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C O N T R O L S

Orion-M

Fieldbus Communications Guide



Communicator™

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Safety Information in this Manual

Notes, cautions and warnings appear throughout this book to draw your attention to important operational and safety information.

A “**NOTE**” marks a short message to alert you to an important detail.

A “**CAUTION**” safety alert appears with information that is important for protecting your equipment and performance.

A “**WARNING**” safety alert appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.



This symbol (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.



This symbol (a lightning bolt in a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

Technical Assistance

If you encounter a problem with your Orion-M controller, review all of your configuration information to verify that your selections are consistent with your application: inputs; outputs; alarms; limits; etc. If the problem persists after checking the above, you can get technical assistance by dialing +1 (866) 342-5332 or by faxing your request to +1 (866) 332-8014, Monday thru Friday, 8:00 a.m. to 5:00 p.m. Eastern Standard Time. You can also email your request to support@futuredesigncontrols.com.

An applications engineer will discuss your application with you.

Please have the following information available:

- Complete Model #'s and/or Serial #'s for Component(s) in Question
- Complete Software Version #'s
- All Configuration Information
- All User Manuals

Warranty and return information is on the back cover of this manual.

Your Comments

Your comments or suggestions on this manual are welcome. Please send them to:
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1 What is the Orion-M?

The Orion-M is a multi-loop process control system combined with an embedded SCADA color touch interface. The Orion-M provides a configurable control platform for a variety of OEM applications requiring up to 15 separate loops of control. In addition to 15 loops of control, the Orion-M can also provide up to an additional 15 inputs for process monitoring, for a total of 30 process inputs.

The system is provided with eight 24Vdc digital inputs, two 24Vdc outputs and 6 relay outputs standard. The Orion-M can be expanded to a total of 16 digital inputs and 32 digital outputs. The Orion-M also provides the capability of accepting analog inputs for remote set point control and analog outputs capable of retransmitting system variables to other devices such as a chart recorder. The 0-10Vdc or 4-20mA user selectable signals are provided through the addition of optional analog expander cards.

The Orion-M complements its versatile hardware platform by providing a host of standard features and configuration capabilities, all through its visual, touch interface. The touch screen interface is an embedded, industrial PC with all software included. No external PC software is required for setup or configuration of the Orion-M. All of the setup and configuration data is saved to the Orion-M's internal memory.

Individual process controllers, one for each loop in the system, provide reliable, consistent and accurate control by distributing the process control requirements of the system among multiple processors. Each loop controller provides full auto tune functionality with high resolution, universal process inputs. When coupled with the built in ramping profiler of the Orion-M, it allows for automatic, timed control of all processes and outputs of the system. No other control system on the market provides the flexibility, functionality and configurability of the Orion-M.

1.1 Features

The digital inputs of the Orion-M can be configured as alarm inputs with adjustable delay timers, as control inputs for controlling profile operation or for direct control of the system's digital outputs. The outputs of the Orion-M can be used as direct outputs for controlling external equipment related to the application through software switches, called events, or be programmed to act as system alarm or status outputs. All outputs have adjustable delay times for on, off and cycle times.

The Orion-M can be operated in single set point or automatic profile control mode. Profile entry is made easy through the use of copy, paste and delete menu selections. Profiles can be copied to the external 'USB' memory stick and then imported to another Orion-M controller which eliminates the need to enter duplicate profiles into multiple Orion-M systems. When running in automatic profile mode, the operator can place the system into hold and change any control parameter without modifying the saved profile. This gives the operator maximum flexibility over the controlled process.

Data file analysis tools (auto-trend) make looking at historical data a simple task. Any control variable saved to the Orion-M flash memory can be plotted on the historical data trend, for any time frame within the data file's total time range. Full 'USB' print capabilities from the Orion-M interface to a standard HP inkjet printer Model 6540, 6940, 6980 (or compatible printer), eliminates the need for a PC, strip or circular chart-recording device. Graphics trends, historical and report print functions are standard.

The built in Ethernet functionality includes a 'Web Server' to provides access to all Orion-M data (view only), a VNC interface for remote control and monitoring and an NTS clock, all available via a local Intranet connection (wired or wireless), or the World Wide Web using standard software like Microsoft's Internet Explorer.

The Orion-M provides a rich set of tools for control interaction and data analysis. Views include system overviews, trends, alarms, profiles as well as historical data, alarm history and audit trail views. The menu driven interface eliminates screen 'clutter' by providing an easy to use 'Windows' interface for interaction between the user and the Orion-M system.

The Orion-M can store more than one year of data on its internal compact flash card. Data logging can be enabled manually or automatically during automatic profile run. Data backup is provided with the 'USB I-Stick' for plug and play transfer of files to any PC running Microsoft Windows XP operating systems.

The Orion-M security module provides full system security with three levels of access. Each of the three access levels allow for independent user rights. Up to 30 users can be entered into the system while the audit trail tracks all operator actions and records them.

The Orion-M control system includes the following interface features:

- Overview screen that displays all "runtime" information.
- Profile run and monitor views.
- Profile entry, open, save and download interface screens.
- Current alarm and alarm history views (alarm history for up to 1 year).
- Real time trends (with adjustable X,Y limits) for all inputs.
- System and application setup (control loops, monitors, inputs/outputs, alarms, etc.).
- Data logging interface screens include log point selection and historical viewing.
- 'Plug and Play' memory stick functionality for data transfer/backup.
- Full USB print capabilities and on-line help screens
- Web server for intranet/internet access (view only).
- VNC server for intranet/internet access (control/view).
- FTP data back-up for automatic data file transfer over intranet/internet.
- Integrated email server for alarm notification and file transfer.
- NTS clock with daylight savings time insures that the system is up to date.
- Full security with audit trail for tracking user actions.
- Maintenance counters for output cycles and on times.
- Helps screens are available for most screen views; configurable in English, Spanish and French
- Voice assisted help in English, Spanish and French (external speakers required – not included).

2 Anybus Communicator

The Anybus Communicator can connect the Orion-M to a variety of fieldbus networks such as DeviceNet and Profibus-DP. The Communicator performs as an intelligent converter between the Modbus RTU serial protocol of the Orion-M and the chosen industrial network. The translation between the serial protocol and the network is configured by using the free “ABC ConfigTool” provided by HMS.

