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# **BioTector B7000/B7000i Analyzer Modbus V1.1 Addendum**

User Manual

10/2018, Edition 1



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# Section 1 Introduction

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This document supplies the Modbus installation and configuration instructions and the Modbus registers for the B7000 and B7000i analyzers.

This document is an addendum to the user manual. The content in this addendum supercedes the content in the user manual.

The software requirement for Modbus is 5.03a or later.



### **⚠ DANGER**



Electrocution hazard. Always remove power to the instrument before making electrical connections.

## 2.1 Modbus RTU (RS485) wiring

For Modbus RTU data transmission, connect the Modbus RTU terminals in the analyzer to a Modbus master device as follows:

1. Remove power to the analyzer. Refer to the illustrated steps in [Figure 1](#).
2. Put a 4-wire, twisted pair, shielded cable through a cable strain-relief fitting on the right side of the analyzer. Use wire gauge of 0.2 mm<sup>2</sup> (24 AWG) minimum.
3. Connect three of the wires to the Modbus RTU terminals in the analyzer. Refer to [Figure 2](#) and [Table 1](#) for wiring information.  
Refer to [Figure 3](#) for the location of the Modbus RTU terminals in the analyzer.
4. Connect the shield wire of the cable to the earth ground terminal in the analyzer.  
*Note: As an alternative, connect the shield wire to the ground terminal of the Modbus master device.*
5. Tighten the cable strain-relief fitting.
6. Connect the other end of the cable to a Modbus master device. Refer to [Figure 2](#).
7. Make sure that the wire connected to terminal 58 (D+) is positively biased compared to terminal 59 (D–) when the bus is in an idle condition.
8. To terminate the bus, install a jumper on J15 of the motherboard. Refer to [Figure 3](#).  
The motherboard is in the electronic enclosure on the door behind the stainless steel cover.

**Figure 1 Remove power to the analyzer**

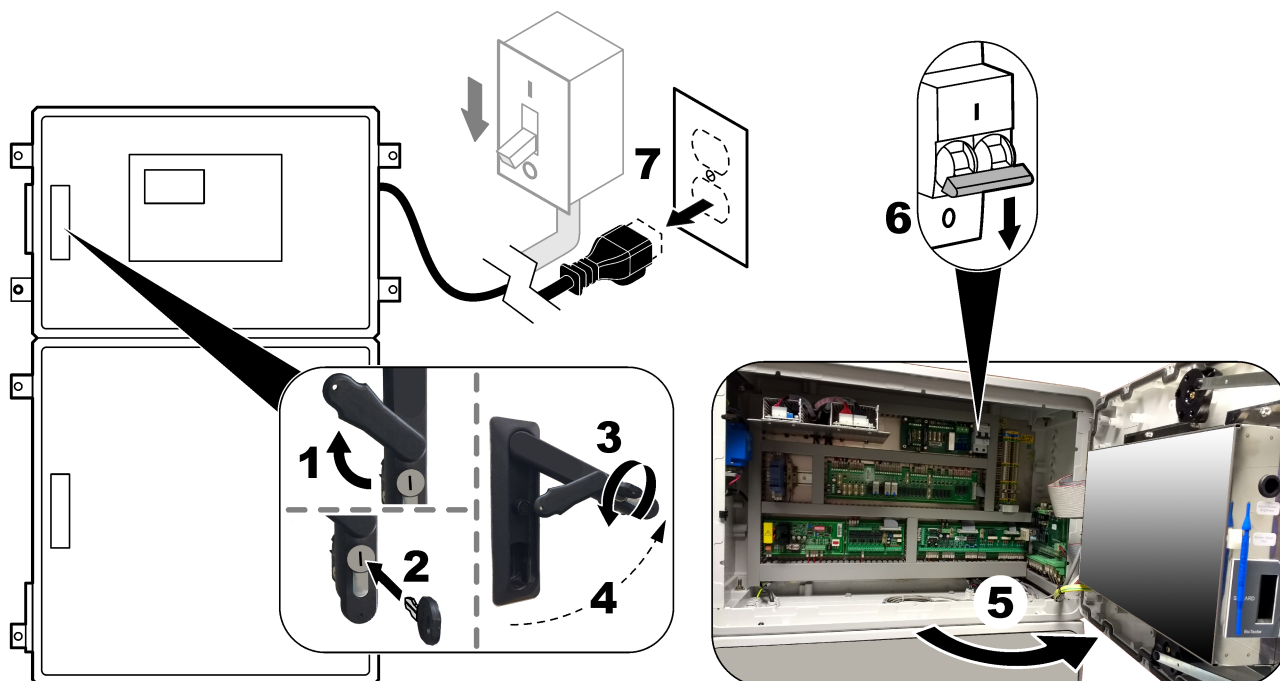
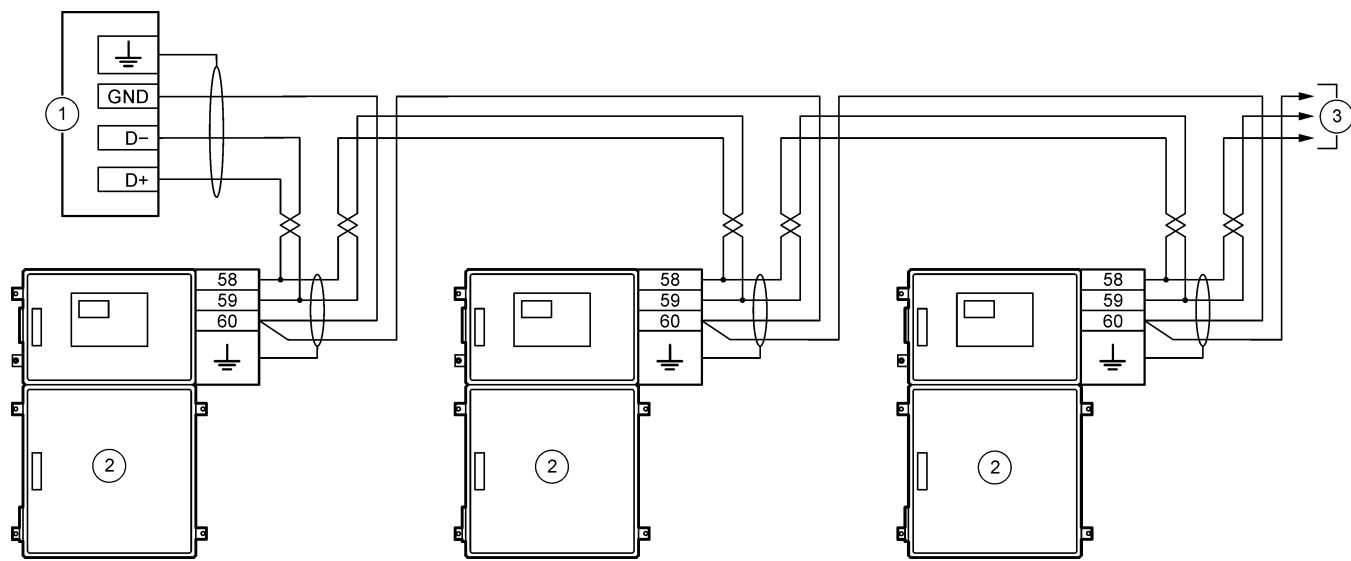


Figure 2 Wiring diagram



|                 |                          |
|-----------------|--------------------------|
| 1 Modbus master | 3 To other RS485 devices |
| 2 Analyzer      |                          |

