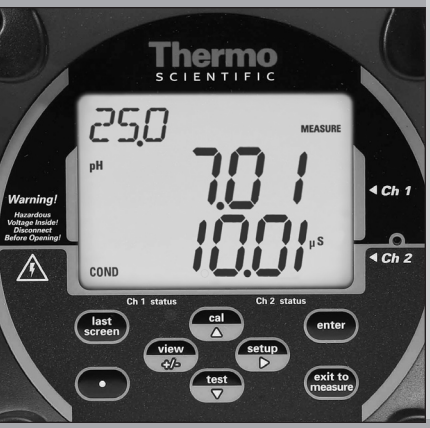
Orion 2100 Digital Communication

User Guide



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Chapter 1 Introduction and Installation

Introduction

The 2100 Digital Communication Module is designed for digital communication between the Programmable Logic Controller (PLC), and the Thermo Scientific Orion 2100 series analyzers.

The 2100 Digital Communication Module allows a Modbus master to communicate with the 2100 via a physical layer of RS485 and a transmission mode of Modbus-RTU. Once installed and setup, the 2100 Digital Communication Module is a versatile interface.

Installation Procedure

⚠⚠ ***Warning:*** *To reduce the risk of shock hazard, disconnect the power prior to opening the analyzer. Read and observe safety requirements as described in the 2100 series users guide.*

List of Parts and Tools required

Quantity	Item
2	Plastic Standoffs
2	Phillips-head screws
1	Phillips-head screwdriver

The 2100 Digital Communication Module can be installed in either a single channel or dual channel 2100 Series Analyzer.

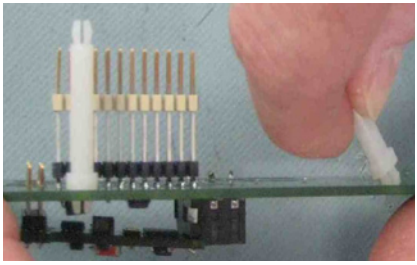

Figure 1

1. Insert the 2 plastic standoffs in the 2100DC Digital Communication Module, as demonstrated in Figure 1.

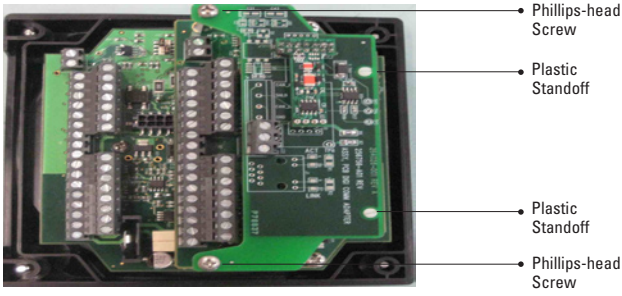

Figure 2

2. Align the 24 pin connector and plastic standoffs into either the 2100 main board or second channel module of the 2100 Series Analyzer, as shown in **Figure 2**.

3. Press the plastic standoffs into the mounting holes.

4. Fasten the front of the board with two screws, as noted in **Figure 2**.

Terminal Assignments

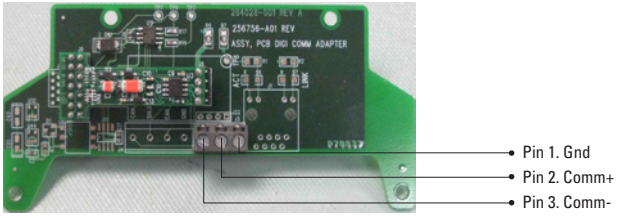

Figure 3

1. Locate the terminals on the board as shown in Figure 3.

2. Wire the 2100DC as a shown in the table below:

Terminal Number	Signal Name
J3-1	Ground
J3-2	Comm + (B)
J3-3	Comm – (A)

Note: *It is recommended that the stub created by the cable be kept as short as possible. This can be accomplished by locating the junction box as close as possible to the 2100DC.*

3. Termination resistor placement depends on the application.

   a. ***For applications involving a single 2100DC on a network***, a termination resistor should be placed across the bus at the master and also across the bus at the 2100DC.

   b. ***For applications involving multiple 2100DC on a network***, a termination resistor should be placed across the bus at each end.

