xSlave

Data **P**rocessing **A**pplications

User Manual

2015-12-17

NOTE:

Jason Hua has made every reasonable attempt to ensure the completeness and accuracy of this document. However, the information contained in this manual is subject to change without notice.

ALL RISKS OF USING THIS SOFTWARE WILL REMAIN WITH THE USER.
NEITHER THIS SOFTWARE PROGRAM NOR PROGRAMMER HAS ANY LIABILITIES FOR ANY RISKS AND DAMAGES THAT THIS SOFTWARE MIGHT CAUSE. AND NEITHER THIS SOFTWARE PROGRAM NOR OUTCOMES OF ITS RUNTIME DOES PROVE ANYTHING AT ALL THAT YOU MAY WANT TO.

ANY COMMENTS WELCOME!

Revision Notes

This Manual is for the version of 2.2013.5.15 or higher.

TABLE OF CONTENTS

1 Overview

The xSlave is a set of software of Protocol Slave Application that helps you to:

1. **Easily and efficiently and quickly set up the Simulation of Protocol Slave devices talking to the Protocol Master End over Serial Link, MB Plus Network and Ethernet (TCP/IP).**
2. **Simulate data of Digital Input, Analogue Input and Counter.**
3. **Monitor control-commands (i.e. Digital Output, Analogue Output, Freezing, etc.) sent by the Protocol Master End.**
4. **Record/Log protocol messages.**
5. **Simulate the PLC program Runtime.**
6. **Share the point database with Protocol Master Applications to make a PC (Embedded) to be a RTU.**

1.1 The Directory of Files

The directory of files of this set of software (so called as xSlave below) is located at 'C:\xMaster'.

1.2 The List of Files

The list of files of xSlave is as follows.

NO.	File Name	Comment
1	DNP_Slave.exe	The xSlave for DNP3 executable file.
2	MB_Slave.exe	The xSlave for Modbus executable file.
3	MB_Plus_Slave.exe	The xSlave for Modbus Plus executable file.
4	Readme.txt	Readme file.
5	xSlave_Manual.pdf	This manual.
6	*.SDB, *.LDB, *.DAS, *.LGC	Configuration files.
7	*.Log	Logs File.
8	PLC_CMD.txt	PLC Program Run-time simulator script file.

1.3 Installation of the software

1.3.1 Preparation for installation

Minimum system requirements

- Windows XP

You might have to get the Administrator/Boost privileges in order to install and register the xSlave software.

1.3.2 Installation

You run the installation program: Install_xMasterSlave.exe to install xMasterSlave.

2 Start up

2.1 Making the registration file

If it is the first time to run the xSlave program on the current PC, you will be asked to register the xSlave software and send the registration file: "software.aut" to the xSlave developer. And the xSlave developer will send you back two files: "software.aut" and "software.key". You should copy them into the directory "c:\xMaster". The register window is shown in the screenshot Figure 2-1.

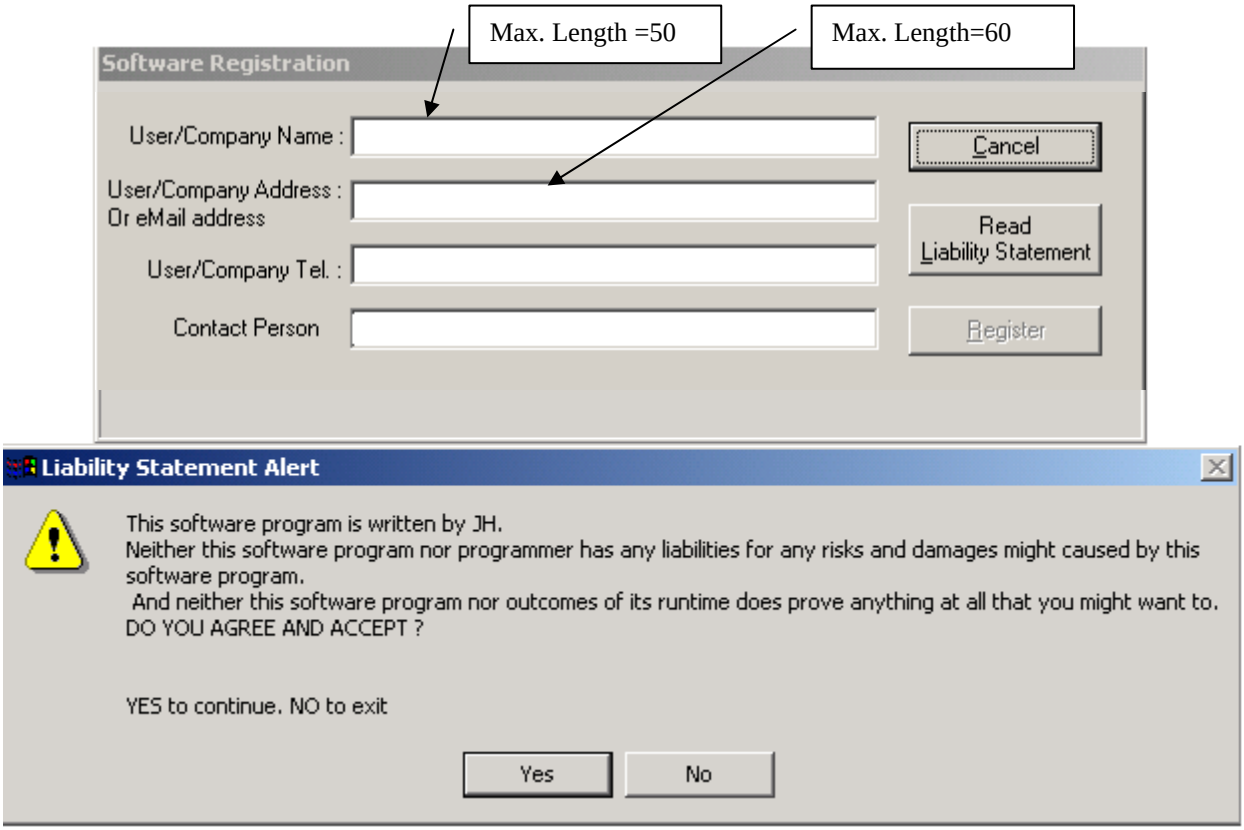
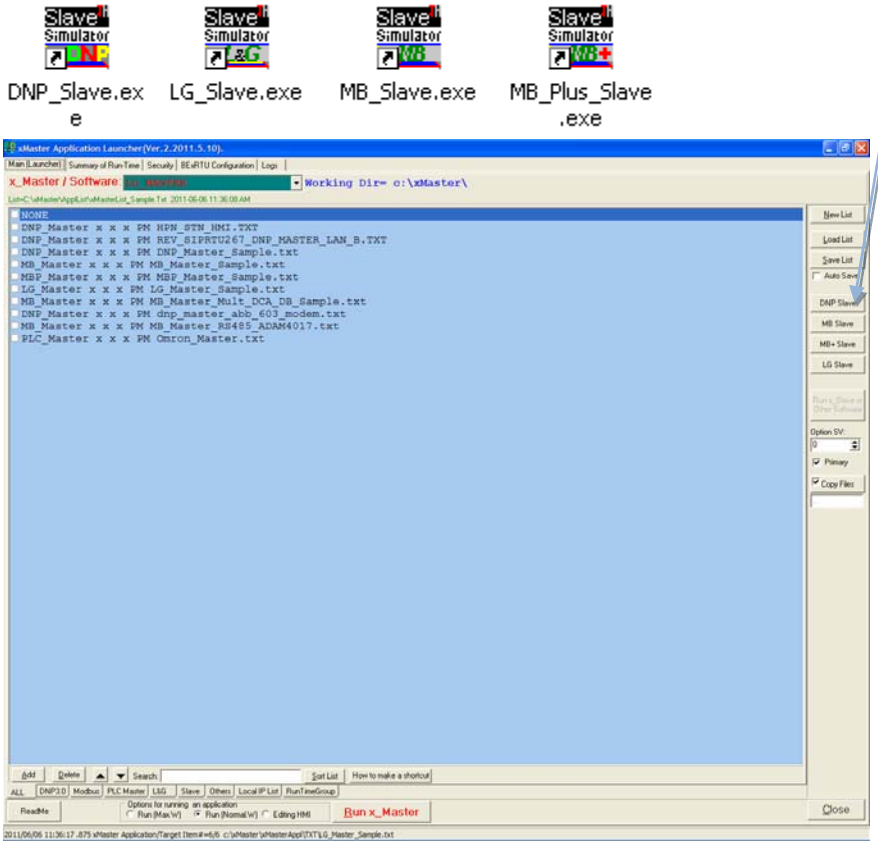


