ICC Modbus Master Tool User's Manual

ICC

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User's Manual

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1. Introduction

This manual describes the operation of the ICC Modbus Master Tool software. It also describes the profile configuration files used by the software.

This manual assumes the user has a working knowledge of the Modbus RTU and/or Modbus/TCP protocol. For more information about these protocols, refer to the *Modicon Modbus Protocol Reference Guide*.

This manual also assumes a familiarity with XML files and the XML tag format. All profile configuration files are written in XML notation and must be independently created and edited using an application such as a text editor or XML file editor.

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2. Application Overview

The ICC Modbus Master Tool is used to connect to a Modbus RTU or Modbus/TCP slave device in order to upload, download, verify, or log register values on the device. Preconfigured profiles appear as selectable buttons. Once a profile is selected, the user can upload, download, verify, or log the registers defined in the profile's register settings.

Upon startup, the software will load the profiles from the **Data Files** directory in the application's data directory. The data files are validated and encrypted from user-created XML configuration files by using the XML Manager. These files contain customizable features such as names, icons, and versions for each profile.

The XML Manager is an embedded feature of the ICC Modbus Master Tool that can be accessed by clicking on the XML Manger button. It is used to first verify that an XML profile configuration file is valid, and then encrypt it into a data file. The XML Manager can also be used to decrypt the data file back into an editable XML file so that a user may make changes to existing configurations.

The XML files used by the software for configuring a device contain specific XML tags to define the profile configuration. There are two main components to these files: the profile identification and the register settings. Each of these components has its own definitions for valid tags and the format of the tags' values.

The communication settings for the software are configurable and are set upon clicking the "connect" button. After clicking this button, the user can select whether to connect to a device via a serial port (using Modbus RTU), or via an Ethernet interface (using Modbus/TCP).

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3. General Operation

3.1 Connecting and Disconnecting

While disconnected, click the connection status icon on the left-hand side of the status bar (as shown in Figure 1), select the desired media, and enter the communication settings (as shown in Figure 2 and Figure 3).
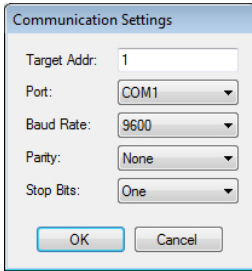

Figure 1: Connecting

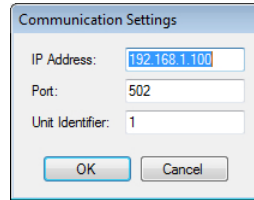**Figure 3: Ethernet Communication Settings**

Figure 2: Serial Communication Settings

While connected, click the connection status icon again to disconnect (as shown in Figure 4).

Figure 4: Disconnecting

3.1.1 Communication Settings

When connecting to a device, the communication settings may be configured by the user (see Figure 2 and Figure 3). This section describes each configurable field and their allowable values.

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3.1.1.1 Serial Settings

Target Addr

This field sets the Modbus RTU slave target address. This is the address the software will use when trying to connect to a device. The default value is "1".

Port

This field selects the serial port. All serial ports available on the computer will be displayed in the dropdown box. The default selection is "COM 1", if available.

Baud

This field selects the baud rate that the software will use to communicate with a device. This field and the baud rate setting of the device must match. The default value is "9600".

Parity

This field selects the parity that the software will use to communicate with a device. This field must match the parity setting of the device. The following describes the valid values:

"None" .. No parity check occurs (default value).
"Even"... Sets the parity bit so that the count of bits set is an even number.
"Odd" .... Sets the parity bit so that the count of bits set is an odd number.

Stop Bits

This field selects the number of stop bits that the software will use to communicate with a device. This field must match the number of stop bits that the device is configured to use. The following describes the valid values:

"One" .... One stop bit is used (default value).
"Two" .... Two stop bits are used.

3.1.1.2 Ethernet Settings

IP Address

This field sets the target IP Address of the Modbus/TCP slave device. The default value is "192.168.1.100".

Port

This field selects the target TCP port. The standard Modbus/TCP port is 502 (default value). This field can usually be left at default.

