

# **Modbus Plus Driver Help**

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## Modbus Plus Driver Help

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Help version 1.025

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### Overview

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The Modbus Plus Driver provides an easy and reliable way to connect Modbus Plus devices to OPC Client applications, including HMI, SCADA, Historian, MES, ERP and countless custom applications. It is intended for use with a Modicon SA85 Network card or Hilscher CIF MBP Interface card. This driver does not support configurations where SA85 and Hilscher CIF cards exist in the same machine.

### Device Setup

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#### SA85 Card

For this configuration, the driver requires the Modicon MBPLUS.SYS driver for Windows NT or the Modicon MBPLUS.VXD driver for Windows 95. These drivers can be acquired from Modicon and must be installed and configured before the driver will work. The SA85 card can define up to eight channels. For more information, refer to [Optimizing Your Modbus Plus Communications](#).

#### Hilscher CIF Card

For this configuration, the driver requires Hilscher's SyCon configuration software to be installed on the same machine as the card. The card is configured and downloaded through SyCon. The Hilscher CIF card can only support one channel per adapter.

#### Polling Multiple Devices

The driver can poll multiple devices (PLCs) on an MBPlus network and also act as a single slave device on the MBPlus network for other devices to poll. The driver is limited to 8192 devices and supports up to 4 adapters. There are three modes of operations supported: Solicited, Unsolicited and Mailbox. To obtain data from the device, refer to the method used by the driver. The mode is specified when entering the Device ID in the device's configuration.

**Note:** Only Solicited Mode is supported with Hilscher CIF cards.

**See Also:** [Device ID](#)

#### Solicited Mode (DM.r1.r2.r3.r4.r5 or S.r1.r2.r3.r4.r5)

The driver will generate Read/Write requests to the device to get/put data. Output coils, input coils, internal registers and holding registers are all available addresses. Upon successful reads from the device, the data is made available to clients of the driver. Unsuccessful reads will generate an error message and invalidate the data for clients. Output coils

and holding register addresses can be written. Input coils and internal registers are Read Only.

### Unsolicited Mode (DS.r1.r2.r3.r4.r5)

When a device is specified to use unsolicited mode, the driver acts as a virtual PLC on the network. Reads and writes do not originate from the driver in unsolicited mode. Any client application that reads or writes from this type of device, will read or write to a local cache allocated for the device instead of the physical device. Devices on the network read and write to the same cache via unsolicited commands.

**Note:** This is not supported by Hilscher CIF cards.

### Mailbox Mode (U.r1.r2.r3.r4.r5)

When a device is specified to use mailbox mode, the driver does not act like a virtual PLC on the network as does unsolicited mode. Instead, it acts as a storage area for each and every mailbox device defined. When the driver receives an unsolicited command, the driver detects the routing path for which the message came from and places the data in the storage area allocated for the device. If the message comes from a device with a routing path that has not been defined as a mailbox device, the message is not processed. Any client application that reads from this type of device reads from the storage area contained in the driver instead of the physical device. Writes are special in that they do write to the physical device as well as write to the local cache. Unsolicited mailbox commands are made possible by the MSTR instruction available in certain Modicon devices. For more information on the MSTR instruction, refer to the Modicon documentation.

**Note:** This is not supported by Hilscher CIF cards.

**Important:** For this driver, the terms Slave and Unsolicited are used interchangeably.

## Device ID (PLC Network Address)

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The Device ID specifies the path to a node on the network. It consists of five consecutive routing bytes in addition to a mode designator. The mode may be Master, Slave or Mailbox.

### Master Mode (Solicited)

Data Master paths start with the prefix DM or S and are used to communicate with another node on the network. The Host PC acts as the master in conversations of this type. A DM path can identify a PLC or any other devices that can respond to Modbus Read and Write commands, including another Host PC running the Modbus Plus Driver. The format of a DM path is *DM.r1.r2.r3.r4.r5* or *S.r1.r2.r3.r4.r5*.

### Slave Mode (Unsolicited)

A single Data Slave path can be configured per SA85 card and has the format *DS.1.0.0.0.0*. By defining a slave path, users enable the Host PC running the Modbus Plus Driver to simulate a PLC device on the network capable of responding to Read/Write requests from other devices. Other devices can communicate with this simulated device by opening a Data Master path to it.

The simulated PLC device uses Modbus byte ordering: first word is low word of DWord for 32 bit and 64 bit values and first DWord is low DWord for 64 bit values for Data Encoding. Therefore, the Data Encoding options for the unsolicited device must be set to the following:

- Modbus Byte Order.
- First Word Low in 32 Bit Data Types.
- First DWord Low in 64 Bit Data Types.

**Note:** For more information, refer to [Settings](#).

Addresses 1 to 65536 are implemented for output coils, input coils, internal registers and holding registers. The driver will respond to any valid request to read or write these values from external devices (Function Codes [decimal] 01, 02, 03, 04, 05, 06, 15, 16). These locations can also be accessed locally by the Host PC as tags assigned to the slave device. Write Only access is not allowed for an unsolicited device.

When a Slave path is enabled, the Modbus Plus Driver will enable eight slave paths on each SA85 card. This allows the remote PLCs and other Modbus Plus devices to access the slave memory of this driver using any of the eight slave paths. The memory accessed is the same in all cases. In terms of an MSTR instruction, users can specify a path of 1 through 8 when defining what path to connect with on the SA85 card serviced by this driver. This can be useful if the application has a large number of remote devices that will be sending data to the PC. If this is the case, users can utilize the 8 slave paths to distribute the load from remote nodes. Each slave path in this driver has its own thread of

execution to ensure the highest level of performance.

If no slave device is defined in the project, the driver will ignore any unsolicited read or write requests it receives.

**Note:** Unsolicited mode is not supported with Hilscher CIF cards.

### Mailbox Mode

A Mailbox path starts with the prefix U and provides a path to a physical device. A storage area will be provided for this physical device in the slave device defined in the project. Although the physical device sends unsolicited writes to this storage area, they can also be accessed locally by the Host PC as tags assigned to the slave device. The format of a mailbox path is *U.r1.r2.r3.r4.r5*.

The driver always opens a slave path when receiving unsolicited mailbox data. The path the driver opens is *DS.1.0.0.0.0*. Devices on the same Modbus Plus network communicate with the driver by opening the Data Master path *DM.<local node>.1.0.0.0*, where the local node is the address set on the SA85 card of the Host Computer. For a description of the path devices on a bridged network use, refer to [Example 3](#).

Devices use the Modbus Plus MSTR instruction to provide data to the driver. In order for the driver to be able to associate the data with a particular device, the Device ID path must be embedded in the first five registers of the received data. If the first five registers of data do not match the Device ID path of the device in the project, the received data is discarded. Only the Write command is supported for the MSTR instruction.

### Notes:

1. Mailbox Mode is not supported with Hilscher CIF cards.
2. The Device ID path is embedded in the path from the Host PC to the device, not the device path to the Host PC.
3. A TIO Module device does not support a slave network address.
4. The Device ID should not be changed while clients are connected. If it is, the change will not take effect until all clients are disconnected and then reconnected.

### Example 1 - Solicited

Suppose the single network consists of four nodes such that nodes 1 and 4 are Host PCs running software that uses the Modbus Plus Driver and nodes 2 and 3 are PLCs. The following table identifies the addressing for the network as seen from each node.

From	To Node 1	To Node 2	To Node 3	To Node 4
Node 1	-----	DM.2.0.0.0.0	DM.3.0.0.0.0	DM.4.1.0.0.0
Node 2	DM.1.1.0.0.0	-----	DM.3.0.0.0.0	DM.4.1.0.0.0
Node 3	DM.1.1.0.0.0	DM.2.0.0.0.0	-----	DM.4.1.0.0.0
Node 4	DM.1.1.0.0.0	DM.2.0.0.0.0	DM.3.0.0.0.0	-----

**Note:** In order to access the simulated device on a Host PC, the last non-zero number in the path is always one: this indicates the slave path used by the driver.

### Example 2 - Mailbox Mode Single Network

Transferring registers 40020 to 40029 from the device to locations 40001 to 40010 of the Host PC. The location of the control block can be different.