Figure 2-1

If the xSlave fails in checking the register file, it alerts you that the current installation of xMasterSlave software has not been registered.

2.2 Running a xSlave



Running xSlave
Press the button of [xxx Slave] to run xSlave software, which can simulate Slave protocol/device (i.e. RTU, Sub-RTU, PLC, IED, etc.). You can add xSlave application line into the list by press the button of [Add]. Note: you have to save the xSlave configuration in xSlave application by press the button of [Save Config].

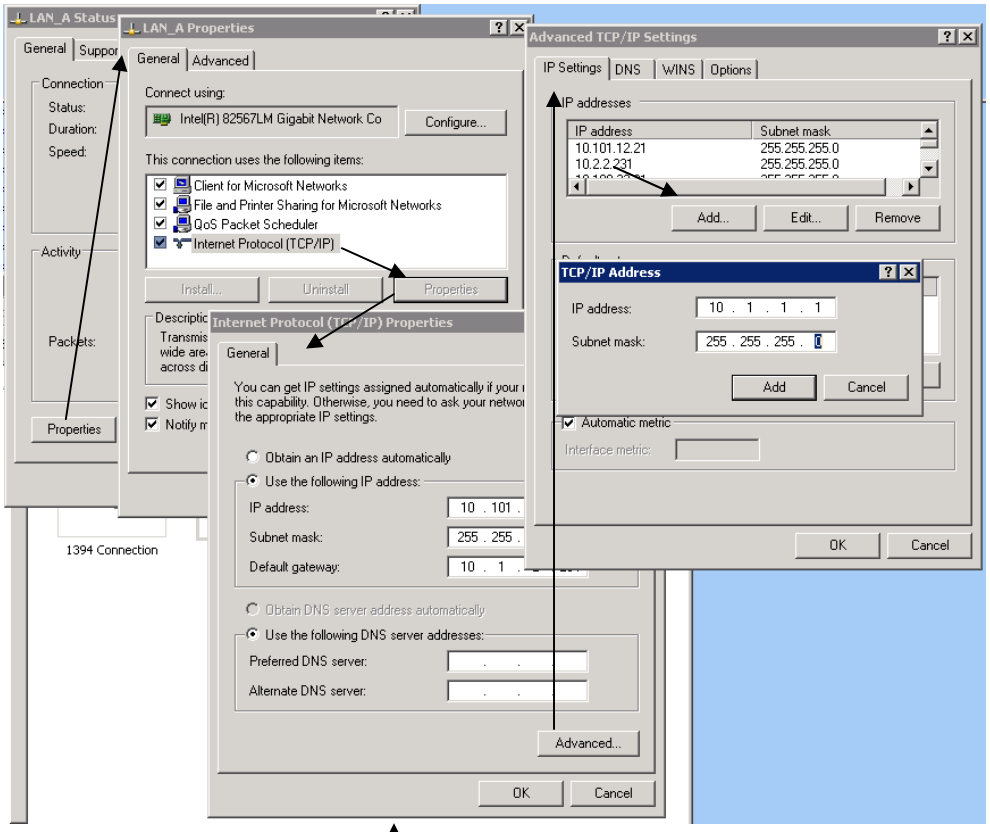
Note:
Multi-instances of xSlave cannot share the same serial port.
xSlave can handle all polling from via the same comm port (incl: multi-drop -- RS422/RS485 link) within ONE session.
xSlave can handle all polling from the LAN with sessions (up to 200 DNP server TCP/IP sessions-connections using same IP port i.e. 20000 -- only in the embedded pc version) respectively.
xSlave can be running multi-instances as many as the PC can handle (if over the LAN TCP/IP, cannot use the same IP Port, i.e. 20000 for DNP, 502 for Modbus. It means that only one can use them.).
Each xSlave instance can be respectively tied/bonded IP address assigned in the same PC. You can assign 200 IPs in a PC to simulate up 200 DNP Slave IEDs.
If you minimize the xSlave window, the window will disappear and you can find it on the task bar and will appear again after a double-click on it. Refer to the following screenshot.

