AN-023
Protégé Controller ModBUS Slave Configuration and Register Map

PUBLICATION INFORMATION

This application note covers the use of the protégé system to perform a specific function and may be used in conjunction with other publications. Specifications may change without notice, for updates visit the Integrated Control Technology website at www.integratedcontroltechnology.com. No other hardware was used to prepare this application note and will not affect the result of the application using the programming information presented.

PREFACE

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Disclaimer

This application note describes the use of various Third Party software products to allow the ModBUS RTU Service to be exercised and monitored for testing purposes. The tag databases used within this application note can be downloaded. The applications used are not supported or supplied by Integrated Control Technology Limited and need to be acquired from the appropriate companies.

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PROTÉGÉ SYSTEM

Introduction

The Protégé System is a powerful integrated alarm and access control management system designed to provide integration with building automation, apartment complex control and HVAC in one flexible package. Communicating through a proprietary high speed protocol across an encrypted RS-485 network using modular-based hardware design, system installers have the flexibility to accommodate any installation from small or large, residential or commercial.

Application Note Information

This application note describes the interface of the Protégé System Controller to a ModBUS RTU Slave Network and the register map associated with the ModBUS RTU Slave communication service.

Application Note Version

This application note is designed to be used with version 1.06 build 2915 of the Protégé System Controller.

Revision	Application Note	Published
1.00	AN_023	**10/25/2006 2:08:00 PM**

ABOUT MODBUS

Overview

The following information describes the operation of Modbus as it relates to the Protégé System Controller. For more detailed information on Modbus, you may also refer to the "Modicon ModBUS Reference Guide", PI-MBUS-300 Rev J, available via download from www.public.modicon.com.

The ModBUS protocol provides an industry standard method that ModBUS devices use for parsing messages. This protocol was developed by Modicon, Incorporated, for industrial automation systems and Modicon programmable controllers. ModBUS devices communicate using a master-slave technique in which only one device (the master) can initiate transactions (called queries). The other devices (slaves) respond by supplying the requested data to the master, or by taking the action requested in the query. A slave is any peripheral device (I/O transducer, valve, network drive, or other measuring device) which processes information and sends its output to the master using ModBUS. The Protégé System Controller operates as a slave device, while a typical master device is a host computer running appropriate application software.

Masters can address individual slaves, or can initiate a broadcast message to all slaves. Slaves return a response to all queries addressed to them individually, but do not respond to broadcast queries. A master's query consists of a slave address (or broadcast address), a function code defining the requested action, any required data, and an error checking field. A slave's response consists of fields confirming the action taken, any data to be returned, and an error checking field. Note that the query and response both include a device address, plus a function code, plus applicable data, and an error checking field. If no error occurs, the slave's response contains the data requested. If an error occurs in the query received, or if the slave is unable to perform the action requested, the slave will return an exception message as its response (see ModBUS Exceptions on the modbus.org website).

The error check field of the message frame allows the master to confirm that the contents of the message are valid. Additionally, parity checking is also applied to each transmitted character in its data frame.

ModBUS Register Maps

ModBUS devices usually include a Register Map. ModBUS functions operate on register map registers to monitor, configure, and control module I/O. A register map is provided in this document for the Protégé System Controller. You will also find it helpful to refer to the register map as you review the functionality that is required to be integrated with the Protégé System Controller.

ModBUS registers are organized into reference types identified by the leading number of the reference address:

Register Reference Description

0xxxxx Read/Write Discrete Outputs or Coils. A 0x reference address is used to drive output data to a digital output channel.

1xxxxx Read Discrete Inputs. The ON/OFF status of a 1x reference address is controlled by the corresponding digital input channel.

3xxxxx Read Input Registers. A 3x reference register contains a 16-bit number received from an external source—e.g. an analog input signal.

4xxxxx Read/Write Output or Holding Registers. A 4x register is used to store 16-bits of numerical data (binary or decimal), or to send the data from the CPU to an analog output channel.

Not all ModBUS functions operate on register map registers. For example, the Report Slave ID and Reset Slave functions do not operate on register map locations.

Standard ModBUS networks employ one of two types of transmission modes. ASCII Mode, or RTU Mode. The transmission mode defines the bit contents of the message bytes transmitted along the network, and how the message information is to be packed into the message stream and decoded.

The mode of transmission is selected within the Protégé ModBUS Slave Service along with other serial port communication parameters (address, baud rate, parity, etc.) as part of the service configuration. The ModBUS RTU Slave Service in the Protégé System Controller supports the Binary Mode only and ASCII mode is not supported due to the increased processing time required.

SERVICE CONFIGURATION

Overview

The following steps show how to configure the service. If you are connecting to a live ModBUS Network ensure that your Slave ID and related information is accurate and that you have tested the connection with a test suite or other application first.

Use a test suite or application such as TopServer to communicate with your ModBUS Service prior to deployment in to a live network. This will allow verification of the points and registers.

Programming The Service

To program the service ensure that you have the Slave ID and Communication Parameters from the host application. In the example below we have a slave id of 01 and default parameters of 9600 baud and even parity.

LCD Keypad Programming
If you are not sure about navigation within the Protégé LCD Keypad review the installation and reference manual. The default installer code is **[000000]**.