Unit Identifier

This field sets the Unit Identifier, or Modbus/TCP slave target address. The default value is "1". This field can usually be left at default.

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3.2 Uploading Register Values

The registers defined in the selected profile may be uploaded to view the current values on the device by clicking the **Upload** button. Once the values are uploaded, the results may be saved to a file, printed, or used to create a new data file.
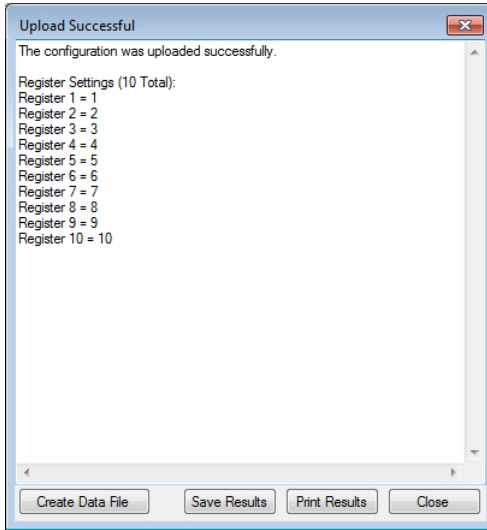

Figure 5: Upload Results

3.2.1 Creating a Data File from Uploaded Data

Any profile loaded in the software can be used to create a new configuration based on the current values of the device's registers. When uploading registers from a device, the results window will display the values for the registers defined in the selected profile. An example of this is shown in Figure 5. By clicking the **Create Data File** button, you can create a new data file based on the selected profile and populated with the register values uploaded from the connected device. This procedure serves as a quick method of copying certain device registers defined in a configuration file by creating a new configuration file to download to a different device.

After uploading registers from the connected device, click the **Create Data File** button and enter a file name for the new configuration. The new configuration will then be automatically added to the list of selectable profiles.

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3.3 Downloading Registers

To download the register values defined for the selected profile, click the **Download** button. A prompt will appear for confirmation to download to the connected device (see Figure 6). Click **Yes** to download the configuration to the device.
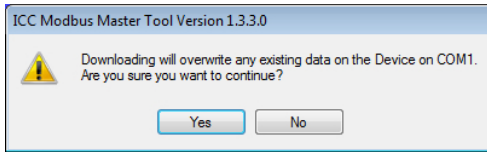

Figure 6: Download Prompt

3.4 Verifying Register Values

To verify that the device is loaded with the selected configuration's values, click the **Verify** button. The tool will upload the values of the registers defined in the configuration from the device and compare them to the values defined in the profile's register definitions. Once complete, the tool will display a message indicating whether or not the registers on the device match the selected profile (refer to Figure 7 and Figure 8).
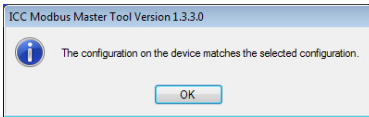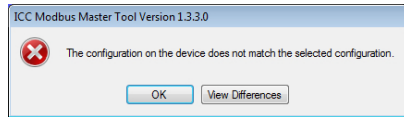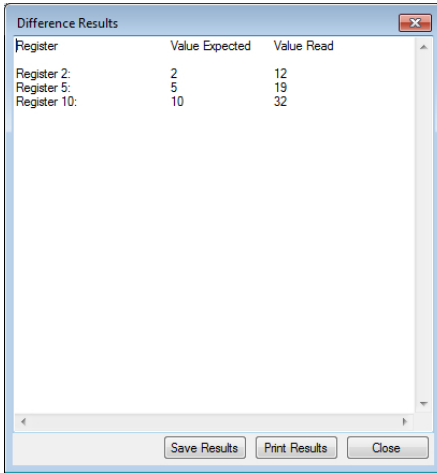

Figure 7: Verification Match

Figure 8: Verification Mismatch

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3.4.1 Comparing Differences

If the register values on the device do not match the values contained in the selected configuration, the user may click the **View Differences** button (shown in Figure 8). This will then display a comparison of the register values in the selected configuration (Value Expected) compared to the corresponding values currently on the device (Value Read). An example Difference Results report is shown in Figure 9.