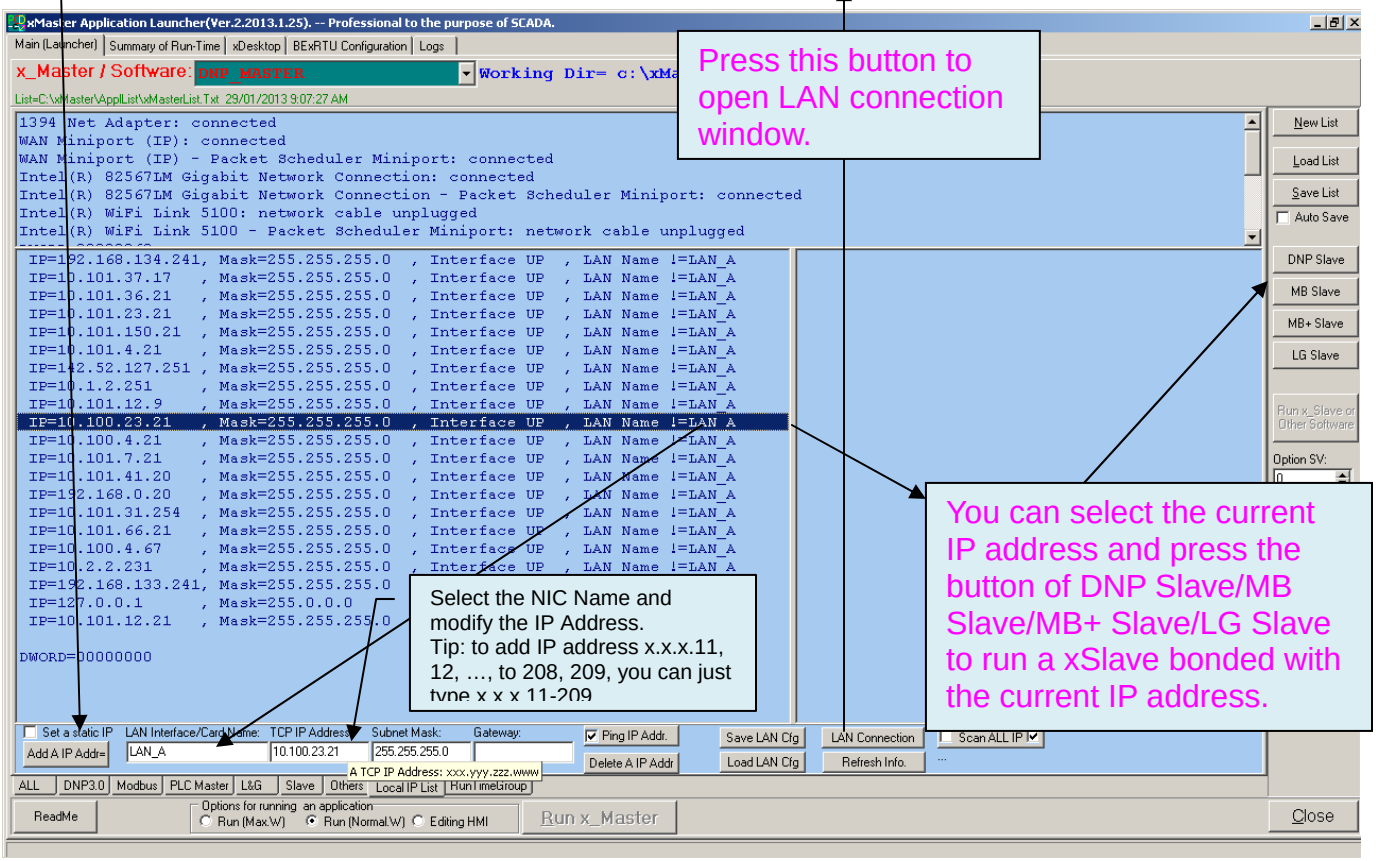
For LAN (TCP/IP) connection:

Assign Multi-IP address to the current computer NIC to simulate Multi-Slaves over the LAN/TCP-IP Connection.

In the Tab of [Local IP List] in xMaster window:

Add all slave IP address here directly (if OS is Window XP) or press the button of [LAN Connection] (if OS is Win7/8) to get into the window of Network Interface Card (NIC) Properties→ TCP/IP →Advanced→ IP Settings [Add].





Press this button to open LAN connection window.

Select the NIC Name and modify the IP Address.
Tip: to add IP address x.x.x.11, 12, …, to 208, 209, you can just type x.x.x.11-209

You can select the current IP address and press the button of DNP Slave/MB Slave/MB+ Slave/LG Slave to run a xSlave bonded with the current IP address.

3 Administrator & Setup

3.1 Setup for MB_Slave

The screenshot Figure 3-1 is the window of Administrator & Setup of MB_Slave.

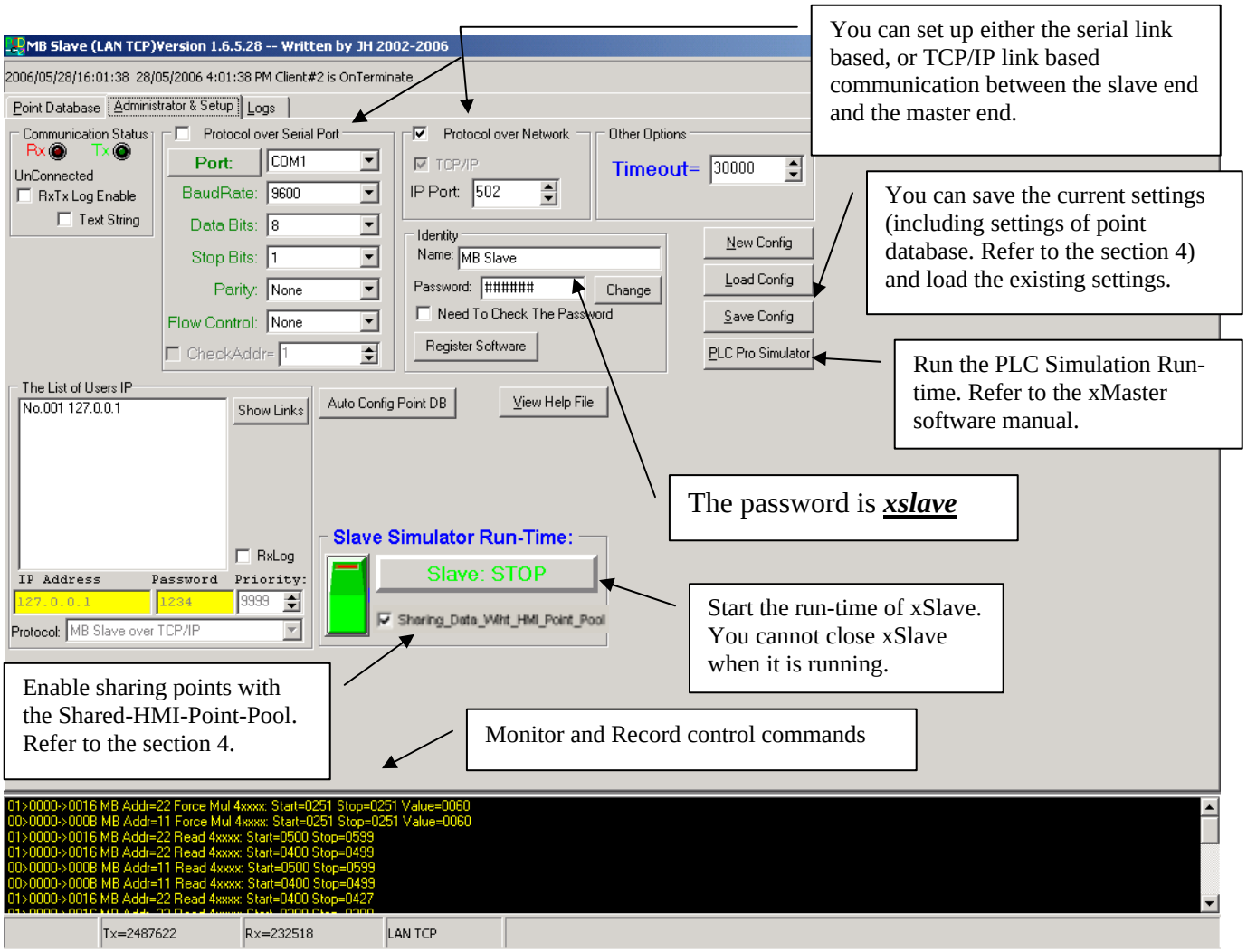


Figure 3-1

Note:
If the IP Port is 502 and 300-3099, the MB_Slave runs the protocol of Modbus TCP/IP, otherwise runs Modbus RTU protocol over TCP/IP.

