

Modbus - Establishing Communications Hints: Application Note: #1168

Introduction

This application note provides supplemental information about configuring Proface Device/PLC drivers to communicate with your device. To configure a driver refer to the Proface Device Connections Manuals for the software you are using. For supplemental information about cabling your 3rd party device to a Proface HMI refer to Application note #1167 3rd Party Modbus Serial Cabling Tips.

Select the Correct Device Driver:

Master or slave device driver? In most installations the HMI is the master and the connected devices are slaves. Modbus serial allows a slave to have only one master. If the project is GP-Pro/PB3 use the "Schneider Modbus RTU 1:n comm." device/PLC driver. If the device has an ASCII – RTU protocol selection choose RTU. (Modbus TCP allows more than one master. The number of masters possible is determined by the ability of the slave device to handle multiple masters.)

If the HMI is the slave and the connected device is the master select the Modbus Slave driver. In GP-Pro/PB3 select the "Modicon Modbus (SLAVE)" driver.

The remainder of this document assumes a Modbus master driver is selected.

Configuring and Establishing Successful Communications

When attempting to establish communications with a 3rd party device for the first time multiple factors need to be determined. Begin with a very simple project. Connect only one master to one slave.

Build a simple single screen application with a numeric entry field in the 400000 range (%MW if using IEC addressing). Select a register in the 3rd party device that is a read/write 16 bit integer that is not locked and can be changed via a Modbus connection. Select a register greater than 400001 or %MW1. Do not attempt to use other memory ranges or bit variables in the test project.

GP-Pro EX only: The driver default setting is traditional Modbus addressing. IEC addressing can be selected in the device driver setup.

Configure the serial parameters speed and parity to match the 3rd party device settings. Set the data length and stop bits to match the device settings if they are known. If they are not known begin with the driver default settings

Set Wait to Send (Send Wait or TX Wait Time) to match the device wait to transmit or send time. This is a configurable parameter in some 3rd party devices. If this information is not available begin with the Device/PLC driver default setting. Exception: If the default setting in the driver is 0 begin with a setting of 4msec. (Modbus TCP typically does not require Wait to Send unless communications is via a TCP to serial bridge)

GP-Pro/PB3 only: Uncheck all the registers in the GP Settings/ Extended Settings/ System Area. Select a System Start Address that is a 16 bit read/write register that can be altered in the 3rd party device. Do not use the System Start Address on any screen. Set the watchdog word address to an

unused register like LS100. GP-Pro PB Read Area Size should 0. These settings can be changed in your project as desired later.

GP-Pro EX only: Do not enable the System Data Area. This can be enabled after communication is established if these features are desired.

Note about devices that support 32 bit words only: If your device has only 32 bit registers configure the test project numeric field as a 32 bit integer. The device addressing must be 16 bit word oriented. This means the 32 bit words use 2 addresses in the device. (Example: One 32 bit word would occupy 400010 and 400011 or %MW9 and %MW10.) Use a register greater than 400002 or %MW2. GP-Pro EX: In Max Query set all words at 2 and all bits at 32

Download the project

If an error appears on the Proface unit refer to the software documentation for a description of the error. The suggestions below are things to check and try:

If communications are not established:

- 1> Check the slave Modbus RTU address or machine number. In GP-Pro/PB3 verify the Modbus RTU Slave Configuration.
- 2> Be sure the 3rd party device is in "Run" mode and the 3rd party device communication port is enabled.
- 3> If the connection is 2 wire RS485 try interchanging the A and B leads.
- 4> Be sure to have a common wire connected. If the device does not have a signal common connection use signal ground. If neither exists connect the common wire to the device frame or earth ground.
- 5> Set the Wait to Send to 10msec and try again. If still no response try 20 msec. (serial connections only) If no response try interchanging the A and B leads again.
- 6> Remove the numeric entry variable from the test project and download it again.
 - a. If the error no longer appears the memory location may be read only or write only or not accessible in the 3rd party device by the HMI.
 - b. *GP-Pro/PB3 only:* If the error still appears the System Start Address may not be an accessible read/write register in the 3rd party device. Verify the register in the 3rd party device is not being written to at the same time by the device. Try another system start address. Also the project may have an error. Check the Symbol Editor for symbols without an Address.
- 7> *GP-Pro EX only:* Try changing the settings in individual device settings. Change all register max query settings to 2 words. Change all the Coil/Discrete Input setting to 16. Try again. Many 3rd party field devices such as drives and sensors including devices that use 32 bit words require small max query settings.
- 8> *GP-Pro EX only:* Change the "Single Bit manipulation to Coil/Discrete Input" setting. Try again.
- 9> *GP-Pro/PB3 only:* Some 3rd party devices that use an earlier implementation of Modbus RTU, especially legacy devices, will only function with the Modicon Corp. "Modicon Modbus (MASTER)" device/PLC driver. If this might be the case try using that driver.

If communications are established but a communication error appears:

- 1> If the error appears only after trying to write a new value using the numeric entry keypad the value is being written by the 3rd party device to that register and it cannot be overwritten, or the register is read-only, or write permission is not established in the device. Try another memory address.

- 2> If an error appears and data is displayed in the numeric field set the wait state to 10msec and try again. If not successful try 20msec. *GP-Pro EX only:* Try changing the settings in individual device settings. Change all register max query settings to 2 words. Change all the Coil/Discrete Input setting to 16. Try again.
- 3> *GP-Pro EX only:* If the above changes did not work change the “Single Bit manipulation to Coil/Discrete Input” setting. Try again.
- 4> The memory location may be read only or write only or not accessible in the 3rd party device by the HMI. Try removing the numeric entry box from the project to see if the error disappears.
- 5> Set the wait state to 10msec and try again. If not successful try 20msec.
- 6> *Modbus TCP only:* Try setting a wait state even when using Modbus TCP. It will slow the requests to the device reducing the communication load on the device and reduce network traffic. Set the wait state to 10msec and try again. If not successful try 20msec

If communications are established and incorrect data appears:

Some 3rd party devices use a different bit order or byte order. In the case of 32 bit values such as double word and floating point sometimes the word order is different.

- 1> Check first that a 16 bit integer is located at the expected address in both devices. It is common for the addressing to differ by one word. One way to do this is to place 3 consecutive numeric entry fields on the screen. (Example 400101, 400102, 400103 or %M101, %M102, %M103. Monitor the same addresses in the 3rd party device. Check if the data is written to the correct address when a change is made on the HMI and not the address above or below it. The register addressing may be offset by one word.
- 2> If the data is written to the correct address, but appears to be the wrong value, try entering a value of 1 from the HMI. If the resulting value in the device is a large number the byte order may be reversed between the units. The byte order can be switched in the HMI using script.
- 3> If the data is written to the correct address, the next step is to test a 32 bit integer. If the value is incorrect, when using GP-Pro EX, change the “Double Word order” selection in Device/PLC Individual Device Settings. If the project is GP-Pro/PB3 ideally the words can be swapped in the third party device; if not the words can be swapped using script.

For more information on Pro-face and our full line of HMI, Operator Interface and Industrial PC products please visit our web site at www.profaceamerica.com.