Product Application Note

Configuring a Parker XPR HMI to Communicate with a MPiec Controller over MODBUS TCP

Applicable Product: MPiec, MotionWorks IEC Pro Version 2.0

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1 Application Overview

This document describes the configuration required on a Yaskawa MPiec controller when used as a slave to communicate to a Parker HMI used as a master using Interact Xpress software.

2 Application Highlights:

Industry:	MODBUS/TCP Users
Major Features:	Easy connectivity Communication to third party HMI's Simple setup

3 Products Used:

Component	Product and Model Number
Servopack	Yaskawa SGDV-R90FE1A
Motor	Yaskawa SGMAV-01A3A61
Controller	Yaskawa MP2600iec
Software	Yaskawa Motion Works IEC Version 2.0.0.27
Firmware	Yaskawa 2.0.0.255
HMI	Parker XPR06VT-4P3 HMI

4 Implementation Method of Core Operation

This application note guides a user through the steps of configuring a Parker HMI as a MODBUS/TCP master communicating with the MPiec controller as a slave. This project was created with the model XPR06VT-4P3 HMI with Interact Xpress Software Version 2.1.4. The MPiec controller had firmware version 2.0.0.255 and MotionWorks IEC Pro software version 2.0.0.27.

5 Application Overview:

This application note was created for an application to index a roll of plastic film for a desired amount of length, wait for a press to mold and then index again. This document is intended to get a user familiar with the MODBUS setup and not the actual application.

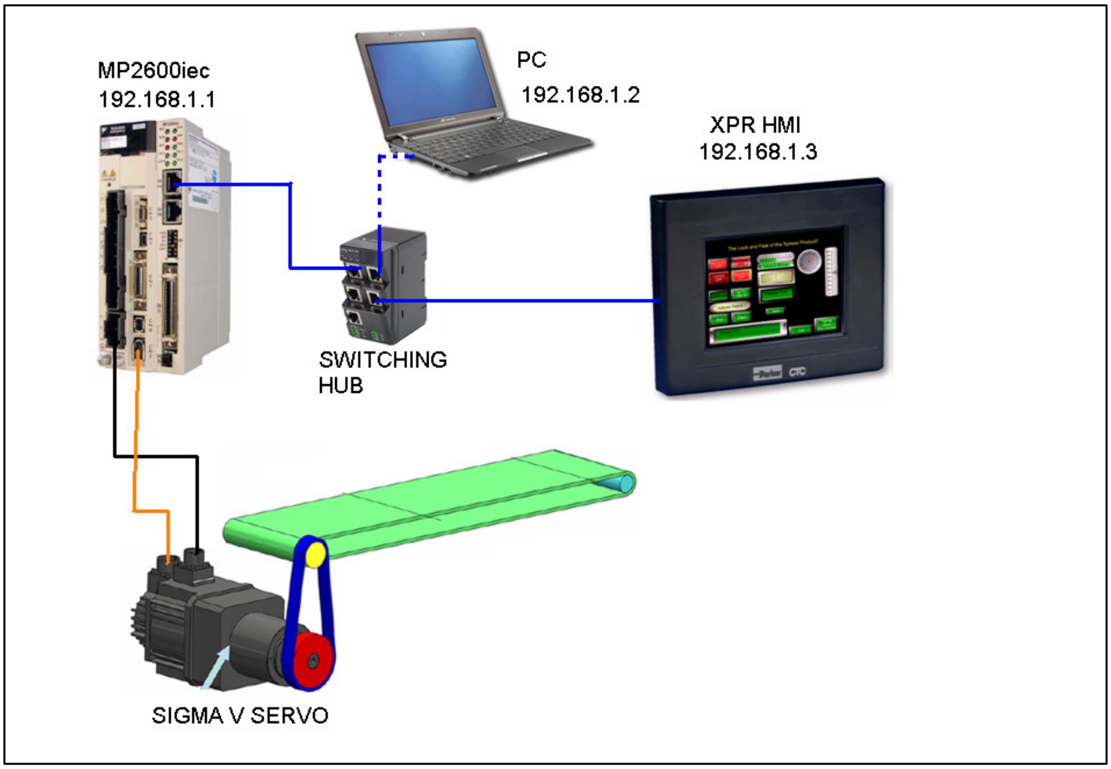


Figure 1 Sample Overview of Application

5.1 MODBUS Allocation

In MotionWorks IEC, the New Project template includes global I/O groups and drivers to allow the controller to respond to incoming MODBUS messages. Figure 2 on the next page shows the MODBUS memory map and how it relates to the Global Variables in MotionWorks IEC. Note that function codes 01 and 03 return data that was sent to the controller from the master and do not reflect data from the Global Variables in the application program.

The MODBUS data memory is copied to the Global Variables at the task update rate.

- MODBUS coil 0 equates to the Global Variable at %IX1152.0 128 coils are available.
- MODBUS register 40000 equates to the Global Variable at %IW1168. 1024 registers are available.
- MODBUS input 10000 equates to the Global Variable at %QX1152.0 128 inputs are available.
- MODBUS register 30000 equates to the Global Variable at %QW1168. 1024 registers are available.

*Note: The above byte numbers correlate to the graphic depicted below. Actual byte numbers may change when working with physical hardware. The application will illustrate later in this document.

As shown in Figure 2 below, the input and output memory is in a different location even though they have the same numerical addressing.

