



MEMS Digital In-Place Inclinometer with DT Loggers & FlexDAQ Quick Start Guide

All efforts have been made to ensure the accuracy and completeness of the information contained in this document. RST Instruments Ltd. reserves the right to change the information at any time and assumes no liability for its accuracy.

Copyright © 2025. RST Instruments Ltd. All rights reserved.

Document Number: ICM0095C

Release Date: 13 May 2025

RST Instruments LTD.

11545 Kingston St.,

Maple Ridge, BC

Canada V2X 0Z5

SALES + SERVICE + MANUFACTURING

604-540-1100 | info@rstinstruments.com

Toll Free (USA & Canada) 1-800-665-5599

www.rstinstruments.com



REVISION HISTORY

Rev.	Revision History	Date	Prepared By	Approved By
A	Initial release	2020-Nov-13	MP	BN
B	Added instructions for Campbell CR6 and CR310 loggers; DT Logger Host instructions updated for v. 1.18.5.	2020-Dec-24	MP	AB
C	Title edited, section 5 edited and renamed to "FlexDAQ Logger Quick Start Up Instructions", and format update.	2025-May-13	SM	SP, AA

TABLE OF CONTENTS

1	INTRODUCTION	1
2	HARDWARE SET UP	1
2.1	Initial Set Up and Configuration	1
2.2	Installation in the Field	3
2.2.1	Cleaning Connectors	3
3	MINIMUM SYSTEM REQUIREMENTS	4
3.1	Hardware	4
3.2	PC Hardware.....	4
3.3	Windows Host Operating System	4
4	DT2485 QUICK START UP INSTRUCTIONS USING DT LOGGER HOST	5
4.1	Digital Output for MEMS IPI Systems	5
4.2	Software Installation	5
4.3	Data Logger Configuration.....	5
4.4	Downloading Data	9
4.5	Help System.....	9
5	FLEXDAQ LOGGER QUICK START UP INSTRUCTIONS	9
5.1	Hardware Requirements.....	9
5.2	CR6 Wiring.....	10
5.2.1	Updating the Modbus Addresses With a CR6.....	10
5.2.2	Code for CR6	12
5.3	CR310 Wiring.....	14
5.3.1	Updating the Modbus Addresses With a CR310	14
5.3.2	Code for CR310	17
6	INSTALLATION	19
7	SERVICE AND REPAIR	19

LIST OF FIGURES

Figure 2-1 Mating the connectors	1
Figure 2-2 Cable tie – do not remove.....	2
Figure 2-3 Place protective caps on connectors when not in use	4
Figure 4-1 DTBUS tab.....	7
Figure 5-1 CR6 wiring schematic.....	10
Figure 5-2 Select CRBasic Editor under the Program menu	10
Figure 5-3 CR6 Series Program icon	11
Figure 5-4 Compiling and saving the code in the CRBasic editor	11
Figure 5-5 Successful compilation message	12
Figure 5-6 Select Connect from Main menu.....	12
Figure 5-7 CR6 code	13
Figure 5-8 Wiring schematic for an IPI system to the CR310 using RS232 DB9 connector	14
Figure 5-9 Wiring schematic for an IPI system to the CR310 logger using C1 and C2.....	14
Figure 5-10 Select CRBasic editor under the Program menu.....	15
Figure 5-11 CR300 Series Program icon	15
Figure 5-12 Compiling and saving the code in the CRBasic editor	16
Figure 5-13 Successful compilation message	16
Figure 5-14 Select Connect from Main menu.....	16
Figure 5-15 CR310 code	18

LIST OF TABLES

Table 2-1 Digital output for MEMS IPI 4 system and RST DT2485	3
Table 4-1 Digital output for MEMS IPI 4 system and RST DT2485	5

1 INTRODUCTION

The following guide provides a high-level overview for setting up a MEMS Digital In-Place Inclinator System (IPI) system. Please consult the MEMS Digital In-Place Inclinator System Installation Manual (ICM0062) and the DT Logger Host Instruction Manual (ELM0080) for detailed instructions not covered in this guide.

2 HARDWARE SET UP

To ensure that all components are working together correctly and able to communicate, RST recommends that initial set up and configuration take place in the office or warehouse, prior to final installation in the field.