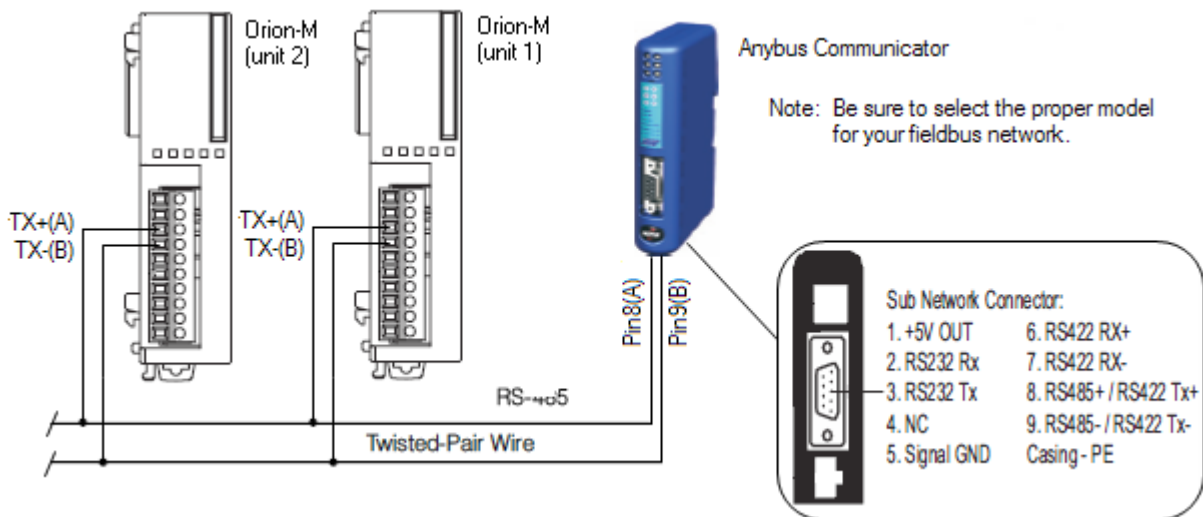
This windows based software has an easy to use interface and requires no programming. All translations are easily configured via pre-defined functions. During configuration, you can define which and how much data shall be passed between the fieldbus network and the Orion-M using the FDC provided device file. In addition, it is possible for a single Communicator to be configured to connect multiple Orion-M's to the same fieldbus network.

The Anybus Communicator uses a simple object based configuration instead of a complex programming language. The ABC ConfigTool provides online help functionality and wizards for the Modbus-RTU based configuration. On completion, the configuration is downloaded from the PC into the Communicator. Now the Communicator is ready to start the communication with its assigned device(s) on the sub-network.

The ABC ConfigTool also provides the functionality to save the configuration into a file. This makes it easy for OEM manufacturers to upload pre-defined configurations for instant usage of the Communicator by their end customers. All that is required to take advantage of this connectivity option for the Orion-M, is the proper model of Anybus Communicator for your fieldbus network, and the Orion-M's user communications interface, an RS-485 (FC5A-SIF4) communications card that must be installed on the Orion-M's control module.

2.1 Connecting the Anybus Communicator to the Orion-M

The Anybus communicator provides a DB-9, female serial port for connecting to the Orion-M. In order to use this connection, a cable must be made to connect pins 8 and 9 of the serial port to the Orion-M using a single twisted-pair cable. If multiple Orion-M units are to be connected to a single fieldbus Communicator, the cable is then daisy-chained from one Orion-M to the next.



NOTE: When using shielded twisted-pair cable, be sure to ground only when end of the cable, preferably at the Communicator. Allowing any other portion of the cable shield to come in contact with ground, or grounding both ends, will cause ground loop currents to flow in that section of the cable and can cause communication errors.

3 Configuring the Anybus Communicator

IMPORTANT:

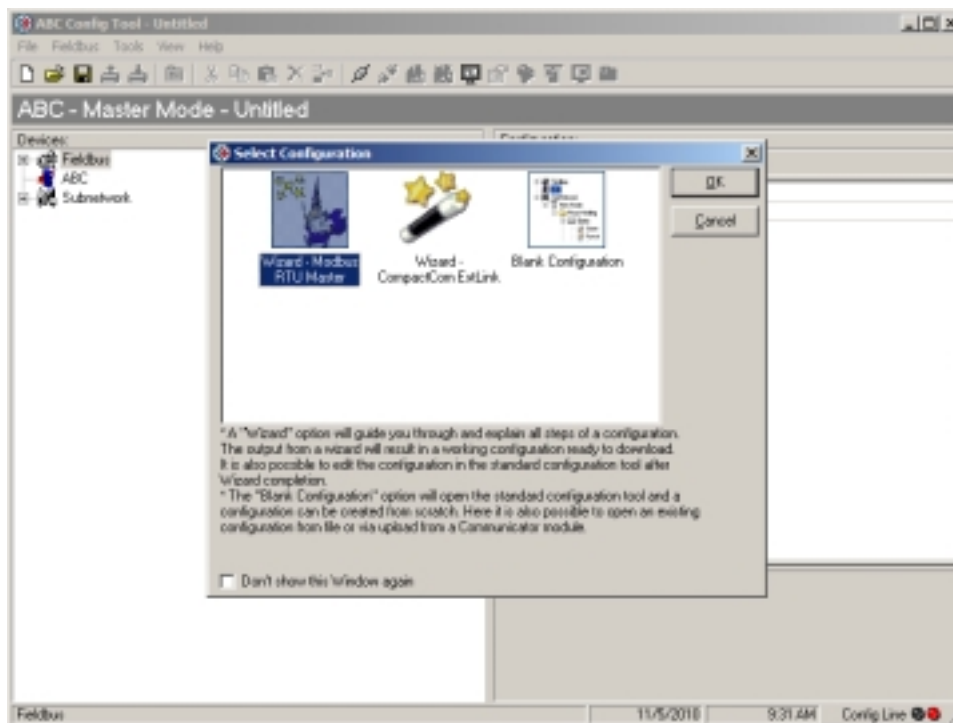
The purpose of this document is to provide assistance for users interested in connecting the Orion-M to a fieldbus network via the Anybus Communicator. It is not intended to assist users in setting up a fieldbus network or how to integrate the Anybus Communicator into their fieldbus network. It is assumed that users who wish to connect the Orion-M to their fieldbus are experienced and knowledgeable regarding the operation of the fieldbus.

This document is a guide to assist users in quickly setting up the Anybus Communicator to operate with the Orion-M. It is highly recommended that the user acquire and read all documentation pertaining to their Anybus Communicator model from HMS before continuing with the configuration and installation of the device.