Host PC address: 7.0.0.0.0

Device address: 3.0.0.0.0

### MSTR Instruction

Control block	40001	-
Data area	40015	Start five registers early
Length	15	Five more than the actual data

### Control Block

40001	1	Write operation
40002	0	Holds error code

40003	15	Number of registers to transfer
40004	1	Starting location in the Host PC (Register 40001)
40005	7	Path to Host PC
40006	1	Path to Host PC
40007	0	Path to Host PC
40008	0	Path to Host PC
40009	0	Path to Host PC

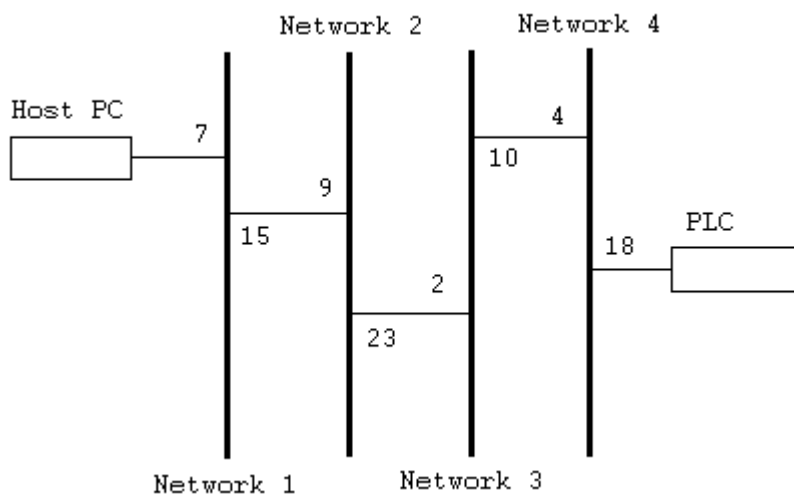
#### Data Area

40015	3	Path back to device from Host PC, the Device ID
40016	0	Path back to device from Host PC
40017	0	Path back to device from Host PC
40018	0	Path back to device from Host PC
40019	0	Path back to device from Host PC
40020	-	Actual data start
40029	-	Actual data end

The following steps are taken by the driver upon receiving an unsolicited message.

1. If the message is understood, the driver will send acknowledgement to the sending device. If messages are received for functions other than **Preset Multiple Registers**, code 0x10, the driver returns a Function Not Implemented response. Preset Multiple Registers is the function code devices on the receiving end of an MSTR instruction get. The driver returns an exception response if the message is not understood or incomplete.
2. The driver will attempt to match the first five registers of data received to the Device ID path of a device in the project. If none is found, the data will be discarded. If the data is less than six registers, it will be discarded immediately.
3. The driver will copy n - 5 registers of data starting at the sixth register of the received data to the image map maintained internally for the device (starting at the location indicated in the message). The driver may need to allocate storage for the image map if this is the first data received for these locations.
4. The data is made available to clients of the driver. The data in this example would be referenced as tags with addresses 40001 to 40009 of the device with Device ID U.3.0.0.0.0. The client would refer to the device using a logical name assigned when the device was created in the project. The data could also be referenced as an array such as 40001[10] or 40001[2][5].

#### Example 3 - Mailbox Mode Bridged Network



If the same registers were to be transferred from the PLC to the same locations in the Host PC, the following control block and data area would be used in the MSTR instruction.

Host PC address from PLC perspective: 4.2.9.7.1

PLC address from Host PC perspective: 15.23.10.18.0 (this would be the Device ID path)

### MSTR Instruction

Control block	40001	-
Data area	40015	Start five registers early
Length	15	Five more than the actual data

### Control Block

40001	1	Write operation
40002	0	Holds error code
40003	15	Number of registers to transfer
40004	1	Starting location in the Host PC (Register 40001)
40005	4	Path to Host PC
40006	2	Path to Host PC
40007	9	Path to Host PC
40008	7	Path to Host PC
40009	1	Path to Host PC

### Data Area

40015	15	Path back to device from Host PC, the Device ID
40016	23	Path back to device from Host PC
40017	10	Path back to device from Host PC
40018	18	Path back to device from Host PC
40019	0	Path back to device from Host PC
40020	-	Actual data start
40029	-	Actual data end

The message would be processed the same.

**Note:** At most, the Host PC can be three networks distant from a device when using this driver.

**Important:** For this driver, the terms Slave and Unsolicited are used interchangeably.

## Block Sizes

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### Coil Block Sizes

#### SA85 Card

Coils can be read from 8 to 2000 points (bits) at a time. The default setting is 512 coils.

#### Hilscher CIF Card

Coils can be read from 8 to 248 points (bits) at a time. The default setting is 248 coils.

### Register Block Sizes

#### SA85 Card

Registers can be read from 1 to 120 locations (words) at a time. The default setting is 120 registers.

#### Hilscher CIF Card

Registers can be read from 1 to 95 locations (words) at a time. The default setting is 95 registers.

**Caution:** If the Register Block sizes value is set above 120 and a 32 or 64 bit data type is used for any tag, then a

"Bad address in block" error could occur. Decrease block size value to 120 to prevent the error from occurring.

**Note:** For a TIO Module, use this setting to inform the driver how many bytes will be returned when reading data location 400001. For modules that return 2 bytes, set this to 1. For modules that return 3 bytes, set this to 2. The driver uses fixed block lengths (independent from this setting) for all other data locations.

### Reasons to Change the Default Block Sizes

1. The device may not support block Read/Write operations of the default size. Smaller Modicon PLCs and non-Modicon devices may not support the maximum data transfer lengths supported by the MBPlus network.
2. The device may contain non-contiguous addresses. If this is the case and the driver attempts to read a block of data that encompasses undefined memory, the device will probably reject the request.

### Perform Block Read on Strings

Check this option to block read string tags, which are normally read individually. When this option is selected, string tags will be grouped together depending on the selected block size. Block reads can only be performed for Modbus model string tags.

## Settings

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### Adapter Number

This parameter specifies the adapter number that will be used by the Modbus Plus card. Valid adapter numbers are 0 to 3. For card-specific information, refer to [Device Setup](#).

### Timeout

This parameter specifies the time that the driver will wait for a response from the device before giving up and going on to the next request. The timeout will be rounded up to the nearest half second. Longer timeouts only affect performance if a device is not responding. The driver polls the MBPlus system driver for the device response at 10 ms intervals.

### ----- Data Access Group -----

### Zero vs. One Based Addressing

If the address numbering convention for the device starts at one instead of zero, users can specify so when defining the device's parameters. By default, user-entered addresses will have one subtracted when frames are constructed to communicate with a Modbus device. If the device doesn't follow this convention, users can uncheck **Use zero based addressing** in Device Properties. For information on the appropriate application from which details on setting device properties may be obtained, refer to the online help. The default behavior follows the convention of the Modicon PLCs.

**Note:** Hilscher CIF cards support One Based Addressing only.

### Zero vs One Based Bit Addressing within registers

Memory types that allow bits within Words can be referenced as a Boolean. The addressing notation for doing this is as follows:

<address>.<bit>

where <bit> represents the bit number within the Word. Zero Based Bit Addressing within registers provides two ways of addressing a bit within a given Word; Zero Based and One Based. Zero Based Bit addressing within registers simply means the first bit begins at 0. With One Based, the first bit begins at 1.

### Zero Based Bit Addressing Within Registers (Default Setting /Checked)

Data Type	Bit Range
Word	Bits 0-15

### One Based Bit Addressing Within Registers (Unchecked)

Data Type	Bit Range
Word	Bits 1-16

### Holding Register Bit Mask Writes

When writing to a bit location within a holding register, the driver should only modify the bit of interest. Some devices support a special command to manipulate a single bit within a register (Function code hex 0x16 or decimal 22). If the device does not support this feature, the driver will need to perform a Read/Modify/Write operation to ensure that only the single bit is changed.

Check this box if the device supports holding register bit access. The default setting is unchecked. If this setting is selected, then the driver will use function code 0x16, irrespective of the setting for **Use Modbus function 06 for single register writes**. If this setting is not selected, the driver will use either function code 0x06 or 0x10 depending on the selection for Use Modbus function 06 for single register writes.

**Note 1:** When Modbus byte order is deselected, the byte order of the masks sent in the command will be Intel byte order.

**Note 2:** Hilscher CIF cards do not support Holding Register Bit Mask Writes.

### Use Modbus Function 06 or 16

The Modbus driver has the option of using two Modbus protocol functions to write Holding register data to the target device. In most cases, the driver switches between these two functions based on the number of registers being written. When writing a single 16 bit register, the driver will use the Modbus function 06. When writing a 32 bit value into two registers, the driver will use Modbus function 16. For the standard Modicon PLC, the use of either of these functions is not a problem. There are, however, a large number of third party devices that have implemented the Modbus protocol. Many of these devices support only the use of Modbus function 16 to write to Holding registers regardless of the number of registers to be written.

