive 1 = Active
132	R	Channel 2	
		Auto/Manual States	
141	R	Manual State Channel 1	0 = Auto, 1 = Manual
142	R	Auto State Channel 1	0 = Manual, 1 = Auto
143	R	Manual State Channel 2	0 = Auto, 1 = Manual
144	R	Auto State Channel 2	0 = Manual, 1 = Auto
149	R/W	A/M State Channel 1	0 = Auto, 1 = Manual
150	R/W	A/M State Channel 2	0 = Auto, 1 = Manual
		On/Off Count States	
151	R	Channel 1	0 = Off 1 = On
152	R	Channel 2	
		Valve Open/Close Relay States	
161	R	Open Relay State Ch. 1	0 = De-energized 1 = Energized
162	R	Close Relay State Ch. 1	
163	R	Open Relay State Ch. 2	
164	R	Close Relay State Ch. 2	
171*	R	Event Status (C1951, C1952, C1953 Pasteurizer versions only)	0 = Divert, 1 = Forward
181	R/W	MODBUS Save MODBUS writes to Non-Volatile Memory	0 = Not Saved, 1 = Saved

7.2 Holding Registers

Register Number	Read/Write	Description	Response/Entry
		Analog Inputs	
011	R	Process Variable 1	In Engineering Units in
012	R	Process Variable 2	Range –9999 to +9999
013	R	Process Variable 3	
014	R	Process Variable 4	
015	R	Process Variable 1 Failure State	0 = Input Active
016	R	Process Variable 2 Failure State	1 = Input Failed
017	R	Process Variable 3 Failure State	2 = A to D Failed
018	R	Process Variable 4 Failure State	3 = Input and A to D Failed
		Number of Decimal Points	
019	R	Process Variable 1 Value	0 to 3 Decimal Places
020	R	Process Variable 2 Value	
021	R	Process Variable 3 Value	
022	R	Process Variable 4 Value	
		Input Values	
031	R	Main Input	In Engineering Units in Range –9999 to +9999
032	R	Module 2	
033	R	Module 3	
034	R	Module 4	
035	R	Module 5	
		Engineering Ranges	
041	R	Input 1 Decimal Point Position	0 to 3 Decimal Places
042	R	Input 2 Decimal Point Position	
043	R	Input 3 Decimal Point Position	
044	R	Input 4 Decimal Point Position	
045	R	Input 5 Decimal Point Position	