Table 1 Wiring information


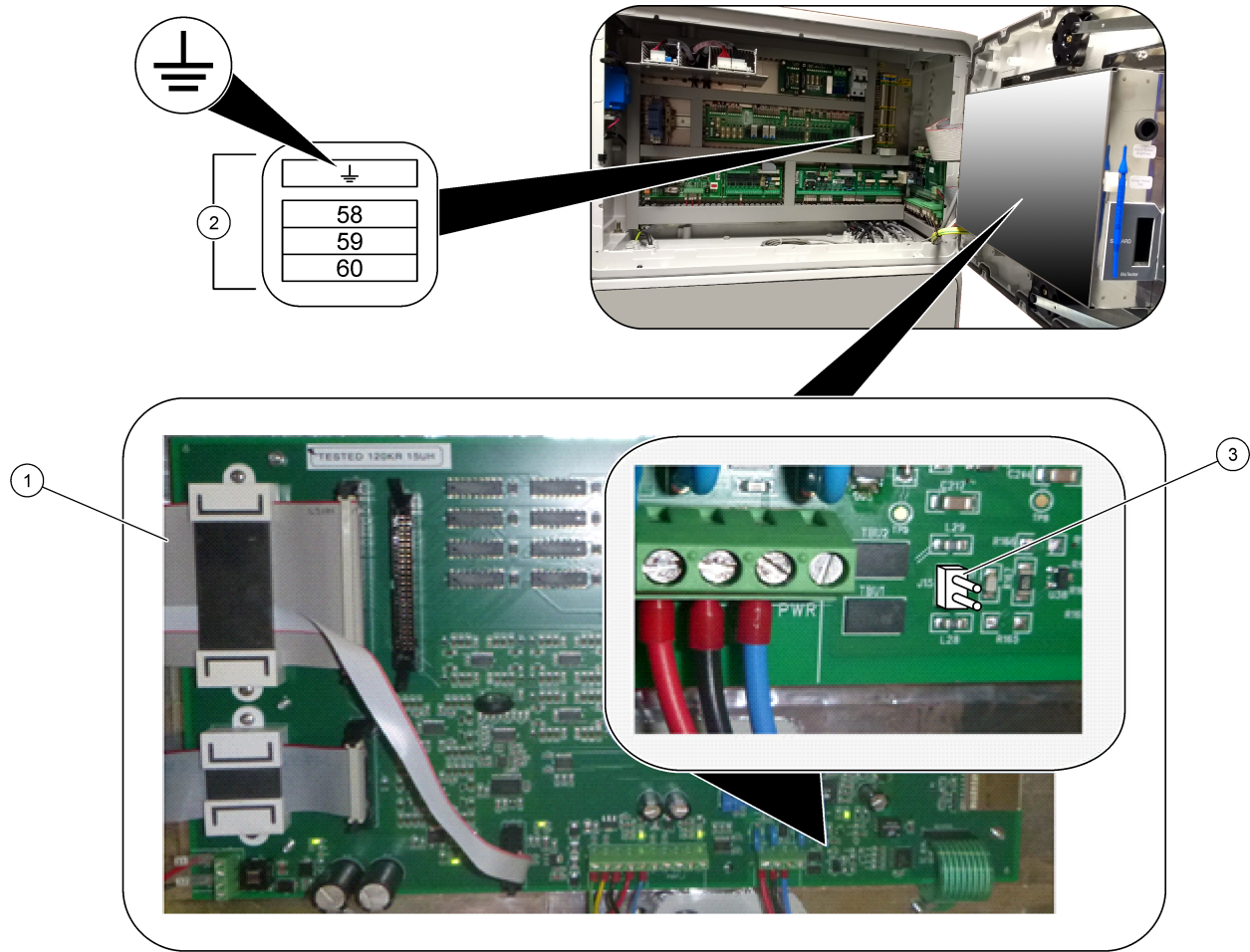
| Terminal  | Signal        |
|---|---------------|
| 58  | D+            |
| 59  | D–            |
| 60  | Modbus ground |
|  | Earth ground  |



Figure 3 Location of Modbus RTU terminals and bus-termination jumper



|                        |                                |
|------------------------|--------------------------------|
| 1 Motherboard          | 3 Bus-termination jumper (J15) |
| 2 Modbus RTU terminals |                                |

## 2.2 Modbus TCP (Ethernet)

### 2.2.1 Configure the Modbus TCP module

1. Set the analyzer power to on.
2. Use an Ethernet cable to connect a laptop to the Modbus TCP/IP (RJ45) connector in the analyzer. Refer to [Figure 4](#) on page 9.
3. On the laptop, click the Start icon and select Control Panel.
4. Select Network and Internet.
5. Select Network and Sharing Center.
6. On the right side of the window, select Change adapter settings.
7. Right-click Local Area Connection and select Properties.
8. Select Internet Protocol Version 4 (TCP/IPv4) from the list, then click **Properties**.
9. Record the properties to go back to the properties in the future as necessary.
10. Select Use the following IP address.
11. Enter the IP address and subnet mask that follow:
  - IP address: 192.168.254.100
  - Subnet mask: 255.255.255.0
12. Click **OK**.
13. Close the open windows.
14. Open a web browser.
15. In the address bar of the web browser, enter the default IP address (192.168.254.254).

The web-interface of the Modbus TCP module shows.
16. Use a web-interface at port 80 to change the configuration of the Modbus TCP module, such as the IP address (192.168.254.254) or the TCP/IP port (502).

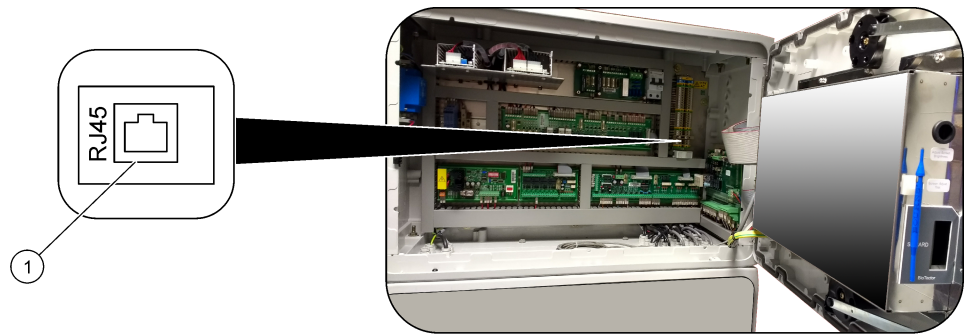
### 2.2.2 Modbus TCP wiring

For Modbus TCP data transmission, connect the Modbus TCP/IP connector in the analyzer to a Modbus master device as follows:

1. Put an Ethernet cable through a cable strain-relief fitting on the right side of the analyzer.
2. Connect the Ethernet cable to the Modbus TCP/IP connector in the analyzer. Refer to [Figure 4](#).
3. Tighten the cable strain-relief fitting.
4. Connect the other end of the Ethernet cable to a Modbus master device. Refer to [Figure 5](#).

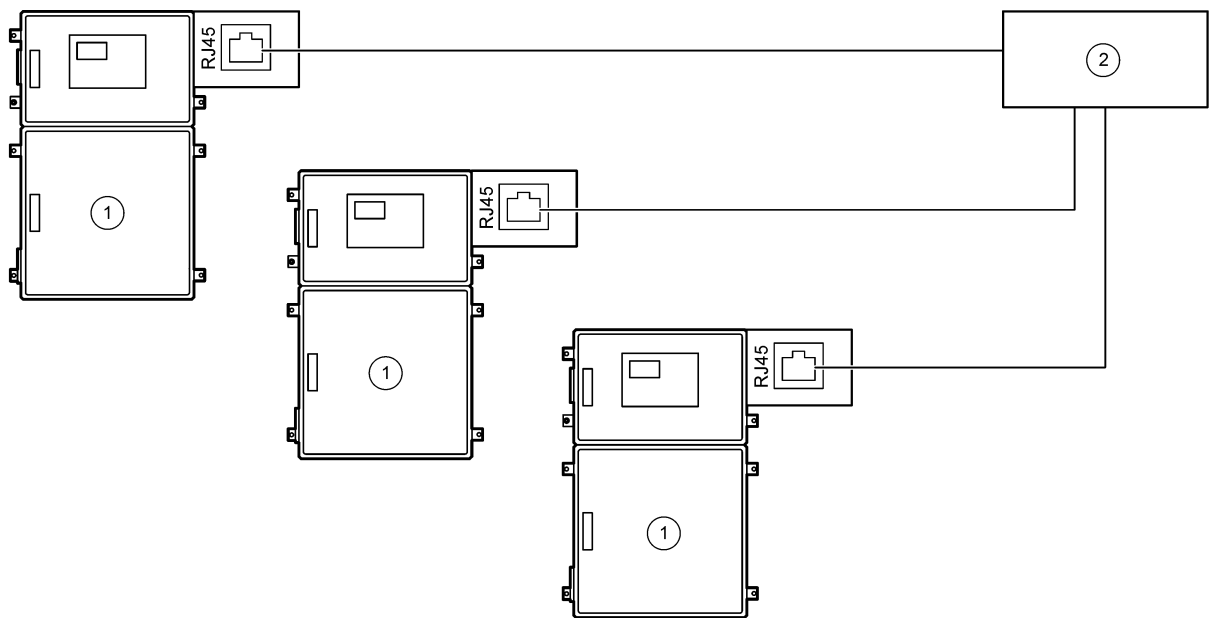
If the analyzer has two Modbus TCP/IP connectors, fully redundant data transmission is possible. To connect an analyzer to two Modbus master devices, refer to [Figure 6](#).