Enter user code: ******	Login to the LCD keypad using the installer code or a suitable code that has been programmed with the Menu 4 access to the system.
Service to modify: SV001	Go to the service programming settings by selecting the Service Programming Menu. Press **[MENU, 4, 7, 1]**. The display will prompt you to select a service to modify.
Service to modify: SV005	Press the **[UP]** arrow key until you get to a service that is not being used. Our example uses service 5 which by default is a spare service. Once you have the service you are going to modify press **[ENTER]**.
SV005 State Halted	Press the **[ENTER]** key to move to the next screen. We will be returning to this screen to start the service when we have completed the programming.
SV005 Ser Type ModBUS Slave	Press the **[1]** key until the display shows the ModBUS Slave service type. Press the **[ENTER]** key to save the setting.
SV005 Ser Mode Start with O/S	Press the **[1]** key until the display shows the Start with O/S option. This will mean that if the system controller is reset or powered down the service will start automatically. Press the **[ENTER]** key to save the setting and move to the next screen.

SV005 Port **Ext Port 1**	Press the **[1]** key until the display shows the Serial Port that will be used to communicate with the ModBUS Network. In our configuration we are using External Port 1. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Speed **9600**	Press the **[1]** key until the display shows the communication speed Serial Port that will be used to communicate with the ModBUS Network. In our configuration we are using 9600 bits per second. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Parity **Even Parity**	Press the **[1]** key until the display shows the parity that will be used to communicate with the ModBUS Network. In our configuration we are using Even Parity. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Device **address: 01**	Use the numerical keys and the **[2]** and **[3]** key to enter the hexadecimal address that will be used as the device ID when communicating on the ModBUS Slave Network. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Data **[********]**	Use the numerical keys from **[1]** to **[8]** to enable options. We are using the default options. Refer to the Protégé System Controller Reference Manual for a list of these options and configurations. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Poll fail **time: 030 secs**	Use the numerical keys to enter a poll failure time. This is a time that the system controller will allow no communication to occur without activating a poll failure alarm and alarming the ModBUS failure trouble zone. Press the **[ENTER]** key to save the setting and move to the next screen.
SV005 Poll fail **pgm: --000:00**	The poll fail PGM will activate if communication has not occurred for the poll fail time. If the poll fail option is not used do not program a PGM. Press the **[ENTER]** key to save the setting and move to the next screen.

Starting The Service

Once you have pressed the **[ENTER]** key at the last screen press it until you see the service state display this is the first screen after the service to modify screen. Press the **[1]** key to start the service.

Protégé System Management Suite Programming

Programming the services using the Protégé System Management Suite is accomplished using the services option under the system programming tab in the shortcuts menu. Select the service you want to program by double clicking the item in the list.

Figure 1 – Service Selection

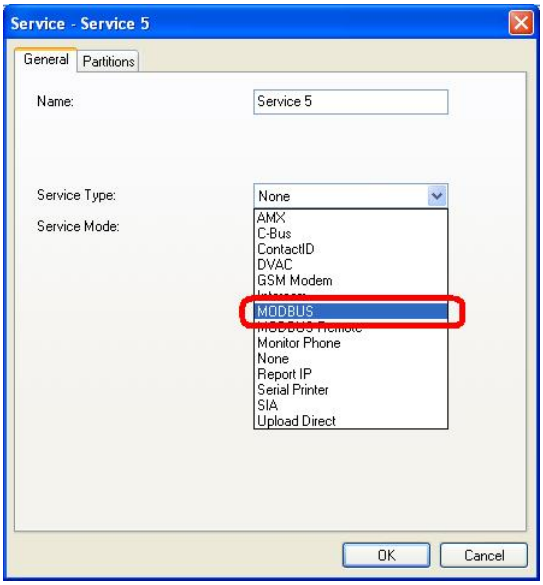

Figure 2 – Setting the Service Type

After the selection of the service type you will be prompted to close and open the service again this is so the application can redraw the dialog box with the options that are defined for that service type.

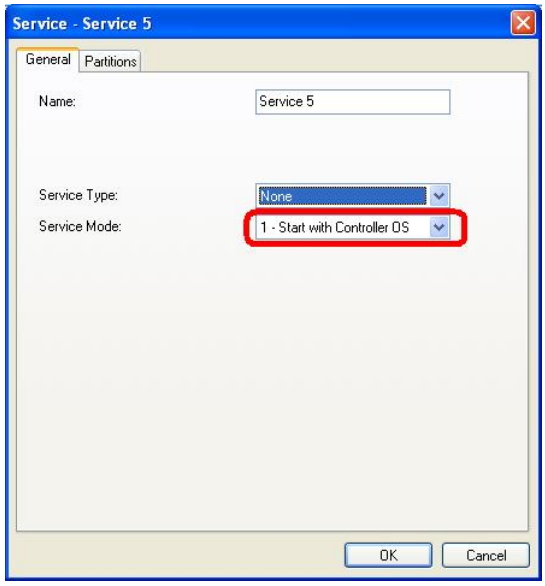

Figure 3 – Setting the Start with Operating System Operation

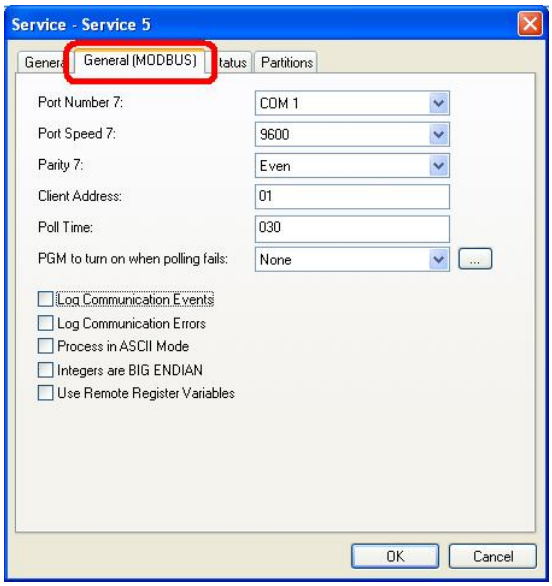

Figure 4 – General Settings

To start the service from the Protégé System Management Suite right click on the service number and select the start option from the context menu.