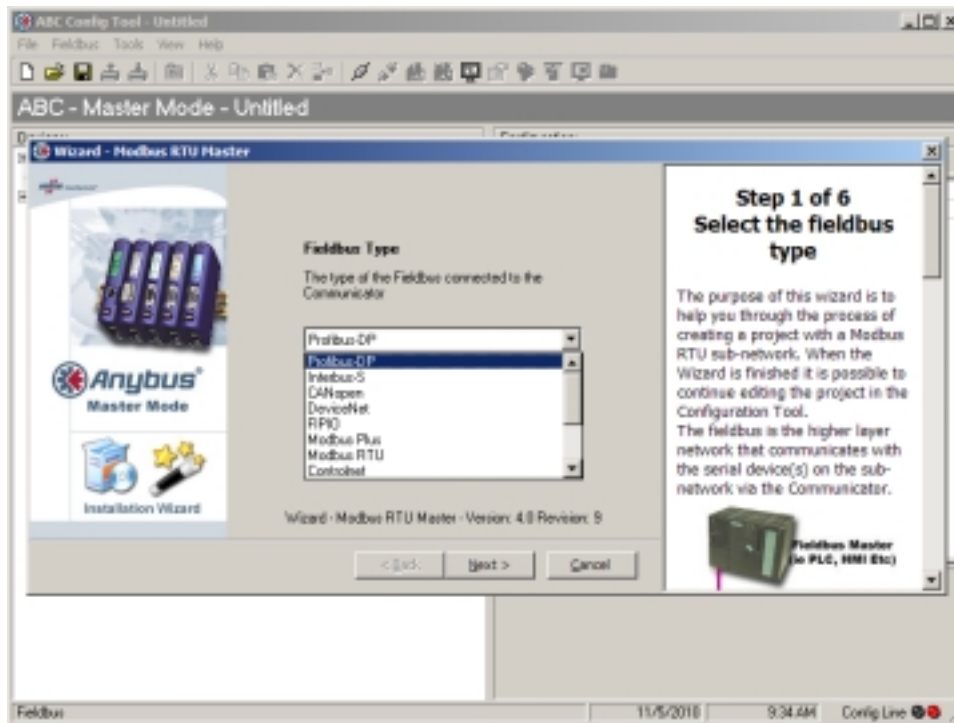
FDC is not responsible for any loss or damages arising from the use of the Anybus Communicator. It is the end user's responsibility to insure that the Anybus Communicator is compatible with all devices on their fieldbus and is configured and set up properly for operation.

3.1 ABC Config Tool

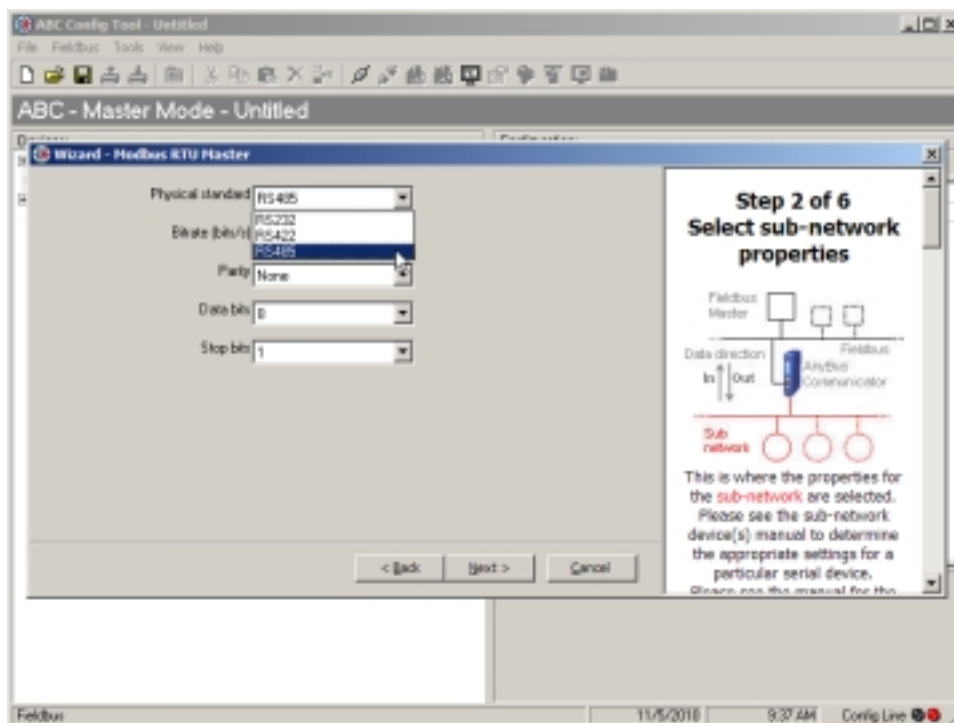
Install the ABC Config Tool on your PC and run the program. Once started, the program will load with the "Select Configuration" wizard. If you are using the configuration tool for the first time, it is recommended that you select "OK" and use the wizard. If you have used the tool before, or already have a configuration file that you wish to use, select "Cancel" to quit the wizard.



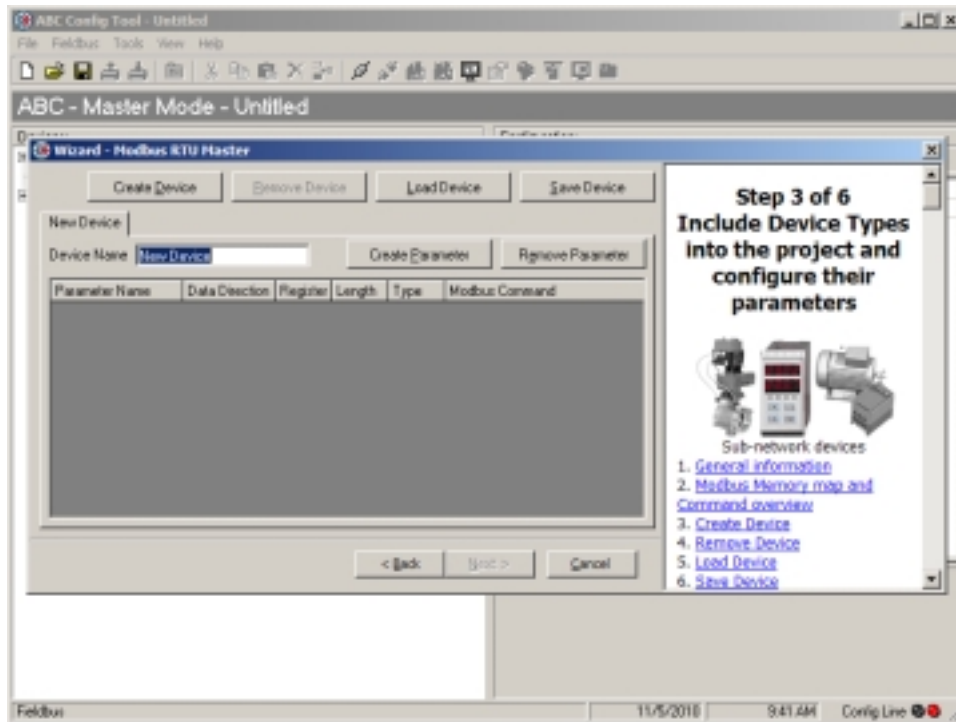
After selecting “OK”, the wizard will ask you for the fieldbus type of the communicator you are using. Select the correct model from the list and select “Next”.