Figure 9: Verification Difference Results

3.5 Logging Registers

To periodically log the registers defined in the selected profile configuration, click the **Log** button. This will open the logging window. To begin logging, choose the log file name and location as well as the logging interval and click **Start Logging**. This will create a .CSV file containing the time-stamped log entries, which can later be opened by a variety of data processing applications (such as Microsoft Excel) to display and format the data to your needs. While logging in the background, the tool may continue to be used as normal, allowing multiple logging windows to be opened simultaneously. This gives the tool the ability to simultaneously log multiple register sets from any number of targets.
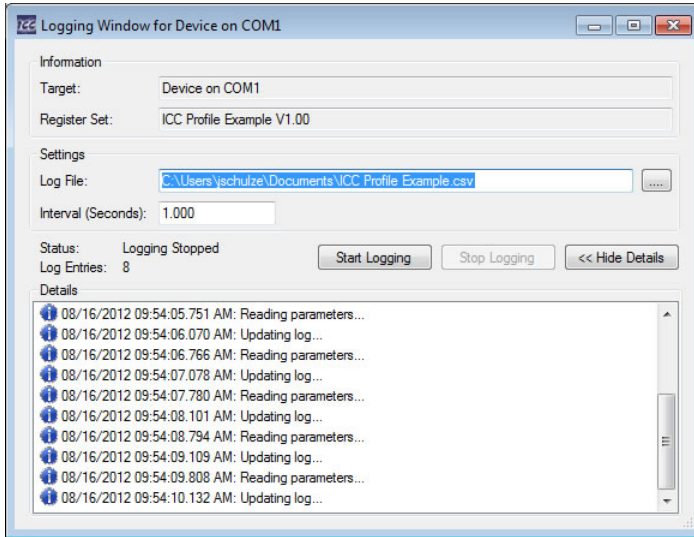
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3.5.1 Logging Window Overview

Figure 10: Logging Window

3.5.1.1 Information

Target

This specifies the device to connect to when logging. This will always be the device that the tool was connected to when the **Log** button was clicked.

Register Set

This specifies the register set that will be logged. This will always be the profile configuration that was selected when the **Log** button was clicked.

3.5.1.2 Settings

Log File

This field specifies the path of the log file that the logger will write to. The log file path may be entered manually or selected by clicking on the ellipsis (**….**) button.

Interval

This field specifies the interval (in seconds) between log entries. The logging interval may be specified down to the millisecond (0.001 second). Note that in some cases it may take the tool longer to read each register in the register set than the configured interval, resulting in log entries with an interval greater than what was configured.

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3.5.1.3 Status & Log Entries

Status

This specifies the status of the logger. It will indicate if the logger is stopped, paused, or running.

Log Entries

This records the number of successful log entries written to the log. A log entry consists of the timestamp, register number, and register value for each register in the register set.

3.5.1.4 Details

The details window can be shown and hidden by clicking the **Show/Hide Details** button. This window will provide information about when logging is started, paused, or resumed, as well as when registers are being read from the target device and when the log is being updated with new log entries. This window will also show any errors or warnings that occur while logging.
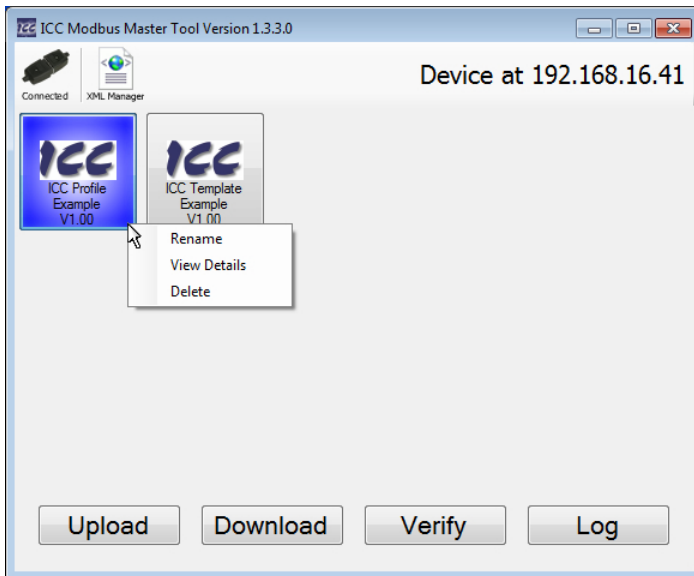
3.6 Profile Management

Figure 11: Profile Management Menu

Existing profiles can be managed by right clicking on the profile icon button. The options shown in Figure 11 are described in this section.