The "Use Modbus function 06" selection is used to force the driver to use only Modbus function 16 (if needed). This selection is checked by default, thus allowing the driver to switch between 06 and 16 as needed. If a device requires all writes to be done using only Modbus function 16, uncheck this selection.

**Note:** For bit within word writes, the **Holding Register Bit Mask Writes** property takes precedence over **Use Modbus Function 06**. If "Holding Register Bit Mask Writes" is selected, then function code 0x16 will be used no matter what the selection for this property. If it is not selected, then the selection of this property will determine whether function code 0x06 or 0x10 will be used for bit within word writes.

### Use Modbus Function 05 or 15

The Modbus driver can use two Modbus protocol functions to write output coil data to the target device. In most cases, the driver switches between these two functions based on the number of coils being written. When writing a single coil, the driver will use the Modbus function 05. When writing an array of coils, the driver will use Modbus function 15. For the standard Modicon PLC, the use of either of these functions is not a problem. There are, however, a large number of third party devices that have implemented the Modbus protocol. Many of these devices support only the use of Modbus function 15 to write to output coils regardless of the number of coils to be written.

The "Use Modbus Function 05" selection is used to force the driver to use only Modbus function 15 if needed. This selection is checked by default, thus allowing the driver to switch between 05 and 15 as needed. If a device requires all writes to be done using only Modbus function 15, uncheck this selection.

## ----- Data Encoding Group -----

### Modbus Byte Order

The byte order used by the Modbus Plus Driver can be changed from the default Modbus byte ordering to Intel byte ordering by using this selection. This selection is checked by default and is the normal setting for Modbus compatible devices. If the device uses Intel byte ordering, deselecting this selection will enable the Modbus driver to properly read Intel formatted data.

### First Word Low in 32 Bit Data Types

Two consecutive registers' addresses in a Modbus device are used for 32 bit data types. Users can specify whether the driver should assume the first word is the low or the high word of the 32 bit value. The default (first word low) follows the convention of the Modicon Modsoft programming software.

### First DWord Low in 64 Bit Data Types

Four consecutive registers' addresses in a Modbus device are used for 64 bit data types. Users can specify whether the driver should assume the first DWord is the low or the high DWord of the 64 bit value. The default (first DWord low) follows the default convention of 32 bit data types.

### Use Modicon Bit Ordering

When checked, the driver will reverse the bit order on reads and writes to registers to follow the convention of the Modicon Modsoft programming software. For example, a write to address 40001.0/1 will affect bit 15/16 in the device when this option is enabled. This option is disabled (unchecked) by default.

**Note:** For the following example, the 1st through 16th bit signifies either 0-15 bits or 1-16 bits depending on if the driver is set at Zero Based or One Based Bit Addressing within registers.

MSB = Most Significant Bit

LSB = Least Significant Bit

#### Use Modicon Bit Ordering Checked

MSB								LSB							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

#### Use Modicon Bit Ordering Unchecked (Default Setting)

MSB								LSB							
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

#### Data Encoding Options Details

The following summarizes usage of the Data Encoding options.

- Use default Modbus byte order option sets the data encoding of each register/16 bit value.
- First word low in 32 bit data types option sets the data encoding of each 32 bit value and each double word of a 64 bit value.
- First DWord low in 64 bit data types option sets the data encoding of each 64 bit value.

Data Types	Use default Modbus byte order Applicable	First word low in 32 bit data types Applicable	First DWord low in 64 bit data types Applicable
Word, Short, BCD	Yes	No	No
Float, DWord, Long, LBCD	Yes	Yes	No
Double	Yes	Yes	Yes

If needed, use the following information and the particular device's documentation to determine the correct settings of the Data Encoding options. The default settings are acceptable for most Modbus devices.

Data Encoding Group Option	Data Encoding	
Use default Modbus byte order Checked	High Byte(15..8)	Low Byte(7..0)
Use default Modbus byte order Unchecked	Low Byte(7..0)	High Byte(15..8)
First word low in 32 bit data types Unchecked	High Word(31..16)	Low Word(15..0)
First word low in 32 bit data types Checked	High Word(63..48) of Double Word in 64 bit data types	Low Word(47..32) of Double Word in 64 bit data types
First DWord low in 64 bit data types Unchecked	Low Word(15..0)	High Word(31..16)
First DWord low in 64 bit data types Checked	Low Word(47..32) of Double Word in 64 bit data types	High Word(63..48) of Double Word in 64 bit data types
First DWord low in 64 bit data types Unchecked	High Double Word(63..32)	Low Double Word(31..0)
First DWord low in 64 bit data types Checked	Low Double Word(31..0)	High Double Word(63..32)

## Variable Import Settings

### Variable Import File

This parameter specifies the exact location of the Concept or ProWORX variable import file the driver should use when automatic tag database generation is enabled for this device.

### Display Descriptions

Check this box in order to use imported tag descriptions (if present in file).

**Note:** For more information on how to configure automatic tag database generation and how to create a variable import file, refer to [Automatic Tag Database Generation](#).

## Automatic Tag Database Generation

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The Modbus Plus Driver utilizes the OPC server's Automatic Tag Database Generation feature, which enables drivers to automatically create tags that access data points used by the device's ladder program. Although it is sometimes possible to query a device for the information needed to build a tag database, this driver must use a **Variable Import File** instead. Variable import files can be generated using the Concept and ProWORX device programming applications.

### Creating the Variable Import File

The import file must be in semicolon delimited Concept .txt format, which is the default export file format of the Concept device programming application. The ProWORX programming application can also export variable data in this format. For application-specific information on creating the variable import file, refer to [Exporting Variables from Concept](#) and [Exporting Variables from ProWORX](#).

### OPC Server Configuration

Automatic Tag Database Generation can be customized to fit the application's needs. The primary control options can be set either during the Database Creation step of the Device Wizard or later by selecting the Database Creation tab in Device Properties. For more information, refer to the OPC server's help documentation.

Modbus Plus requires other settings in addition to the basic settings common to all drivers that support automatic tag database generation. Such specialized settings include the requiring the name and location of the variable import file. This information can be specified either during the Variable Import Settings step of the Device Wizard or later by selecting the Variable Import Settings tab in Device Properties. For more information, refer to [Variable Import Settings](#).

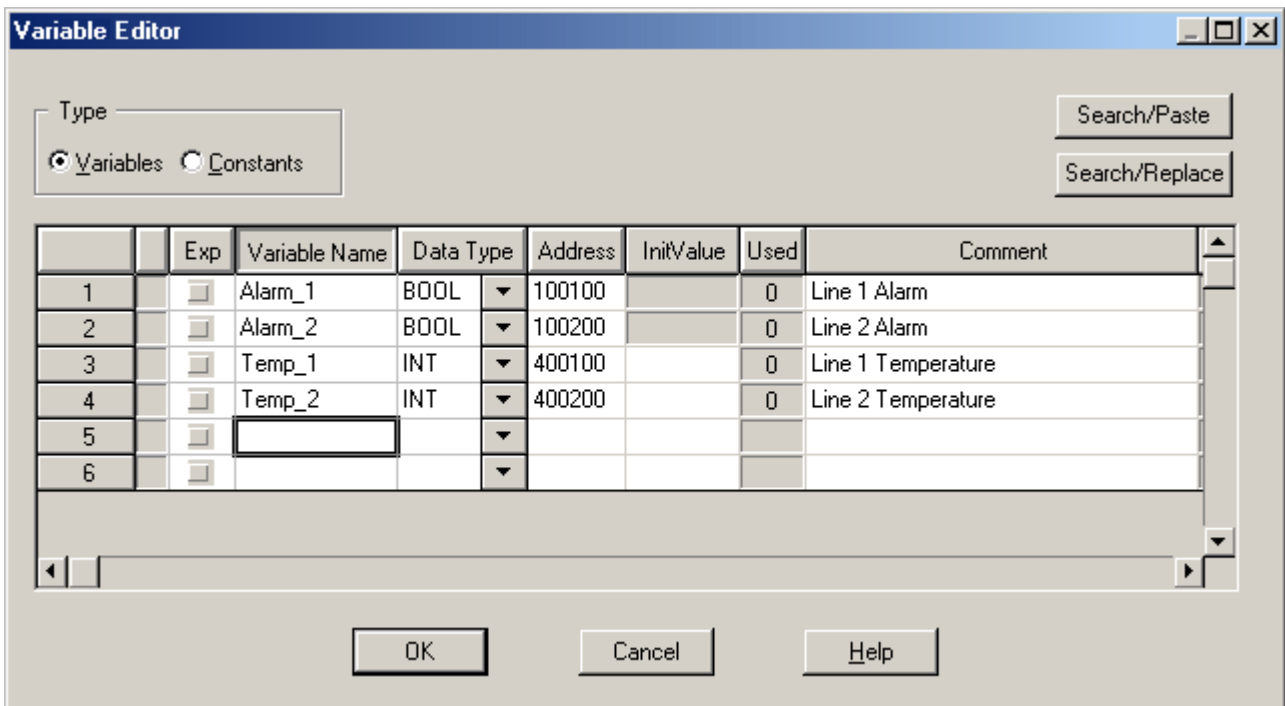
### Operation

Depending on the specific configuration, tag generation may either start automatically when the OPC Server project starts or be initiated manually at some other time. The OPC server's Event Log will show when the tag generation process started, any errors that occurred while processing the variable import file and when the process completed.