2.1 INITIAL SET UP AND CONFIGURATION

1. Connect all IPI sensors in a string by mating the connectors (Figure 2-1).



NOTE: It is not mandatory to connect the bay rods at this point, but it can be done to ensure familiarity with the connection procedure.



FIGURE 2-1 MATING THE CONNECTORS



NOTE: Do not cut the cable tie that locks the cable to the wheel assembly (Figure 2-2). Cable ties have been placed to relieve tension on the cables.



FIGURE 2-2 CABLE TIE – DO NOT REMOVE

2. Record the serial number of each sensor and its order in the string, from the top to the bottom of the string.



CAUTION: It is critical that the sensors are installed in the same order on the string as in the initial set up and configuration. Read errors and string failure may occur.

Connect the IPI string to the desired data logger, following the wiring scheme outlined in Table 2-1.

TABLE 2-1 DIGITAL OUTPUT FOR MEMS IPI 4 SYSTEM AND RST DT2485

Wire Color	MEMS IPI 4
Red	V+
Green	A
White	B
Black	GND
Bare	SH

- Follow the instructions outline in Section 4 to configure the string. Ensure that serial numbers are entered in the same order as they appear on the string.
- Disconnect all sensors and place the shipping caps on all connectors to prevent contamination.

2.2 INSTALLATION IN THE FIELD

Once the system and communication have been configured in the office or warehouse, installation in the field will be straightforward. See ICM0062 for detailed instructions.



CAUTION: It is critical that the sensors are installed in the same order on the string as in the initial set up and configuration. Read errors and system failure may occur.

2.2.1 Cleaning Connectors

Keep caps on connectors (Figure 2-3) until mated to the next sensor to prevent contamination. Store the caps in a clean, dry location for future use.

Any dirt within the connectors may cause water ingress and cause an entire string of IPIs to fail.



CAUTION: Contamination, such as dirt or dust, in the connectors can cause read failures in an entire string of IPIs.

In the event of contamination within the connectors, the connector ends may be flushed with isopropyl alcohol and set aside to dry.



FIGURE 2-3 PLACE PROTECTIVE CAPS ON CONNECTORS WHEN NOT IN USE

3 MINIMUM SYSTEM REQUIREMENTS

3.1 HARDWARE

- DT2485 logger, or
- Campbell Logger
 - PC with LoggerNet, and
 - RST ELGL4000 Interface (if using CR310)

3.2 PC HARDWARE

- Desktop or laptop with Intel or AMD processor
- USB port

3.3 WINDOWS HOST OPERATING SYSTEM

The following Microsoft™ Windows operating systems are supported:

- Windows 7 (x86 and x64)
- Windows Server 2008 R2 (x64)
- Windows 8 (x64)
- Windows Server 2012 R2 (x64)
- Windows 8.1 (x64)
- Windows 10 (x86 and x64)

4 DT2485 QUICK START UP INSTRUCTIONS USING DT LOGGER HOST

The following is a brief outline to get you up and running quickly with the RST DT2485 data logger and DT Logger Host.

4.1 DIGITAL OUTPUT FOR MEMS IPI SYSTEMS

To connect the IPI system to the DT2485, wire the cable to the screw terminal according to Table 4-1.

TABLE 4-1 DIGITAL OUTPUT FOR MEMS IPI 4 SYSTEM AND RST DT2485

Wire Color	MEMS IPI 4
Red	V+
Green	A
White	B
Black	GND
Bare	SH

4.2 SOFTWARE INSTALLATION

1. Run the software installation file `RST_DTLogger_Setup_X.XX.X.exe`, where X.XX.X indicates current software version. The current version can be downloaded from:
<https://rstinstruments.com/resources/software>. Navigate to the site and select the appropriate data logger.
2. Follow the on-screen instructions to install the software. The default directory is: **C:\Program Files (x86)\RST Instruments\DT Logger Host**



NOTE: The DT Logger Host software requires a set of drivers installed on the host computer to communicate over USB communication port.

If automatic driver update is enabled, and an internet connection is available, RST USB drivers will be downloaded from Microsoft™ Windows Update Server and installed automatically.

Please contact RST Instruments with any questions or concerns.