⚠ ***Caution:*** *The shield wire must be connected to ensure proper electromagnetic immunity from other electrical equipment.*

Chapter II PLC Communication Setup

Default Parameters

The default communications parameters for the 2100DC are:

- Slave address (reg. 43022): 1
- Baud Rate (reg. 43023): 19.2 kbps
- Data Bits (not changeable): 8
- Stop Bits (not changeable): 1
- Parity (reg. 43024): Odd
- PLC Data Type (reg 43025): Little Endian word swap

Changing Default Parameters

The default parameters can be modified by looking at the corresponding values in the 2100DC Modbus map. Refer to **Chapter IV** for additional information. These parameters must be changed by removing the 2100DC from the network, and connecting it locally to a Modbus master. The new values written do not take effect until the unit is power-cycled.

To change the parameter:

1. Connect the 2100DC to a local Modbus Master.

2. Change parameter.

3. Cycle power. The unit will power up with the new PLC setting.

Restoring Default Parameters

In the event that the default parameters are unknown, the communication settings can be restored to factory default values by following the procedure below:

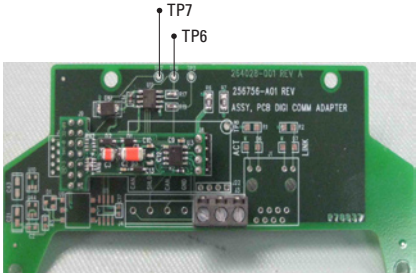

Figure 4

1. Remove power from the 2100 series analyzer, and remove the 2100DC wiring from the network.
2. Make an electrical connection between TP6 and TP7 on the 2100DC using a jumper wire. See **Figure 4** for the location of TP6 and TP7.
3. Apply power to the 2100 Series Analyzer and wait at least 10 seconds.
4. Remove power from the 2100 Series Analyzer.
5. Remove the electrical connection between TP6 and TP7.
6. Default PLC communication settings are now restored, and can be modified if required.

Chapter III Reading Analyzer Values

2100 Series Analyzer Channel

Only one channel can be monitored at a time. For example, the Sensor and Temperature values are presented for the Channel that is set in register 46001. The unit will power up with register 46001 set to channel 1.

For Example:

1. Set register 46001 to 1
2. Read the sensor and temperature values for channel 1
3. Set register 46001 to 2
4. Read the sensor and temperature values for channel 2

2100 Series Analyzer Measurement

There is an integer representation of sensor value using registers 43001/44001, and the temperature value using registers 43002/44002. See Chapter IV, notes 2 and 3 in the Modbus Register Map for restrictions.

When channel is in a Hold, read via register 41003, the sensor data register will be incorrect.

If there is a Red or Amber LED condition on that channel, read via register 41006, the sensor/temperature data may also be incorrect. Check the local display to determine the error/warning condition.

Function Codes

The 2100DC supports the Remote Terminal Unit (RTU) mode of serial transmission. Further, it supports the Modbus Function Codes shown in the table below:

Code	Name
03	Read Holding Registers
06	Preset Single Register
16	Preset Multiple Registers

Modbus Function Codes are defined in the Modbus Application Protocol Specification, V1.1. If the function code contained in a query is not supported, the 2100DC will respond with an Exception Code of 01 indicating an illegal function.

Chapter IV Modbus Register Map

Register number	Description	Data Type	Reg Type	Register Value	Ex.	Variable Class
41001	Comm Status	Integer	R	0 = OK 1 = Comm Error		Status
41003	Sensor Status *note 1	Integer	R	1 = HOLD (not valid data) 2 = Not in HOLD (valid data)	1	Status
41006	Run Status *note 1	Integer	R	0 = Red – system error 1 = Amber – soft error or unit in HOLD 2 = Green – System OK	1	Status
42001, 42002	Sensor Value *note 1	Float	R	Measurement of sensor. *(See register 43017 for definition of units.)*	7.04	Process Value
42003, 42004	Temperature Value *note 1	Float	R	Temperature in Celsius	25.1	Process Value
43001	Sensor Value *note 1	Integer	R	Integer of 42001/42002 register *see note 2	704	Process Value
43002	Temperature Value *note 1	Integer	R	Integer of 42003/42004 register	251	Process Value