Figure 4 Modbus TCP/IP connector



1 Modbus TCP/IP connector

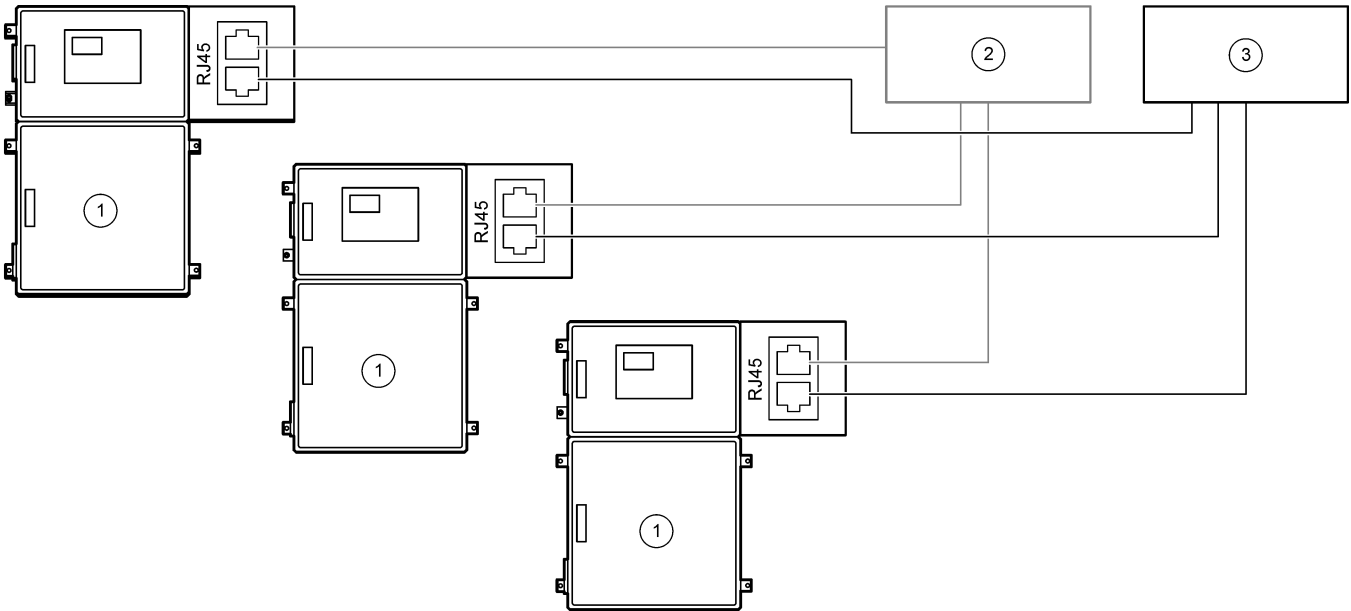
Figure 5 Normal Modbus TCP wiring



1 Analyzer

2 Modbus master

Figure 6 Redundant Modbus TCP wiring



|                   |                  |
|-------------------|------------------|
| 1 Analyzer        | 3 Modus Master 2 |
| 2 Modbus Master 1 |                  |

## Section 3 Configure the Modbus settings

1. Push ✓, then select MAINTENANCE > SYSTEM CONFIGURATION > HARDWARE CONFIGURATION > SYSTEM/HARDWARE SETUP > DATA PORT. Make sure that Modbus is enabled.
2. Push ✓, then select MAINTENANCE > COMMISSIONING > MODBUS PROGRAM.
3. Select an option.

| Option                    | Description  |
|---------------------------|--|
| <b>MODE</b>               | Shows the Modbus operating mode: BIOTECTOR.  |
| <b>BAUDRATE</b>           | Sets the Modbus baudrate for the instrument and the Modbus master device (1200 to 115200 bps, default: 57600).<br><b>Note:</b> For Modbus TCP (Ethernet), do not change the BAUDRATE setting. The RTU-to-TCP converter uses the default BAUDRATE setting.  |
| <b>PARITY</b>             | Sets the parity to NONE (default), EVEN, ODD, MARK or SPACE.<br><b>Note:</b> For Modbus TCP (Ethernet), do not change the PARITY setting. The RTU-to-TCP converter uses the default PARITY setting.  |
| <b>DEVICE BUS ADDRESS</b> | Sets the Modbus address of the instrument (default: AUTO). Do one of the options that follow: <ul style="list-style-type: none"><li>• Enter a fixed address that a Modbus protocol message cannot change.</li><li>• Enter "0" (AUTO) to let the Modbus master device dynamically supply the bus address.</li></ul> |
| <b>MANUFACTURE ID</b>     | Sets the manufacturer ID of the instrument (default: 1 for Hach).  |
| <b>DEVICE ID</b>          | (Optional) Sets the class or family of the instrument (default: 1234).   |
| <b>SERIAL NUMBER</b>      | Sets the serial number of the instrument. Enter the serial number that is on the instrument.   |
| <b>LOCATION TAG</b>       | Sets the location of the instrument. Enter the country where the instrument is installed.  |
| <b>FIRMWARE REV</b>       | Shows the firmware revision installed on the instrument.   |
| <b>REGISTER MAP REV</b>   | Shows the Modbus register map version used by the instrument. Refer to <a href="#">Appendix—Modbus register maps</a> on page 19.   |



## Section 4 Show the Modbus status

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1. Push ✓, then select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS.
2. Select an option.

| Option              | Description  |
|---------------------|--|
| MODE                | Shows the Modbus operating mode, which is BIOTECTOR.   |
| DEVICE BUS ADDRESS  | Shows the Modbus address of the instrument.  |
| BUS MESSAGE COUNT   | Shows the number of Modbus messages that were correctly received and were sent to the Modbus address of the instrument.<br><b>Note:</b> When the count is 65,535, the subsequent message received sets the count to 1. |
| BUS COM ERROR COUNT | Shows the number of corrupted or not fully received Modbus messages that the Modbus received.<br><b>Note:</b> When the count is 65,535, the subsequent message received sets the count to 1.                           |
| MANUFACTURE ID      | Shows the manufacturer ID for the instrument (e.g., 1 for Hach).   |
| DEVICE ID           | Shows the class or family of the instrument, if entered (default: 1234).   |
| SERIAL NUMBER       | Shows the serial number of the instrument.   |
| LOCATION TAG        | Shows the location of the instrument.  |
| FIRMWARE REV        | Shows the firmware revision installed on the instrument.   |
| REGISTER MAP REV    | Shows the Modbus register map version used by the instrument. Refer to <a href="#">Appendix—Modbus register maps</a> on page 19.   |
| LAST MESSAGE        | Shows the first 17 bytes of the last received (RX) and transmitted (TX) Modbus message.  |





## Section 5      Modbus warning

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| Warning            | Description  | Solution  |
|--------------------|--|---|
| 135_MODBUS<br>WARN | Internal Modbus tasks are in an unknown condition. | When this warning occurs, the Modbus circuit starts again automatically. Acknowledge the warning and tell the distributor or the manufacturer. If the warning continues, replace the motherboard <sup>1</sup> . |

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<sup>1</sup> The B7000 motherboard part number is 19-PCB-054. The ARM motherboard part number is 19-PCB-053.