## Exporting Variables from Concept

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As the ladder program is created, symbolic names for the various data points referenced can be defined using the **Variable Editor**. Additional symbols and constants that are not used by the ladder program can also be defined.



**Note:** Although Concept can define variable names that begin with an underscore, such names are not allowed by the OPC server. The driver will modify invalid imported tag names as needed and note all name changes in the server's Event Log.

User defined data types are not currently supported by this driver. Records in the export file containing references to such types will be ignored. The following simple data types are supported:

Concept Data Type	Generated Tag Data Type
Bool	Boolean
Byte	Word
Dint	Long
Int	Short
Real	Float
Time	DWord
Udint	DWord
Uint	Word
Word	Word

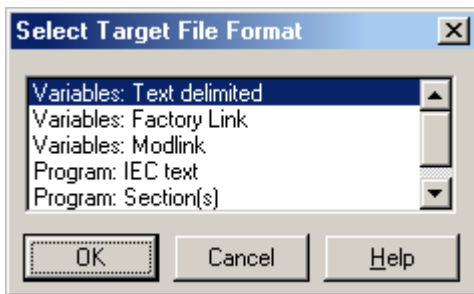
**Note 1:** Unlocated variables, which do not correspond to a physical address in the device, will be ignored by the driver.

**Note 2:** Comments are allowed and may be included as the generated tag descriptions. For more information, refer to [Variable Import Settings](#).

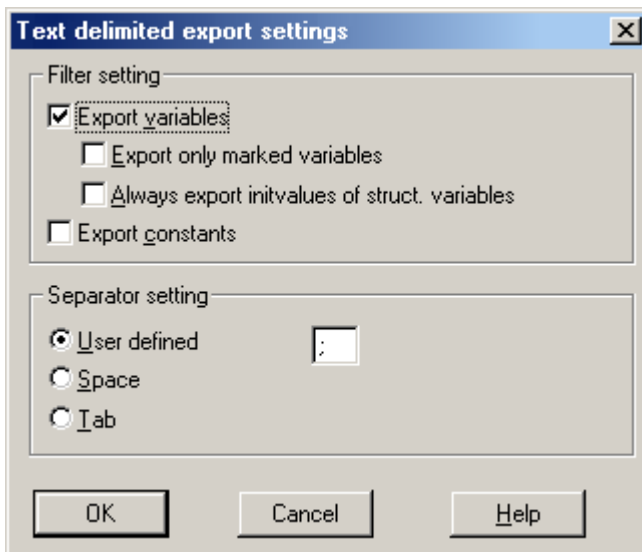
### Exporting Variables From Concept

Once the variables have been defined, the data must be exported from the Concept. To do so, follow the instructions below.

1. Select **File | Export**. Then select the **Variables: Text delimited** format.



2. Click **OK**. Next, specify the filter and separator settings.



**Note:** Although any filter settings can be chosen, this driver will only be able to read the exported data if the default semicolon separator is used.

3. Click **OK** to generate the file.

### **Exporting Variables from ProWORX**

In order for ProWORX to export the necessary variable information, check the **Symbols** option under **File | Preferences**. Symbolic names for various data points referenced can be defined by using the **Document Editor**.

**Documentation Editor (10100)**

**Descriptor:**  
Line 1 alarm

**Symbol:**  
Alarm\_1  **MMI**

**Short Comment:**

**Page Title:**

**Long Comment:**  **Next Available**  **Leading**  **Trailing** **Expand**

**Navigate By:**  
 **Reference** 10100  **Symbol**

**Copy Record** **Cut Record**  
**Paste Record** **Delete Record**

**OK** **Cancel** **Summary...** **Search...** **Goto...** **Add Bits** **Help**

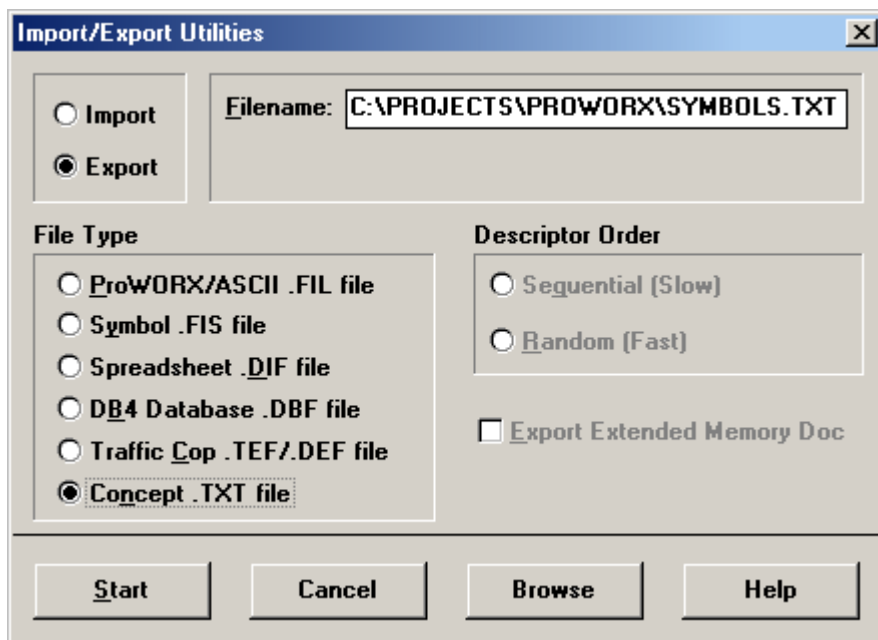
**Note:** ProWORX does not place many restrictions on variable names. The OPC Server, however, requires that tag names consist of only alphanumeric characters and underscores, and that the first character not be an underscore. The driver will modify invalid imported tag names as needed and will inform when any name changes in the server's Event Log.

ProWORX will also assign a data type of either BOOL or INT to the exported variables. The driver will create tags of type Boolean and Short respectively. In order to generate tags with other data types, manually edit the exported file and use any of the supported Concept data types. For a list of supported types, refer to [Exporting Variables from Concept](#).

### Exporting Variables From ProWORX

Once the variables have been defined, they must be exported from ProWORX. To do so, follow the instructions below.

1. Select **File | Utilities | Import/Export**.
2. Select the **Export** and the **Concept .TXT file** format.



**Note:** Descriptors are allowed and can be included as the generated tag descriptions. For more information, refer to [Variable Import Setting](#).

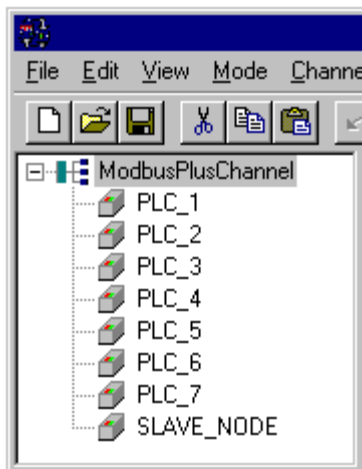
3. Click **OK** to generate the file.

## Optimizing Your Modbus Plus Communications

The following optimizations apply to the SA85 card only. Hilscher CIF card configurations only support 1 channel per adapter.