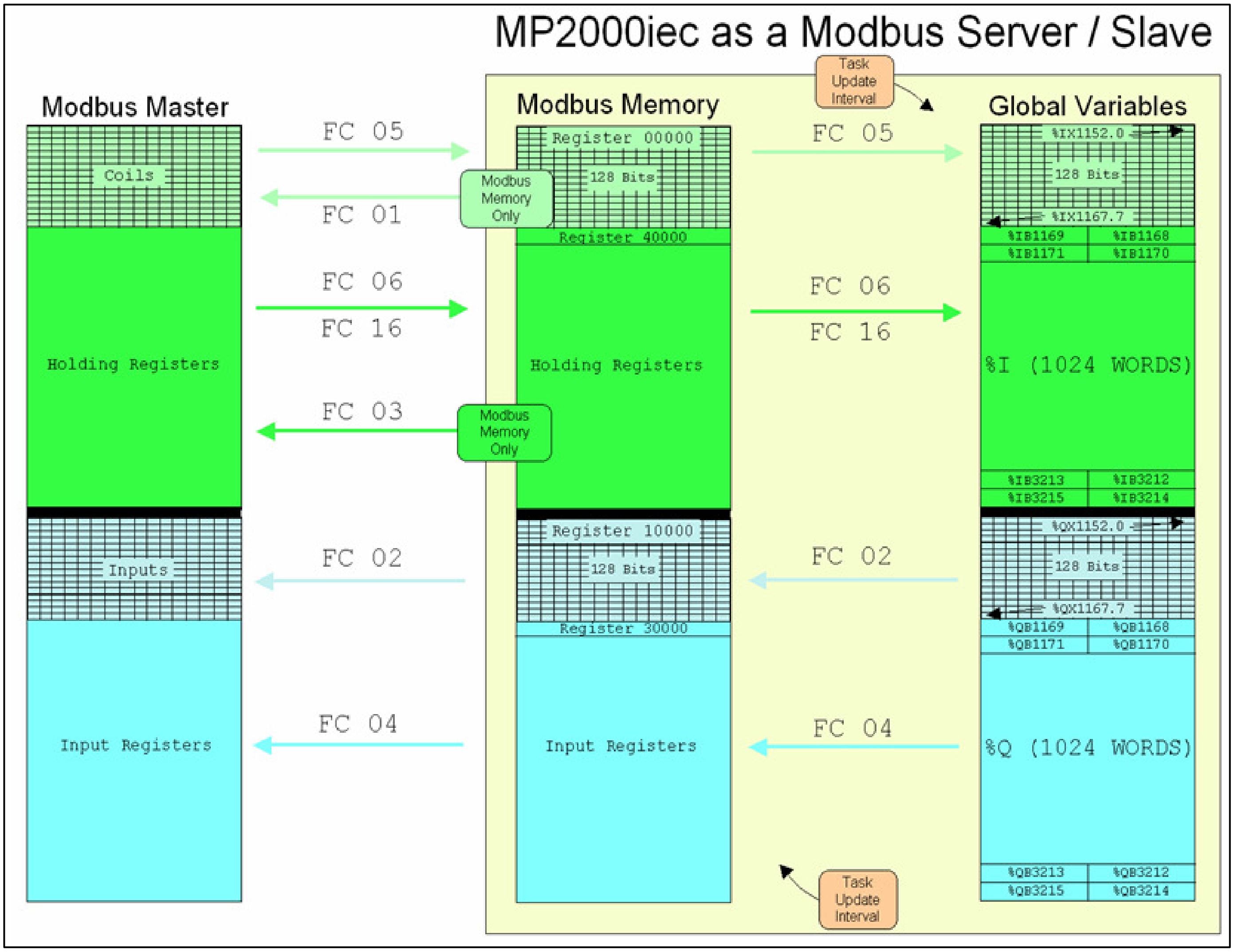
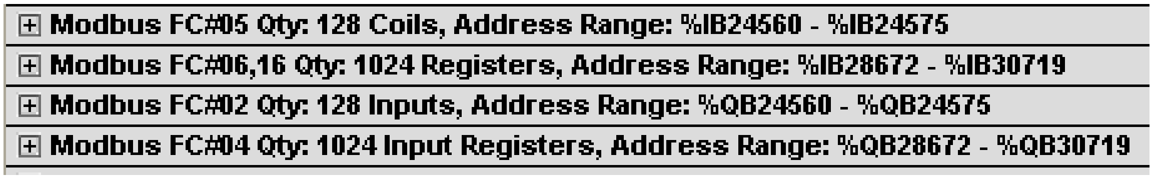


Figure 2 MODBUS Mapping

The “New Project” template will automatically create communication drivers and allocate global memory for external devices to read & write information in the controller. These memory areas are generic and no variables are automatically created. The user can decide on the arrangement and type of data to populate within the communications memory region. If the MPiec controller is the slave, no set up is required in the controller. The user can add variables as required in each group used for communication.



⊞ Modbus FC#05 Qty: 128 Coils, Address Range: %IB24560 - %IB24575

⊞ Modbus FC#06,16 Qty: 1024 Registers, Address Range: %IB28672 - %IB30719

⊞ Modbus FC#02 Qty: 128 Inputs, Address Range: %QB24560 - %QB24575

⊞ Modbus FC#04 Qty: 1024 Input Registers, Address Range: %QB28672 - %QB30719

Figure 3 Variable groups created in template

A word coming from the HMI will be mapped from register 40000 in the PARKER XPR to %IB28672. The user should verify the data type used for data transfer. Examples are provided below:

- Bits written from the HMI to the controller are mapped from 00000 to %IX24560.0
- Words written from the HMI to the controller are mapped from 40000 to %IB28672
- Outputs from the controller to the HMI are mapped from %QX24560.0 to 30000
- Words from the controller to the HMI are mapped from %QB28672 to 10000

For Video reference of how MODBUS works, click on the below:

http://www.yaskawa.com/site/Training.nsf/training/MotionELearningModule.html?opendocument&DMSD=86256EC30069B634862576B0005A4FDA

5.2 Configuration Procedure

5.2.1 IP Addressing

Set the IP addresses of the devices (HMI, MPiec Controller and PC). In the test set up, the IP addresses were: MPiec Controller: 192.168.1.1, PC: 192.168.1.2, HMI: 192.168.1.3

a. To set the IP address of the controller, turn the **CNFG** and **E-Init** DIP switches to the "ON" position. All other switches should be in the "OFF" position. The default IP addresses on the MP2600iec controller are 192.168.1.1 for CN11A and 192.168.2.1 for CN11B unless changed by a user.

***Note: For MP2000 Series IEC Controllers, the default IP address is 192.168.1.1. The above mentions two IP addresses for use with the MP2600iec Controller since it has two Ethernet ports, CN11A and CN11B, respectively.**

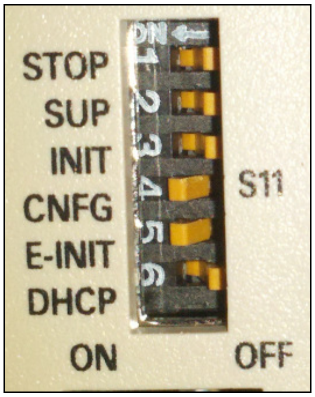


Figure 4 Dip Switch Bank on MPiec

b. To set the IP address of the Parker HMI, turn power on to the screen itself. After HMI has booted up, select Settings on the HMI Shell screen. Touch Networking and set IP address to 192.168.1.3.

c. To set the IP address of a PC, follow the normal Windows procedure.