7.3 Controller Settings/Outputs

Register Number	Read/Write	Description	Response/Entry
		Controller Settings/Outputs Channel 1	
051	R	Process Variable 1	–9999 to +9999
052	R/W	Control Set Point	–9999 to +9999
053	R/W	Control Output (write in manual mode)	0 to 1000 Representing (0.0.to 100.0%)
054	R	Position Feedback 1	0 to 1000 Representing (0.0.to 100.0%)
055	R	Position Feedback 1 Failure State	0 = Input Active 1 = Input Failed 2 = A to D Failed 3 = Input and A to D Failed
056	R/W	On/Off Hysteresis Value	0 to 1000 Representing (0.0.to 100.0%)
057	R/W	Cycle-Time Heat Control	10 to 3000 (1.0 to 300.0 Seconds)
058	R/W	Proportional Band (Heat) Control	1 to 9999 (0.1 to 999.9%)
059	R/W	Integral Value (Heat) Control	0 = OFF, 1 to 7200 Seconds
060	R/W	Manual Reset (Heat) Control	0 to 1000 (0.0 to 100.0%)
061	R/W	Derivative Action	1 to 9999 (0.1 to 999.9 Seconds)
062	R/W	Approach Band	1 to 30 (0.1 to 3.0)
063	R/W	Heat Output (write manual mode only)	0 to 1000 (0.0 to 100.0%)
064	R/W	Cool Output (write manual mode only)	0 to 1000 (0.0 to 100.0%)
065	R/W	Proportional Band Cool Control	1 to 9999 (0.1 to 999.9%)
066	R/W	Integral Value Cool Control	0 = OFF, 1 to 7200 Seconds
067	R/W	Manual Reset Cool Control	0 to 1000 (0.0 to 100.0%)
068	R/W	Cycle-Time Cool Control	10 to 3000 (1.0 to 300.0 Seconds)
069	R/W	Crossover Band	0 to 1000 (0.0 to 100.0%)
070	R/W	Transition Band	0 to 1000 (0.0 to 100.0%)
		Controller Settings/Outputs Channel 2	
071	R	Process Variable 2	–9999 to +9999
072	R/W	Control Set Point	–9999 to +9999
073	R/W	Control Output (write in manual mode)	0 to 1000 Representing (0.0.to 100.0%)
074	R	Position Feedback 2	0 to 1000 Representing (0.0.to 100.0%)
075	R	Position Feedback 2 Failure State	0 = Input Active 1 = Input Failed 2 = A to D Failed 3 = Input and A to D Failed
076	R/W	On/Off Hysteresis Value	0 to 1000 Representing (0.0.to 100.0%)
077	R/W	Cycle-Time Heat Control	10 to 3000 (1.0 to 300.0 Seconds)
078	R/W	Proportional Band (Heat) Control	1 to 9999 (0.1 to 999.9%)
079	R/W	Integral Value (Heat) Control	0 = OFF, 1 to 7200 Seconds
080	R/W	Manual Reset (Heat) Control	0 to 1000 (0.0 to 100.0%)
081	R/W	Derivative Action	1 to 9999 (0.1 to 999.9 Seconds)
082	R/W	Approach Band	1 to 30 (0.1 to 3.0)
083	RW	Heat Output (write manual mode only)	0 to 1000 (0.0 to 100.0%)
084	RW	Cool Output (write manual mode only)	0 to 1000 (0.0 to 100.0%)
085	R/W	Proportional Band Cool Control	1 to 9999 (0.1 to 999.9%)
086	R/W	Integral Value Cool Control	0 = OFF, 1 to 7200 Seconds
087	R/W	Manual Reset Cool Control	0 to 1000 (0.0 to 100.0%)
088	R/W	Cycle-Time Cool Control	10 to 3000 (1.0 to 300.0 Seconds)
089	R/W	Crossover Band	0 to 1000 (0.0 to 100.0%)
090	R/W	Transition Band	0 to 1000 (0.0 to 100.0%)

7.4 Set Points

Register Number	Read/Write	Description	Response/Entry
		Set Points Channel 1	
101	R/W	Local Set Point	–9999 to +9999
102	R/W	Dual Set Point	–9999 to +9999
103	R	Remote Set Point (without Ratio/Bias)	–9999 to +9999
104	R	Remote Set Point (with Ratio/Bias)	–9999 to +9999
105	R	Remote Set Point Failure State	Refer to Process Variable Failure States
107	R/W	Set Point Selection	0 = Local, 1 = 2nd Set Point
		Set Points Channel 2	
111	R/W	Local Set Point	–9999 to +9999
112	R/W	Dual Set Point	–9999 to +9999
113	R	Remote Set Point (without Ratio/Bias)	–9999 to +9999
114	R	Remote Set Point (with Ratio/Bias)	–9999 to +9999
115	R	Cascade Set Point	–9999 to +9999
116	R	Remote Set Point Failure State	Refer to Process Variable Failure States
117	R/W	Set Point Selection	0 = Local, 1 = 2nd Set Point

7.5 Alarm Settings

Register Number	Read/Write	Description	Response/Entry
		Alarm Settings	
121	R/W	Alarm A Trip Value Channel 1	
122	R/W	Alarm B Trip Value Channel 1	
123	R/W	Alarm C Trip Value Channel 1	
124	R/W	Alarm D Trip Value Channel 1	
125	R/W	Alarm A Trip Value Channel 2	
126	R/W	Alarm B Trip Value Channel 2	
127	R/W	Alarm C Trip Value Channel 2	
128	R/W	Alarm D Trip Value Channel 2	–9999 to +9999 High/Low Process Limit
129	R/W	Alarm A Trip Value Channel 3	5 to 5000 (0.5 to 500.0%) Fast/Slow Rate
130	R/W	Alarm B Trip Value Channel 3	Alarm Limit
131	R/W	Alarm C Trip Value Channel 3	
132	R/W	Alarm D Trip Value Channel 3	
133	R/W	Alarm A Trip Value Channel 4	
134	R/W	Alarm B Trip Value Channel 4	
135	R/W	Alarm C Trip Value Channel 4	
136	R/W	Alarm D Trip Value Channel 4	
141	R	Alarm A Type Channel 1	
142	R	Alarm B Type Channel 1	
143	R	Alarm C Type Channel 1	
144	R	Alarm D Type Channel 1	
145	R	Alarm A Type Channel 2	0 = Alarm Off
146	R	Alarm B Type Channel 2	1 = High Process
147	R	Alarm C Type Channel 2	2 = Low Process
148	R	Alarm D Type Channel 2	3 = High Output
149	R	Alarm A Type Channel 3	4 = Low Output
150	R	Alarm B Type Channel 3	5 = High Deviation
151	R	Alarm C Type Channel 3	6 = Low Deviation
152	R	Alarm D Type Channel 3	7 = Fast Rate
153	R	Alarm A Type Channel 4	8 = Slow Rate
154	R	Alarm B Type Channel 4	
155	R	Alarm C Type Channel 4	
156	R	Alarm D Type Channel 4	