REGISTER CONFIGURATION

Overview

The following register map defines each coil, input and register that is available in the Protégé System Controller. Any registers that are not defined should be treated as a reserved location and not used for any other purpose.

Map Structure

Many of the registers within the Protégé System Controller are mapped using standard registers this allows data to be sent in the raw binary form. As an alternative the trouble zones and zones are mapped using the Input Type and they provide a single bit value for alarm and closed. Programmable outputs are mapped to type coils unless the zone coil option is set which allows zones to be opened and closed from a ModBUS device for reporting.

Physical PGM Outputs Coil Address Map

Coils are Boolean values (1 or 0) that are used to typically represent an output device. Coils can be controlled and can also return a status dependent on the attached or associated device. The following shows the mapping between the Coil address and outputs on the Protégé System Controller and Modules. There are also some coils that provide the ability to control doors and automation outputs in the Protégé System Controller.

System Controller PGM Output Coils
There is only one control panel per ModBUS configuration and this will allow the control and status of the 4 on board PGM Outputs.

PGM Number	Function	Read / Write	ModBUS Coil Number
CP001:01	Bell 1 Siren Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	00001
CP001:02	Bell 2 Siren Output	RD+WR	00002
CP001:03	PGM 3 Output	RD+WR	00003
CP001:04	PGM 4 Output	RD+WR	00004

LCD Keypad PGM Output Coils

The keypad will allow the manipulation of PGM outputs 1 to 4 on the first 128 registered modules. To find out if a particular module or device is registered you can used the module registration registers that are available in the ModBUS Protocol.

PGM Number	Function	Read / Write	ModBUS Coil Number
KP001:01	PGM 1 Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	00005
KP001:02	Red LED Output	RD+WR	00006
KP001:03	Green LED Output	RD+WR	00007
KP001:04	Beeper Output	RD+WR	00008
KP002:01	PGM 1 Output	RD+WR	00009
▌ ▌ ▌	▌ ▌ ▌ ▌ ▌	▌ ▌	▌ ▌
KP128:04	Beeper Output	RD+WR	00516

16 Zone Input Expander PGM Output Coils

The zone expander will allow the manipulation of PGM outputs 1 to 4 on the first 128 registered expanders. To find out if a particular module or device is registered you can used the module registration registers.

PGM Number	Function	Read / Write	ModBUS Coil Number
ZX001:01	Bell 1 PGM Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	00517
ZX001:02	Bell 2 PGM Output	RD+WR	00518
ZX001:03	PGM 3 Output	RD+WR	00519
ZX001:04	PGM 4 Output	RD+WR	00520
ZX002:01	Bell 1 PGM Siren Output	RD+WR	00521
▌ ▌ ▌	▌ ▌ ▌ ▌ ▌	▌ ▌	▌ ▌
ZX128:04	PGM 4 Output	RD+WR	01028

Two Reader Expander (All Models) PGM Output Coils

The reader expander will allow the manipulation of PGM outputs 1 to 8 on the first 128 registered modules. If you want to control a door do not control the LOCK output directly use the door control registers to process the door unlock and lock commands as this will interact correctly with the door open and closed and relocking functions.

PGM Number	Function	Read / Write	ModBUS Coil Number
RD001:01	Lock 1 PGM Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	01029
RD001:02	Lock 2 PGM Output	RD+WR	01030
RD001:03	Reader 1 Green LED PGM Output	RD+WR	01031
RD001:04	Reader 1 Red LED PGM Output	RD+WR	01032
RD001:05	Reader 1 Beeper PGM Output	RD+WR	01033
RD001:06	Reader 2 Green LED PGM Output	RD+WR	01034
RD001:07	Reader 2 Red LED PGM Output	RD+WR	01035
RD001:08	Reader 2 Beeper PGM Output	RD+WR	01036
RD002:01	Lock 1 PGM Output	RD+WR	01037
⋮	⋮	⋮	⋮
RD128:08	Reader 2 Beeper PGM Output	RD+WR	02052

16 PGM Output Expander PGM Output Coils

The PGM output expander will allow the manipulation of PGM outputs 1 to 16 on the first 128 registered modules.

PGM Number	Function	Read / Write	ModBUS Coil Number
PX001:01	PGM 1 Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	02053
PX001:02	PGM 2 Output	RD+WR	02054
PX001:03	PGM 3 Output	RD+WR	02055
PX001:04	PGM 4 Output	RD+WR	02056
PX001:05	PGM 5 Output	RD+WR	02057

PX001:06	PGM 6 Output	RD+WR	02058
PX001:07	PGM 7 Output	RD+WR	02059
PX001:08	PGM 8 Output	RD+WR	02060
PX001:09	PGM 9 Output	RD+WR	02061
PX001:10	PGM 10 Output	RD+WR	02062
PX001:11	PGM 11 Output	RD+WR	02063
PX001:12	PGM 12 Output	RD+WR	02064
PX001:13	PGM 13 Output	RD+WR	02065
PX001:14	PGM 14 Output	RD+WR	02066
PX001:15	PGM 15 Output	RD+WR	02067
PX001:16	PGM 16 Output	RD+WR	02068
PX002:01	PGM 1 Output	RD+WR	02069
⋮	⋮	⋮	⋮
PX128:16	PGM 16 Output	RD+WR	04100

Analog Input/Output Expander PGM Output Coils

The analog output expander will allow the manipulation of PGM outputs 1 to 4 on the first 128 registered modules.