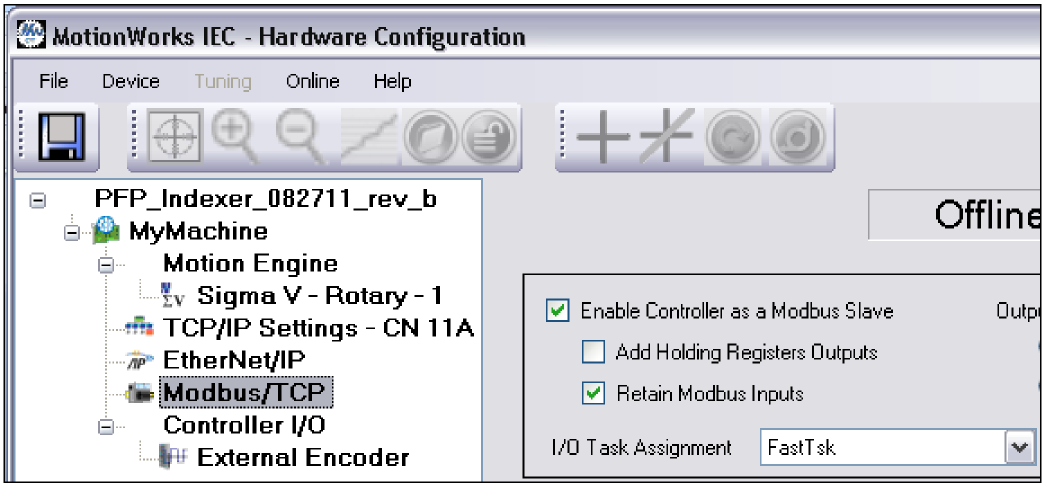
5.2.2 *MPiec Setup*

The MPiec needs to be configured as a MODBUS Slave device, and then sent to the controller. Before the new configuration will become effective, power on the controller must be cycled. With the PC connected to the MPiec CN11A port, open MotionWorks IEC Pro Version 2.0.

In MotionWorks IEC Pro Version 2.0:

a. Launch the Hardware Configuration

b. Click on MODBUS TCP and click on “Enable Controller as MODBUS Slave”



PFP_Indexer_082711_rev_b
- MyMachine
  - Motion Engine
    - Sigma V - Rotary - 1
  - TCP/IP Settings - CN 11A
  - EtherNet/IP
  - Modbus/TCP
  - Controller I/O
    - External Encoder