4.3 DATA LOGGER CONFIGURATION

1. Connect the IPI string to the logger by following the wiring scheme outlined in Table 4-1. Connect the logger to a PC via the USB port or via the wireless module, if applicable.
2. Launch the software. Once the software connects to the logger, the port and status indicators will turn green and the *Status* screen should display logger information.
3. Navigate to the *DTBus* tab to configure the IPI sensors (Figure 4-1, see next page). All currently configured sensors are listed along with sensor index, sensor serial number and sensor type.

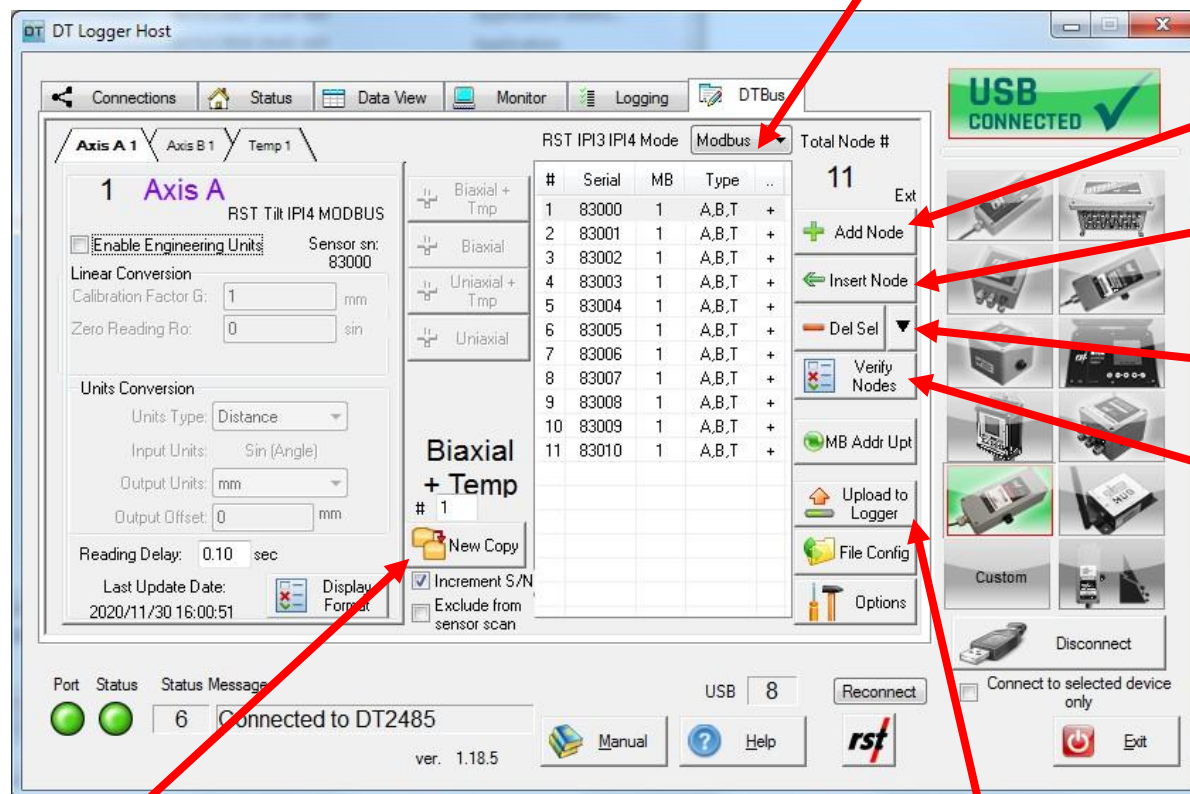


FIGURE 4-1 DTBUS TAB

-
- a. Confirm that the communication mode has been set to Modbus.



CAUTION: Ensure that the communication mode has been set to MODBUS to avoid communication errors.

- b. Clear existing entries on the table by clicking *Del Sel*.



NOTE: Existing entries must be cleared (not renamed) before new sensors are added to the table.