In MB/MBP Slave you have an option to configure how to form 32bit data. [X]Modbus 32Bit Data If checked, the 2nd Word(16bit) is the Bit31-24 of 32bit data, otherwise is Bit15-00 of 32bit data. The data of 1x001 - 1x0ddd is assigned to the data of 3x001 - 3x0(ddd/16). e.g. if 1x001-1x0160 is assigned, 3x001-3x010 stores the data of 1x001-1x0160 by default.

3.2 Setup for MB_Plus_Slave

The screenshot Figure 3-3 is the window of Administrator & Setup of MB_Plus_Slave.

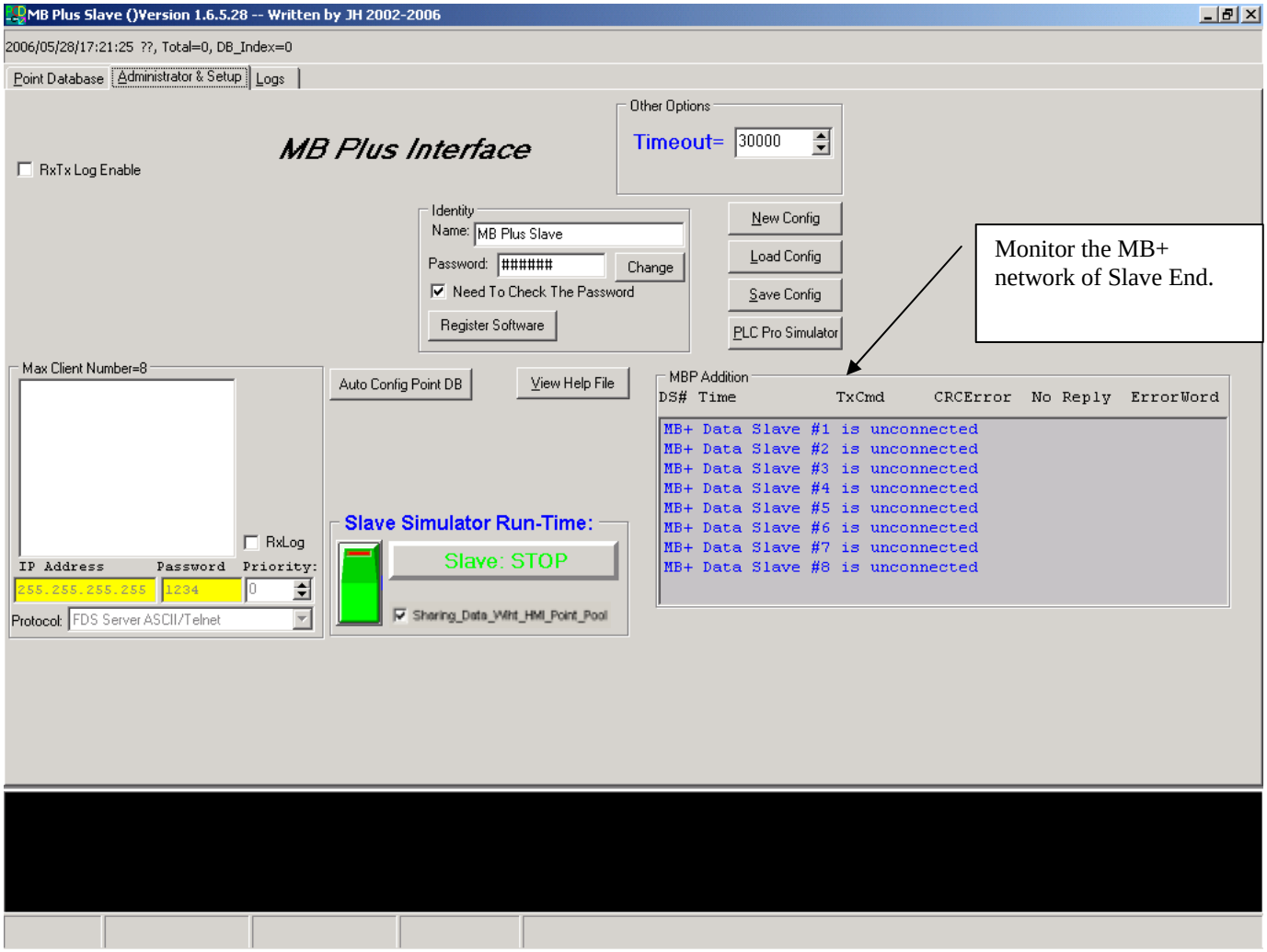


Figure 3-2

Note:
You have to ensure that MB+ Card driver works and is set up accordingly for MB+ network. You can use CONCEPT, the MB PLC programming tool, to connect to MB+ network and verify the existence of MB+ Master End or MB+ Network.

3.3 Setup for DNP_Slave

The screenshot Figure 3-4 is the window of Administrator & Setup of DNP_Slave.