## Section 6      Modbus troubleshooting

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1. Push ✓, then select MAINTENANCE > SYSTEM CONFIGURATION > HARDWARE CONFIGURATION > SYSTEM/HARDWARE SETUP > DATA PORT. Make sure that Modbus is enabled.
2. Make sure that the device bus address is correct. Refer to [Configure the Modbus settings](#) on page 11.
3. Make sure that the register address (5-digit code) is correct.
4. Push ✓, then select MAINTENANCE > DIAGNOSTICS > MODBUS STATUS > BUS COM ERROR COUNT. Look at the bus transmission error count.  
The bus error count should increase each time the analyzer reads an invalid or not fully received Modbus message.  
**Note:** *Valid messages that are not addressed to the instrument do not increase the counter.*
5. For the Modbus RTU option, make sure that the wire connected to terminal 58 (D+) is positively biased compared to the wire connected to terminal 59 (D–) when the bus is in an idle condition.
6. Make sure that there is a jumper installed on J15 of the motherboard at the end of the bus to terminate the bus. The motherboard is in the electronic enclosure on the door behind the stainless steel cover. Refer to [Figure 3](#) on page 7.
7. For the Modbus TCP option, open the web interface. Refer to [Configure the Modbus TCP module](#) on page 8. If the web interface does not open, do the steps that follow:
  - a. Make sure that the network settings are correct.
  - b. Make sure that the Ethernet cable connectors are fully installed in the Ethernet ports.
  - c. Make sure that the LED for the Modbus TCP/IP (RJ45) connector is green.



## Section 7 Appendix—Modbus register maps

### 7.1 Measurement registers

#### Stream 1 measurements

| Name  | Description  | Register     | Data type   |
|---|--|--------------|---|
| STREAM_1_RLOG_TIC   | Stream 1: Last total inorganic carbon measurement                | 40001, 40002 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_1_RLOG_TOC   | Stream 1: Last total organic carbon measurement                  | 40003, 40004 |   |
| STREAM_1_RLOG_TC  | Stream 1: Last total carbon measurement                          | 40005, 40006 |   |
| STREAM_1_RLOG_VOC   | Stream 1: Last volatile organic carbon measurement               | 40007, 40008 |   |
| STREAM_1_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 1: Last total nitrogen measurement                        | 40009, 40010 |   |
| STREAM_1_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 1: Last total phosphorus measurement                      | 40011, 40012 |   |
| STREAM_1_RLOG_COD   | Stream 1: Last chemical oxygen demand measurement                | 40013, 40014 |   |
| STREAM_1_RLOG_BOD   | Stream 1: Last biochemical oxygen demand measurement             | 40015, 40016 |   |
| STREAM_1_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 1: Last calculated lost product index (%) result          | 40017, 40018 |   |
| STREAM_1_RLOG_LP<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1: Last calculated lost product (L/h) result              | 40019, 40020 |   |
| STREAM_1_RLOG_FLOW<br><i>Note: Only used with B7000i analyzers.</i> | Stream 1: Last flow meter measurement                            | 40021, 40022 |   |
| STREAM_1_RLOG_TW<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1: Total waste result                                     | 40023, 40024 |   |
| STREAM_1_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 1: Last total reactive and organic phosphorus measurement | 40025, 40026 |   |
| STREAM_1_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1: Last full cleaning reaction measurement                | 40027, 40028 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.

## Appendix—Modbus register maps

### Stream 2 measurements

| Name  | Description  | Register     | Data type   |
|---|--|--------------|---|
| STREAM_2_RLOG_TIC   | Stream 2: Last total inorganic carbon measurement                | 40029, 40030 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_2_RLOG_TOC   | Stream 2: Last total organic carbon measurement                  | 40031, 40032 |   |
| STREAM_2_RLOG_TC  | Stream 2: Last total carbon measurement                          | 40033, 40034 |   |
| STREAM_2_RLOG_VOC   | Stream 2: Last volatile organic carbon measurement               | 40035, 40036 |   |
| STREAM_2_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 2: Last total nitrogen measurement                        | 40037, 40038 |   |
| STREAM_2_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 2: Last total phosphorus measurement                      | 40039, 40040 |   |
| STREAM_2_RLOG_COD   | Stream 2: Last chemical oxygen demand measurement                | 40041, 40042 |   |
| STREAM_2_RLOG_BOD   | Stream 2: Last biochemical oxygen demand measurement             | 40043, 40044 |   |
| STREAM_2_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 2: Last calculated lost product index (%) result          | 40045, 40046 |   |
| STREAM_2_RLOG_LP<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2: Last calculated lost product (L/h) result              | 40047, 40048 |   |
| STREAM_2_RLOG_FLOW<br><i>Note: Only used with B7000i analyzers.</i> | Stream 2: Last flow meter measurement                            | 40049, 40050 |   |
| STREAM_2_RLOG_TW<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2: Total waste result                                     | 40051, 40052 |   |
| STREAM_2_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 2: Last total reactive and organic phosphorus measurement | 40053, 40054 |   |
| STREAM_2_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2: Last full cleaning reaction measurement                | 40055, 40056 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.

Stream 3 measurements

| Name  | Description  | Register     | Data type   |
|---|--|--------------|---|
| STREAM_3_RLOG_TIC   | Stream 3: Last total inorganic carbon measurement                | 40057, 40058 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_3_RLOG_TOC   | Stream 3: Last total organic carbon measurement                  | 40059, 40060 |   |
| STREAM_3_RLOG_TC  | Stream 3: Last total carbon measurement                          | 40061, 40062 |   |
| STREAM_3_RLOG_VOC   | Stream 3: Last volatile organic carbon measurement               | 40063, 40064 |   |
| STREAM_3_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 3: Last total nitrogen measurement                        | 40065, 40066 |   |
| STREAM_3_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 3: Last total phosphorus measurement                      | 40067, 40068 |   |
| STREAM_3_RLOG_COD   | Stream 3: Last chemical oxygen demand measurement                | 40069, 40070 |   |
| STREAM_3_RLOG_BOD   | Stream 3: Last biochemical oxygen demand measurement             | 40071, 40072 |   |
| STREAM_3_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 3: Last calculated lost product index (%) result          | 40073, 40074 |   |
| STREAM_3_RLOG_LP<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3: Last calculated lost product (L/h) result              | 40075, 40076 |   |
| STREAM_3_RLOG_FLOW<br><i>Note: Only used with B7000i analyzers.</i> | Stream 3: Last flow meter measurement                            | 40077, 40078 |   |
| STREAM_3_RLOG_TW<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3: Total waste result                                     | 40079, 40080 |   |
| STREAM_3_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 3: Last total reactive and organic phosphorus measurement | 40081, 40082 |   |
| STREAM_3_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3: Last full cleaning reaction measurement                | 40083, 40084 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.

## Appendix—Modbus register maps

### Stream 4 measurements

| Name   | Description  | Register     | Data type   |
|--|--|--------------|---|
| STREAM_4_RLOG_TIC  | Stream 4: Last total inorganic carbon measurement                | 40085, 40086 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_4_RLOG_TOC  | Stream 4: Last total organic carbon measurement                  | 40087, 40088 |   |
| STREAM_4_RLOG_TC   | Stream 4: Last total carbon measurement                          | 40089, 40090 |   |
| STREAM_4_RLOG_VOC  | Stream 4: Last volatile organic carbon measurement               | 40091, 40092 |   |
| STREAM_4_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 4: Last total nitrogen measurement                        | 40093, 40094 |   |
| STREAM_4_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 4: Last total phosphorus measurement                      | 40095, 40096 |   |
| STREAM_4_RLOG_COD  | Stream 4: Last chemical oxygen demand measurement                | 40097, 40098 |   |
| STREAM_4_RLOG_BOD  | Stream 4: Last biochemical oxygen demand measurement             | 40099, 40100 |   |
| STREAM_4_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i> | Stream 4: Last calculated lost product index (%) result          | 40101, 40102 |   |
| STREAM_4_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 4: Last total reactive and organic phosphorus measurement | 40103, 40104 |   |
| STREAM_4_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 4: Last full cleaning reaction measurement                | 40105, 40106 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.

### Stream 5 measurements

| Name   | Description  | Register     | Data type   |
|--|--|--------------|---|
| STREAM_5_RLOG_TIC  | Stream 5: Last total inorganic carbon measurement                | 40107, 40108 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_5_RLOG_TOC  | Stream 5: Last total organic carbon measurement                  | 40109, 40110 |   |
| STREAM_5_RLOG_TC   | Stream 5: Last total carbon measurement                          | 40111, 40112 |   |
| STREAM_5_RLOG_VOC  | Stream 5: Last volatile organic carbon measurement               | 40113, 40114 |   |
| STREAM_5_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 5: Last total nitrogen measurement                        | 40115, 40116 |   |
| STREAM_5_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 5: Last total phosphorus measurement                      | 40117, 40118 |   |
| STREAM_5_RLOG_COD  | Stream 5: Last chemical oxygen demand measurement                | 40119, 40120 |   |
| STREAM_5_RLOG_BOD  | Stream 5: Last biochemical oxygen demand measurement             | 40121, 40122 |   |
| STREAM_5_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i> | Stream 5: Last calculated lost product index (%) result          | 40123, 40124 |   |
| STREAM_5_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 5: Last total reactive and organic phosphorus measurement | 40125, 40126 |   |
| STREAM_5_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 5: Last full cleaning reaction measurement                | 40127, 40128 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.