- c. Click on *Add Node* to add a new sensor to the string. Ensure the right sensor type and version have been selected.
- d. Click on the *Serial* column and enter the last 5 digits of the serial number of the first sensor in the string.
- e. Repeat Steps c and d until all sensors in the string have been entered.
- f. Confirm that the serial numbers of the sensors are entered in the same order they will be installed.
-



NOTE: If entered correctly, the order that the sensors appear in DT Logger Host will be a visual representation of the layout of the string in the borehole, with the bottom-most sensor on the DT Logger Host list corresponding to the bottom-most sensor in the borehole, and the sensor in position 1 on the software corresponding to the top-most sensor in the string.

DT LOGGER HOST	BOREHOLE
Sensor 1	Sensor 1
Sensor 2	Sensor 2
Sensor 3	Sensor 3
Sensor 4	Sensor 4
Sensor 5	Sensor 5

Taking time to set up and configure the sensors correctly at the outset will result in a more pleasant data collection and interpretation experience.

- g. Click on *Verify Nodes* to ensure that each sensor in the string is able to communicate with the logger.
4. Enable *Eng Units* to record the data in specific Engineering Units. Enter the appropriate parameters.
 5. Once the desired parameters are set, click the *Upload to Logger* button to apply the changes. Click "Yes" when asked to update Modbus Addresses.
 6. Wait for update process to finish. The logger is now logging data.
 7. If desired, real time sensor readings can be monitored by selecting the *Monitor* tab.

8. Under the *Status* tab, check to make sure the parameters are correct and that the logger is either *logging* or there is a *log pending* under the *Sampling* section.
9. Click *Disconnect* button to terminate logger connection.
10. Exit the software and disconnect the communication cable.
11. The data logger should now be taking readings. Return to the logger to download the data. Check the remaining battery life every time you connect. The battery state is an approximate value based on recent battery use.

4.4 DOWNLOADING DATA

1. Connect the communication cable to your computer and the DT2485 and launch the software. If the connection is successful, the port and status indicators turn green and the *Status* screen should display logger information.
2. Press the *Collect Data* button on the *Status* tab to download the data. A data file (*.csv) will automatically be created in the data directory. The default data directory is:
My Documents\Multichannel
3. Before downloading, the program will ask whether you would like to erase the existing data on the logger or keep appending to existing records. To erase the old data and continue logging with the same parameters, select the *Logging* tab and press *Apply Settings*.
4. To keep the old data on the logger and continue logging, exit the program, and disconnect the communication cable.
5. To change any logging parameters, do so under the *Logging* tab and press *Apply Settings* to save the changes.
6. Disconnect the communication cable when finished.

4.5 HELP SYSTEM

An extensive help system in DT Logger Host can be activated anytime by pressing F1 or the RST icon. Answers to common problems and troubleshooting tips can be found by browsing help topics or searching using keywords.

5 FLEXDAQ LOGGER QUICK START UP INSTRUCTIONS

The following is a brief outline to update the Modbus addresses of IPI sensors in a string with a CR6 or CR310 model FlexDAQ logger.

5.1 HARDWARE REQUIREMENTS

- Campbell Logger
 - CR6
 - CR310
 - RST ELGL4000 Interface
- PC with the latest version of LoggerNet

5.2 CR6 WIRING

To connect the IPI system to a CR6 Campbell logger, follow the wiring schematic outlined in Figure 5-1 (assuming no Multiplexers are being used):

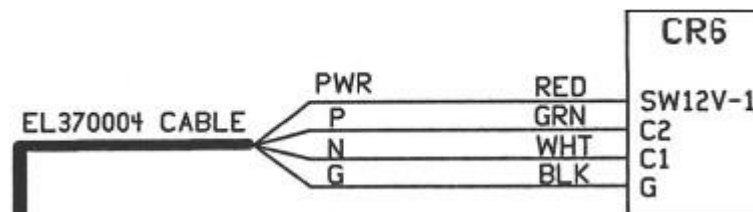


FIGURE 5-1 CR6 WIRING SCHEMATIC

5.2.1 Updating the Modbus Addresses With a CR6

Before updating the Modbus addresses on the IPI string, ensure that all settings have been saved on the logger unit.

Modbus addresses for sensors connected to a Campbell CR6 logger can be updated via a CRBasic code. Once the user has defined the number of sensors and their respective serial numbers, the code will automatically assign a Modbus address to each sensor in the string once the code is run.