☑ Enable Controller as a Modbus Slave

□ Add Holding Registers Outputs

☑ Retain Modbus Inputs

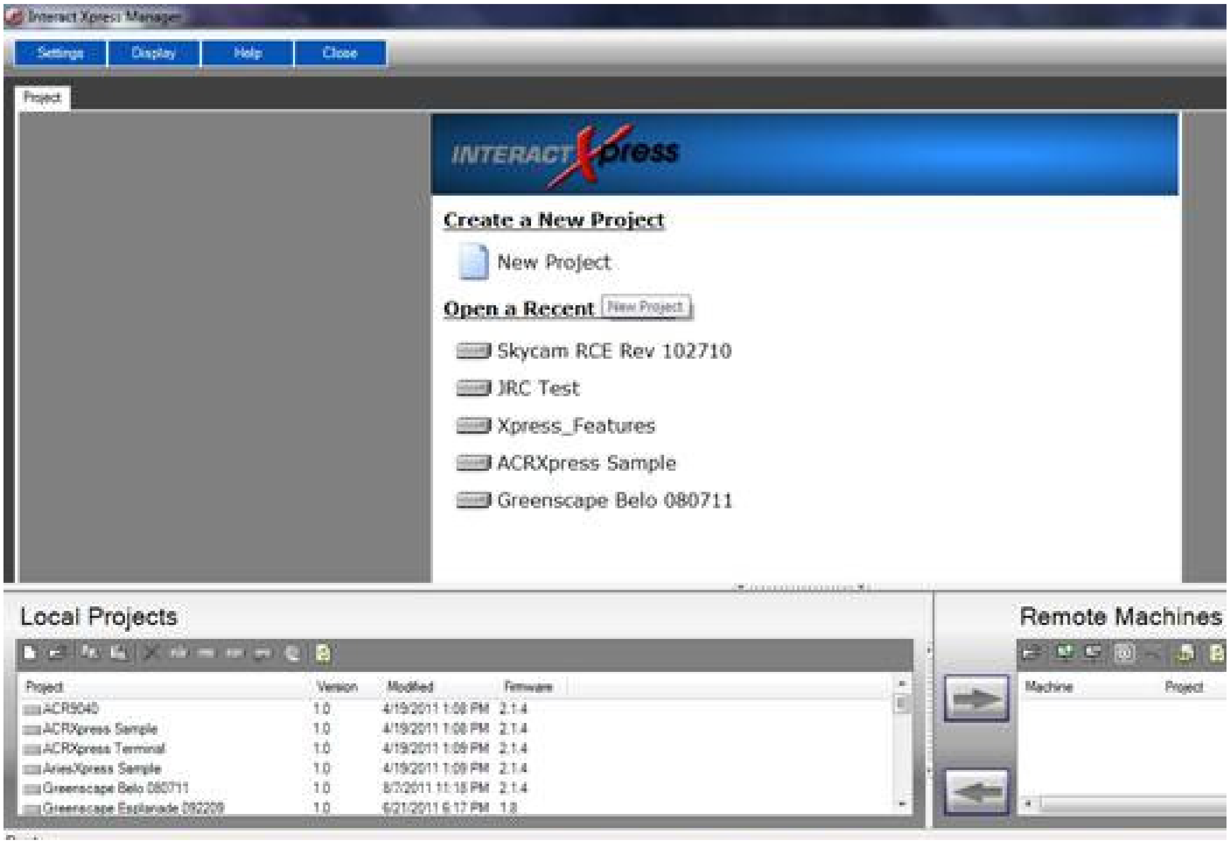
I/O Task Assignment: FastTsk

Figure 5 Enabling MPiec as a MODBUS Slave

c. Save the configuration and cycle power to the controller

5.2.3 PARKER XPR Setup

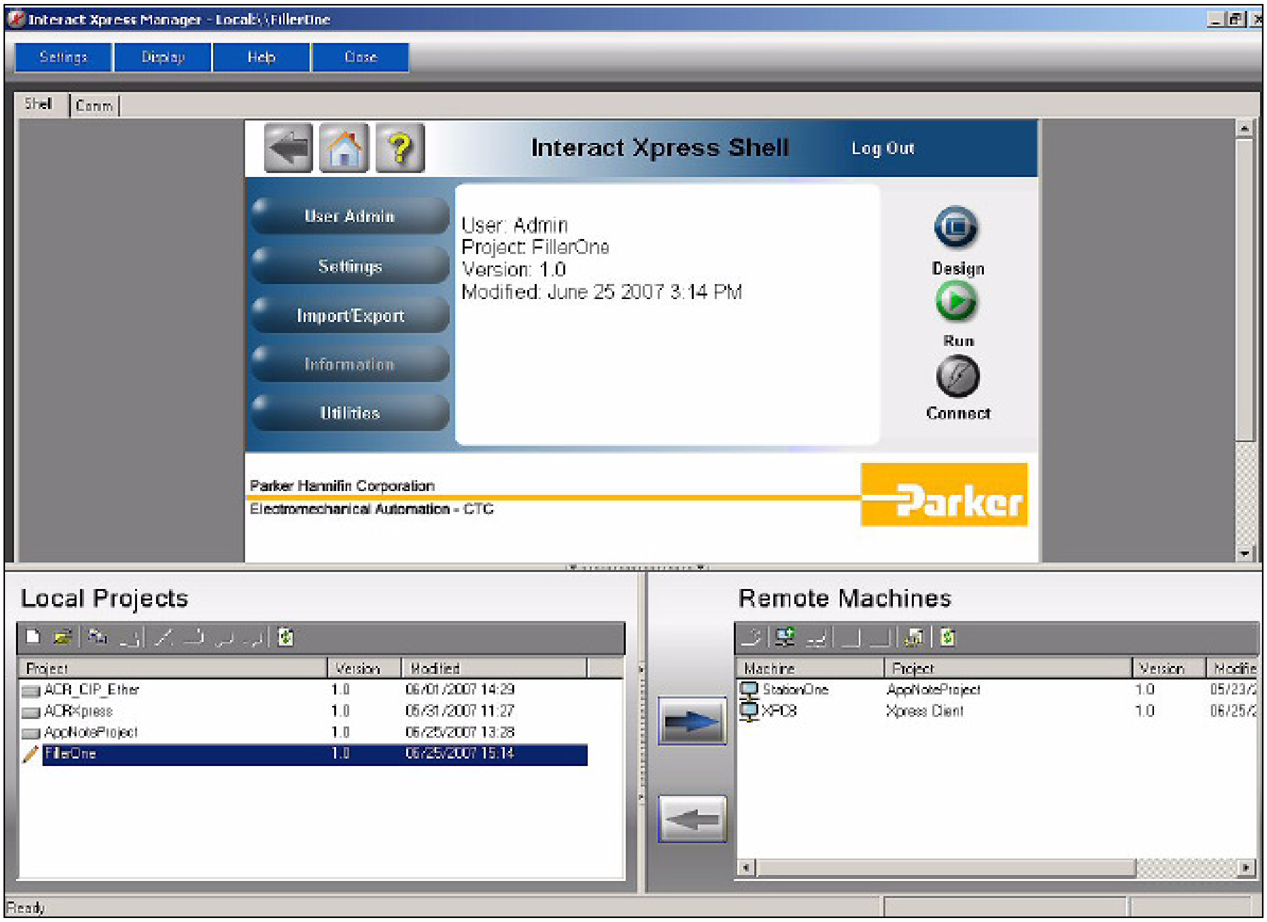
Launch Interact Xpress Manager from your workstation (PC). After Interact Xpress Manager launches and displays the welcome screen in the workspace, select the **New Project** from the local pane. The New Project dialog appears.



Project	Version	Modified	Firmware
ACR9040	1.0	4/19/2011 1:08 PM	2.1.4
ACRXpress Sample	1.0	4/19/2011 1:08 PM	2.1.4
ACRXpress Terminal	1.0	4/19/2011 1:09 PM	2.1.4
AriesXpress Sample	1.0	4/19/2011 1:09 PM	2.1.4
Greenscape Belo 080711	1.0	8/7/2011 11:18 PM	2.1.4
Greenscape Esplanade 092209	1.0	6/21/2011 6:17 PM	1.8

Figure 6 New Project in Interact Xpress

Enter a name for your project such as *MPiec*. The project is created and displays an icon within the local pane. The project launches within the workspace and Shell Screen appears as shown below.



User: Admin
Project: FillerOne
Version: 1.0
Modified: June 25 2007 3:14 PM

Project	Version	Modified
ACR_CIP_Ether	1.0	06/01/2007 14:29
ACRXpress	1.0	05/31/2007 11:27
AppNoteProject	1.0	06/25/2007 13:28
FillerOne	1.0	06/25/2007 15:14

Machine	Project	Version	Modifie
StationOne	AppNoteProject	1.0	05/23/2
XPC8	Xpress Client	1.0	06/25/2

Figure 7 Shell Screen

5.2.3.1 Create a Channel

Click on the “Comm” tab located on the upper top left corner.

Select “Click to add a channel” and create a name, such as “Channel 1.” Click next.

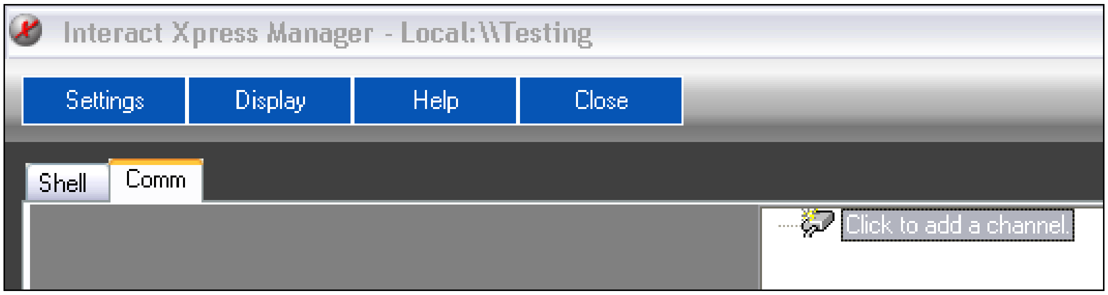
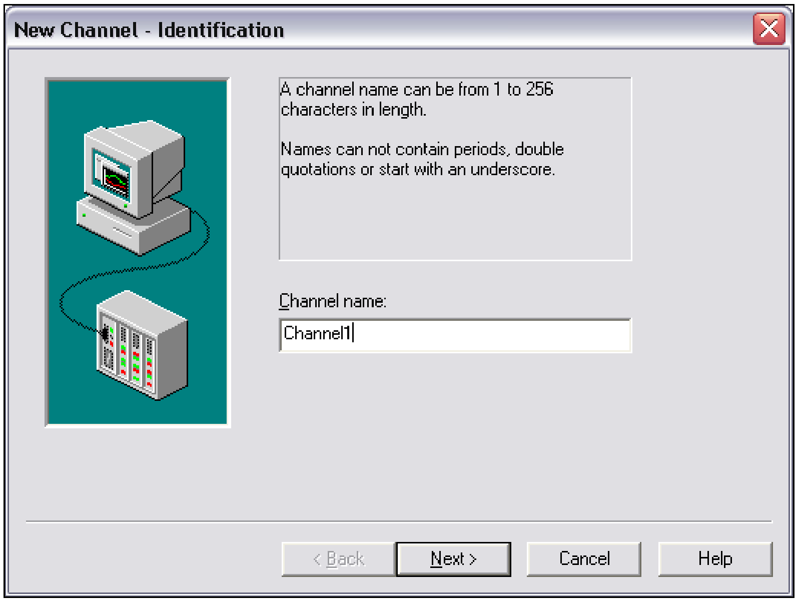