Stream 6 measurements

| Name   | Description  | Register     | Data type   |
|--|--|--------------|---|
| STREAM_6_RLOG_TIC  | Stream 6: Last total inorganic carbon measurement                | 40129, 40130 | float, read only<br>-1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| STREAM_6_RLOG_TOC  | Stream 6: Last total organic carbon measurement                  | 40131, 40132 |   |
| STREAM_6_RLOG_TC   | Stream 6: Last total carbon measurement                          | 40133, 40134 |   |
| STREAM_6_RLOG_VOC  | Stream 6: Last volatile organic carbon measurement               | 40135, 40136 |   |
| STREAM_6_RLOG_TN<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 6: Last total nitrogen measurement                        | 40137, 40138 |   |
| STREAM_6_RLOG_TP<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 6: Last total phosphorus measurement                      | 40139, 40140 |   |
| STREAM_6_RLOG_COD  | Stream 6: Last chemical oxygen demand measurement                | 40141, 40142 |   |
| STREAM_6_RLOG_BOD  | Stream 6: Last biochemical oxygen demand measurement             | 40143, 40144 |   |
| STREAM_6_RLOG_LPI<br><i>Note: Only used with B7000i analyzers.</i> | Stream 6: Last calculated lost product index (%) result          | 40145, 40146 |   |
| STREAM_6_RLOG_TPR<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 6: Last total reactive and organic phosphorus measurement | 40147, 40148 |   |
| STREAM_6_RLOG_CF<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 6: Last full cleaning reaction measurement                | 40149, 40150 |   |

**Note:** When a register is read, the value in the `_TIME` register for that register (e.g., `STREAM_1_RLOG_TIC_TIME`) is updated.

## 7.2 Measurement time registers

Stream 1 measurement times

| Name   | Description   | Register     | Data type   |
|--|---|--------------|---|
| STREAM_1_RLOG_TIC_TIME   | Stream 1<br>Time and date of the last total inorganic carbon measurement                | 40300, 40301 | integer, read only<br>0x00000000 to<br>0xFFFFFFFF |
| STREAM_1_RLOG_TOC_TIME   | Stream 1<br>Time and date of the last total organic carbon measurement                  | 40302, 40303 |   |
| STREAM_1_RLOG_TC_TIME  | Stream 1<br>Time and date of the last total carbon measurement                          | 40304, 40305 |   |
| STREAM_1_RLOG_VOC_TIME   | Stream 1<br>Time and date of the last volatile organic carbon measurement               | 40306, 40307 |   |
| STREAM_1_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 1<br>Time and date of the last total nitrogen measurement                        | 40308, 40309 |   |
| STREAM_1_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 1<br>Time and date of the last total phosphorus measurement                      | 40310, 40311 |   |
| STREAM_1_RLOG_COD_TIME   | Stream 1<br>Time and date of the last chemical oxygen demand measurement                | 40312, 40313 |   |
| STREAM_1_RLOG_BOD_TIME   | Stream 1<br>Time and date of the last biochemical oxygen demand measurement             | 40314, 40315 |   |
| STREAM_1_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 1<br>Time and date of the last calculated lost product index (%) result          | 40316, 40317 |   |
| STREAM_1_RLOG_LP_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1<br>Time and date of the last calculated lost product (L/h) result              | 40318, 40319 |   |
| STREAM_1_RLOG_FLOW_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 1<br>Time and date of the last flow meter reading.                               | 40320, 40321 |   |
| STREAM_1_RLOG_TW_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1<br>Time and date of the last calculated total waste result.                    | 40322, 40323 |   |
| STREAM_1_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 1<br>Time and date of the last total reactive and organic phosphorus measurement | 40324, 40325 |   |
| STREAM_1_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 1<br>Time and date of the last full cleaning reaction measurement                | 40326, 40327 |   |

Stream 2 measurement times

| Name   | Description   | Register     | Data type                                      |
|--|---|--------------|--|
| STREAM_2_RLOG_TIC_TIME   | Stream 2<br>Time and date of the last total inorganic carbon measurement                | 40328, 40329 | integer, read only<br>0x00000000 to 0xFFFFFFFF |
| STREAM_2_RLOG_TOC_TIME   | Stream 2<br>Time and date of the last total organic carbon measurement                  | 40330, 40331 |  |
| STREAM_2_RLOG_TC_TIME  | Stream 2<br>Time and date of the last total carbon measurement                          | 40332, 40333 |  |
| STREAM_2_RLOG_VOC_TIME   | Stream 2<br>Time and date of the last volatile organic carbon measurement               | 40334, 40335 |  |
| STREAM_2_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 2<br>Time and date of the last total nitrogen measurement                        | 40336, 40337 |  |
| STREAM_2_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 2<br>Time and date of the last total phosphorus measurement                      | 40338, 40339 |  |
| STREAM_2_RLOG_COD_TIME   | Stream 2<br>Time and date of the last chemical oxygen demand measurement                | 40340, 40341 |  |
| STREAM_2_RLOG_BOD_TIME   | Stream 2<br>Time and date of the last biochemical oxygen demand measurement             | 40342, 40343 |  |
| STREAM_2_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 2<br>Time and date of the last calculated lost product index (%) result          | 40344, 40345 |  |
| STREAM_2_RLOG_LP_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2<br>Time and date of the last calculated lost product (L/h) result              | 40346, 40347 |  |
| STREAM_2_RLOG_FLOW_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 2<br>Time and date of the last flow meter reading.                               | 40348, 40349 |  |
| STREAM_2_RLOG_TW_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2<br>Time and date of the last calculated total waste result.                    | 40350, 40351 |  |
| STREAM_2_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 2<br>Time and date of the last total reactive and organic phosphorus measurement | 40352, 40353 |  |
| STREAM_2_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 2<br>Time and date of the last full cleaning reaction measurement                | 40354, 40355 |  |

## Appendix—Modbus register maps

### Stream 3 measurement times

| Name   | Description   | Register     | Data type   |
|--|---|--------------|---|
| STREAM_3_RLOG_TIC_TIME   | Stream 3<br>Time and date of the last total inorganic carbon measurement                | 40356, 40357 | integer, read only<br>0x00000000 to<br>0xFFFFFFFF |
| STREAM_3_RLOG_TOC_TIME   | Stream 3<br>Time and date of the last total organic carbon measurement                  | 40358, 40359 |   |
| STREAM_3_RLOG_TC_TIME  | Stream 3<br>Time and date of the last total carbon measurement                          | 40360, 40361 |   |
| STREAM_3_RLOG_VOC_TIME   | Stream 3<br>Time and date of the last volatile organic carbon measurement               | 40362, 40363 |   |
| STREAM_3_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 3<br>Time and date of the last total nitrogen measurement                        | 40364, 40365 |   |
| STREAM_3_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>    | Stream 3<br>Time and date of the last total phosphorus measurement                      | 40366, 40367 |   |
| STREAM_3_RLOG_COD_TIME   | Stream 3<br>Time and date of the last chemical oxygen demand measurement                | 40368, 40369 |   |
| STREAM_3_RLOG_BOD_TIME   | Stream 3<br>Time and date of the last biochemical oxygen demand measurement             | 40370, 40371 |   |
| STREAM_3_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 3<br>Time and date of the last calculated lost product index (%) result          | 40372, 40373 |   |
| STREAM_3_RLOG_LP_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3<br>Time and date of the last calculated lost product (L/h) result              | 40374, 40375 |   |
| STREAM_3_RLOG_FLOW_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 3<br>Time and date of the last flow meter reading.                               | 40376, 40377 |   |
| STREAM_3_RLOG_TW_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3<br>Time and date of the last calculated total waste result.                    | 40378, 40379 |   |
| STREAM_3_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 3<br>Time and date of the last total reactive and organic phosphorus measurement | 40380, 40381 |   |
| STREAM_3_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>   | Stream 3<br>Time and date of the last full cleaning reaction measurement                | 40382, 40383 |   |