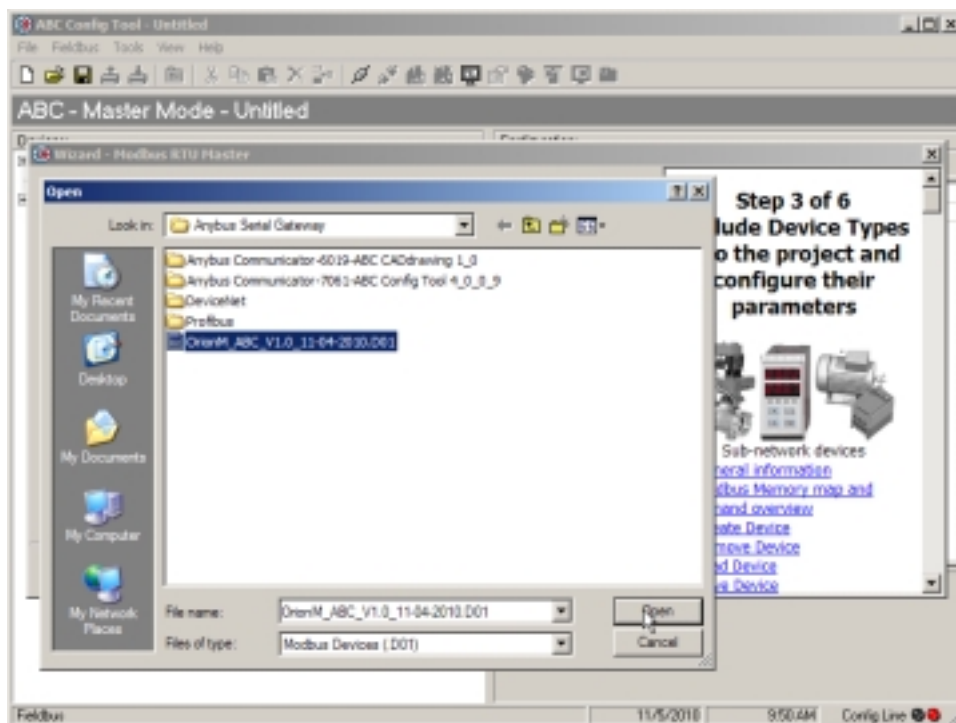
The wizard will then ask for the Modbus RTU communication settings. The proper settings for the Orion-M are the Physical standard = RS485, Bitrate (bit/s) = 9600, Parity = even, Data bits = 8 and Stop bits = 1. Once the proper settings are made, press “Next”.



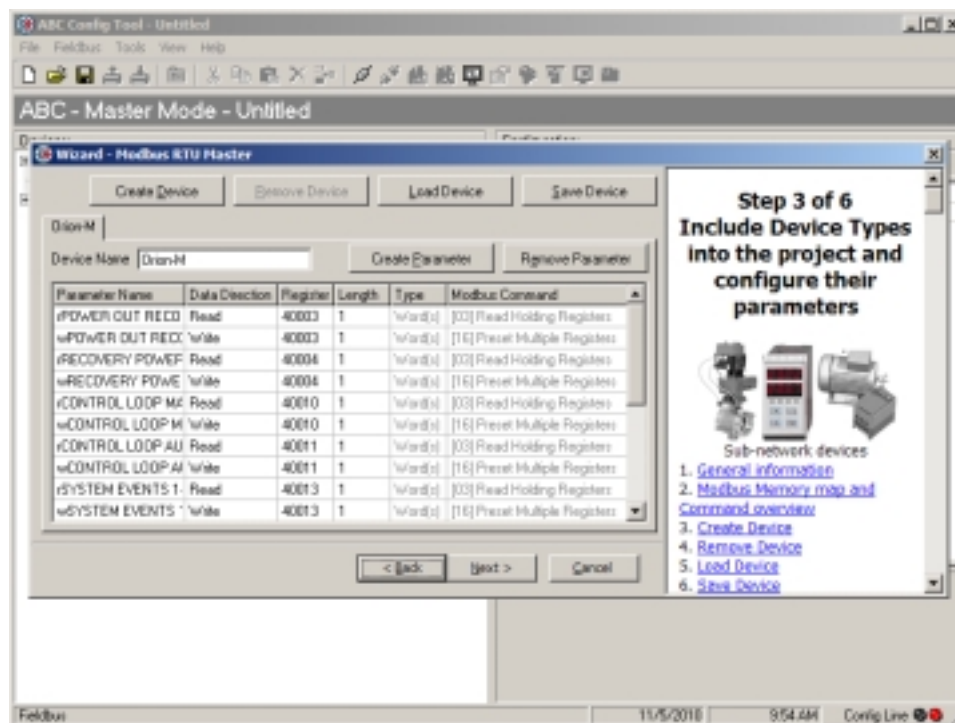
The wizard will then prompt you to either create or load a device. Future Design has an Orion-M device file available free of charge. Download the device file (*OrionM_ABC_V1.1_01-16-2011.D01* at the time of print) from FDC’s website and save the file to your PC.



Select “Load Device” and navigate to the folder in which you saved the Orion-M device file. Select the file and press the “Open” to use the file.



Once the file is opened, the parameter list will be filled with the available data points in the Orion-M. Note that many of the points are repeated, i.e., listed twice. The reason for this, is that the parameter can be both read and written to. Each parameter is specified as either a read or a write. Thus, parameters that allow both actions must be listed twice. The read parameters are preceded with a lower case “r” while the write parameter version is preceded with a “w”.