PGM Number	Function	Read / Write	ModBUS Coil Number
AE001:01	PGM 1 Output <u>Coil Read</u> Status Value • 0 = PGM is Off • 1 = PGM is On <u>Coil Write</u> Control Value • 0 = Deactivate PGM • 1 = Activate PGM	RD+WR	04101
AE001:02	PGM 2 Output	RD+WR	04102
AE001:03	PGM 3 Output	RD+WR	04103
AE001:04	PGM 4 Output	RD+WR	04104
AE002:01	PGM 1 Output	RD+WR	04105
⋮	⋮	⋮	⋮
AE128:04	PGM 4 Output	RD+WR	04612

System Doors Output Coils

The doors being mapped as coils is provided as a alternative to using the register maps the coil provides a single status which is the lock and not the position (see inputs).

Door Number	Function	Read / Write	ModBUS Coil Number
DR001	Door 1 Lock Output <u>Coil Read</u> Status Value • 0 = Door Locked	RD+WR	08001

	• 1 = Door Unlocked (can be any of the unlock types, this means the door lock is not locked) <u>Coil Write</u> Control Value • 0 = Lock Door • 1 = Unlock Door For Door Time		
DR002	Door 2 Lock Output	RD+WR	08002
DR003	Door 3 Lock Output	RD+WR	08003
⎪ ⎪	⎪ ⎪ ⎪ ⎪ ⎪	⎪ ⎪	⎪ ⎪
DR256	Door 256 Lock Output	RD+WR	08256

System Automation Control Output Coils
The ability to map automation points as a coil is provided as an alternative to using the register maps. The status returned reflects the automation point status. Automation points and ModBUS can be used to create a ModBUS to C-Bus® Communication Bridge.

Door Number	Function	Read / Write	ModBUS Coil Number
AT001	Automation Control 1 Output <u>Coil Read</u> Status Value • 0 = Automation Point is Off • 1 = Automation Point is On (could be any activation state) <u>Coil Write</u> Control Value • 0 = Turn Off Automation Point • 1 = Turn On Automation Point	RD+WR	08257
AT002	Automation Control 2 Output	RD+WR	08258
AT003	Automation Control 3 Output	RD+WR	08259
⎪ ⎪	⎪ ⎪ ⎪ ⎪ ⎪ ⎪ ⎪	⎪ ⎪	⎪ ⎪
AT256	Automation Control 256 Output	RD+WR	08512

Zone Coil Translation Functions

As mentioned in the coils section above they are Boolean values (1 or 0) that are used to typically represent an output device however in the Protégé System Controller there is the ability to enable the zone to coil translation option to allow a coil to be mapped to a zone input (virtual, no device is present at the location).

The ability to map a coil to a physical or virtual zone on the Protégé System Controller allows a coil to be activated from the ModBUS host which will then cause an alarm or action to occur on the Protégé System. This might be used for reporting alarms from a SCADA system or performing some other automation or integrated action to occur.

Reading from the coil that is within one of the zone translation values will return the status of the zone input and not a memory region or coil value. The zone will return a '1' to the coil register for open / alarm and '0' for closed / restored.

To allow these coils to be written and the subsequent zone to be opened or closed as a result of the request the option must be set to allow this to occur in the service data options. When writing a coil that is translated to a zone setting a coil value of '1' will open the zone and '0' will restore the zone. Writing a value that is already set for the zone will result in no change taking place on the zone and no event occurring.

Control Panel Zone Coil Translation Functions

The control panel zones can NOT be controlled from the ModBUS interface using the Zone Coil Translation Functions.

LCD Keypad Zone Coil Translation Functions

The LCD Keypad will allow the manipulation of zone inputs 1 to 4 on the first 128 modules that are not registered. Do not use zones that are on a registered module as the module will over write the ModBUS settings.

Zone Number	Function	Read / Write	ModBUS Coil Number
KP001:01	Zone 1 Activation	RD+WR	60001
KP001:02	Zone 2 Activation	RD+WR	60002
KP001:03	Zone 3 Activation	RD+WR	60003
KP001:04	Zone 4 Activation	RD+WR	60004
KP002:01	Zone 1 Activation	RD+WR	60005
| |	| | | | | |	| |	| |
KP128:04	Zone 4 Activation	RD+WR	60512

Zone Expander Zone Coil Translation Functions

The Zone Expander will allow the manipulation of zone inputs 1 to 16 on the first 128 modules that are not registered. Do not use zones that are on a registered module as the module will over write the ModBUS settings.

Zone Number	Function	Read / Write	ModBUS Coil Number
ZX001:01	Zone 1 Activation	RD+WR	60513
ZX001:02	Zone 2 Activation	RD+WR	60514
ZX001:03	Zone 3 Activation	RD+WR	60515
ZX001:04	Zone 4 Activation	RD+WR	60516
ZX001:05	Zone 5 Activation	RD+WR	60517
ZX001:06	Zone 6 Activation	RD+WR	60518
ZX001:07	Zone 7 Activation	RD+WR	60519
ZX001:08	Zone 8 Activation	RD+WR	60520
ZX001:09	Zone 9 Activation	RD+WR	60521
ZX001:10	Zone 10 Activation	RD+WR	60522
ZX001:11	Zone 11 Activation	RD+WR	60523
ZX001:12	Zone 12 Activation	RD+WR	60524
ZX001:13	Zone 13 Activation	RD+WR	60525
ZX001:14	Zone 14 Activation	RD+WR	60526
ZX001:15	Zone 15 Activation	RD+WR	60527
ZX001:16	Zone 16 Activation	RD+WR	60528
ZX002:01	Zone 1 Activation	RD+WR	60529

ZX128:16	Zone 16 Activation	RD+WR	62560

Two Reader Expander Zone Coil Translation Functions

The Two Reader Expander will allow the manipulation of zone inputs 1 to 8 on the first 128 modules that are NOT registered. Do not use zones that are on a registered module as the module will over write the ModBUS settings.