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3.6.1 Rename

Click **Rename** to rename the profile's title. This will open the renaming prompt, as shown in Figure 12. After a profile is renamed, the software will automatically refresh the profile configurations.
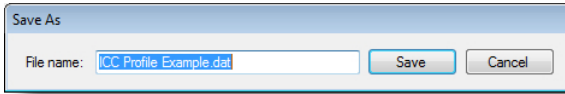

Figure 12: Renaming Prompt

3.6.2 View Details

Click **View Details** to view the details of the XML parsing information for the selected profile. The details will be shown in the details window similar to the one shown in Figure 13.
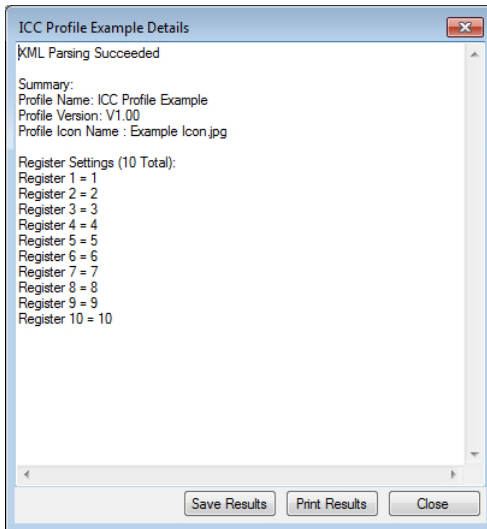

Figure 13: Profile Details

3.6.3 Delete

Click **Delete** to permanently remove the profile from the software's database. After a profile is deleted, the software will automatically refresh the available profile configurations.

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4. XML Configuration Files

4.1 Data Files

The core functionality of the ICC Modbus Master Tool comes from the information contained in the data files located in the **Data Files** folder. Data files are the encrypted versions of XML profile configuration files (see Section 5.2 for details). The software uses this information to display the available profiles and upload, download, or verify the configuration to or from supported devices. The title of the data file is used as the profile icon's display name in the software. This section describes the tags and valid values for an XML profile configuration file. A profile configuration file is always enclosed with the "Profile" tag.

4.1.1 XML Tags

The following are the tags that are present within a profile configuration's XML file.

<u>Profile</u>

This is the root tag for the file. All profile configuration files must be enclosed by this tag.

<u>Version</u>

The text from the value for this tag will be displayed below the profile's title in the software to indicate the configuration's version. This tag is required, and is intended for user version management of profiles.

<u>Icon</u>

This tag specifies the file path (relative to the XML file) of the image to use as the profile configuration's icon. The icon image file, or a folder containing the image file, must be in the same directory as the profile configuration's XML file when encrypting it into a data file via the XML Manager. If the icon is placed in a folder, the tag's value must be in the form "*[Folder Name]\[Icon File Name]*".

The icon image may be any of the following file formats: BMP, GIF, EXIF, JPG, PNG, or TIFF. The preferred size for the icon image is 64 x 64 pixels; however, the XML Manager will scale the image to the required size as necessary (while preserving the original aspect ratio), regardless of the original image size.

This tag is optional. The default icon will be used if the Icon tag is omitted, has no value, or the designated image file cannot be found.

4.1.1.1 Register Tags

This section describes the tags used to configure the profile's register set using Modbus holding registers. The profile configuration must contain at least one register entry. These tags are always enclosed with the "Register" tag.

Register

This is the enclosing tag for the register entry. All register entries must be enclosed by this tag.

Address

This is the Modbus register, in decimal. Refer to the device's instruction manual for the register mapping. This tag is required.