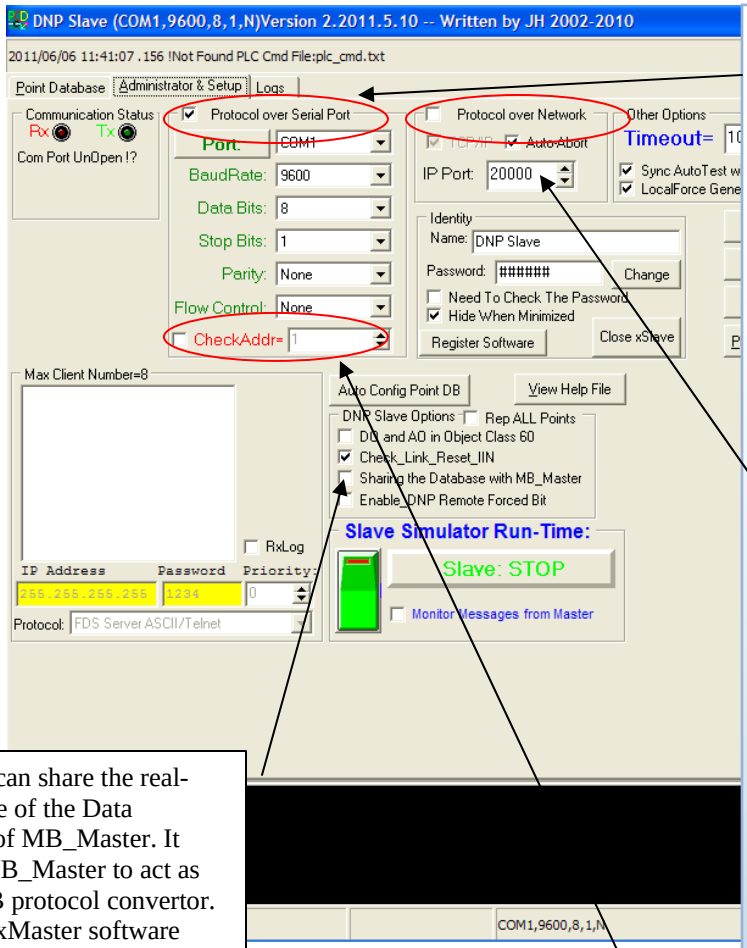


Figure 3-3

DNP_Slave can share the real-time database of the Data Acquisition of MB_Master. It allows the MB_Master to act as the DNP-MB protocol convertor. Refer to the xMaster software manual. The DNP Slave End can forward controls sent by the DNP_Master to the slave end of the MB_Master, which is Modbus Slave End. It means DNP Master can control Modbus device(s) indirectly.

Setup the communication

For link over RS232:
Step1: check [X] Protocol over Serial Port.
Step2: select the comm port.
Step3: setup comm port parameters to match with the existing communication link between the DNP Master and the Slave.
Double-Click on the settings of Serial com port (Protocol over Serial Port) to popup Windows Device Manager.

For link over LAN:
Step1: check [X] Protocol over Network (TCP/IP).
Step2: Setup the IP port. For DNP3, the port number usually is 20000.
Step3: Setup your PC local LAN IP Address that can be recognized (reachable) by the DNP Master. If the DNP Master IP is 10.100.7.1, for example, your PC LAN IP address can be 10.100.7. 102 – the existing DNP Slave device IP address and must disconnect the existing LAN connection before the setting.

There is an option [ ]Auto-Abort to enable/disable terminate the LAN TCP/IP socket connection if the Master End is silent for a while (TO=Timeout setting X 100).

If want to response only for a specific slave address check it and define the current slave device address/node. It's for multi-drop link over serial (incl. Modem) connections.

3.4 The List of TCP/IP Connection

The screenshot Figure 3-5 is the List of Client Connection over TCP/IP Link.

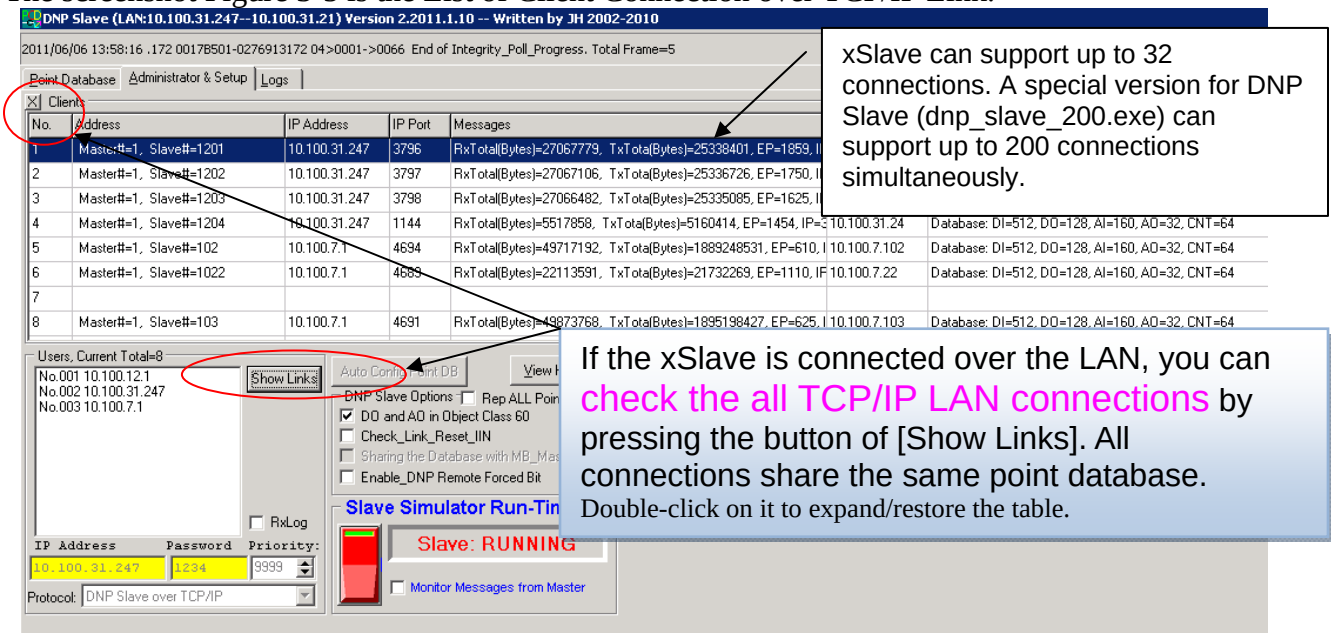


Figure 3-4

Note:
TCP Connection Silent Timeout is 10 times the setting of Timeout. It means that the TCP/IP connection between the slave and the master will be terminated after xx minutes the master still does not talk to the slave.

Right-Click on the current session/connection to determinate how to connect the Slave Point Database. The default is all Slave sessions/connection share the same point database. You can have the current session/connection link not to reply any data changes ([Disconnect from Database (Reply with Data-Zero)]) and the rest sessions still share the point database. You also can have the current session is the only one connected to the point database ([Connect Database exclusively]) and the rest sessions reply polling with Data-Zero only.

Note: If the current session/TCP IP connection is disconnected you have select another alive session to be connected or [Restore Database connection for ALL].

EP: Event Poll Interval/ How often the Master End Poll Class 1/2/3.

IP: Integrity Poll Interval/ How often the Master End Poll Class 0.

To expand/restore the window of LAN(TCP/IP) Link-Clients, you can double-click on the "Clients".

4 Point Database

You can set up a default point database after setting the total points of DI/DO/AI/AO/COUNTER. Refer to the section 3, you can click on the button of “AutoConfig DB”, which sets the default actions for DO/AO.

Note: All sessions of xSlave share the same point database. You may save the settings of total points of DI/DO/AI/AO/COUNTER. Refer to the section 3.1: buttons of “Load/Save Config”. And you should enable settings by clicking on the button of “Set DB Point”.

You can check whether the current point is sharing the data with others. Refer to the screenshot Figure 4-1.