Zone Number	Function	Read / Write	ModBUS Coil Number
RD001:01	Zone 1 Activation	RD+WR	62561
RD001:02	Zone 2 Activation	RD+WR	62562
RD001:03	Zone 3 Activation	RD+WR	62563
RD001:04	Zone 4 Activation	RD+WR	62564
RD001:05	Zone 5 Activation	RD+WR	62565
RD001:06	Zone 6 Activation	RD+WR	62566
RD001:07	Zone 7 Activation	RD+WR	62567
RD001:08	Zone 8 Activation	RD+WR	62568
RD002:01	Zone 1 Activation	RD+WR	62569
RD128:08	Zone 8 Activation	RD+WR	63584

Input Address Map

Inputs are Boolean values (1 or 0) that are read only and typically return the status of an Input. If an input is requested that is not registered on the system or outside the bounds of the interface the response will be 0 and will not generate an exception result.

System Controller Zone Input Address

There is only one control panel per ModBUS configuration and this will allow the reading of the 16 onboard zone inputs. Zone inputs are 4 states on the Protégé System however when using the input functions if the zone is not closed it will be shown as 0. Use the input registers to read the actual zone values, this also returns the bypass values.

Zone Number	Function	Read / Write	ModBUS Input Number
CP001:01	Zone 1 Input	RD	00001
CP001:02	Zone 2 Input	RD	00002
CP001:03	Zone 3 Input	RD	00003
CP001:04	Zone 4 Input	RD	00004
CP001:05	Zone 5 Input	RD	00005
CP001:06	Zone 6 Input	RD	00006
CP001:07	Zone 7 Input	RD	00007
CP001:08	Zone 8 Input	RD	00008
CP001:09	Zone 9 Input	RD	00009
CP001:10	Zone 10 Input	RD	00010
CP001:11	Zone 11 Input	RD	00011
CP001:12	Zone 12 Input	RD	00012
CP001:13	Zone 13 Input	RD	00013
CP001:14	Zone 14 Input	RD	00014
CP001:15	Zone 15 Input	RD	00015
CP001:16	Zone 16 Input	RD	00016

LCD Keypad Zone Inputs

The keypad will allow the status of the 4 on board zones to be read for the first 128 keypads that are registered on the system.

Zone Number	Function	Read / Write	ModBUS Input Number
KP001:01	Zone 1 Input	RD	00017
KP001:02	Zone 2 Input	RD	00018
KP001:03	Zone 3 Input	RD	00019
KP001:04	Zone 4 Input	RD	00020
KP002:01	Zone 1 Input	RD	00021
⎪ ⎪ ⎪	⎪ ⎪ ⎪ ⎪ ⎪	⎪	⎪ ⎪
KP128:04	Zone 4 Input	RD	00528

16 Zone Input Expander Zone Inputs

The zone expander will allow the status of the 16 on board zones to be read for the first 128 expanders that are registered on the system.

Zone Number	Function	Read / Write	ModBUS Input Number
ZX001:01	Zone 1 Input	RD	00529
ZX001:02	Zone 2 Input	RD	00530
ZX001:03	Zone 3 Input	RD	00531
ZX001:04	Zone 4 Input	RD	00532
ZX001:05	Zone 5 Input	RD	00533
ZX001:06	Zone 6 Input	RD	00534
ZX001:07	Zone 7 Input	RD	00535
ZX001:08	Zone 8 Input	RD	00536
ZX001:09	Zone 9 Input	RD	00537
ZX001:10	Zone 10 Input	RD	00538
ZX001:11	Zone 11 Input	RD	00539
ZX001:12	Zone 12 Input	RD	00540
ZX001:13	Zone 13 Input	RD	00541
ZX001:14	Zone 14 Input	RD	00542
ZX001:15	Zone 15 Input	RD	00543
ZX001:16	Zone 16 Input	RD	00544
ZX002:01	Zone 1 Input	RD	00545
⎪ ⎪ ⎪	⎪ ⎪ ⎪ ⎪ ⎪	⎪	⎪ ⎪
ZX128:16	Zone 16 Input	RD	02576

Two Reader Expander Zone Inputs

The two reader expander will allow the status of the 8 on board zones to be read for the first 128 expanders that are registered on the system.

Zone Number	Function	Read / Write	Input Number
RD001:01	Zone 1 Input	RD	02577
RD001:02	Zone 2 Input	RD	02578
RD001:03	Zone 3 Input	RD	02579
RD001:04	Zone 4 Input	RD	02580
RD001:05	Zone 5 Input	RD	02581

RD001:06	Zone 6 Input	RD	02582
RD001:07	Zone 7 Input	RD	02583
RD001:08	Zone 8 Input	RD	02584
RD002:01	Zone 1 Input	RD	02585
⋮	⋮	⋮	⋮
RD128:08	Zone 8 Input	RD	03600

16 PGM Output Expander Zone Inputs

The 16 PGM Output Expander does not have any physical zone inputs and is therefore not included in the input map.

4 Channel Analog Input/Output Expander Zone Inputs

The 4 channel analog input/output Expander does not have any physical zone inputs and is therefore not included in the input map.