Value

This is the decimal value to which the register is to be set (when downloading) or compared against (when verifying). Because this value is written unmodified to the device, care must be taken when defining the value so that the proper scaling is used. For example, each numerical increment to a "Maximum Frequency" register on a device may increment the actual parameter setting by 0.1Hz. Therefore, in order to set the Maximum Frequency parameter value to 60.0 Hz, a raw value of 600 (60 divided by 0.1) must be used.

This tag is optional. If this tag is omitted, the configuration will only have the ability to upload values from the device.
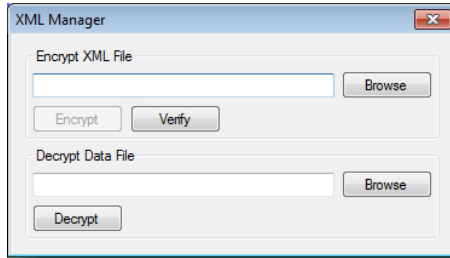
5. XML Manager

Figure 14: XML Manager

The XML Manager is a feature embedded into the ICC Modbus Master Tool which allows a user to create profile configuration data files for use by the software. The XML Manager can check XML profile configuration files for validity and inform the user when errors are detected. Once an XML file is verified, it can then be encrypted into a data file for use by the software. The XML Manager can also be used to decrypt existing data files back into XML files, which can then be viewed or edited with a standard XML editor or text editor.

5.1 Opening the XML Manager

To launch the XML Manager, click the "XML Manager" button in the toolbar (as shown in Figure 15).
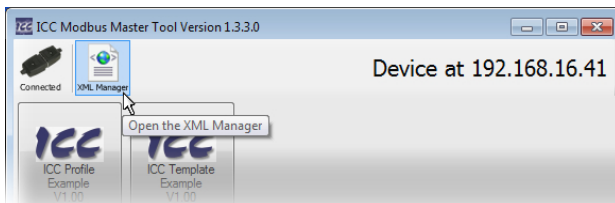

Figure 15: Opening the XML Manager

5.2 Encrypting a File

The XML Manager can be used to encrypt XML configuration files into profile data files for use by the software. The encrypted data file will be placed in the **Data Files** directory in the application's data directory. The icon file (if defined) will also be copied to this location. Prior to being encrypted, a configuration file must first be verified by the XML Manager. This requirement ensures that all profile data files used by the software are valid and (because they are encrypted) have not been modified after verification.

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5.2.1 Verification

The verification process ensures that the XML profile configuration file is compatible with the software. After verifying the selected XML file, the XML manager will display the results. The results window will indicate whether the file was parsed successfully or not, as well as any applicable errors or warnings. It also lists the register settings defined in the XML file so that the user can easily confirm these values. An example of the results window is shown in Figure 16.
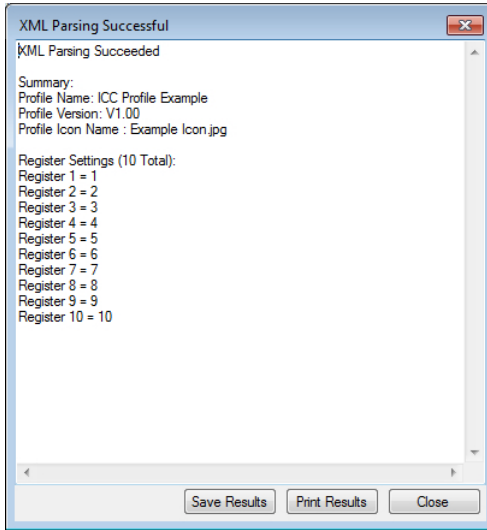

Figure 16: Results Window

5.3 Decrypting a File

The XML Manager can also be used to decrypt data files back into their original XML format. This provides the ability to make changes to existing profile configurations quickly by decrypting the data file, making the necessary changes, and re-encrypting the modified XML file back into a data file.

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6. Troubleshooting

The ICC Modbus Master Tool and XML Manager offer detailed feedback when certain errors occur. This section details the troubleshooting techniques that should be used while creating and debugging a new profile configuration.