7.6 Chart Settings

Register Number	Read/Write	Description	Response/Entry
		Chart Settings	
161	R/W	Chart Rotation Time	1 to 167 Hrs,168 = 7 Days to 193 = 32 Day
162	R	Pen Lift Status	0 = Pen recording on chart 1 = Pen lifting off chart

7.7 Ramp/Soak Settings

Register Number	Read/Write	Description	Response/Entry
		Ramp/Soak Settings Channel 1	
171	W	Ramp Soak Run Command	1 = Run Profile
172	W	Ramp Soak Hold Command	1 = Hold Profile
173	W	Ramp Soak Skip Forward Command	1 = Skip Forward
174	W	Ramp Soak Skip Backward Command	1 = Skip Backward
175	W	Ramp Soak Reset Command	1 = Reset Profile
176	R	Profile Status	0 = Off 1 = Ramp 2 = Soak 3 = Retort Ramp 4 = Operator Hold 5 = Holdback Hold 6 = Retort Hold 7 = End
177	W	Extend Soak Time Command	2 = Extend Soak Time
178	R	Remaining Segment Time	0 to 9999 (0.0 to 999.9 Hours or Minutes)
179	R/W	Selected Program	Select Channel 1 Program to Run, 1 to 10
		Ramp/Soak Settings Channel 2	
181	W	Ramp Soak Run Command	1 = Run Profile
182	W	Ramp Soak Hold Command	1 = Hold Profile
183	W	Ramp Soak Skip Forward Command	1 = Skip Forward
184	W	Ramp Soak Skip backward Command	1 = Skip Backward
185	W	Ramp Soak Reset Segment Command	1 = Reset Profile
186	R	Profile Status	0 = Off 1 = Ramp 2 = Soak 3 = Retort Ramp 4 = Operator Hold 5 = Holdback Hold 6 = Retort Hold 7 = End
187	W	Extend Soak Time Command	2 = Extend Soak Time
188	R	Remaining Segment Time	0 to 9999 (0.0 to 999.9 Hours or Minutes)
189	R/W	Selected Program	Select Channel 1 Program to Run, 1 to 10

7.8 Totalizer Settings

Register Number	Read/Write	Description	Response/Entry
		Predetermined Value Channel 1*	
191	R	High Word	
192	R	Low Word	
		Preset Value Channel 1*	
193	R	High Word	
194	R	Low Word	The Limit for High Word:Low Word linked
		Front-panel Totalizer Value Ch. 1*	together is 0 to 99,999,999
195	R	High Word	
196	R	Low Word	
		Secure Totalizer Value Ch. 1*	
197	R	High Word	
198	R	Low Word	
199	R/W	Totalizer Stop/Go Command	0 = Stop, 1 = Go
200	W	Totalizer Front-Panel Reset Command	1 = Reset
		Predetermined Value Ch. 2*	
201	R	High Word	
202	R	Low Word	
		Preset Value Channel 2*	
203	R	High Word	
204	R	Low Word	The Limit for High Word:Low Word linked
		Front-panel Totalizer Value Ch. 2*	together is 0 to 99,999,999
205	R	High Word	
206	R	Low Word	
		Secure Totalizer Value Ch. 2*	
207	R	High Word	
208	R	Low Word	
209	R/W	Totalizer Stop/Go Command	0 = Stop, 1 = Go
210	W	Totalizer Front-Panel Reset Command	1 = Reset
		Predetermined Value Channel 3*	
211	R	High Word	
212	R	Low Word	
		Preset Value Channel 3*	
213	R	High Word	
214	R	Low Word	The Limit for High Word:Low Word linked
		Front-panel Totalizer Value Ch. 3*	together is 0 to 99,999,999
215	R	High Word	
216	R	Low Word	
		Secure Totalizer Value Channel 3*	
217	R	High Word	
218	R	Low Word	
219	R/W	Totalizer Stop/Go Command	0 = Stop, 1 = Go
220	W	Totalizer Front-Panel Reset Command	1 = Reset
		Predetermined Value Channel 4*	
221	R	High Word	
222	R	Low Word	
		Preset Value Channel 4*	
223	R	High Word	
224	R	Low Word	The Limit for High Word:Low Word linked
		Front-panel Totalizer Value Ch. 4*	together is 0 to 99,999,999
225	R	High Word	
226	R	Low Word	
		Secure Totalizer Value Channel 4*	
227	R	High Word	
228	R	Low Word	
229	R/W	Totalizer Stop/Go Command	0 = Stop, 1 = Go
230	W	Totalizer Front-Panel Reset Command	1 = Reset