System Controller Trouble Zone Input Address

The system controller will allow the status of the 64 on board trouble zones to be read. Only one system controller is available per interface.

Trouble Zone Number	Function	Read / Write	Input Number
CP001:01	Module Tamper	RD	10001
CP001:02	AC failure	RD	10002
CP001:03	Low Battery	RD	10003
CP001:04	Real Time Clock Not Set	RD	10004
CP001:05	Service Report Test	RD	10005
CP001:06	Service Report Failure To Communicate	RD	10006
CP001:07	Phone Line Fault	RD	10007
CP001:08	Auxiliary Failure	RD	10008
CP001:09	Bell 1 Cut/Tamper	RD	10009
CP001:10	Bell 2 Cut/Tamper	RD	10010
CP001:11	Bell 1 Over Current	RD	10011
CP001:12	Bell 2 Over Current	RD	10012
CP001:13	Module Communication	RD	10013
CP001:14	Module Network Security	RD	10014
CP001:15	Expansion Device Missing	RD	10015
CP001:16	Communication Port 1 Fault	RD	10016
CP001:17	Communication Port 2 Fault	RD	10017
CP001:18	Communication Port 3 Fault	RD	10018
CP001:19	Communication Port 4 Fault	RD	10019
CP001:20	Ethernet Link Lost	RD	10020
CP001:21	DVAC Line Fault/Polling Error	RD	10021
CP001:22	ModBUS Communication Fault	RD	10022
CP001:23	Protégé SMGT Remote Access	RD	10023
CP001:24	Installer Logged In	RD	10024
CP001:25	Service 1 Stopped	RD	10025
CP001:26	Service 2 Stopped	RD	10026
CP001:27	Service 3 Stopped	RD	10027
CP001:28	Service 4 Stopped	RD	10028
CP001:29	Reserved	RD	10029
⋮	⋮	⋮	⋮

CP001:64	Reserved	RD	10064

LCD Keypad Trouble Zone Input

The LCD keypad will allow the status of the 8 on board trouble zones to be read for the first 128 registered modules.

Trouble Zone Number	Function	Read / Write	Input Number
KP001:01	Module Tamper	RD	10065
KP001:02	Power Trouble	RD	10066
KP001:03	Panic	RD	10067
KP001:04	Duress	RD	10068
KP001:05	Door Left Open	RD	10069
KP001:06	Door Forced Open	RD	10070
KP001:07	Invalid Code Lockout	RD	10071
KP001:08	Module Offline	RD	10072
KP002:01	Module Tamper	RD	10073
⎪ ⎪ ⎪	⎪ ⎪	⎪	⎪ ⎪
KP128:08	Module Offline	RD	11088

Zone Expander Trouble Zone Input

The zone expander will allow the status of the 16 on board trouble zones to be read for the first 128 registered modules.

Trouble Zone Number	Function	Read / Write	Input Number
ZX001:01	Module Tamper	RD	11089
ZX001:02	AC failure	RD	11090
ZX001:03	Low Battery	RD	11091
ZX001:04	Aux Failure	RD	11092
ZX001:05	Bell 1 Cut/Tamper	RD	11093
ZX001:06	Bell 2 Cut/Tamper	RD	11094
ZX001:07	Bell 1 Over Current	RD	11095
ZX001:08	Bell 2 Over Current	RD	11096
ZX001:09	Reserved	RD	11097
ZX001:10	Reserved	RD	11098
ZX001:11	Reserved	RD	11099
ZX001:12	Reserved	RD	11100
ZX001:13	Reserved	RD	11101
ZX001:14	Reserved	RD	11102
ZX001:15	Reserved	RD	11103
ZX001:16	Module Offline	RD	11104
ZX002:01	Module Tamper	RD	11105
⎪ ⎪ ⎪	⎪ ⎪	⎪	⎪ ⎪
ZX128:16	Module Offline	RD	13136

16 PGM Output Expander Trouble Zone Input

The 16 PGM output expander will allow the status of the 8 on board trouble zones to be read for the first 128 registered modules.

Trouble Zone Number	Function	Read / Write	Input Number

PX001:01	Module Tamper	RD	13137
PX001:02	AC failure	RD	13138
PX001:03	Low Battery	RD	13139
PX001:04	Aux Failure	RD	13140
PX001:05	Relay Supply Failure	RD	13141
PX001:06	Reserved	RD	13143
PX001:07	Reserved	RD	13144
PX001:08	Module Offline	RD	13145
PX002:01	Module Tamper	RD	13146
⎪ ⎪ ⎪	⎪ ⎪	⎪	⎪ ⎪
PX128:08	Module Offline	RD	14160

Two Reader Expander Trouble Zone Input

The two reader expander will allow the status of the 16 on board trouble zones to be read for the first 128 registered modules.

Trouble Zone Number	Function	Read / Write	Input Number
RD001:01	Module Tamper	RD	14161
RD001:02	AC failure	RD	14162
RD001:03	Low Battery	RD	14163
RD001:04	Aux Failure	RD	14164
RD001:05	Lock Failure	RD	14165
RD001:06	Door 1 Forced	RD	14166
RD001:07	Door 2 Forced	RD	14167
RD001:08	Door 1 Left Open	RD	14168
RD001:09	Door 2 Left Open	RD	14169
RD001:10	Reader 1 Voltage	RD	14170
RD001:11	Reader 2 Voltage	RD	14171
RD001:12	Reader 1 Tamper	RD	14172
RD001:13	Reader 2 Tamper	RD	14173
RD001:14	Door 1 Lockout	RD	14174
RD001:15	Door 2 Lockout	RD	14175
RD001:16	Module Offline	RD	14176
RD002:01	Module Tamper	RD	14177
⎪ ⎪ ⎪	⎪ ⎪	⎪	⎪ ⎪
RD128:16	Module Offline	RD	16208

4 Channel Analog Input/Output Expander Trouble Zone Input

The 4 Channel Analog Input/Output Expander will allow the status of the 8 on board trouble zones to be read for the first 128 registered modules.