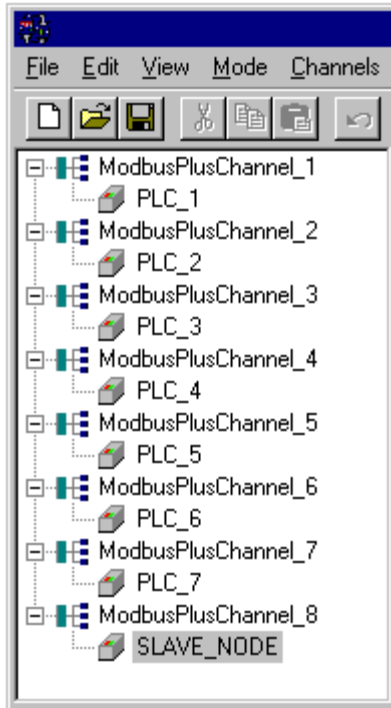
The Modbus Plus Driver has been redesigned to provide better throughput and take full advantage of the SA85 card. Previously, the Modbus Plus Driver restricted users to configuring a single channel in the OPC Server project and required that all Modbus Plus devices that would be accessed be defined under this channel. This meant that the driver had to move between devices one at a time in order to make requests. Since the OPC Server was already designed to be efficient, the single channel scheme provided enough performance for most application. With the advent of OPC as an enabling technology, however, the size of projects has increased dramatically. In order to maintain a high level of performance, the Modbus Plus Driver has been redesigned to operate at a new level of efficiency and performance.

**Note:** Before beginning these changes, users should back up the OPC Server project directory in order to quickly return to previous settings if needed.



In this project, there is only one Modbus Plus channel defined. All devices that need to be accessed are defined under that one channel. Thus, the Modbus Plus Driver must move from one device to the next as quickly as possible to gather information at an effective rate. As more devices are added or more information is requested from a single device, the update rate begins to suffer.

The latest version of the Modbus Plus Driver uses multiple channel definitions in order to boost the application's performance. In this configuration, each channel in the OPC Server represents a separate path of execution. By adding up to 8 additional channels, the application's work load is spread across the new channels. This creates multiple paths of execution that run independently, and results in a significant increase in performance. The image below shows the same application reconfigured to use multiple channels.



Each device has now been defined under its own channel. In this new configuration, the OPC Server can dedicate a single path of execution to the task of gathering data from a single device because each has its own dedicated channel. If the application has 8 or less devices it can be optimized as displayed.

Even if the application has more than 8 devices, there will still be a gain. While 8 or less devices may be ideal, the application will still benefit from additional channels. Although this means that within a given channel the server must move from device to device, it can now do so with less devices to process on a single path.

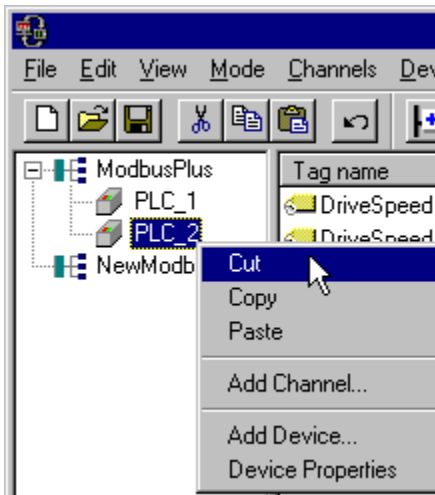
**Note:** The 8 channel limit matches the multi-path limitations of the SA85 and Hilscher card as set by the manufacturer.

The application can be redesigned to support multiple channels easily even if there are a large number of tags defined under each device. For more information, follow the instructions below.

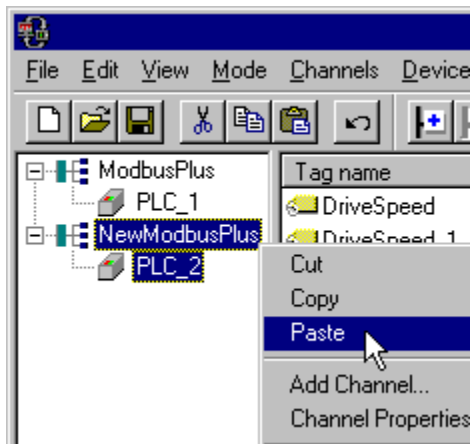
1. In the existing OPC Server project that is still single channel-based, click **Channels | Add Channel** and then name it as desired.

**Note:** In this example, it has been named "NewModbusPlus".

2. Next, cut **PLC2** from the **ModbusPlus** channel.



3. Paste it under the **NewModbusPlus** channel. The cut and paste functions quickly modify the application to take advantage of the new Modbus Plus Driver.



These examples highlight the most obvious optimizations that are now possible with the new Modbus Plus Driver. Other possible optimizations include dedicating a single channel to just Global data. To do so, simply define a new set of device names for each device whose global data will be accessed under that new channel. Remember to only access Global data from these newly defined channels. There are many possible configurations that may benefit the application; the new Modbus Plus Driver gives users the opportunity to investigate them.

## Data Types Description

Data Type	Description
Boolean	Single bit
Word	Unsigned 16 bit value bit 0 is the low bit bit 15 is the high bit
Short	Signed 16 bit value bit 0 is the low bit bit 14 is the high bit bit 15 is the sign bit
DWord	Unsigned 32 bit value bit 0 is the low bit bit 31 is the high bit
Long	Signed 32 bit value bit 0 is the low bit bit 30 is the high bit bit 31 is the sign bit
BCD	Two byte packed BCD Value range is 0-9999. Behavior is undefined for values beyond this range.
LBCD	Four byte packed BCD Value range is 0-99999999. Behavior is undefined for values beyond this range.
String	Null terminated ASCII string Supported on Modbus Model, includes Hi-Lo Lo-Hi byte order selection.
Double*	64 bit floating point value

	The driver interprets four consecutive registers as a double precision value by making the last two registers the high DWord and the first two registers the low DWord.
Double example	If register 40001 is specified as a double, bit 0 of register 40001 would be bit 0 of the 64 bit data type and bit 15 of register 40004 would be bit 63 of the 64 bit data type.
Float*	32 bit floating point value
	The driver interprets two consecutive registers as a single precision value by making the last register the high word and the first register the low word.
Float example	If register 40001 is specified as a float, bit 0 of register 40001 would be bit 0 of the 32 bit data type and bit 15 of register 40002 would be bit 31 of the 32 bit data type.

\*The descriptions assume the default first DWord low data handling of 64 bit data types, and first word low data handling of 32 bit data types.

## Address Descriptions

Address specifications vary depending on the model in use. Select a link from the following list to obtain specific address information for the model of interest.

[Modbus TIO Module](#)

## Modbus Addressing

The driver supports the following addresses.

[Output Coils](#)  
[Input Coils](#)  
[Packed Coils](#)  
[Internal Registers](#)  
[Holding Registers](#)  
[Global Data](#)

## Output Coils

### Decimal Addressing

Address	Range	Data Type	Access	Function Code
0xxxxx	1-65536	Boolean	Read/Write	01, 05, 15

### Hexadecimal Addressing

Address	Range	Data Type	Access
H0yyyyy	1-10000	Boolean	Read/Write

### Mailbox Mode

Only Holding Registers are supported in [Mailbox Mode](#).

### Array Support

Arrays are supported for output coil addresses. The syntax for declaring an array (using decimal addressing) is as follows:

0xxxx[cols] with assumed row count of 1  
 or 0xxxx[rows][cols].

The base address + (rows \* cols) cannot exceed 65536. The total number of coils being requested cannot exceed the output coil block size that was specified for this device.

**Example:**

The 255<sup>th</sup> output coil would be addressed as '0255' using decimal addressing or 'H0FF' using hexadecimal addressing.

## Input Coils

### Decimal Addressing

Address	Range	Data Type	Access	Function Code
1xxxxx	1-65536	Boolean	Read Only	02

### Hexadecimal Addressing

Address	Range	Data Type	Access
H1yyyyy	1-10000	Boolean	Read Only

### Mailbox Mode

Only Holding Registers are supported in [Mailbox Mode](#).

### Array Support

Arrays are supported for input coil addresses. The syntax for declaring an array (using decimal addressing) is as follows:

1xxxx[cols]  
with assumed row count of 1 or 1xxxx[rows][cols].

The base address + (rows \* cols) cannot exceed 65536. The total number of coils being requested cannot exceed the input coil block size that was specified for this device.

**Example:**

The 127<sup>th</sup> input coil would be addressed as '10127' using decimal addressing or 'H107F' using hexadecimal addressing.

## Packed Coils

The Packed Coil address type allows access to multiple consecutive coils as an analog value. This feature is available for the Modbus model in Master mode only. The only valid data type is Word. The syntax is as follows:

Output coils: 0xxxxx#nn Word Read/Write  
Input coils: 1xxxxx#nn Word Read Only

where xxxxx is the address of the first coil (decimal and hex values allowed), and nn is the number of coils to be packed into an analog value (1-16, decimal only).

**Note:** The bit order will be such that the start address will be the LSB (least significant bit) of analog value.

## Internal Registers

The default data types are shown in **bold**.