1. Open LoggerNet.
2. Navigate to the "CRBasic Editor" option under the *Program* menu (Figure 5-2).



FIGURE 5-2 SELECT CRBASIC EDITOR UNDER THE PROGRAM MENU

3. Select the appropriate logger from the menu, depending on the type of logger used.



CR6 Series Program

FIGURE 5-3 CR6 SERIES PROGRAM ICON



NOTE: If the CR6 series program icon does not appear, it will need to be added via the Set Up menu first.

4. Ensure that any existing settings have been saved
5. Remove the template code and paste the code (see Section 5.2.2) into the editor. The appropriate code will depend on the type of logger that will be used.
6. Update the number of IPIs and the serial number of each IPI in the code, in order of installation or planned installation.
7. Compile the code, and then name and save it.

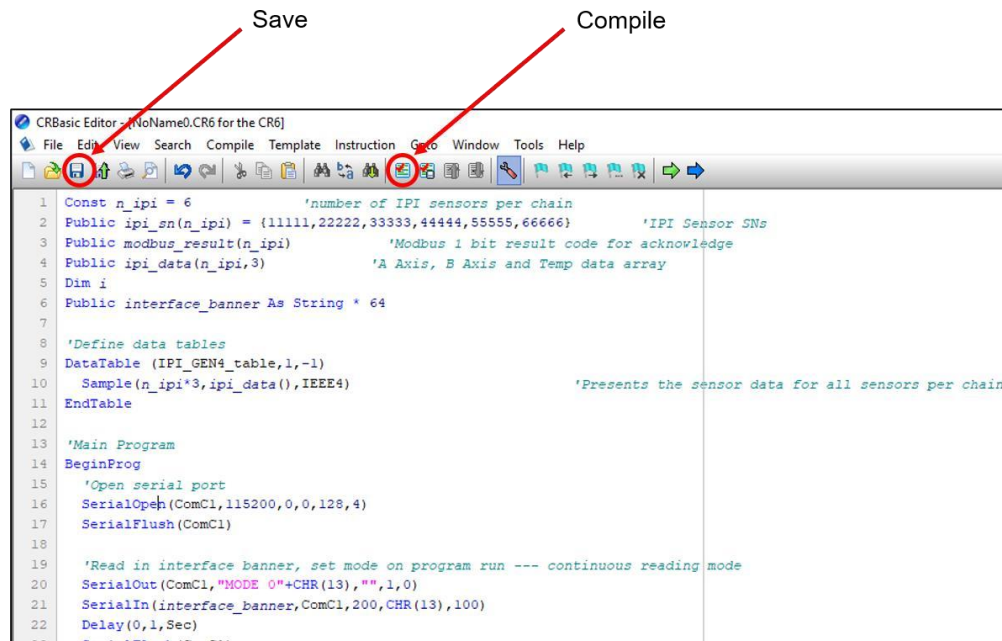


FIGURE 5-4 COMPILING AND SAVING THE CODE IN THE CRBASIC EDITOR

8. If the compilation was successful, the following message will appear at the bottom of the window:

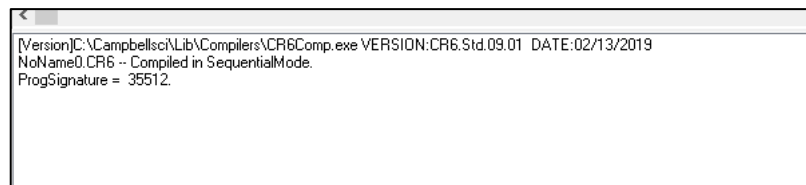


FIGURE 5-5 SUCCESSFUL COMPILATION MESSAGE

9. Close the CRBasic Editor.
10. On the Main LoggerNet menu, select "Connect".



FIGURE 5-6 SELECT CONNECT FROM MAIN MENU

11. Follow general LoggerNet instructions for ensuring current settings have been saved.
12. Select “Send New” on the right-hand side of the screen and open the saved CRBasic code from Step 7.



CAUTION: Collect existing data from the logger before sending the new program.