Trouble Zone Number	Function	Read / Write	Input Number
AE001:01	Module Tamper	RD	16209
AE001:02	Analog Power	RD	16210
AE001:03	Aux Power	RD	16211
AE001:04	Reserved	RD	16212
AE001:05	Reserved	RD	16213
AE001:06	Reserved	RD	16214
AE001:07	Reserved	RD	16215
AE001:08	Module Offline	RD	16216

AE002:01	Module Tamper	RD	16217
AE128:16	Module Offline	RD	17232

Input Register Address Map

An input register is a 16 bit value that is read only and usually returns internal data that can not be written to. Internal registers are used to return information about the System Controller Version, Programmed Name and other system related configuration variables.

System Controller Analog Inputs

The system controller provides the analog values that are present on the controller's inputs and power supply monitoring in the Input Register Map. This allows the values to be displayed on a screen or used within calculation functions.

Analog Number	Function	Read / Write	Input Number
AN001	Zone 1 Analog Value	RD	00001
AN002	Zone 2 Analog Value	RD	00002
AN003	Zone 3 Analog Value	RD	00003
AN004	Zone 4 Analog Value	RD	00004
AN005	Zone 5 Analog Value	RD	00005
AN006	Zone 6 Analog Value	RD	00006
AN007	Zone 7 Analog Value	RD	00007
AN008	Zone 8 Analog Value	RD	00008
AN009	Zone 9 Analog Value	RD	00009
AN010	Zone 10 Analog Value	RD	00010
AN011	Zone 11 Analog Value	RD	00011
AN012	Zone 12 Analog Value	RD	00012
AN013	Zone 13 Analog Value	RD	00013
AN014	Zone 14 Analog Value	RD	00014
AN015	Zone 15 Analog Value	RD	00015
AN016	Zone 16 Analog Value	RD	00016
AN017	Tamper Analog Value	RD	00017
AN018	Auxiliary Supply Analog Value	RD	00018
AN019	Battery Voltage Analog Value	RD	00019
AN020	Battery Charge Current Analog Value	RD	00020
AN021	AC Input Analog Value	RD	00021
AN022	Channel Ground (Always 0)	RD	00022

System Controller Information

The system controller provides the analog values that are present on the controller's inputs and power supply monitoring in the Input Register Map. This allows the values to be displayed on a screen or used within calculation functions.

Description ID	Function	Read / Write	Input Number
NAME	Controller Name 16 ASCII Bytes stored as high byte low byte order.	RD	00101
TIME	Controller Time	RD	00109

	Time returned as ASCII bytes in the format HH:MM:SS stored as high byte low byte order.		
DATE	Controller Date Date returned as ASCII bytes in the format DD/MM/YYYY DOW stored as high byte low byte order. DOW is shown as _MON, _TUE etc where _ is a space character.	RD	00113

Schedule Status

The system controller provides the status of the internal schedules up to 512 if they are available which can be used for input in to a SCADA system or monitored by the application software. The upper byte of the data will contain the current holiday mask while the lower byte will contain the schedule status.

Schedule Number	Function	Read / Write	Input Number
SC001	Schedule 1 Status Upper Byte = Holiday Mask • Bit 0 = Holiday Group 1 Valid • Bit 1 = Holiday Group 2 Valid • Bit 2 = Holiday Group 3 Valid • Bit 3 = Holiday Group 4 Valid • Bit 4 = Holiday Group 5 Valid • Bit 5 = Holiday Group 6 Valid • Bit 6 = Holiday Group 7 Valid • Bit 7 = Holiday Group 8 Valid Lower Byte = Schedule Status • Bit 0 = Schedule Start Valid • Bit 1 = Schedule End Valid • Bit 2 = Schedule Valid • Bit 3 – 7 = Reserved	RD	00201
SC002	Schedule 2 Status	RD	00202
⋮	⋮	⋮	⋮
SC512	Schedule 512 Status	RD	00712

Register Address Map

A register is a 16 bit value that is used to store data and can be read or written or combination of both. Registers are the preferred method of accessing data and provide a much larger amount of information about objects that are being accessed. For example PGM Outputs will provide a more detailed state information which shows what is controlled the output. Doors return both the lock and input states and areas return the 24 Hour and Normal Arming conditions as part of the register.

Area Status Register Map

The system controller uses makes the area status available and controllable from the register maps. If an area is being controlled that area MUST be a single register write command, multiple register writes will not allow control of an area.