## Stream 4 measurement times

| Name  | Description   | Register     | Data type                                      |
|---|---|--------------|--|
| STREAM_4_RLOG_TIC_TIME  | Stream 4<br>Time and date of the last total inorganic carbon measurement                | 40384, 40385 | integer, read only<br>0x00000000 to 0xFFFFFFFF |
| STREAM_4_RLOG_TOC_TIME  | Stream 4<br>Time and date of the last total organic carbon measurement                  | 40386, 40387 |  |
| STREAM_4_RLOG_TC_TIME   | Stream 4<br>Time and date of the last total carbon measurement                          | 40388, 40389 |  |
| STREAM_4_RLOG_VOC_TIME  | Stream 4<br>Time and date of the last volatile organic carbon measurement               | 40390, 40391 |  |
| STREAM_4_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 4<br>Time and date of the last total nitrogen measurement                        | 40392, 40393 |  |
| STREAM_4_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 4<br>Time and date of the last total phosphorus measurement                      | 40394, 40395 |  |
| STREAM_4_RLOG_COD_TIME  | Stream 4<br>Time and date of the last chemical oxygen demand measurement                | 40396, 40397 |  |
| STREAM_4_RLOG_BOD_TIME  | Stream 4<br>Time and date of the last biochemical oxygen demand measurement             | 40398, 40399 |  |
| STREAM_4_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 4<br>Time and date of the last calculated lost product index (%) result          | 40400, 40401 |  |
| STREAM_4_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 4<br>Time and date of the last total reactive and organic phosphorus measurement | 40402, 40403 |  |
| STREAM_4_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 4<br>Time and date of the last full cleaning reaction measurement                | 40404, 40405 |  |

## Appendix—Modbus register maps

### Stream 5 measurement times

| Name  | Description   | Register     | Data type   |
|---|---|--------------|---|
| STREAM_5_RLOG_TIC_TIME  | Stream 5<br>Time and date of the last total inorganic carbon measurement                | 40406, 40407 | integer, read only<br>0x00000000 to<br>0xFFFFFFFF |
| STREAM_5_RLOG_TOC_TIME  | Stream 5<br>Time and date of the last total organic carbon measurement                  | 40408, 40409 |   |
| STREAM_5_RLOG_TC_TIME   | Stream 5<br>Time and date of the last total carbon measurement                          | 40410, 40411 |   |
| STREAM_5_RLOG_VOC_TIME  | Stream 5<br>Time and date of the last volatile organic carbon measurement               | 40412, 40413 |   |
| STREAM_5_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 5<br>Time and date of the last total nitrogen measurement                        | 40414, 40415 |   |
| STREAM_5_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 5<br>Time and date of the last total phosphorus measurement                      | 40416, 40417 |   |
| STREAM_5_RLOG_COD_TIME  | Stream 5<br>Time and date of the last chemical oxygen demand measurement                | 40418, 40419 |   |
| STREAM_5_RLOG_BOD_TIME  | Stream 5<br>Time and date of the last biochemical oxygen demand measurement             | 40420, 40421 |   |
| STREAM_5_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 5<br>Time and date of the last calculated lost product index (%) result          | 40422, 40423 |   |
| STREAM_5_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 5<br>Time and date of the last total reactive and organic phosphorus measurement | 40424, 40425 |   |
| STREAM_5_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 5<br>Time and date of the last full cleaning reaction measurement                | 40426, 40427 |   |

## Stream 6 measurement times

| Name  | Description   | Register     | Data type                                      |
|---|---|--------------|--|
| STREAM_6_RLOG_TIC_TIME  | Stream 6<br>Time and date of the last total inorganic carbon measurement                | 40428, 40429 | integer, read only<br>0x00000000 to 0xFFFFFFFF |
| STREAM_6_RLOG_TOC_TIME  | Stream 6<br>Time and date of the last total organic carbon measurement                  | 40430, 40431 |  |
| STREAM_6_RLOG_TC_TIME   | Stream 6<br>Time and date of the last total carbon measurement                          | 40432, 40433 |  |
| STREAM_6_RLOG_VOC_TIME  | Stream 6<br>Time and date of the last volatile organic carbon measurement               | 40434, 40435 |  |
| STREAM_6_RLOG_TN_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 6<br>Time and date of the last total nitrogen measurement                        | 40436, 40437 |  |
| STREAM_6_RLOG_TP_TIME<br><i>Note: Not used with B7000i analyzers.</i>   | Stream 6<br>Time and date of the last total phosphorus measurement                      | 40438, 40439 |  |
| STREAM_6_RLOG_COD_TIME  | Stream 6<br>Time and date of the last chemical oxygen demand measurement                | 40440, 40441 |  |
| STREAM_6_RLOG_BOD_TIME  | Stream 6<br>Time and date of the last biochemical oxygen demand measurement             | 40442, 40443 |  |
| STREAM_6_RLOG_LPI_TIME<br><i>Note: Only used with B7000i analyzers.</i> | Stream 6<br>Time and date of the last calculated lost product index (%) result          | 40444, 40445 |  |
| STREAM_6_RLOG_TPR_TIME<br><i>Note: Not used with B7000i analyzers.</i>  | Stream 6<br>Time and date of the last total reactive and organic phosphorus measurement | 40446, 40447 |  |
| STREAM_6_RLOG_CF_TIME<br><i>Note: Only used with B7000i analyzers.</i>  | Stream 6<br>Time and date of the last full cleaning reaction measurement                | 40448, 40449 |  |

## 7.3 Sample status registers

| Name                  | Description  | Register     | Data type                                      |
|-----------------------|--|--------------|--|
| RLOG_SMPL_STATUS      | Sample status<br>Quality of the sample, which is measured by the ultrasonic sensor | 40200, 40201 | float, read only<br>0.0 to 100.0               |
| RLOG_SMPL_STATUS_TIME | Time and date of the last sample status measurement                                | 40202, 40203 | integer, read only<br>0x00000000 to 0xFFFFFFFF |

**Note:** When a register is read, the value in the \_TIME register for that register is updated.

### 7.4 Settings registers

| Name                      | Description  | Register   | Data type           | Min/Max                          |
|---------------------------|--|--|---------------------|----------------------------------|
| DEVICE_ADDR               | DEVICE BUS ADDRESS setting   | 40500  | integer, read/write | 0x0000 to 0x00C8                 |
| DEVICE_ID                 | DEVICE ID setting  | 40501  | integer, read/write | 0x0000 to 0xFFFF                 |
| MANUF_ID                  | MANUFACTURE ID setting   | 40502  | integer, read/write | 0x0000 to 0x00FF                 |
| DEVICE_SERIAL_ID          | SERIAL NUMBER setting  | 40503, 40504, 40505                                    | uint48, read only   | 0x000000000000 to 0xFFFFFFFFFFFF |
| PROTO_REV                 | Modbus protocol implementation revision<br>rev AA.BB = 0xAABB  | 40506  | integer, read only  | 0x0000 to 0x9999                 |
| FRMW_REV                  | FIRMWARE REV setting<br>rev AA.BB = 0xAABB   | 40507  | integer, read only  | 0x0000 to 0x9999                 |
| REGS_MAP_REV              | REGISTER MAP REV setting<br>rev AA.BB = 0xAABB   | 40508  | integer, read only  | 0x0000 to 0x9999                 |
| LOCATION_STR              | LOCATION TAG setting<br><b>Note:</b> Null terminate the string if there are less than 16 characters.   | 40509, 40510, 40511, 40512, 40513, 40514, 40515, 40516 | string, read/write  | 16 characters maximum            |
| BAUDRATE                  | BAUDRATE setting<br>0 = 1200 bps<br>1 = 2400 bps<br>2 = 4800 bps<br>3 = 9600 bps<br>4 = 14400 bps<br>5 = 19200 bps<br>6 = 38400 bps<br>7 = 57600 bps<br>8 = 115200 bps | 40517  | integer, read/write | 0x0000 to 0x0008                 |
| SYS_TIMEDATE <sup>2</sup> | System time and date in seconds since January 1, 1970.   | 40518, 40519   | integer, read/write | 0x00000000 to 0xFFFFFFFF         |
| SYS_TIME <sup>2</sup>     | System time in higher/lower bytes<br>HH:MM = 0xHHMM  | 40520  | integer, read/write | 0x0000 to 0x3B3B                 |
| SYS_DATE <sup>2</sup>     | System date in 4 bytes<br>Higher word DAY:MON = 0xDDMM<br>Lower word YEAR = 0xYYYY   | 40521, 40522   | integer, read/write | 0x00000000 to 0x1F0C0833         |