13. Click on “Start Running”.
14. The Modbus addresses for the sensors on the IPI string will now be updated.

5.2.2 Code for CR6

Copy and paste the following code into the CRBasic Editor. The items in red indicate user input:

```

'Constants and variables definitions
Const n_ipi = n                                     'Number of IPI sensors per chain, replace 'n' with
                                                    number of IPIs in string

Dim modbus_serial_number(n_ipi) As Long 'IPI Sensor SN for Modbus protocol
Public ipi_sn(n_ipi) = {xxxxx,yyyyy,...,nnnnn}      'IPI Sensor SN, replace "xxxxx" with correct SN for
                                                    each IPI, separated by comma

Public modbus_result(n_ipi)                    'Modbus 1 bit result code for acknowledge
Public ipi_data(n_ipi,3)                      'A Axis, B Axis and Temp data array
Dim i

Public interface_banner As String * 64

'Define data tables
DataTable (IPI_GEN4_table,1,-1)
    Sample(n_ipi*3,ipi_data(),IEEE4)            'Presents the sensor data for all sensors per string
EndTable

'Main Program
BeginProg
'Open serial port
SerialOpen(ComC1,9600,0,0,128,4)
SerialFlush(ComC1)
'Guard against serial number error causing incorrect data
    SerialOut(ComC1,"@@65534 MBA 247 247"+CHR(13),"",1,0)
    Delay(0,1,Sec)
    SerialFlush(ComC1)
'Set devices endianness to standard CDAB
    SerialOut(ComC1,"@@65534 TXO 0"+CHR(13),"",1,0)
    Delay(0,1,Sec)
    SerialFlush(ComC1)
'Set & Verify Modbus Addresses
    For i = 1 To n_ipi                                'up to the number of IPI sensors
'Set device Modbus address command to default 1 to "n_ipi"
        SerialOut(ComC1,"@"+"+ipi_sn(i)+" MBA "+"+" "+"+CHR(13),"",1,0)
        Delay(0,1,Sec)
        SerialFlush(ComC1)
    Next i

    Scan (1,Min,0,0)                                'Reading interval per IPI string
        'Power Up Bus & query Sensors for current reading
        For i = 1 To n_ipi
            'Read A Axis, B Axis and Temp starting from 0x30 register
            ModbusMaster(modbus_result(i),ComC1, 9600,i,3,ipi_data(i,1),49,3,3,300)
            Delay(0,50,mSec)
        Next i
        CallTable IPI_GEN4_table                    'Call table to store the data
    NextScan
EndProg

```

FIGURE 5-7 CR6 CODE

5.3 CR310 WIRING

To connect an IPI system to a CR310 Campbell logger, an RS485 to RS232 interface, such as RST's ELGL4000 series, will need to be used (assuming no Multiplexers are being used). The interface/IPI assembly can be wired as follows (Figure 5-8):

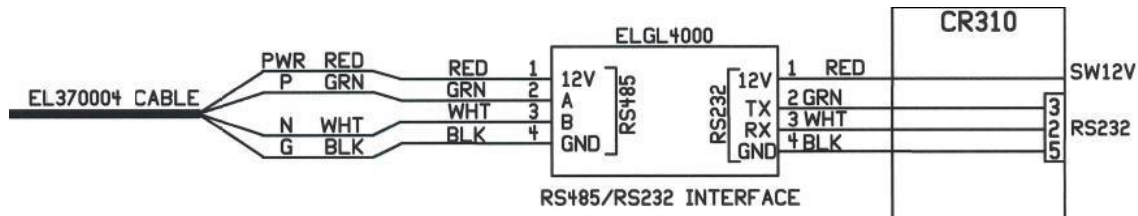


FIGURE 5-8 WIRING SCHEMATIC FOR AN IPI SYSTEM TO THE CR310 USING RS232 DB9 CONNECTOR

In the event that the C1 and C2 ports are vacant, the C1 and C2 ports can be used in place of the DB9 port. See the wiring diagram outlined in Figure 5-9.