Area Number	Function	Read / Write	ModBUS Register

			Number
AR001	Area 1 Status and Control <u>Register Read</u> Low Byte = Area Status • 00h = Disarmed • 01h = Area Disarming • 02h = Checking Bypassed Zones • 03h = Checking Bell Restore Zones • 04h = Open PGM Activation • 05h = Enabling Zones • 06h = Checking Zone Status • 07h = Waiting For User Zones Open • 08h = Too Many Zones Bypassed to Arm Area • 09h = Arming Failure Troubles are active • 0Ah = Waiting For User Zones are Bypassed • 0Bh = Can not arm area user count is not zero. • 0Ch = Disarming Child Areas • 80h = Area Armed • 81h = Exit Delay • 82h = Entry Delay • 83h = Disarm Delay • 84h = Code Delay High Byte = 24Hr Status • 00h = 24Hr Monitoring is disabled • 01h = 24Hr Monitoring is disabling. • 02h = 24Hr Monitoring is enabling. • 03h = 24Hr Monitoring is busy performing a task. • 80h = 24Hr Monitoring is enabled • 81h = 24Hr Monitoring is pre enabling settings and is about to enable. <u>Register Write</u> Low Byte = Control Value • 00h = Disarm Area • 01h = Arm Area • 02h = Force Arm Area • 80h = Disable 24Hr • 81h = Enable 24Hr	RD/WR	00001
AR002	Area 2 Status and Control	RD/WR	00002

AR256	Area 256 Status and Control	RD/WR	00256

Area Extended Status Register Map

The system controller makes the extended area status bits available on these registers and are packed in to the register as Boolean values.

Area Number	Function	Read / Write	ModBUS Register Number
AR001	Area 1 Extended Status Low Byte = Status • Bit 0 = When set the area is in an alarm condition. • Bit 1 = When set the siren or bell has been activated for the area. • Bit 2 = When set the area is force armed. • Bit 3 = When set the area is stay armed. • Bit 4 = When set the area is in a defer delay mode and is about to arm. • Bit 5 – 7 = Reserved High Byte = Reserved always reads zero	RD	00257
AR002	Area 2 Extended Status	RD	00258
AR256	Area 256 Extended Status	RD	00512

Area User Current Count Register Map

The system controller uses counting for users within an area, this count can be read and reset using the following registers. A count that has been altered by the ModBUS interface may not update the count PGM for the area and caution should be used when writing count values for areas.

Area Number	Function	Read / Write	ModBUS Register Number
AR001	Area 1 Count Value 0-65535	RD/WR	00513
AR002	Area 2 Count Value 0-65535	RD/WR	00514
AR256	Area 256 Count Value 0-65535	RD/WR	00768

Door Status Register Map

The system controller makes the door status available and controllable from the register maps. If a door is being controlled that door MUST be a single register write command, multiple register writes will not allow control of an door.

Door Number	Function	Read / Write	ModBUS Register Number
DR001	Door 1 Status and Control	RD/WR	00769

	Register Read Low Byte = Door Position Status • 00h = Door Closed • 01h = Door Open • 02h = Door Open Pre Alarm Warning • 03h = Door Left Open • 04h = Door Forced Open High Byte = Door Lock Status • 00h = Locked • 01h = Unlocked • 02h = Schedule Unlocked • 03h = User Timed Unlocked • 04h = User Latched Unlocked • 05h = Request To Exit Unlocked • 06h = Request To Enter Unlocked • 07h = Menu Unlocked (Keypad) • 08h = Unlocked By Area Status Control. • 09h = Unlocked By Fire Alarm Function Register Write Low Byte = Control Value • 00h = Lock Door • 01h = Unlock Door • 02h = Latch Unlock Door		
DR002	Door 2 Status and Control	RD/WR	00770
⋮	⋮	⋮	⋮
DR256	Door 256 Status and Control	RD/WR	01024

Variable Values Register Map

The system controller uses variable registers for the processing of analog input modules, programmable functions and other controllable settings in the Protégé System. The Variable Registers can be written which will result in an analog output module being updated or read from to obtain the current channel information. Variables are also linked to programmable functions to get set points and hysterisis settings.

Variable Register	Function	Read / Write	ModBUS Register Number
VR00001	Variable Register 1	RD/WR	50001
VR00002	Variable Register 2	RD/WR	50002
⋮	⋮	⋮	⋮
VR00512	Variable Register 512	RD/WR	50512

Remote ModBUS Register Map

The system controller will map the remote registers that are used from the ModBUS remote register functions to the remote register values that are located in the upper register map. This allows a Protégé System Controller to report alarms and messages to another Protégé System Controller that is connected to a SCADA or HMI application without the need for specialist host modems and gateways.

Remote Register ID	Function	Read / Write	ModBUS Register Number
RR00001	Remote Register 1	RD/WR	60001
RR00002	Remote Register 2	RD/WR	60002
| |	| | | | |	RD/WR	| |
RR04096	Remote Register 4096	RD/WR	64096

To link remote ModBUS registers the remote ModBUS service must be used and the monitor phone service on the controller must be enabled for remote ModBUS reception. The option in the ModBUS service must also allow the remote registers to be read. Remote registers are common for all services.

REFERENCES

ModBUS References

ModBUS IDA Organisation

Modbus-IDA engages in a broad range of activities relating to the maintenance and proliferation of the Modbus protocol. Some of these activities include:

- Participation in standards activities worldwide.
- Leading the evolution of the Modbus protocol and its variants.
- Encouraging and assisting the use of Modbus across a broad spectrum of physical layers and transmission media.
- Maintaining and evolving a conformance testing program to insure greater interoperability of Modbus devices.
- Providing information to users and supplers alike to help them be successful in their use of Modbus.
- Engaging in educational and promotional efforts including trade shows, newsletters, this website, and other outreach activities.

http://www.modbus.org/

Source Code For ModBUS Drivers

Process Viewer For Linux and Windows

An independent process viewer that has a ModBUS Serial Communications interface and can be used with the Protégé System Controller:

http://pvbrowser.de/pvbrowser/index.php?menu=8&topic=8&subtopic=4

INFORMATION

Introduction

Application notes are provided as is without any implied warranty or intended use and are written by Integrated Control Technology as an aid in programming and connecting devices to the Protégé System. Integrated Control Technology does not support third party applications that are not sold with the Protégé System Controller or Protégé System Management Suite.

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