Figure 8 Comm Tab



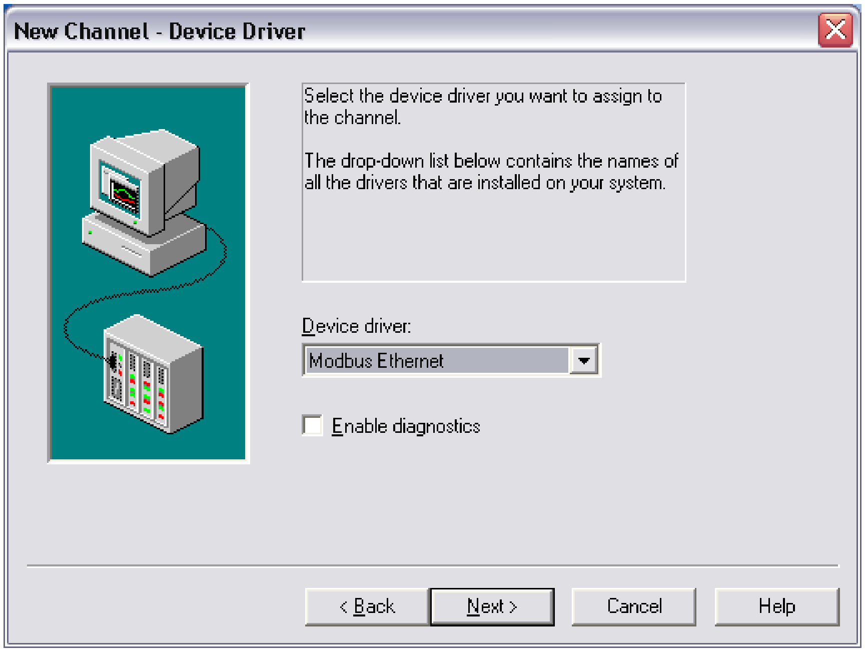
A channel name can be from 1 to 256 characters in length.

Names can not contain periods, double quotations or start with an underscore.

Channel name: Channel1

Figure 9 Channel Name

Select MODBUS ETHERNET on the Device Driver drop down window. Then, click “Next”.



New Channel - Device Driver

Select the device driver you want to assign to the channel.

The drop-down list below contains the names of all the drivers that are installed on your system.

Device driver: Modbus Ethernet

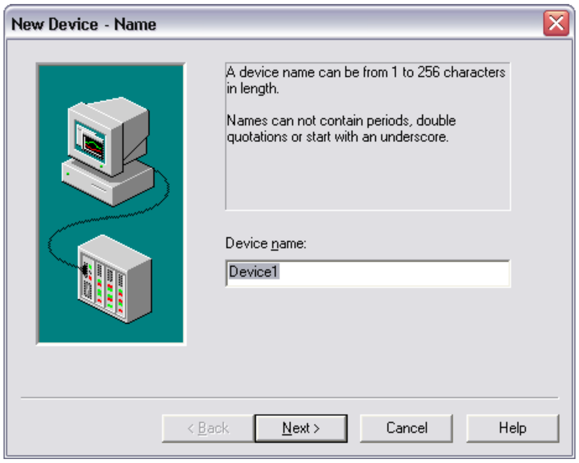
□ Enable diagnostics

Figure 10 MODBUS Device Driver

The next few pages should be familiar with Parker HMI users, such as Network Adapter, Optimization, Number of Sockets on Channel and a Summary Page. These can be left at default. Click Finish.

5.2.3.2 Create a Device

Next, create the device name, i.e. “MPiec”, and select device model, “MODBUS.” Click next.



New Device - Name

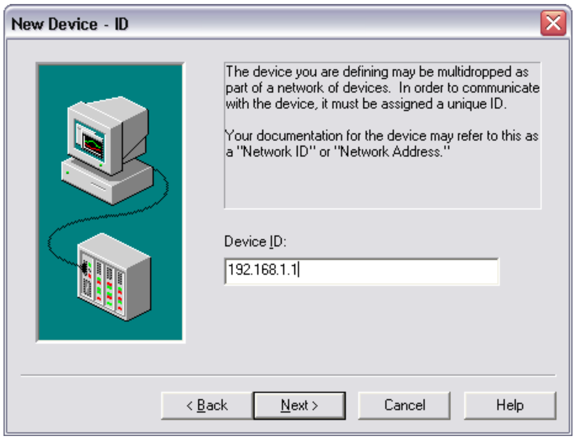
A device name can be from 1 to 256 characters in length.

Names can not contain periods, double quotations or start with an underscore.

Device name: Device1

Figure 11 Device Name

Set the IP address of the MPiec (192.168.1.1 with E-INIT dip switch set to ON). Click next until finished.



New Device - ID

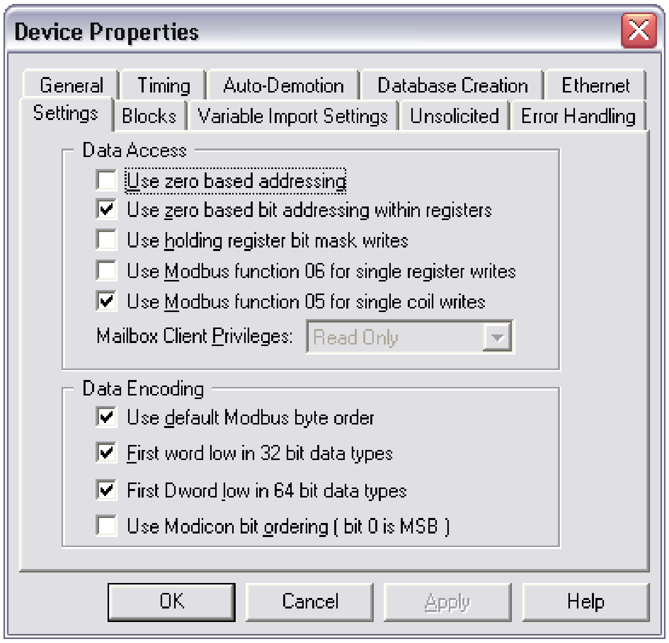
The device you are defining may be multidropped as part of a network of devices. In order to communicate with the device, it must be assigned a unique ID.