<sup>2</sup> This register cannot be changed until the system is fully stopped.



| Name                          | Description | Register     | Data type        | Min/Max          |
|-------------------------------|-------------|--------------|------------------|------------------|
| REACT_TIC_RANGE1 <sup>3</sup> | TIC range 1 | 40550, 40551 | float, read only | 0.0 to 1000000.0 |
| REACT_TIC_RANGE2 <sup>3</sup> | TIC range 2 | 40552, 40553 |                  |                  |
| REACT_TIC_RANGE3 <sup>3</sup> | TIC range 3 | 40554, 40555 |                  |                  |
| REACT_TOC_RANGE1 <sup>3</sup> | TOC range 1 | 40556, 40557 |                  |                  |
| REACT_TOC_RANGE2 <sup>3</sup> | TOC range 2 | 40558, 40559 |                  |                  |
| REACT_TOC_RANGE3 <sup>3</sup> | TOC range 3 | 40560, 40561 |                  |                  |
| REACT_TC_RANGE1 <sup>3</sup>  | TC range 1  | 40562, 40563 |                  |                  |
| REACT_TC_RANGE2 <sup>3</sup>  | TC range 2  | 40564, 40565 |                  |                  |
| REACT_TC_RANGE3 <sup>3</sup>  | TC range 3  | 40566, 40567 |                  |                  |
| REACT_TN_RANGE1 <sup>3</sup>  | TN range 1  | 40568, 40569 |                  |                  |
| REACT_TN_RANGE2 <sup>3</sup>  | TN range 2  | 40570, 40571 |                  |                  |
| REACT_TN_RANGE3 <sup>3</sup>  | TN range 3  | 40572, 40573 |                  |                  |
| REACT_TP_RANGE1 <sup>3</sup>  | TP range 1  | 40574, 40575 |                  |                  |
| REACT_TP_RANGE2 <sup>3</sup>  | TP range 2  | 40576, 40577 |                  |                  |
| REACT_TP_RANGE3 <sup>3</sup>  | TP range 3  | 40578, 40579 |                  |                  |
| REACT_TPR_RANGE1 <sup>3</sup> | TPR range 1 | 40580, 40581 |                  |                  |
| REACT_TPR_RANGE2 <sup>3</sup> | TPR range 2 | 40582, 40583 |                  |                  |
| REACT_TPR_RANGE3 <sup>3</sup> | TPR range 3 | 40584, 40585 |                  |                  |

## 7.5 Calibration registers

| Name              | Description   | Register | Data type          | Min/Max          |
|-------------------|---|----------|--------------------|------------------|
| AUTOCAL_PROG      | Auto calibration day<br>bit 0 = off<br>bit 1 = Monday<br>bit 2 = Tuesday<br>bit 3 = Wednesday<br>bit 4 = Thursday<br>bit 5 = Friday<br>bit 6 = Saturday<br>bit 7 = Sunday | 40700    | integer, read only | 0x0000 to 0x000F |
| AUTOCAL_PROG_TIME | Time of scheduled auto calibration in higher/lower bytes<br>HH:MM = 0xHHMM  | 40701    | integer, read only | 0x0000 to 0x3B3B |

<sup>3</sup> Shown as 0.0 if in the analysis mode for this result is not available.

## Appendix—Modbus register maps

| Name  | Description   | Register     | Data type           | Min/Max                               |
|---|---|--------------|---------------------|---------------------------------------|
| CLOG_CAL_SELECT <sup>4</sup>  | Calibration type<br>0 = TIC<br>1 = TOC<br>2 = TC<br>3 = TN<br>4 = TP<br>5 = TPR   | 40702        | integer, read/write | 0x0000 to 0x0004                      |
| CLOG_CAL1_SPAN_STATUS   | Status of the last span calibration<br>bit 0 = calibration<br>bit 1 = check<br>bit 2 = calibration successful<br>bit 3 = result outside band<br>bit 4 = calculated from other range<br>bit 5 = calculated from TOC/TC result<br>bit 6 = entered by operator<br><b>Note:</b> If a calibration failure occurs on the master range, it is necessary to update the derived results status also. | 40703        | integer, read only  | 0x0000 to 0x007F                      |
| CLOG_CAL2_SPAN_STATUS   |   | 40717        |                     |                                       |
| CLOG_CAL3_SPAN_STATUS   |   | 40731        |                     |                                       |
| <b>Note:</b> The CLOG_CALx register values are only updated when the associated CLOG_CALx_SPAN_STATUS register is read. |   |              |                     |                                       |
| CLOG_CAL1_SPAN_TIME   | Time and date of the last span calibration  | 40704, 40705 | integer, read only  | 0x00000000 to 0xFFFFFFFF              |
| CLOG_CAL2_SPAN_TIME   |   | 40718, 40719 |                     |                                       |
| CLOG_CAL3_SPAN_TIME   |   | 40732, 40733 |                     |                                       |
| CLOG_CAL1_SPAN_STD  | Calibration standard<br><b>Note:</b> Null if bits 4–6 are set in the _STATUS register.  | 40706, 40707 | float, read only    | -1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| CLOG_CAL2_SPAN_STD  |   | 40720, 40721 |                     |                                       |
| CLOG_CAL3_SPAN_STD  |   | 40734, 40735 |                     |                                       |
| CLOG_CAL1_SPAN_RSLT   | Calibration results<br><b>Note:</b> Null if bits 4–6 are set in the _STATUS register.   | 40708, 40709 | float, read only    | -1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| CLOG_CAL2_SPAN_RSLT   |   | 40722, 40723 |                     |                                       |
| CLOG_CAL3_SPAN_RSLT   |   | 40736, 40737 |                     |                                       |
| CLOG_CAL1_SPAN_FACTOR   | Span adjustment factor  | 40710, 40711 | float, read only    | -1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| CLOG_CAL2_SPAN_FACTOR   |   | 40724, 40725 |                     |                                       |
| CLOG_CAL3_SPAN_FACTOR   |   | 40738, 40739 |                     |                                       |

<sup>4</sup> This register value changes the values of the CLOG registers that follow.

| Name                  | Description  | Register     | Data type           | Min/Max                               |
|-----------------------|--|--------------|---------------------|---------------------------------------|
| CLOG_CAL1_ZERO_STATUS | Status of the last zero calibration<br>bit 0 = zero calibration<br>bit 1 = zero check<br>bit 2 = zero successful<br>bit 3 = result outside band<br>bit 4 = calculated from other range<br>bit 5 = TIC: no zero required<br>bit 6 = entered by operator | 40712        | integer, read/write | 0x0000 to 0x007F                      |
| CLOG_CAL2_ZERO_STATUS |  | 40726        |                     |                                       |
| CLOG_CAL3_ZERO_STATUS |  | 40740        |                     |                                       |
| CLOG_CAL1_ZERO_TIME   | Time and date of the last zero calibration   | 40713, 40714 | integer, read only  | 0x00000000 to 0xFFFFFFFF              |
| CLOG_CAL2_ZERO_TIME   |  | 40727, 40728 |                     |                                       |
| CLOG_CAL3_ZERO_TIME   |  | 40741, 40742 |                     |                                       |
| CLOG_CAL1_ZERO_OFFSET | Zero offset  | 40715, 40716 | float, read only    | -1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| CLOG_CAL2_ZERO_OFFSET |  | 40729, 40730 |                     |                                       |
| CLOG_CAL3_ZERO_OFFSET |  | 40743, 40744 |                     |                                       |