Register number	Description	Data Type	Reg Type	Register Value	Ex.	Variable Class
43017	Sensor Units *note 1	Integer	R	**Model Type 21-26, 28-30:** 0 = ppb **Model Type 27:** 0 = ppm **Model type 31:** 0 = rmV (ORP value) 1 = pH (pH value) **Model type 32:** 0 = uS/cm (conductivity) 1 = Meg-Ohm-cm (resistivity) 2 = ppt (salinity) 3 = percent concentration 4 = mg/L(TDS)	1	Process Value
43022	Slave Address	Integer	R/W	1 to 240	1	Configuration
43023	Baud Rate	Integer	R/W	0 or 6 = 19.2k 1 = 1.2k 2 = 2.4k 3 = 4.8k 4 = 9.6k 5 = 14.4k 7 = 28.8k 8 = 38.4k 9 = 57.5k 10 = 76.8k 11 = 115.2k 12 = 230.4k	6	Configuration
43024	Parity	Integer	R/W	0 or 2 = odd 1 = None 3 = Even	2	Configuration

Register number	Description	Data Type	Reg Type	Register Value	Ex.	Variable Class
43025	PLC Data Type	Integer	R/W	0 = Little Endian (Control Logix) 1 = Little Endian Word Swap (SLC) 2 = Big Endian 3 = Big Endian Word Swap	1	Configuration
43026	Timeout	Integer	R/W	For engineering use Meter to comm board millisec.	50	Configuration
44001	Sensor Value S.F., *note 1	Integer	R		100	Scale Factor
44002	Temperature Value S.F., *note 1	Integer	R	Scale Factor for 43001 register *see note 2, 3	10	Scale Factor

Register number	Description	Data Type	Reg Type	Register Value	Ex.	Variable Class
45022	Model Type *note 1	Integer	R	0 = Unknown 21 = 2111LL Low Level Sodium 22 = 2111XP Sodium 23 = 2109XP Fluoride 24 = 2110XP Ammonia 25 = 2117XP Chloride 26 = 2120XP Calcium Hardness 27 = 2117HL Chloride 28 = 2118XP Oxygen Scavenger (Hydrazine) 29 = 2118XP Oxygen Scavenger Eliminox) 30 = 2117LL Low Level Chloride 31 = 2102PH pH/Orp 32 = 2104CD Conductivity	20	Information
45024	Comms Adapter Code Version	Integer	R	Value representing SW version	x0303	Information
46001	2100 Channel for Sensor, Temp, and Status	Integer	R/W	1 = Channel 1 2 = Channel 2	1	2100 Configuration

Notes:

1. On 2-channel models this is the value for the channel selected by Register 46001

2. The upper limit for an integer value is 32ppm for model types 21-26, 28-30, and 32ms for conductivity. The floating point register 42001, does not have any value restriction.

3. Not all PLC's support floating-point values. For this reason all values of type floating-point offered by the 2100DC Communication Module are also available as type integer. Integer data types include a corresponding Scale Factor that defines the relationship between the integer type of the value and the floating-point type. The integer type value is calculated from the floating-point type, by multiplying the floating-point type by the scale factor. For example, for a Sensor Type of pH, the Scale Factor for the Sensor Value is 100. If the floating-point Sensor Value is 7.04, then the integer Sensor Value is 7.04 x 100 = 704.

4. If the 2100DC is unable to communicate with the 2100 Series Analyzer, the Sensor Value (floating-point) and Temperature Value (floating-point) will read as "Not a Number" (NaN). NaN is equal to "FFFF FFFFH" in hexadecimal representation.

Chapter v Ordering Information

Cat. No.	Description
2100DC	Digital Communication Module for Orion 2100 Series Analyzers (Modbus)

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Registered Quality System ISO 9001:2000

265579-001 RevB 1210

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