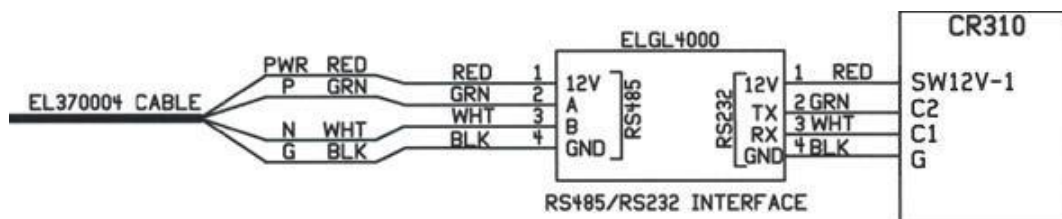


FIGURE 5-9 WIRING SCHEMATIC FOR AN IPI SYSTEM TO THE CR310 LOGGER USING C1 AND C2

5.3.1 Updating the Modbus Addresses With a CR310



NOTE: An RS485 to RS232 interface must be used when updating the MODBUS addresses with a CR310 logger.

Before updating the Modbus addresses on the IPI string, ensure that all settings have been saved on the logger unit.

Modbus addresses for sensors connected to a Campbell CR310 logger can be updated via a CRBasic code. Once the user has defined the number of sensors and their respective serial numbers, the code will automatically assign a Modbus address to each sensor in the string once the code is run.

1. Open LoggerNet.
2. Navigate to the "CRBasic Editor" option under the *Program* menu (Figure 5-2).



FIGURE 5-10 SELECT CRBASIC EDITOR UNDER THE PROGRAM MENU

3. Select the appropriate logger from the menu, depending on the type of logger used.



CR300 Series Program

FIGURE 5-11 CR300 SERIES PROGRAM ICON



NOTE: If the CR6 series program icon does not appear, it will need to be added via the set up menu first.

4. Ensure that any existing settings have been saved
5. Remove the template code and paste the code (see Section 5.3.2) into the editor. The appropriate code will depend on the type of logger that will be used.
6. Update the number of IPIs and the serial number of each IPI in the code, in order of installation or planned installation.
7. Compile the code, and then name and save it.