### Decimal Addressing

Address	Range	Data Type	Access	Function Code
3xxxxx	1-65536	<b>Word</b> , Short, BCD	Read Only*	04
3xxxxx.bb	3xxxxx.0/1-3xxxxx.15/16**	<b>Boolean</b>	Read Only*	04
3xxxxx	1-65535	Float, DWord, Long, LBCD	Read Only*	04
3xxxxx	1-65533	Double	Read Only*	04
Internal Registers As	300001.2H-365536.240H	String	Read Only	04

String with HiLo Byte Order	.Bit is string length, range 2 to 240 bytes.			
Internal Registers As String with LoHi Byte Order	300001.2L-365536.240L .Bit is string length, range 2 to 240 bytes.	String	Read Only	04

\*For slave devices, these locations are Read/Write.

\*\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### Hexadecimal Addressing

Address	Range	Data Type	Access
H3yyyyy	1-10000	<b>Word</b> , Short, BCD	Read Only*
H3yyyyy.cc	H3yyyyy.0/1-H3yyyyy.F/10	<b>Boolean</b>	Read Only*
H3yyyyy	1-FFFF	Float, DWord, Long, LBCD	Read Only*
H3yyyyy	1-FFFD	Double	Read Only*
Internal Registers As String with HiLo Byte Order	H300001.2H-H3FFFF.240H .Bit is string length, range 2 to 240 bytes.	String	Read Only
Internal Registers As String with LoHi Byte Order	H300001.2L-H3FFFF.240L .Bit is string length, range 2 to 240 bytes.	String	Read Only

\*For slave devices, these locations are Read/Write.

### Mailbox Mode

Only Holding Registers are supported in [Mailbox Mode](#). Double data type is not supported.

### Array Support

Arrays are also supported for the internal register addresses. The syntax for declaring an array (shown using decimal addressing) is as follows:

3xxxx[cols] with assumed row count of 1  
3xxxx[rows][cols]

For Word, Short and BCD arrays, the base address + (rows \* cols) cannot exceed 65536.

For Float, DWord, Long and Long BCD arrays, the base address + (rows \* cols \* 2) cannot exceed 65536.

For all arrays, the total number of registers being requested cannot exceed the internal register block size that was specified for this device.

**Note:** For this driver, the terms Slave and Unsolicited are used interchangeably.

## Holding Registers

The default data types are shown in **bold**.

### Decimal Addressing

Address	Range	Data Type	Access	Function Code
4xxxxx	1-65536	<b>Word</b> , Short, BCD	Read/Write	03, 06, 16
4xxxxx.bb	4xxxxx.0/1-4xxxxx.15/16*	<b>Boolean</b>	Read/Write	03, 06, 16, 22

4xxxxx	1-65535	Float, DWord, Long, LBCD	Read/Write	03, 06, 16
4xxxxx	1-65533	Double	Read/Write	03, 06, 16
Holding Registers As String with HiLo Byte Order	400001.2H-465536.240H .Bit is string length, range 2 to 240 bytes.	<b>String</b>	Read/Write	03, 16
Holding Registers As String with LoHi Byte Order	400001.2L-465536.240L .Bit is string length, range 2 to 240 bytes.	<b>String</b>	Read/Write	03, 16

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### Hexadecimal Addressing

Address	Range	Data Type	Access
H4yyyyy	1-10000	<b>Word</b> , Short, BCD	Read/Write
H4yyyyy.c	H4yyyyy.0/1-H4yyyyy.F/10	<b>Boolean</b>	Read/Write
H4yyyyy	1-FFFF	Float, DWord, Long, LBCD	Read/Write
H4yyyyy	1-FFFD	Double	Read/Write
Holding Registers As String with HiLo Byte Order	H400001.2H-H4FFFF.240H .Bit is string length, range 2 to 240 bytes.	<b>String</b>	Read/Write
Holding Registers As String with LoHi Byte Order	H400001.2L-H4FFFF.240L .Bit is string length, range 2 to 240 bytes.	<b>String</b>	Read/Write

### Write Only Access

All Read/Write addresses may be set as Write Only by prefixing a "W" to the address such as "W40001", which will prevent the driver from reading the register at the specified address. Any attempts by the client to read a Write Only tag will result in obtaining the last successful write value to the specified address. If no successful writes have occurred, then the client will receive 0/NULL for numeric/string values for an initial value.

**Caution:** Setting the "Client access" privileges of Write Only tags to Read Only will cause writes to these tags to fail and the client to always receive 0/NULL for numeric/string values.

### Mailbox Mode

Only Holding Registers are supported in Mailbox Mode. When read from a client, the data is read locally from a cache, not from a physical device. When written to from a client, the data is written to both the local cache and also the physical device as determined by the Device ID routing path. For more information, refer to [Mailbox Mode](#).

**Note:** The Double data type is not supported.

### String Support

The Modbus model supports reading and writing holding register memory as an ASCII string. When using holding registers for string data, each register will contain two bytes of ASCII data. The order of the ASCII data within a given register can be selected when the string is defined. The length of the string can be from 2 to 240 bytes and is entered in place of a bit number. The length must be entered as an even number. Appending either an "H" or "L" to the address specifies the byte order.

### String Examples

1. To address a string starting at 40200 with a length of 100 bytes and Hi-Lo byte order, enter:  
40200.100H
2. To address a string starting at 40500 with a length of 78 bytes and Lo-Hi byte order, enter:

40500.78L

**Note:** The string length may be limited by the maximum size of the write request that the device will allow. If the an error message "Unable to write to address <address> on device<device>: Device responded with exception code 3" is received in the server event window while utilizing a string tag, the device did not like the string's length. If possible, try shortening the string.

### Array Support

Arrays are also supported for the holding register addresses. The syntax for declaring an array (using decimal addressing) is as follows:

4xxx[cols] with assumed row count of 1  
4xxx[rows][cols]

For Word, Short and BCD arrays, the base address + (rows \* cols) cannot exceed 65536.

For Float, DWord, Long and Long BCD arrays, the base address + (rows \* cols \* 2) cannot exceed 65535.

For all arrays, the total number of registers being requested cannot exceed the holding register block size that was specified for this device.

## Global Data

Global data is not supported for the slave device. The default data types are shown in **bold**.

### Decimal Addressing

Address	Range	Data Type	Access
Gxx	1-32	<b>Word</b> , Short, BCD	Read/Write
Gxx.0/1 - Gxx.15/16*	1-32	<b>Boolean</b>	Read Only
Gxx	1-31	Float, DWord, Long, LBCD	Read/Write
Gxx	1-29	Double	Read/Write

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### Hexadecimal Addressing

Address	Range	Data Type	Access
HGyy	1-20	<b>Word</b> , Short, BCD	Read/Write
HGyy.0/1-HGyy.F/10	1-20	<b>Boolean</b>	Read Only
HGyy	1-1F	Float, DWord, Long, LBCD	Read/Write
HGyy	1-1D	Double	Read/Write

### Write Only Access

All Read/Write addresses may be set as Write Only by prefixing a "W" to the address such as "WG01", which will prevent the driver from reading the register at the specified address. Any attempts by the client to read a Write Only tag will result in obtaining the last successful write value to the specified address. If no successful writes have occurred, then the client will receive 0/NULL for numeric/string values for an initial value.

### Mailbox Mode

Only Holding Registers are supported in [Mailbox Mode](#).

### Array Support

Arrays are also supported for global data. The syntax for declaring an array (shown using decimal addressing) is as follows:

Gxx[cols] with assumed row count of 1.  
Gxx[rows][cols]

For Word, Short and BCD arrays, the base address + (rows \* cols) cannot exceed 32.

For Float, DWord, Long and Long BCD arrays, the base address + (rows \* cols \* 2) cannot exceed 32.

**Note:** For this driver, the terms Slave and Unsolicited are used interchangeably.

## **TIO Module Addressing**

---

The driver supports the following addresses:

[Data I/O](#)  
[Data Input - Latched](#)  
[Module Timeout](#)  
[Module Status](#)  
[Module ASCII Header](#)

**Note:** Mailbox Mode is not supported for this model.

## **Data I/O**

---

The default data types are shown in **bold**.

### **Decimal Addressing**

Address	Range	Data Type	Access
400001	N/A	<b>Word</b> , Short	Read/Write
400001.bb	400001.0/1-400001.15/16*	<b>Boolean</b>	Read/Write

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### **Hexadecimal Addressing**

Address	Range	Data Type	Access
H40001	N/A	<b>Word</b> , Short	Read/Write
H40001.cc	H40001.0/1-H40001.F/10	<b>Boolean</b>	Read/Write

**Note:** The value read from this location comes from the module's input register. When writing to this location, the value sent modifies the module's output register. Therefore, the value read at this location does not correspond to the value previously written to this location.