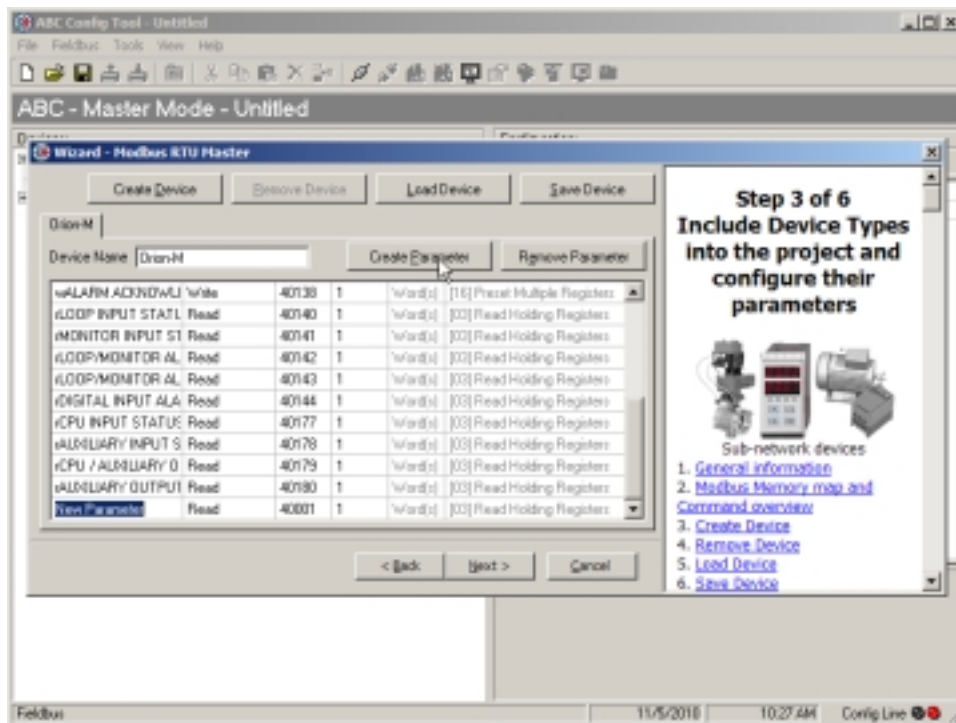
BEFORE proceeding to the next step of the wizard, you need to determine what values you want to read from and write to the Orion-M. It is recommended that you obtain a copy of the Orion-M User Communications Reference Manual to assist you in making this determination. The Orion-M User Communications Reference Manual provides the list of parameters in an easy to read format along with the valid data ranges.

NOTE: The provided device file lists all data registers in the Orion-M individually, so that the descriptions for each register can be viewed. If the list of data registers you wish to read are grouped in sequential order, i.e., data for loops 1, 2 and 3 for example (registers 40061 through 40069), it is recommended that you create a new parameter to read all 9 registers with one read.

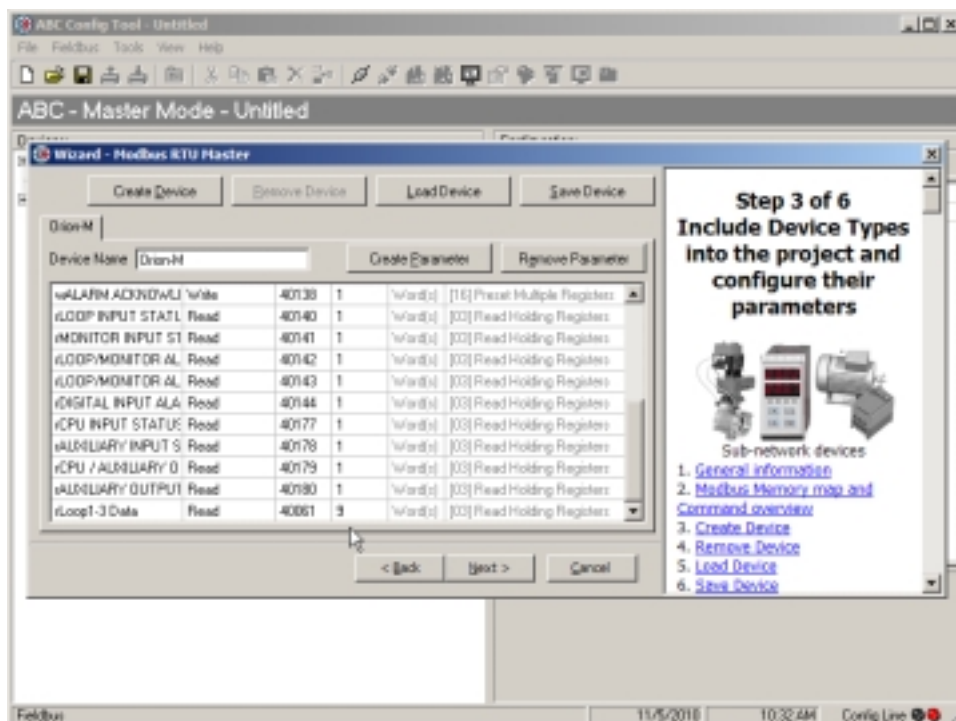
This will improve the performance of the Anybus communicator by telling it to grab all 9 registers at once with a single read command rather than perform 9 separate read commands to acquire the data. You can then save the device file for the Orion-M with your new parameters so that they are available at a later time.

Create Parameter Example

Using the requirement listed in the note above for the need to read loop data for loops 1, 2 and 3, we will create a new parameter. To begin, press the “Create Parameter” button. Upon doing so, a new parameter will be added to the bottom of the device parameter list.