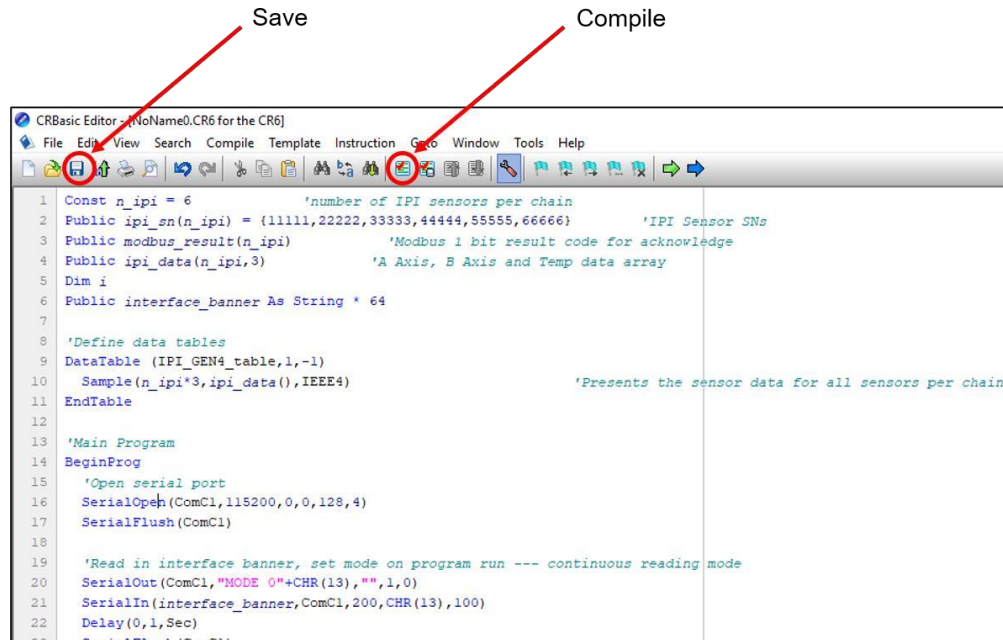


FIGURE 5-12 COMPILING AND SAVING THE CODE IN THE CRBASIC EDITOR

8. If the compilation was successful, the following message will appear at the bottom of the window:

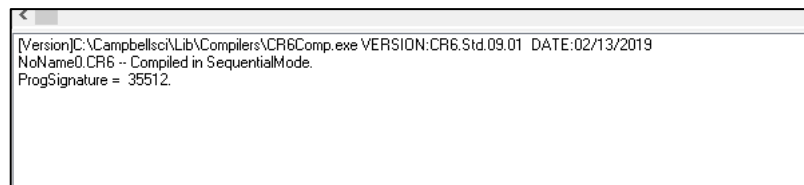


FIGURE 5-13 SUCCESSFUL COMPILATION MESSAGE

9. Close the CRBasic Editor.
10. On the Main LoggerNet menu, select "Connect".



FIGURE 5-14 SELECT CONNECT FROM MAIN MENU

11. Follow general LoggerNet instructions for ensuring current settings have been saved.
12. Select “Send New” on the right-hand side of the screen and open the saved CRBasic code from Step 7.



CAUTION: Collect existing data from the logger before sending the new program.

13. Click on “Start Running”.
14. The Modbus addresses for the sensors on the IPI string will now be updated.

5.3.2 Code for CR310

Copy and paste the following code into the CRBasic Editor. The items in red indicate user input:

```

'Constants and variables definitions
Const n_ipi = n

Public ipi_sn(n_ipi) = {xxxxx,yyyyy,...,nnnnn}

Public modbus_result(n_ipi)
Public ipi_data(n_ipi,3)
Dim i
Public interface_banner As String * 64

'Define data tables
DataTable (IPI_GEN4_table,1,-1)
Sample(n_ipi*3,ipi_data(),IEEE4)
EndTable

'Main Program
BeginProg
'Open serial port
SerialOpen(Com1,115200,0,0,128,4)
SerialFlush(Com1)
    'Read in interface banner, set mode on program run --- continuous reading mode
    SerialOut(Com1,"MODE 0"+CHR(13),"",1,0)
    SerialIn(interface_banner,Com1,200,CHR(13),100)
Delay(0,1,Sec)
SerialFlush(Com1)
'Guard against serial number error causing incorrect data
    SerialOut(Com1,"@@65534 MBA 247 247"+CHR(13),"",1,0)
    Delay(0,1,Sec)
    SerialFlush(Com1)
    'Set devices endianness to standard CDAB
    SerialOut(Com1,"@@65534 TXO 0"+CHR(13),"",1,0)
    Delay(0,1,Sec)
    SerialFlush(Com1)
    'Set Modbus Addresses
    For i = 1 To n_ipi
        'Set device Modbus address command to default 1 to "n_ipi"
        SerialOut(Com1,"@"+ipi_sn(i)+" MBA "+i+" "+i+CHR(13),"",1,0)
        Delay(0,1,Sec)
        SerialFlush(Com1)
    Next i

    Scan (1,Min,0,0)
        'Power Up Bus & query Sensors for current reading
        For i = 1 To n_ipi
            'Read A Axis, B Axis and Temp starting from 0x30 register
            ModbusMaster(modbus_result(i),Com1,115200,i,3,ipi_data(i,1),49,3,3,300)
            Delay(0,50,mSec)
        Next i
        CallTable IPI_GEN4_table
    NextScan
EndProg

```

FIGURE 5-15 CR310 CODE

6 INSTALLATION

Refer to the MEMS Digital In-Place Inclinator System Instruction Manual available on the [MEMS Digital In-Place Inclinator System Product Page](#) for detailed installation instructions.

7 SERVICE AND REPAIR

This product contains no user-serviceable parts. Contact RST for product service or repair not covered in this manual.

- For sales information: sales@rstinstruments.com
- For technical support: support@rstinstruments.com
- Service portal: <https://support.rstinstruments.com/support/tickets/new>
- Website: www.rstinstruments.com
- Toll free: 1-800-665-5599

RST Canada Office (Head Quarters)

Address: 11545 Kingston Street, Maple Ridge, BC, Canada V2X 0Z5

Telephone: 604-540-1100

Fax: 604-540-1005

Business hours: 7:30 a.m. to 5:00 p.m. (PST) Monday to Friday, except holidays

RST UK Office

Address: Unit 4 Charles Industrial Estate Stowupland Road, Stowmarket Suffolk, UK, IP14 5AH

Telephone: +44 1449 706680

Business hours: 9:00 a.m. to 6:30 p.m. (GMT) Monday to Friday except holidays