*These values are a combination of the High Word and Low Word.

7.9 Holding Registers – Pasteurizer Versions Only

Register Number	Read/Write	Description	Response/Entry
91	R	Second RTD	–9999 to +9999
92	R	RTD Deviation	0.0 to 100.0
93	R	Cold Set Point (C1953 Only)	–999.9 to +999.9
94	R	Hot Water Temperature (C1952/3 Only)	–9999 to +9999
95	R	Hot Product Temperature	–9999 to +9999
96	R	Cold Product Temperature	–9999 to +9999
		Single or Multiple Divert 1	
231	R/W	Divert Temperature 1	–999.9 to +999.9
232	R/W	Multiple Divert/ Hot Water Set Point 1	–999.9 to +999.9
		Multiple Divert 2	
233	R/W	Divert Temperature 2	–999.9 to +999.9
234	R/W	Multiple Divert/ Hot Water Set Point 2	–999.9 to +999.9
		Multiple Divert 3	
235	R/W	Divert Temperature 3	–999.9 to +999.9
236	R/W	Multiple Divert/ Hot Water Set Point 3	–999.9 to +999.9
		Multiple Divert 4	
237	R/W	Divert Temperature 4	–999.9 to +999.9
238	R/W	Multiple Divert/ Hot Water Set Point 4	–999.9 to +999.9
		Multiple Divert 5	
239	R/W	Divert Temperature 5	–999.9 to +999.9
240	R/W	Multiple Divert/ Hot Water Set Point 5	–999.9 to +999.9
		Multiple Divert 6	
241	R/W	Divert Temperature 6	–999.9 to +999.9
242	R/W	Multiple Divert/ Hot Water Set Point 6	–999.9 to +999.9
		Multiple Divert 7	
243	R/W	Divert Temperature 7	–999.9 to +999.9
244	R/W	Multiple Divert/ Hot Water Set Point 7	–999.9 to +999.9
		Multiple Divert 8	
245	R/W	Divert Temperature 8	–999.9 to +999.9
246	R/W	Multiple Divert/ Hot Water Set Point 8	–999.9 to +999.9

NOTES

NOTES

NOTES

Sales

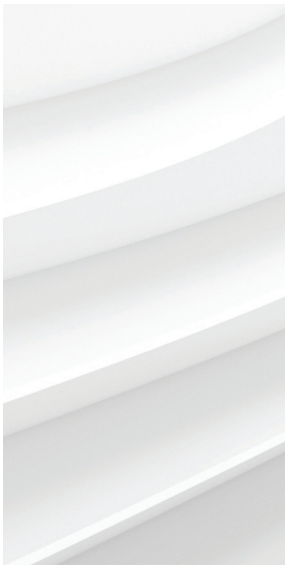
Service

Software

ABB Limited
Measurement & Analytics
Howard Road, St. Neots
Cambridgeshire, PE19 8EU
UK
Tel: +44 (0)870 600 6122
Fax: +44 (0)1480 217 948
Email: enquiries.mp.uk@gb.abb.com

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

abb.com/measurement



IM/C1900-MOD Rev. G 09.2018