Your documentation for the device may refer to this as a "Network ID" or "Network Address."

Device ID: 192.168.1.1

Figure 12 Device ID - IP Address

Once back at the Shell page, double click on the device and verify the options below.



Data Access

- □ Use zero based addressing
- ☑ Use zero based bit addressing within registers
- □ Use holding register bit mask writes
- □ Use Modbus function 06 for single register writes
- ☑ Use Modbus function 05 for single coil writes

Mailbox Client Privileges: Read Only

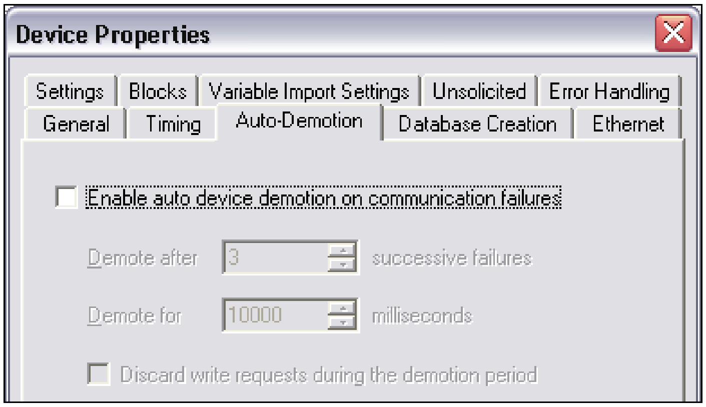
Data Encoding

- ☑ Use default Modbus byte order
- ☑ First word low in 32 bit data types
- ☑ First Dword low in 64 bit data types
- □ Use Modicon bit ordering (bit 0 is MSB)

Figure 13 Device Properties

- Use zero based addressing is “unchecked”
- Use MODBUS function 05 for single coil writes is “checked”
  - If this is not checked, it will default to function 03

Also verify Auto-Demotion is “unchecked”.



☐ Enable auto device demotion on communication failures

Demote after 3 successive failures

Demote for 10000 milliseconds

☐ Discard write requests during the demotion period

Figure 14 Auto-Demotion

After the device has been created, it should be displayed as below:

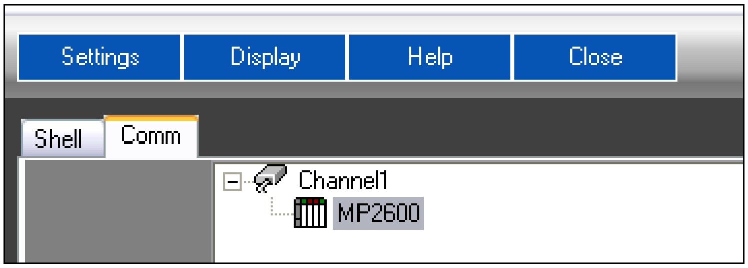
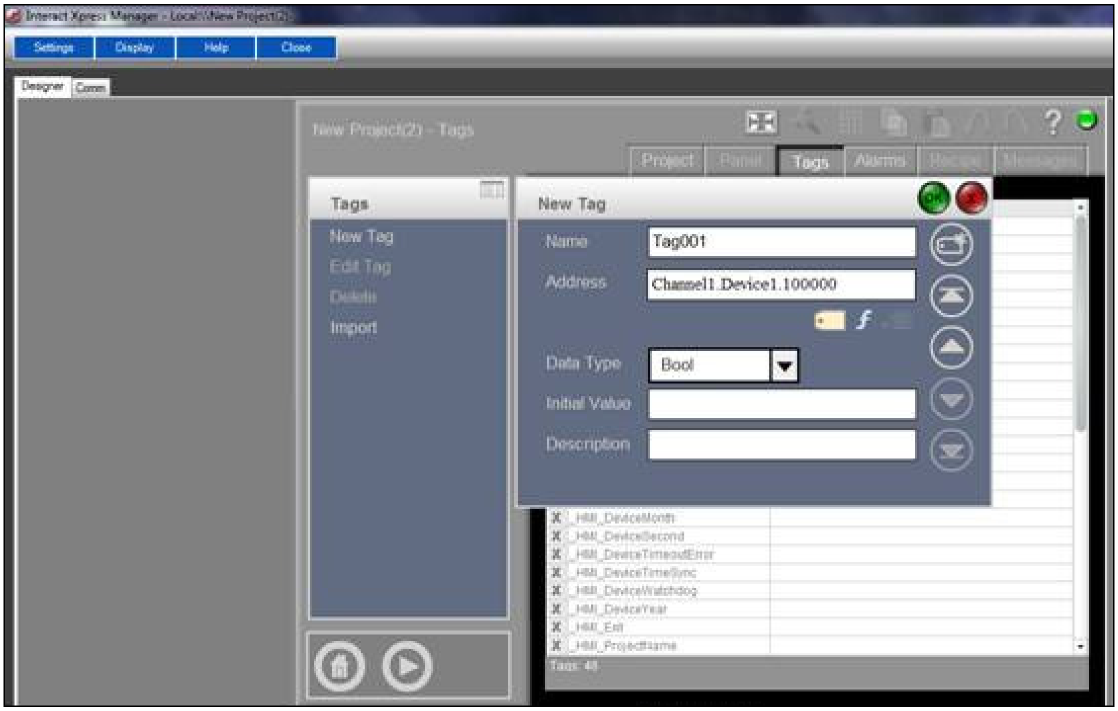


Figure 15 Created Device Display

5.2.3.3 Create a Tag

Click on the “Shell” tab at top left hand corner. Then click “Design”. Next, click on “Tags” and start creating a Tag Name, the address where to read/write and the data type.



Name: Tag001

Address: Channel1.Device1.100000

Data Type: Bool

Initial Value:

Description:

Figure 16 Referencing Tags

***Note: PARKER XPR HMI has the ability to reference the tag within the software instead of using KEPServer for creating tags. This way there is no duplication of creating tags then addressing them within Parker’s HMI. The following format is used when referencing tags within Interact Xpress:**

“ChannelName.DeviceName.FunctionCodeNumberMODBUSRegister”.