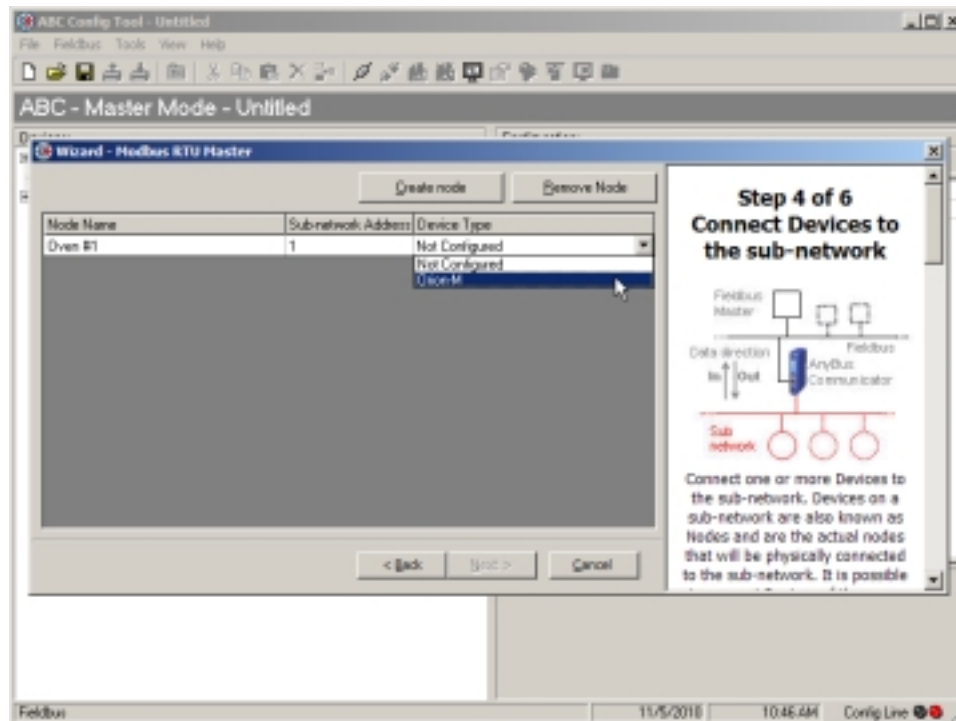


The parameter name will be highlighted. Let's first give it a name such as "rLoop1-3 Data". The lower case "r" at the beginning of the name will let us know that it is a read parameter which will be useful later in the Anybus configuration. Now that we have given it a name, we need to specify the starting register number for where the read is to begin. This is loop 1 process variable, which is data register 60 (40061). Next, let's set the number of data registers that are to be read. This would be a value of 9, which includes the process variable, setpoint and percentage of output values for the three loops.



That's it. We have now added our new parameter to the device list for the Orion-M. This can be done as many times as desired for different groups of registers depending on the values you are required to read or write to in the Orion-M. Up to a maximum of 64 registers can be read with a single command. Thus, if you had an Orion-M with 15 control loops and 15 monitor points, you could read the data for all of them using a single parameter starting with register 40061 and reading 60 registers.

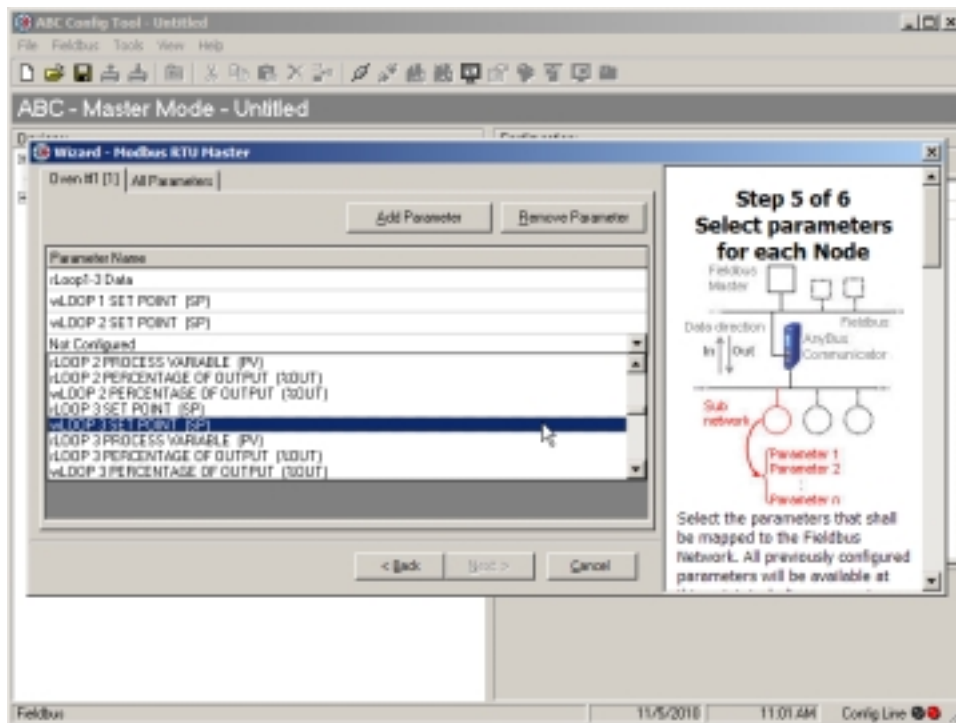
Once you have added all the parameters you wish to use, press “Next” to **continue with the Anybus configuration**. The wizard will then prompt you to add a device to the sub-network of the Communicator. This is the serial communication side of the Communicator which is where the Orion-M is added. Press the “Create Node” button to add a device.



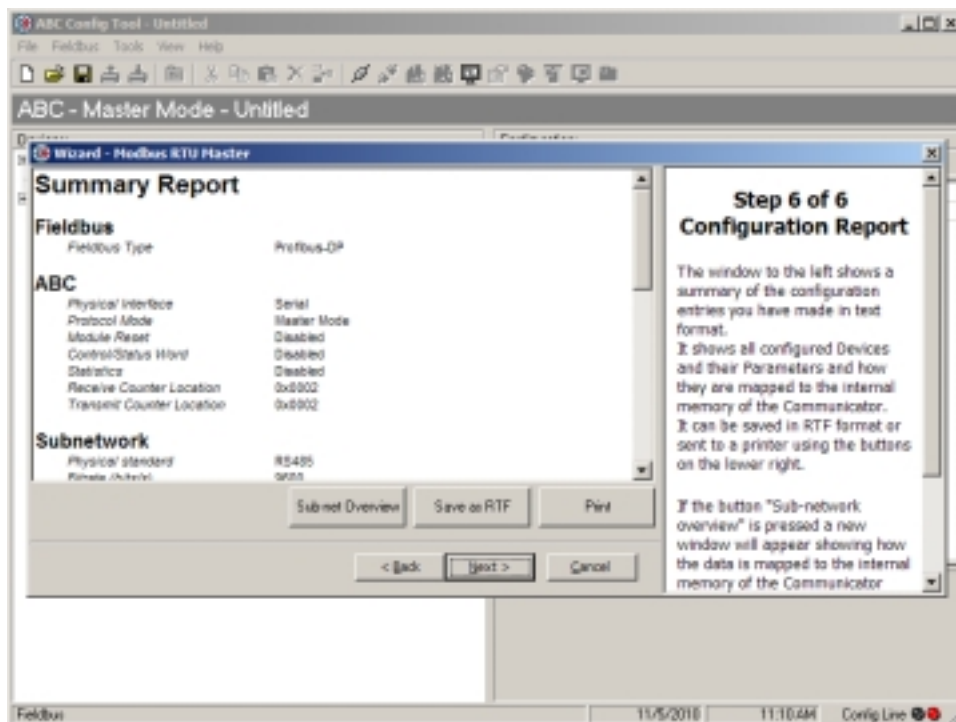
You can then enter in a name for the node such as “Oven #1”. You must then set the address to match the address of the Orion-M and then select the “Orion-M” as the device type for the node. If you have more than one Orion-M you wish to connect to the Communicator, you can create additional nodes, one for each additional Orion-M. The only requirement is that you assign a different address to each Orion-M on the sub-network.