6.1 XML Parsing

When the XML Manager encounters certain error or warning conditions in an XML configuration file, it will report them in the warnings and errors sections in the results window.

Figure 17 shows the results window from parsing the same XML file described in section 5.2.1; in this instance, however, the XML file contains a typo in both the opening tag and closing tag for register 1's entry. The XML Manager reports this with the warning shown, "*WARNING: Unknown Profile opening tag found. Profile tag = 'Registr'*". Note that this XML file is still considered a valid configuration file, and the remaining tags are therefore parsed successfully. It is the user's responsibility to check the results window for any warnings that appear in a successfully verified configuration and confirm the

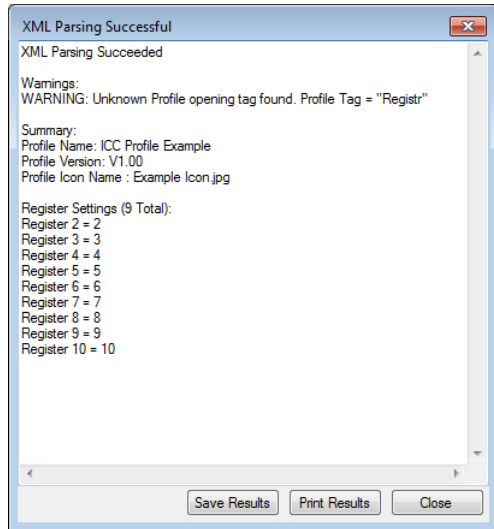**Figure 17: Unknown Tag Warning**

register settings for every profile configuration.

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Figure 18 shows the results window from parsing an XML file that could not be parsed successfully. This XML file contains a typo in only the opening "Register" tag. Because this entry contains an opening tag, but no matching closing tag, the entire XML file is considered to be invalid and all other tags after the unmatched opening tag are considered a part of that tag section. Therefore, the XML file as a whole has no proper closing tag for the main "Profile" tag and also no registers defined, both of which are fatal errors. The warning shown in Figure 18 identifies the offending tag.
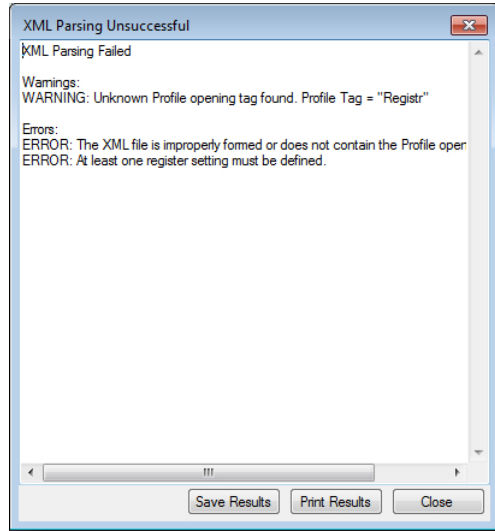

Figure 18: Error Results Window

6.2 Register Settings

Once the XML configuration file is verified and encrypted into a data file, the user should test the configuration to ensure that the indicated register settings are applicable for the targeted device. The software will display any errors received from the connected device while trying to upload, download, or verify a selected profile configuration, and will indicate the exception, register address, and value that caused the error. To cancel the entire operation, click the **Abort** button. To retry the offending Modbus request, click the **Retry** button. To skip over the current register and move on to the next, click the **Ignore** button.

Figure 19 shows an error received while downloading a configuration to a device, and one of the register values contained in the profile is out-of-range for the targeted register. Refer to the device's instruction manual for valid register value ranges.
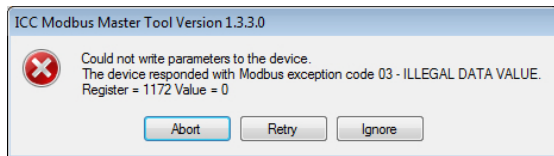

Figure 19: Illegal Data Value Exception

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Figure 20 shows an error received while uploading a configuration from a device, and one of the targeted registers contained in the profile does not exist on the device. Refer to the

Figure 20: Illegal Data Address Exception

device's instruction manual and ensure that the register address has been calculated correctly.

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