For example:

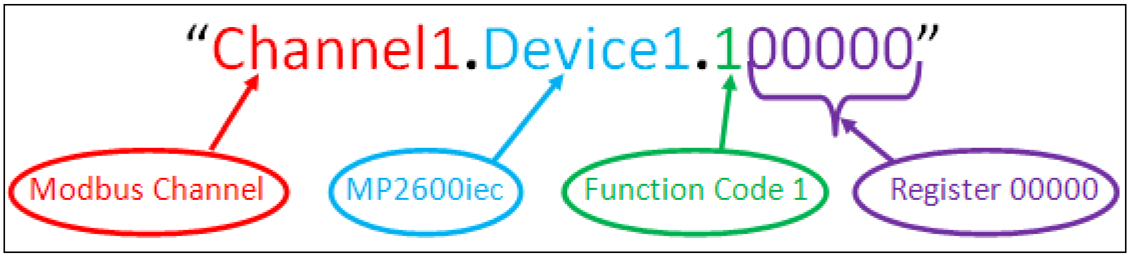
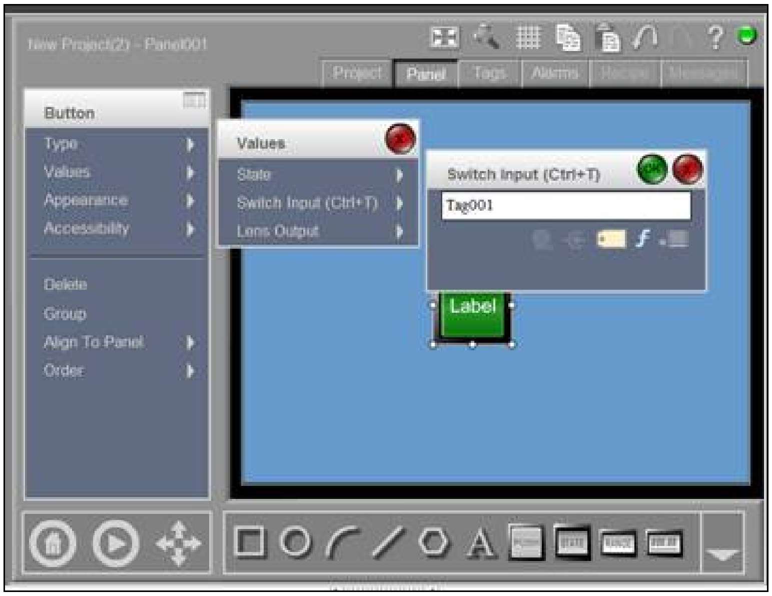


Figure 17 Format of Tag Name in INTERACT XPRESS

Go to Project tab and create a new Panel or panel from Template and start making an indicator light or pushbutton on panel area and link tag created.

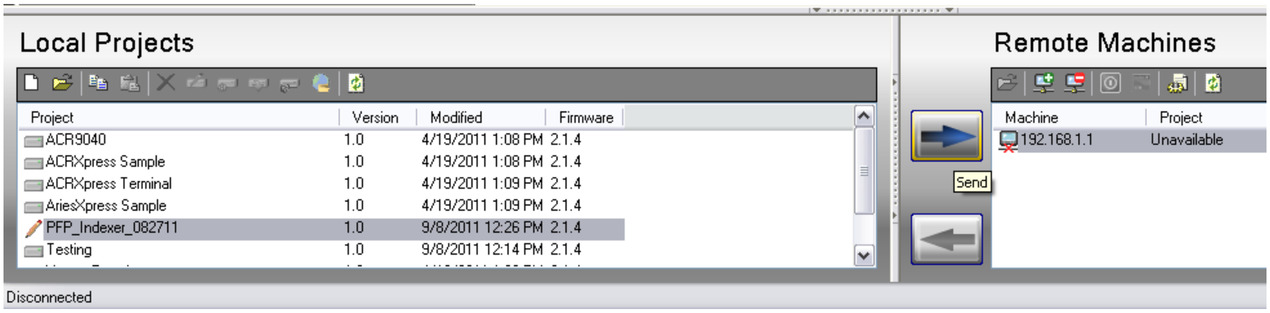


Tag001

Figure 18 New Panel with Tag Name

5.3 Send Project to HMI

In the Remote Machines Panel located at the bottom right hand corner: click on IP address. In the Local Projects, make sure project is selected. Click "Send" button.



Local Projects

Project	Version	Modified	Firmware
ACR9040	1.0	4/19/2011 1:08 PM	2.1.4
ACRXpress Sample	1.0	4/19/2011 1:08 PM	2.1.4
ACRXpress Terminal	1.0	4/19/2011 1:09 PM	2.1.4
AriesXpress Sample	1.0	4/19/2011 1:09 PM	2.1.4
PFP_Indexer_082711	1.0	9/8/2011 12:26 PM	2.1.4
Testing	1.0	9/8/2011 12:14 PM	2.1.4

Remote Machines

Machine	Project
192.168.1.1	Unavailable

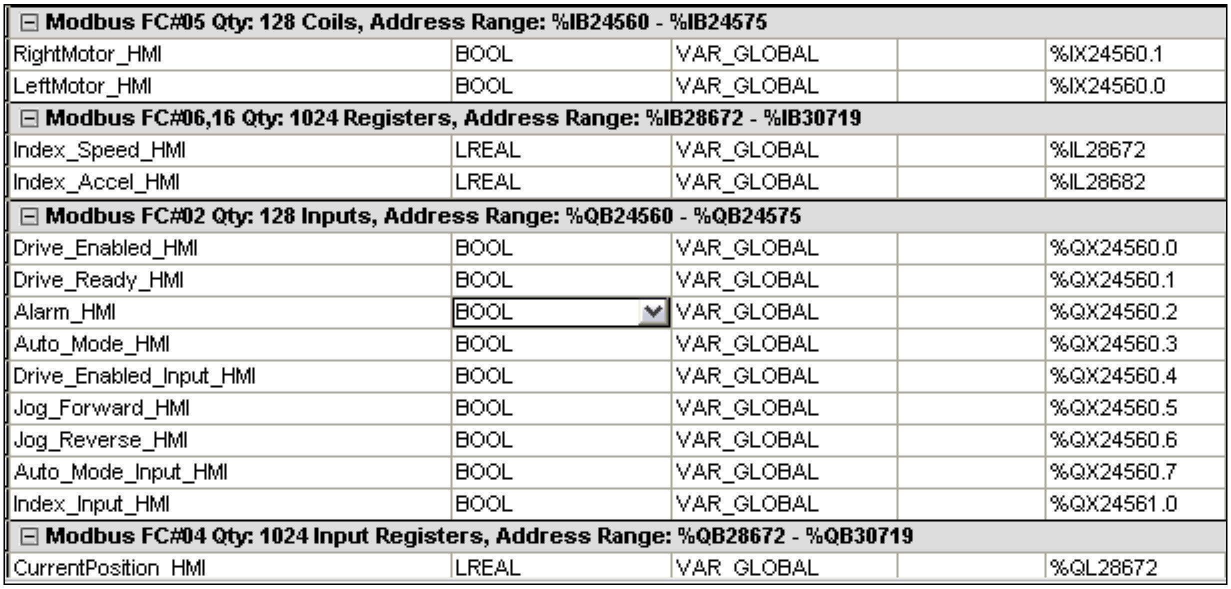
Figure 19 Send Project to HMI

On physical HMI screen, once booted into Shell page, click RUN on screen itself. Verify pushbutton toggles I/O on MPiec.