Once the Orion-M has been added as a node, press “Next” to continue to the next step. This is where the device parameters, including the new one we created, are assigned to the devices on the sub-network, which tells the Anybus Communicator what values it is to read and write from each Orion-M on the sub-network. The wizard provides a separate tab for each device, so that each Orion-M (if more than one added) can be selected and its individual parameters assigned independently from the others.

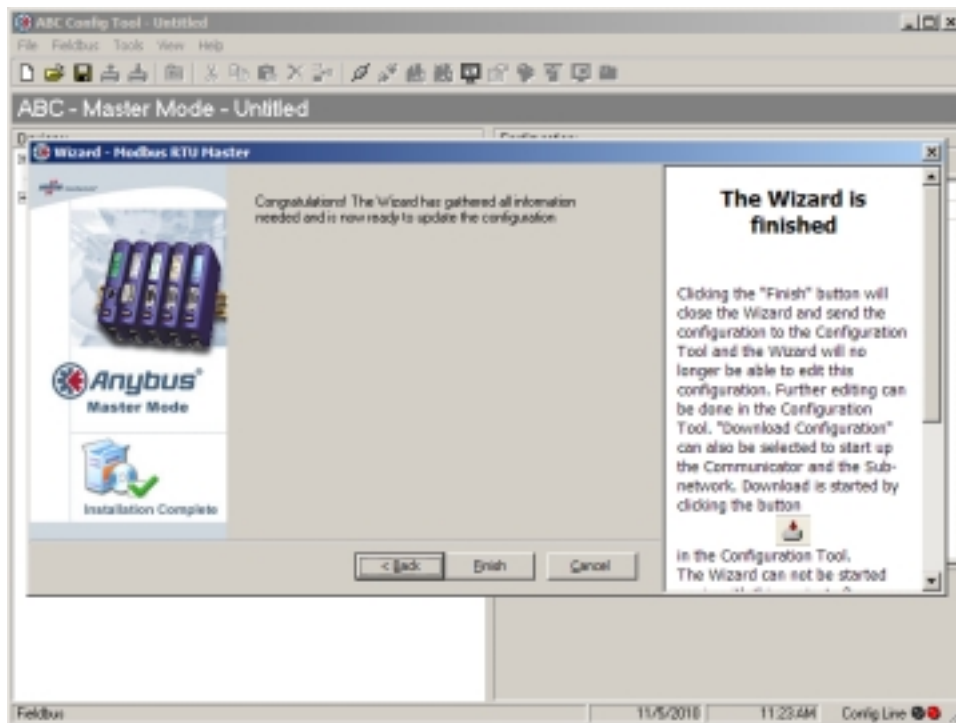
In the case of our example, we have one Orion-M (Oven #1). To add parameters, press the “Add Parameter” button. Each time the button is pressed, another parameter is added. The next step is to select which device parameter (data register of the Orion-M) we want the parameter to be. In following example, we have added four parameters. Our newly created parameter reading loop data for loops 1, 2 and 3. In addition, we need to be able to set the setpoints for the loops, so let’s also add the individual setpoint write parameters (those preceded with the lower case “r”).



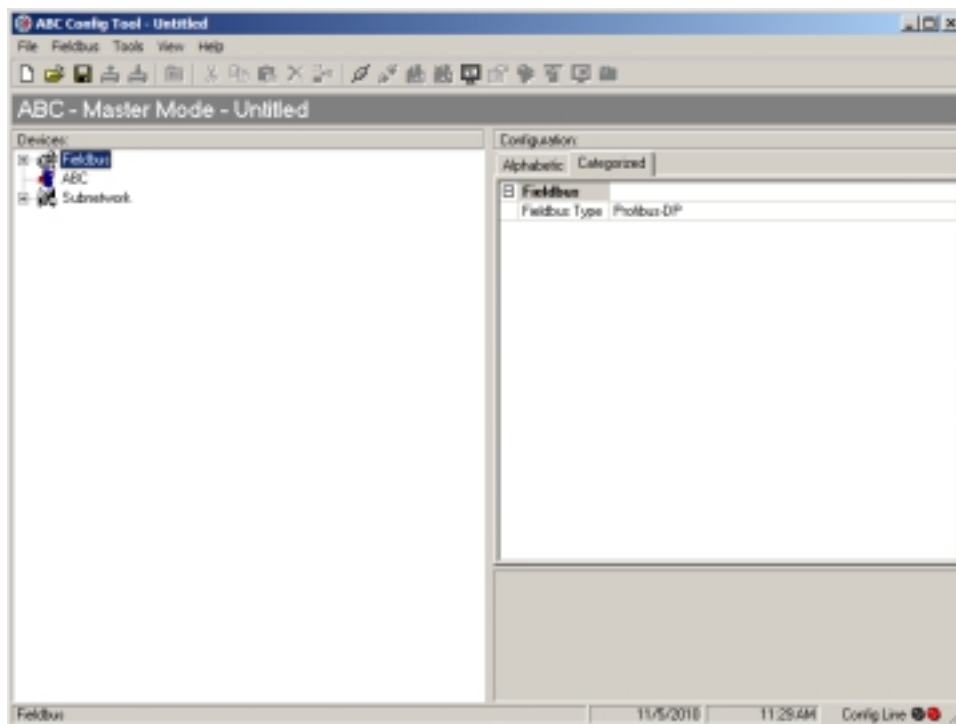
Once all of the desired parameters have been added and configured, press the “Next” button. The wizard will then provide a summary report of the configuration. That’s it, the configuration is complete and ready for download to the Anybus Communicator.