## **Data Input - Latched**

---

The default data types are shown in **bold**.

### **Decimal Addressing**

Address	Range	Data Type	Access
400257	N/A	<b>Word</b> , Short	Read Only
400257.bb	400257.0/1-400257.15/16*	<b>Boolean</b>	Read Only

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### **Hexadecimal Addressing**

Address	Range	Data Type	Access
H40101	N/A	<b>Word</b> , Short	Read Only
H40101.cc	H40101.0/1-40101.F/10	<b>Boolean</b>	Read Only

## Module Timeout

---

The default data types are shown in **bold**.

### Decimal Addressing

Address	Range	Data Type	Access
461441	N/A	<b>Word</b> , Short	Read/Write
461441.bb	461441.0/1-461441.15/16*	<b>Boolean</b>	Read/Write

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### Hexadecimal Addressing

Address	Range	Data Type	Access
H4F001	N/A	<b>Word</b> , Short	Read/Write
H4F001.cc	H4F001.0/1-H4F001.F/10	<b>Boolean</b>	Read/Write

## Module Status

---

The default data types are shown in **bold**.

### Decimal Addressing

Address	Range	Data Type	Access
4xxxxx	463489-463497	<b>Word</b> , Short	Read Only
4xxxxx.bb	4xxxxx.0/1-4xxxxx.15/16*	<b>Boolean</b>	Read Only

\*For more information, refer to "Zero Vs. One-Based Addressing" in [Settings](#).

### Hexadecimal Addressing

Address	Range	Data Type	Access
H4yyyy	H4F801-H4F809	<b>Word</b> , Short	Read Only
H4yyyy.cc	H4yyyy.0/1-H4yyyy.F/10	<b>Boolean</b>	Read Only

## Module ASCII Header

---

### Decimal Addressing

Address	Range	Data Type	Access
464513	N/A	String	Read Only

### Hexadecimal Addressing

Address	Range	Data Type	Access
H4FC01	N/A	String	Read Only

## Error Descriptions

---

The following error/warning messages may be generated. Click on the link for a description of the message.

### Address Validation Messages

[Missing address](#)

[Device address '<address>' contains a syntax error](#)

[Address '<address>' is out of range for the specified device or register](#)

[Data Type '<type>' is not valid for device address '<address>'](#)

[Device address '< address>' is Read Only](#)

[Array size is out of range for address '<address>'](#)

[Array support is not available for the specified address: '<address>'](#)

### Automatic Tag Database Generation Messages

[Tag import failed due to low memory resources](#)

[File exception encountered during tag import](#)

[Error parsing import file record number <record>, field <field>](#)

[Description truncated for import file record number <record>](#)

[Imported tag name '<tag name>' is invalid. Name changed to '<tag name>'](#)

[Tag '<tag name>' could not be imported because data type '<data type>' is not supported](#)

### Device Specific Messages

[Unable to start MBPLUS.SYS device](#)

[Unable to communicate with MBPLUS.VXD](#)

[Unable to open MBPLUS slave path](#)

[Error opening MBPLUS path: <ID>](#)

[Bad address in block \[<start address> to <end address>\] on device '<device name>'](#)

[Block address \[<start address> to <end address>\] on device '<device name>' responded with exception '<exception code>'](#)

[Address block error address address responded with exception 132](#)

[Unable to read from address '<array address>' on device '<device>', board responded with exception code '<code>'](#)

[Unable to write to address '<array address>' on device '<device>', board responded with exception code '<code>'](#)

[Unable to read from address '<address>' on device '<device>'. Device responded with exception code '<code>'](#)

[Unable to write to address '<address>' on device '<device>'. Device responded with exception code '<code>'](#)

### Device Status Messages

[Started MBPLUS.SYS device](#)

[Device '<device name>' is not responding](#)

[Unable to write to '<address>' on device '<device name>'](#)

### Exception Codes

[Modbus Exception Codes](#)

[Hilscher CIF Exception Codes](#)

**Note:** For this driver, the terms Slave and Unsolicited are used interchangeably.

### Address Validation Messages

---

The following error/warning messages may be generated. Click on the link for a description of the message.

#### Address Validation

[Missing address](#)

[Device address '<address>' contains a syntax error](#)

[Address '<address>' is out of range for the specified device or register](#)

[Data Type '<type>' is not valid for device address '<address>'](#)

[Device address '< address>' is Read Only](#)

[Array size is out of range for address '<address>'](#)

[Array support is not available for the specified address: '<address>'](#)

---

**Missing address**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically has no length.

**Solution:**

Re-enter the address in the client application.

---

**Device address '<address>' contains a syntax error**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically contains one or more invalid characters.

**Solution:**

Re-enter the address in the client application.

---

**Address '<address>' is out of range for the specified device or register**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically references a location that is beyond the range of supported locations for the device.

**Solution:**

Verify that the address is correct; if it is not, re-enter it in the client application.

---

**Data Type '<type>' is not valid for device address '<address>'**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically has been assigned an invalid data type.

**Solution:**

Modify the requested data type in the client application.

---

**Device address '<address>' is Read Only**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically has a requested access mode that is not compatible with what the device supports for that address.

**Solution:**

Change the access mode in the client application.

**Array size is out of range for address '<address>'**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically is requesting an array size that is too large for the address type or block size of the driver.

**Solution:**

Re-enter the address in the client application to specify a smaller value for the array or a different starting point.

**Array support is not available for the specified address: '<address>'**

---

**Error Type:**

Warning

**Possible Cause:**

A tag address that has been specified statically contains an array reference for an address type that doesn't support arrays.

**Solution:**

Re-enter the address in the client application to remove the array reference or correct the address type.

**Automatic Tag Database Generation Messages**

---

The following error/warning messages may be generated. Click on the link for a description of the message.

**Automatic Tag Database Generation Messages**

[Tag import failed due to low memory resources](#)

[File exception encountered during tag import](#)

[Error parsing import file record number <record>, field <field>](#)

[Description truncated for import file record number <record>](#)

[Imported tag name '<tag name>' is invalid. Name changed to '<tag name>'](#)

[Tag '<tag name>' could not be imported because data type '<data type>' is not supported](#)

**Tag import failed due to low memory resources**

---

**Error Type:**

Serious

**Possible Cause:**

The driver could not allocate memory required to process variable import file.

**Solution:**

Shutdown all unnecessary applications and retry.

**File exception encountered during tag import**

---

**Error Type:**

Serious

**Possible Cause:**

The variable import file could not be read.

**Solution:**

Regenerate the variable import file.

---

**Error parsing import file record number <record>, field <field>**

---

**Error Type:**

Serious

**Possible Cause:**

The specified field in the variable import file could not be parsed because it is longer than expected or invalid.

**Solution:**

Edit the variable import file to change the offending field if possible.

---

**Description truncated for import file record number <record>**

---

**Error Type:**

Warning

**Possible Cause:**

The tag description given in specified record is too long.

**Solution:**

The driver will truncate the description as needed. To prevent this error in the future, edit the variable import file to change the description if possible.

---

**Imported tag name '<tag name>' is invalid. Name changed to '<tag name>'**

---

**Error Type:**

Warning

**Possible Cause:**

The tag name encountered in the variable import file contained invalid characters.

**Solution:**

The driver will construct a valid name based on the one from the variable import file. To prevent this error in the future, and to maintain name consistency, change the name of the exported variable if possible.

---

**Tag '<tag name>' could not be imported because data type '<data type>' is not supported**

---

**Error Type:**

Warning

**Possible Cause:**

The data type specified in the variable import file is not one of the types supported by this driver.

**Solution:**

If possible, change the data type specified in variable import file to one of the supported types. If the variable is for a structure, manually edit the file to define each tag required for the structure. Alternatively, manually configure the required tags in the OPC Server.

**See Also:**

[Exporting Variables from Concept](#)

---

**Device Specific Messages**

---

The following error/warning messages may be generated. Click on the link for a description of the message.