5.4 Verify Operation

The table below is a sample of data types to use.

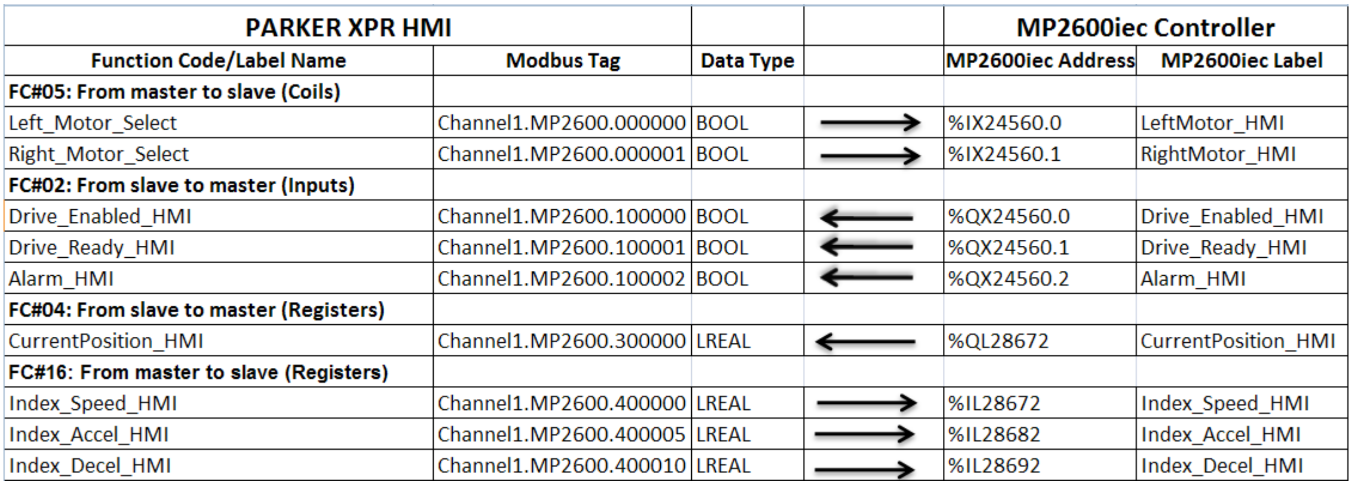
Table 1 Sample Variables



⊟ **Modbus FC#05 Qty: 128 Coils, Address Range: %IB24560 - %IB24575**				
RightMotor_HMI	BOOL	VAR_GLOBAL		%IX24560.1
LeftMotor_HMI	BOOL	VAR_GLOBAL		%IX24560.0
⊟ **Modbus FC#06,16 Qty: 1024 Registers, Address Range: %IB28672 - %IB30719**				
Index_Speed_HMI	LREAL	VAR_GLOBAL		%IL28672
Index_Accel_HMI	LREAL	VAR_GLOBAL		%IL28682
⊟ **Modbus FC#02 Qty: 128 Inputs, Address Range: %QB24560 - %QB24575**				
Drive_Enabled_HMI	BOOL	VAR_GLOBAL		%QX24560.0
Drive_Ready_HMI	BOOL	VAR_GLOBAL		%QX24560.1
Alarm_HMI	BOOL	VAR_GLOBAL		%QX24560.2
Auto_Mode_HMI	BOOL	VAR_GLOBAL		%QX24560.3
Drive_Enabled_Input_HMI	BOOL	VAR_GLOBAL		%QX24560.4
Jog_Forward_HMI	BOOL	VAR_GLOBAL		%QX24560.5
Jog_Reverse_HMI	BOOL	VAR_GLOBAL		%QX24560.6
Auto_Mode_Input_HMI	BOOL	VAR_GLOBAL		%QX24560.7
Index_Input_HMI	BOOL	VAR_GLOBAL		%QX24561.0
⊟ **Modbus FC#04 Qty: 1024 Input Registers, Address Range: %QB28672 - %QB30719**				
CurrentPosition_HMI	LREAL	VAR_GLOBAL		%QL28672

Some of the global variables listed with the MODBUS variables being used is shown in detail in Figure 18. The groups corresponding to function codes 05 and 16 are the input variables written from the HMI to the controller. The groups under function codes 02 and 04 are used to transfer variables from the controller to the HMI. They are denoted by %QX and %QL.

Table 2 Variable Tag List



PARKER XPR HMI				MP2600iec Controller	
Function Code/Label Name	Modbus Tag	Data Type		MP2600iec Address	MP2600iec Label
FC#05: From master to slave (Coils)					
Left_Motor_Select	Channel1.MP2600.000000	BOOL	→	%IX24560.0	LeftMotor_HMI
Right_Motor_Select	Channel1.MP2600.000001	BOOL	→	%IX24560.1	RightMotor_HMI
FC#02: From slave to master (Inputs)					
Drive_Enabled_HMI	Channel1.MP2600.100000	BOOL	←	%QX24560.0	Drive_Enabled_HMI
Drive_Ready_HMI	Channel1.MP2600.100001	BOOL	←	%QX24560.1	Drive_Ready_HMI
Alarm_HMI	Channel1.MP2600.100002	BOOL	←	%QX24560.2	Alarm_HMI
FC#04: From slave to master (Registers)					
CurrentPosition_HMI	Channel1.MP2600.300000	LREAL	←	%QL28672	CurrentPosition_HMI
FC#16: From master to slave (Registers)					
Index_Speed_HMI	Channel1.MP2600.400000	LREAL	→	%IL28672	Index_Speed_HMI
Index_Accel_HMI	Channel1.MP2600.400005	LREAL	→	%IL28682	Index_Accel_HMI
Index_Decel_HMI	Channel1.MP2600.400010	LREAL	→	%IL28692	Index_Decel_HMI