Press the “Next” button and then press “Finish” to complete the wizard configuration.



You can then save the configuration to a file via the “File” menu. Once you have connected your Anybus Communicator to your PC’s serial port, you can then download the configuration to the Communicator, and it is ready for operation.



For further assistance and/or information on the functionality of the ABC Config Tool, consult the documentation provided by HMS.

3.1.1 Summary Report

The summary report provides an overview of the configuration just created for the Anybus Communicator. It can be saved to a file or printed by pressing the appropriate button in the wizard. The report also provides the Communicator internal addressing for the Orion-M data registers so that you can configure your fieldbus master for the appropriate data addresses when accessing the Anybus Communicator.

Summary Report

Fieldbus

Fieldbus Type Profibus-DP

ABC

Physical Interface Serial
Protocol Mode Master Mode
Module Reset Disabled
Control/Status Word Disabled
Statistics Disabled
Receive Counter Location 0x0002
Transmit Counter Location 0x0002

Subnetwork

Physical standard RS485
Bitrate (bits/s) 9600
Data bits 8
Stop bits 1
Parity Even
Message delimiter (10ms) 0

Port Pin-out

<i>Pin</i>	<i>Function</i>
1	+5v
5	Ground
8	RS485 +
9	RS485 -

Oven #1

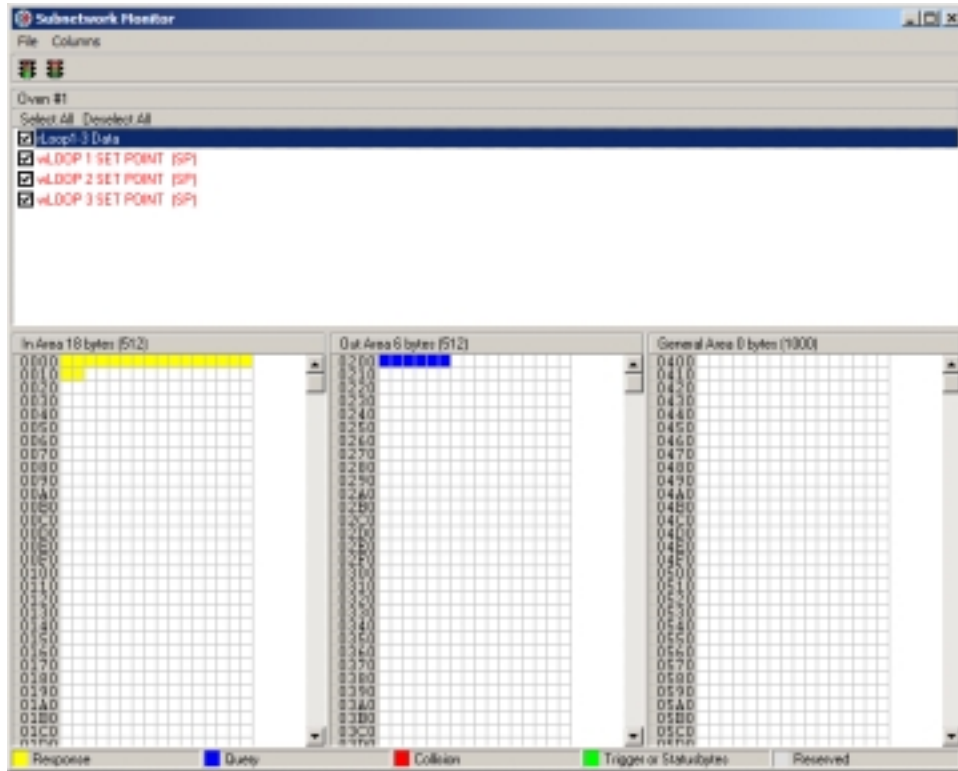
Sub-network Address 1
Device Type Orion-M

Parameter Name

<i>Data Direction</i>	<i>Register</i>	<i>Length</i>	<i>Modbus Command</i>	<i>Communicator Internal Address</i>
rLoop1-3 Data				
Read	40061	9 Word(s)	[03] Read Holding Registers	0x0000
wLOOP 1 SET POINT (SP)				
Write	40062	1 Word(s)	[16] Preset Multiple Registers	0x0200
wLOOP 2 SET POINT (SP)				
Write	40065	1 Word(s)	[16] Preset Multiple Registers	0x0202
wLOOP 3 SET POINT (SP)				
Write	40068	1 Word(s)	[16] Preset Multiple Registers	0x0204

3.1.2 Sub-net Overview

The ABC Config Tool also provides a sub-net overview of the Communicator. By pressing the “Sub-net Overview” button, you can view the memory locations and which data is assigned to each particular memory location. Clicking on the check box next to each parameter, will highlight the corresponding memory locations in the tables for the Communicator’s internal addressing.



If the Anybus Communicator is connected to your PC, the Sub-net Monitor can be used to verify communications between the Anybus and the Orion-M connected to the serial port of the Communicator. For further information, consult the ABC Config Tool manual provided by HMS.

Appendix

Software Usage Note:

The selection, application or use of Future Design Control products or software is the purchaser or user's responsibility. No claims will be allowed for any damages or losses, whether direct, indirect, incidental, special or consequential.

In addition, Future Design reserves the right to make changes without notification to purchaser or user to materials or processing that do not affect compliance with any applicable specification. Future Design makes no warranties when using the Orion-M system.

Warranty:

Future Design Controls products described in this book are warranted to be free from functional defects in material and workmanship at the time the products shipped from Future Design Controls facilities and to conform at that time to the specifications set forth in the relevant Future Design Controls manual, sheet or sheets for a period of one year after delivery to the first purchaser.

Future Design Controls products are warranted to be free from functional defects in materials and workmanship at the time the products shipped from Future Design Controls facilities and to conform at that time to the specifications set forth in the relevant Future Design Controls manual, sheet or sheets for a period of one year after delivery to the first purchaser for use.

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Future Design Controls sole responsibility under the warranty, at Future Design Controls option, is limited to replacement or repair, free of charge, or refund of purchase price within the warranty period specified. This warranty does not apply to damage resulting from transportation, alteration, misuse or abuse.

Future Design Controls reserves the right to make changes without notification to purchaser to materials or processing that do not affect compliance with any applicable specifications.

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