**Device Specific Messages**

[Unable to start MBPLUS.SYS device](#)

[Unable to communicate with MBPLUS.VXD](#)

[Unable to open MBPLUS slave path](#)

[Error opening MBPLUS path: <ID>](#)

[Bad address in block \[\[<start address>\]\(#\) to \[<end address>\]\(#\)\] on device '\[<device name>\]\(#\)'](#)

[Block address \[\[<start address>\]\(#\) to \[<end address>\]\(#\)\] on device '\[<device name>\]\(#\)' responded with exception '\[<exception code>\]\(#\)'](#)

[Unable to read from address '\[<array address>\]\(#\)' on device '\[<device>\]\(#\)', board responded with exception code '\[<code>\]\(#\)'](#)

[Unable to write to address '\[<array address>\]\(#\)' on device '\[<device>\]\(#\)', board responded with exception code '\[<code>\]\(#\)'](#)

[Unable to read from address '\[<address>\]\(#\)' on device '\[<device>\]\(#\)'. Device responded with exception code '\[<code>\]\(#\)'](#)

[Unable to write to address '\[<address>\]\(#\)' on device '\[<device>\]\(#\)'. Device responded with exception code '\[<code>\]\(#\)'](#)

See Also: [Modbus Exception Codes](#)

---

**Unable to start MBPLUS.SYS device****Error Type:**

Fatal

**Possible Cause:**

The MBPLUS.SYS driver was not properly configured.

**Solution:**

Verify that that the MBPLUS device can be started and stopped manually using the **Control Panel | Devices** applet. When the MBPLUS.SYS driver is started manually, the modbus\_unsolicited.dll driver will also be able to start the driver.

---

**Unable to communicate with MBPLUS.VXD****Error Type:**

Fatal

**Possible Cause:**

1. The MBPLUS.VXD driver was not properly configured.
2. The MBPLUS.VXD driver was not installed.

**Solution:**

Install or setup the MBPLUS.VXD properly before running the driver.

**Note:**

To check for proper configuration, use the test programs that come with the VXD driver.

---

**Unable to open MBPLUS slave path****Error Type:**

Fatal

**Possible Cause:**

The driver was unable to open a slave path with the MBPLUS.SYS driver on Windows NT (or the MBPLUS.VXD driver on Windows 95). The MBPLUS driver is not properly installed.

**Solution:**

1. Verify that the MBPLUS device can be started and stopped manually using the **Control Panel | Devices** applet. When the MBPLUS.SYS driver is started manually, the modbus\_unsolicited.dll driver will also be able to start the driver.

2. Install or setup the MBPLUS.VXD properly before running the driver.

**Note:**

To check for proper configuration, use the test programs that come with the VXD driver.

**Error opening MBPLUS path: <ID>**

---

**Error Type:**

Serious

**Possible Cause:**

1. The MBPLUS.SYS driver for Windows NT or the MBPLUS.VXD driver for Windows 95 has not been properly configured.
2. The driver cannot open a path on the specified adapter.

**Solution:**

1. Follow the instructions for installing and configuring the MBPLUS driver.
2. Verify that no more than eight channels are assigned the same adapter number.

**Bad address in block [<start address> to <end address>] on device '<device name>'**

---

**Error Type:**

Serious

**Possible Cause:**

An attempt has been made to reference a nonexistent location in the specified device.

**Solution:**

Verify the addresses of all tags assigned to the device and eliminate ones that reference invalid locations.

**Block address [<start address> to <end address>] on device '<device name>' responded with exception '<exception code>'**

---

**Error Type:**

Fatal

**Possible Cause:**

The requested node did not respond.

**Solution:**

Check the cabling, wiring and pinning.

**See Also:**

[Hilscher CIF Exception Codes](#)

**Address block error <address>-<address> responded with exception 132**

---

**Error Type:**

Fatal

**Possible Cause:**

The requested node did not respond.

**Solution:**

Check the cabling, wiring and pinning.

**See Also:**

### [Hilscher CIF Exception Codes](#)

#### **Unable to read from address '<array address>' on device '<device>', board responded with exception code '<code>'**

---

**Error Type:**

Warning

**SA85 Card**

N/A

**Hilscher CIF Card**

Code -1, -33

**Possible Cause:**

1. The adapter may not exist.
2. Depends on error.

**Solution:**

1. Verify that the proper adapter number has been chosen in Channel Properties. Use SyCon to determine adapter ordering.
2. Refer to the SyCon User Manual.

#### **Unable to write to address '<array address>' on device '<device>', board responded with exception code '<code>'**

---

**Error Type:**

Warning

**SA85 Card**

N/A

**Hilscher CIF Card**

Code -1, -33

**Possible Cause:**

1. The adapter may not exist.
2. Depends on error.

**Solution:**

1. Verify that the proper adapter number has been chosen in Channel Properties. Use SyCon to determine adapter ordering.
2. Refer to the SyCon User Manual.

#### **Unable to read from address '<address>' on device '<device>'. Device responded with exception code '<code>'**

---

**Error Type:**

Warning

**Possible Cause:**

See [Modbus Exception Codes](#) for a description of the exception code.

**Solution:**

See [Modbus Exception Codes](#).

---

**Unable to write to address '<address>' on device '<device>': Device responded with exception code '<code>'**

---

**Error Type:**

Warning

**Possible Cause:**See [Modbus Exception Codes](#) for a description of the exception code.**Solution:**See [Modbus Exception Codes](#).

---

**Device Status Messages**

---

The following error/warning messages may be generated. Click on the link for a description of the message.

**Device Status Messages**[Started MBPLUS.SYS device](#)[Device '<device name>' is not responding](#)[Unable to write to '<address>' on device '<device name>'](#)

---

**Started MBPLUS.SYS device**

---

**Error Type:**

Information

**Possible Cause:**

This message is posted by the driver when the MBPLUS.SYS device driver is started successfully. This is a Windows NT only message and will not be seen if the MBPLUS.SYS driver is already running when the driver starts.

**Solution:**

N/A

---

**Device '<device name>' is not responding**

---

**Error Type:**

Serious

**Possible Cause:**

1. The PLC network card may not be correctly installed in the Host PC.
2. The named device may not be connected to the PLC network.
3. The named device may have been assigned an incorrect Network ID.
4. The driver cannot open a path on the specified adapter.

**Solution:**

1. Verify the network card installation using the supplied utility software.
2. Check the PLC network connections.
3. Verify that the Network ID given to the named device matches that of the actual device.
4. Verify that no more than eight channels are assigned the same adapter number.

---

**Unable to write to '<address>' on device '<device name>'**

---

**Error Type:**

Serious

**Possible Cause:**

1. The PLC network card may not be correctly installed in the Host PC.
2. The named device may not be connected to the PLC network.

3. The named device may have been assigned an incorrect Network ID.

**Solution:**

1. Verify the network card installation using the supplied utility software.
2. Check the PLC network connections.
3. Verify the Network ID given to the named device matches that of the actual device.

### Modbus Exception Codes

The data shown below is from the Modbus Application Protocol Specifications documentation.

Code Dec/Hex	Name	Meaning
01/0x01	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
02/0x02	ILLEGAL DATA ADDRESS	The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 would succeed, a request with offset 96 and length 5 will generate exception 02.
03/0x03	ILLEGAL DATA VALUE	A value contained in the query data field is not an allowable value for server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the MODBUS protocol is unaware of the significance of any particular value of any particular register.
04/0x04	SLAVE DEVICE FAILURE	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05/0x05	ACKNOWLEDGE	The slave has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the master. The master can next issue a Poll Program Complete message to determine if processing is completed.
06/0x06	SLAVE DEVICE BUSY	The slave is engaged in processing a long-duration program command. The master should retransmit the message later when the slave is free.
07/0x07	NEGATIVE ACKNOWLEDGE	The slave cannot perform the program function received in the query. This code is returned for an unsuccessful programming request using function code 13 or 14 decimal. The master should request diagnostic or error information from the slave.
08/0x08	MEMORY PARITY ERROR	The slave attempted to read extended memory, but detected a parity error in the memory. The master can retry the request, but service may be required on the slave device.
10/0x0A	GATEWAY PATH UNAVAILABLE	Specialized use in conjunction with gateways, indicates that the gateway was unable to allocate an internal communication path from the input port to the output port for processing the request. This usually means that the gateway is misconfigured or overloaded.
11/0x0B	GATEWAY TARGET DEVICE FAILED TO RESPOND	Specialized use in conjunction with gateways, indicates that no response was obtained from the target device. Usually means that the device is not present on the network.

**Note:** For this driver, the terms Slave and Unsolicited are used interchangeably.

## Hilscher CIF Exception Codes

---

The data below is from the Modbus Application Protocol Specifications documentation.

CIF Code	Name	Meaning
111	ILLEGAL FUNCTION	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
114	SLAVE DEVICE FAILURE	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.

**Note:** For this driver, the terms Slave and Unsolicited are used interchangeably.

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