## 7.6 Diagnostics registers

| Name   | Description  | Register     | Data type          | Min/Max          |
|--|--|--------------|--------------------|------------------|
| EXP_ANLS   | Shows the oxidation analysis type<br>bit 0 = TIC+TOC<br>bit 1 = TC<br>bit 2 = VOC<br>bit 3 = TIC+TOCe<br>bit 4 = TCe<br>bit 5 = TIC+TOCb<br>bit 6 = TCB<br>bit 7 = VOCb<br>bit 8 = Fast TC | 40586        | integer, read only | 0x0000 to 0x07FF |
| LQP_ANLS<br><i>Note: Not used with B7000i analyzers.</i> | Shows the liquid analysis type<br>bit 0 = TN<br>bit 1 = TP<br>bit 2 = TN+TP<br>bit 3 = TPb<br>bit 4 = TN+TPb<br>bit 5 = TN+TPr+TP<br>bit 6 = TN+TPr  | 40587        | integer, read only | 0x0000 to 0x0017 |
| PANEL_TEMP   | Temperature in the enclosure (°C)  | 40800, 40801 | float, read only   | -100.0 to 150.0  |
| ATM_PRESS  | Atmospheric pressure measurement from sensor (kPa)   | 40802, 40803 | float, read only   | 0.0 to 250.0     |

## Appendix—Modbus register maps

| Name   | Description   | Register        | Data type          | Min/Max                               |
|--|---|-----------------|--------------------|---------------------------------------|
| CO2A_ZERO <sup>5</sup>   | CO <sub>2</sub> analyzer zero setting   | 40804,<br>40805 | float, read only   | -1.0 <sup>6</sup> to 1.0 <sup>6</sup> |
| COOLER_TEMP  | Cooler temperature (°C), if measured  | 40806,<br>40807 | float, read only   | -100.0 to 150.0                       |
| TP_BOILER_TEMP<br><i>Note: Not used with B7000i analyzers.</i>       | Temperature of the TP boiler (°C)   | 40808,<br>40809 | float, read only   | -100.0 to 150.0                       |
| TP_MIX_BOILER_TEMP<br><i>Note: Not used with B7000i analyzers.</i>   | Temperature of the TP mixer boiler (°C)   | 40810,<br>40811 | float, read only   | -100.0 to 150.0                       |
| GCTRL_AIR_PRESSURE<br><i>Note: Only used with B7000i analyzers.</i>  | Air pressure measured at the gas controller circuit board (kPa)   | 40812,<br>40813 | float, read only   | 0.0 to 250.0                          |
| GCTRL_O2_PRESS<br><i>Note: Only used with B7000i analyzers.</i>      | Oxygen pressure measured at the gas controller circuit board (kPa)  | 40814,<br>40815 | float, read only   | 0.0 to 250.0                          |
| REACT_STREAM_VALVE   | Analysis reaction stream valve<br>0 = no analysis on any stream valve<br>1 = analysis on Stream 1 valve<br>2 = analysis on Stream 2 valve<br>3 = analysis on stream 3 valve<br>4 = analysis on Stream 4 valve<br>5 = analysis on Stream 5 valve<br>6 = analysis on Stream 6 valve | 40816           | integer, read only | 0 to 6                                |
| REACT_RANGE  | Analysis reaction range<br>0 = no analysis reaction<br>1 = analysis reaction range 1<br>2 = analysis reaction range 2<br>3 = analysis reaction range 3  | 40817           | integer, read only | 0 to 3                                |
| ACID_RGNT_STATUS   | Number of days of acid remaining  | 40818           | integer, read only | 0 to 999                              |
| BASE_RGNT_STATUS   | Number of days of base remaining  | 40819           | integer, read only | 0 to 999                              |
| TN_CLEAN_RGNT_STATUS<br><i>Note: Not used with B7000i analyzers.</i> | Number of days of TN cleaning fluid remaining   | 40820           | integer, read only | 0 to 999                              |
| DIW_RGNT_STATUS<br><i>Note: Not used with B7000i analyzers.</i>      | Number of days of deionized water remaining   | 40821           | integer, read only | 0 to 999                              |
| C_RGNT_STATUS<br><i>Note: Not used with B7000i analyzers.</i>        | Number of days of Reagent C remaining   | 40822           | integer, read only | 0 to 999                              |
| D_RGNT_STATUS<br><i>Note: Not used with B7000i analyzers.</i>        | Number of days of Reagent D remaining   | 40823           | integer, read only | 0 to 999                              |
| REACT_CNTR   | Reaction counter  | 40824,<br>40825 | integer, read only | 0x00000000 to 0xFFFFFFFF              |
| SERVICE_REQ  | Number of days until service is necessary   | 40826           | integer, read only | 0x0000 to 0xFFFF                      |

<sup>5</sup> This register is set to 0.0 when power is set to on and is set to the correct value during the ANALYZER\_ZERO reaction condition.

## 7.7 Error, Warning and Notification registers

For descriptions of the fault codes, refer to *Troubleshooting of System Faults, Warnings and Notification Events* in the analyzer documentation.

| Name             | Description   | Register | Data type          | Min/Max          |
|------------------|---|----------|--------------------|------------------|
| SYS_ALARM_STATUS | Alarm status<br>bit 0 = fault<br>bit 1 = warning<br>bit 2 = notification<br>bit 3 = Drinking water warning              | 49930    | integer, read only | 0x0000 to 0x000F |
| SYS_COND_GRP     | bit 0 = fault 01_LOW O2 FLOW - EX<br>bit 1 = fault 02_LOW O2 FLOW - SO<br>...<br>bit 15 = fault 16_SAMPLE VALVE SEN3    | 49950    |                    |                  |
| SYS_COND_GRP     | bit 0 = fault 17_SMPL VALVE NOT SYNC<br>bit 1 = fault 18_LIQUID LEAK DET<br>...<br>bit 15 = fault 33_TOC SPAN CHCK FAIL | 49951    |                    |                  |
| ...              | ...   | ...      |                    |                  |
| SYS_COND_GRP     | bit 0 = fault 241<br>bit 1 = fault 242<br>...<br>bit 15 = fault 257   | 49966    |                    |                  |

## 7.8 Status and external control registers

| Name                 | Description  | Register | Data type           | Min/Max          |
|----------------------|--|----------|---------------------|------------------|
| SYS_OP_STATUS        | Operation status<br>bit 0 = normal operation<br>bit 1 = manual operation<br>bit 2 = calibration<br>bit 3 = zero<br>bit 4 = remote standby is activated<br>bit 5 = maintenance switch is activated  | 49931    | integer, read only  | 0x0000 to 0x003F |
| SYS_REM_CTRL         | System remote control<br>0 = no change<br>1 = system finish and stop<br>2 = analysis start<br>3 = zero cal start<br>4 = zero check start<br>5 = span cal start<br>6 = span check start<br>7 = reagents purge and zero                            | 49932    | integer, read/write | 0 to 7           |
| SYS_REM_CTRL_STANDBY | Set Remote Standby function<br>0 = Modbus remote standby deactivated<br>1 = Modbus remote standby activated<br><b>Note:</b> The content of this register is internally ORed (boolean logic) with the Remote Standby digital input, if available. | 49933    | integer, read/write | 0 to 1           |

## Appendix—Modbus register maps

| Name                | Description  | Register | Data type           | Min/Max          |
|---------------------|--|----------|---------------------|------------------|
| SYS_REM_CTRL_SYNC   | Synchronization output for remote control operation<br><b>Note:</b> This register is enabled even when no SYNC output is identified.   | 49934    | integer, read only  | 0 to 1           |
| SYS_REM_CTRL_RANGE  | Select next range<br>0 = not selected / auto<br>1 = range 1<br>2 = range 2<br>3 = range 3<br><b>Note:</b> If this register value is 0, the range is selected with the EXT_RANGE_MUX1-2 digital inputs, if available.<br>If the EXT_RANGE_MUX1-2 digital inputs are not available, the value of this register controls the digital input lines. | 49935    | integer, read/write | 0 to 3           |
| SYS_REM_CTRL_STREAM | Next stream to be selected<br>bit 0 = Stream 1<br>bit 1 = Stream 2<br>bit 2 = Stream 3<br>bit 3 = Stream 4<br>bit 4 = Stream 5<br>bit 5 = Stream 6<br><b>Note:</b> The content of this register is internally ORed (boolean logic) with the STREAM SEL 1-6 digital inputs to enable or disable stream selection.                               | 49936    | integer, read/write | 0x0000 to 0x007f |
| SYS_DEBUG_MODE      | System debug mode register<br>0 = normal system operation<br>1 = system supplies pre-defined Modbus registers values   | 45000    | integer, read/write | 0x0000 to 0x0001 |



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