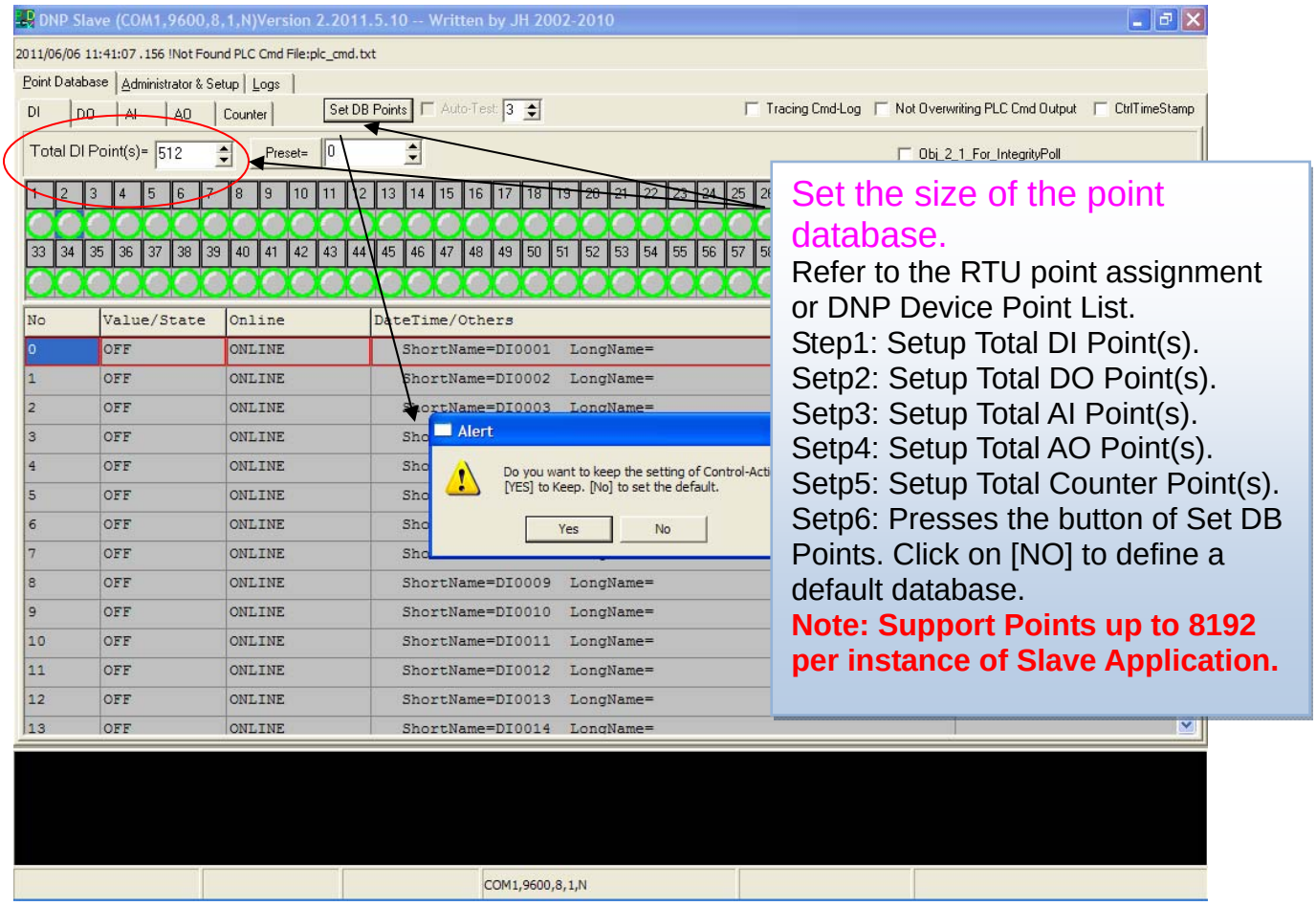


Figure 4-1

4.1 Point Database of DNP

The screenshot Figure 4-2 to 4-6 is the Point Database of DNP.

The page of DI - Digital Input is shown as follows:

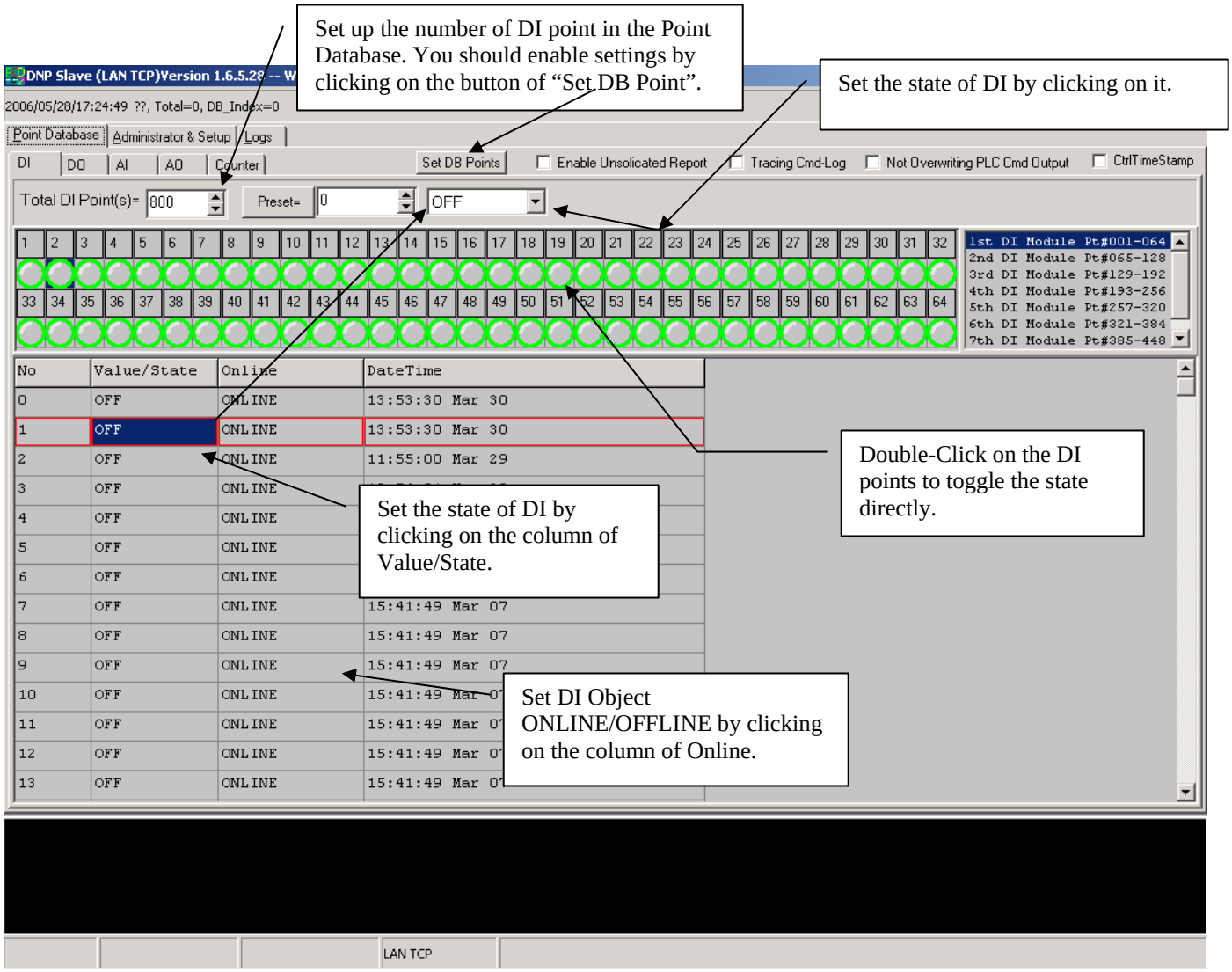


Figure 4-2

Note: the number of points in DNP and LG is starting from 0. But the number of points in DI/DO modules (LED lights panel) and Modbus is starting from 1.

The page of DO - Digital Output is shown as follows:

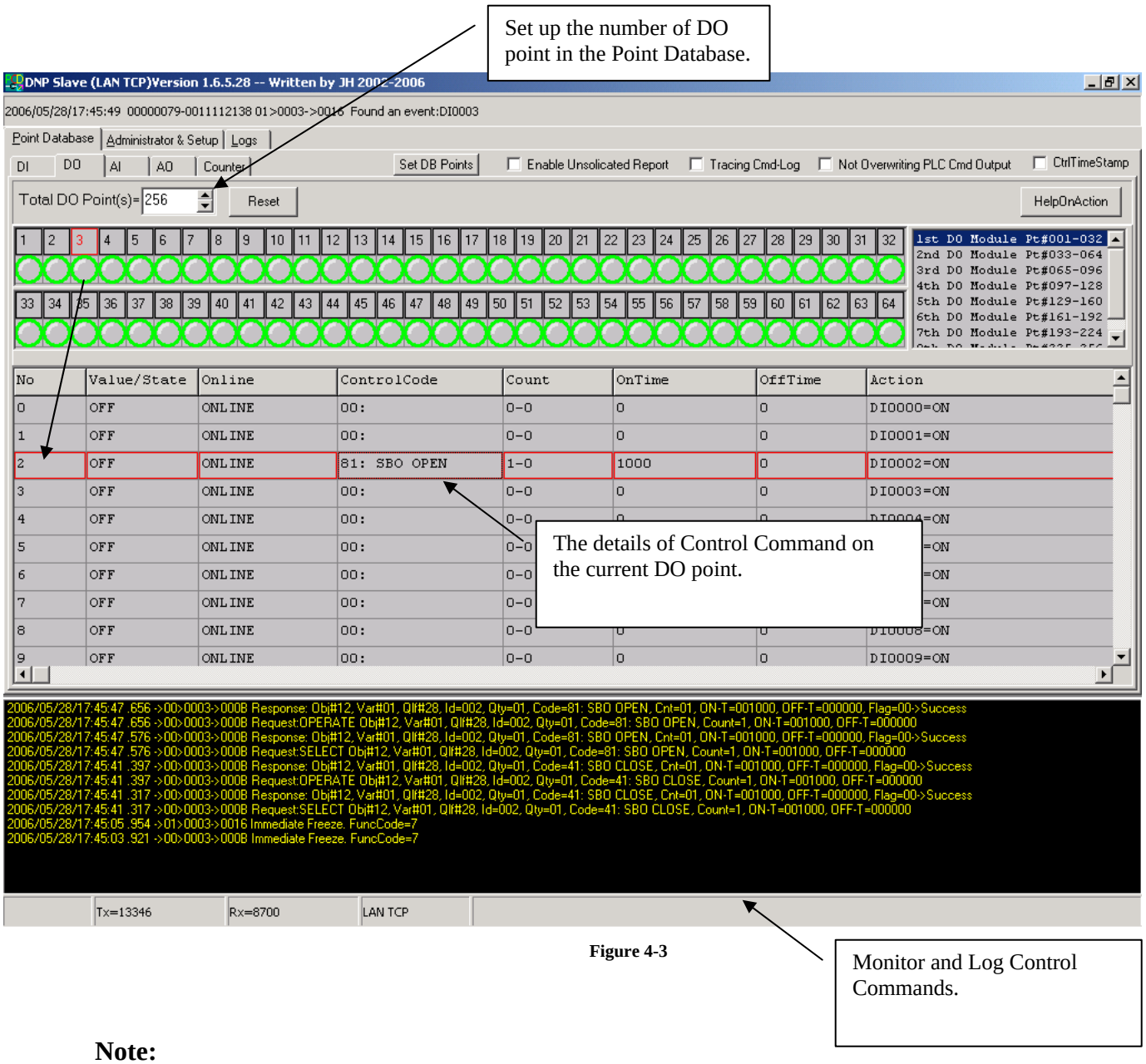


Figure 4-3

Note:

You can setup actions after controls by the configuration of the column of Action. Click on the button of HelpOnAction to get help how the Action works. The default action of DO Control is that the state of DI OFF/ON is set by the DO control commands of ON/OFF or OPEN/CLOSE.

The 24-Bit Binary Output is sharing with SBO/DO/Pulse Output. It means that Binary-Output Point/Block #1 uses DO Point #1 to #24, Binary-Output Point/Block #2 uses DO Point #25 to #48, and so on. The current DO-Script/Control-action will be blocked when its flag of OFFLINE is ON.

The page of AI - Analogue Input is shown as follows:

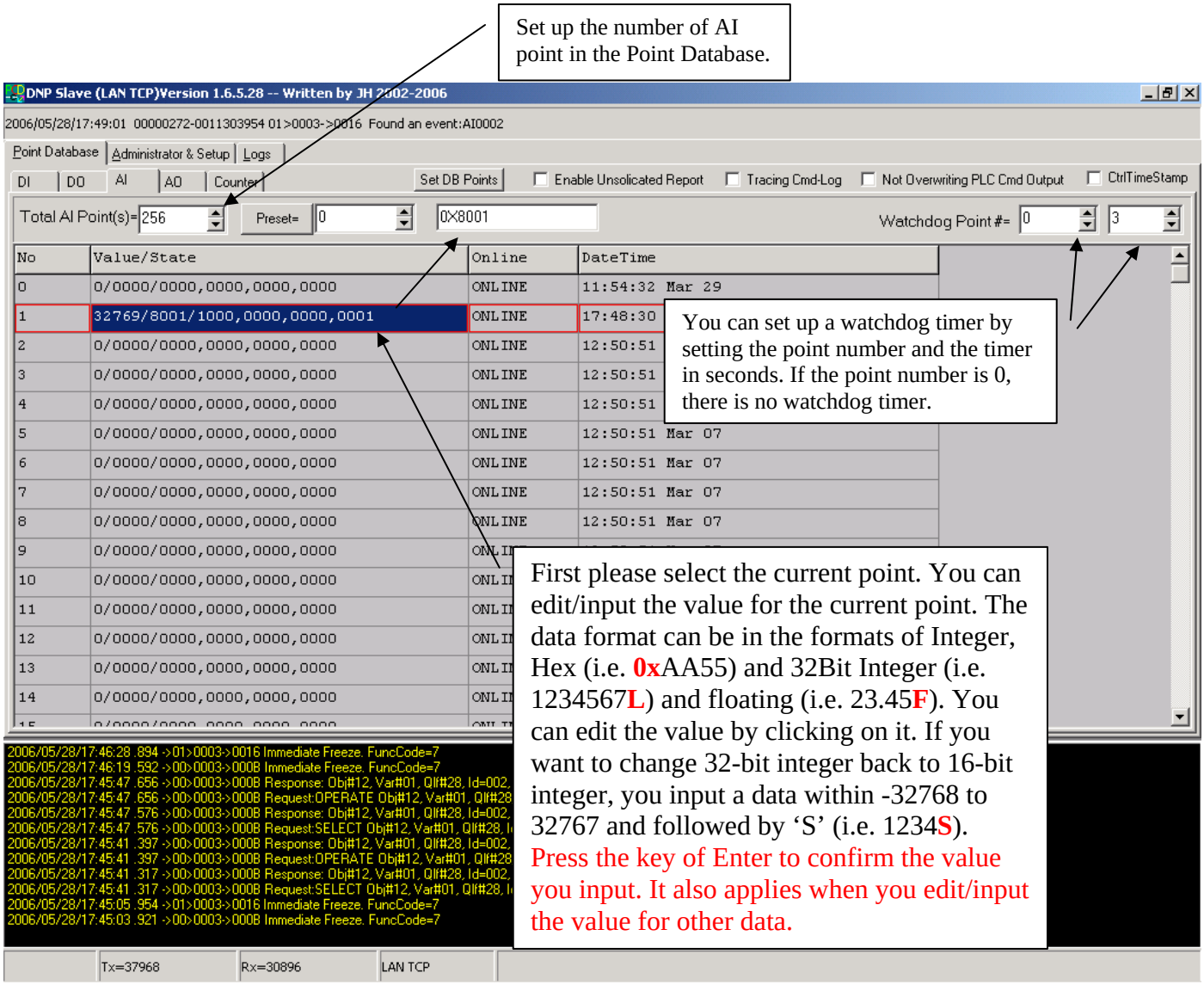


Figure 4-4

The page of AO - Analogue Output is shown as follows:

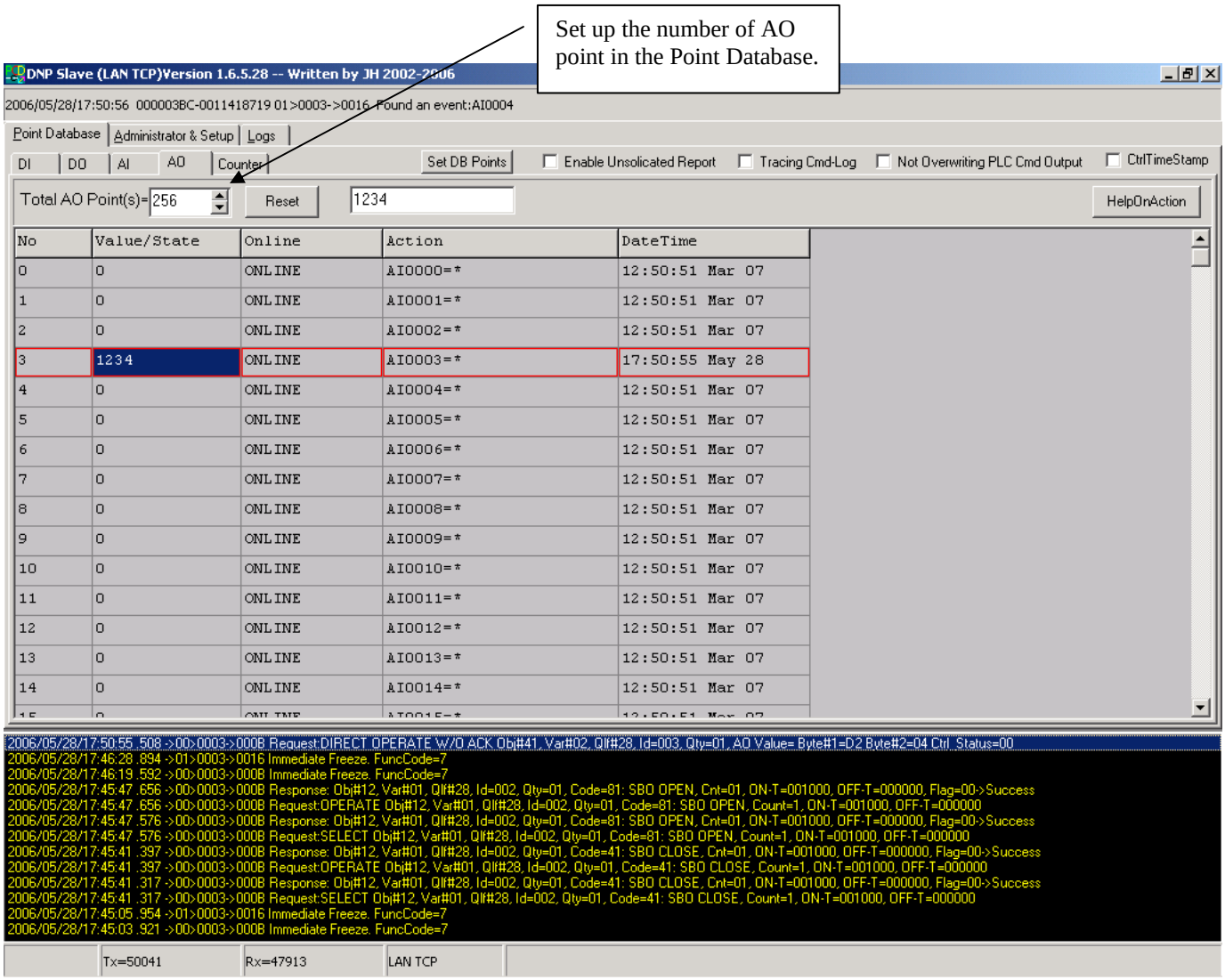


Figure 4-5

Note:

You can setup actions after controls by the configuration of the column of Action. Click on the button of HelpOnAction to get help how the Action works. The default action of AO Control is that the Value of AI is set by the Setpoint of AO.

The page of Counter is shown as follows:

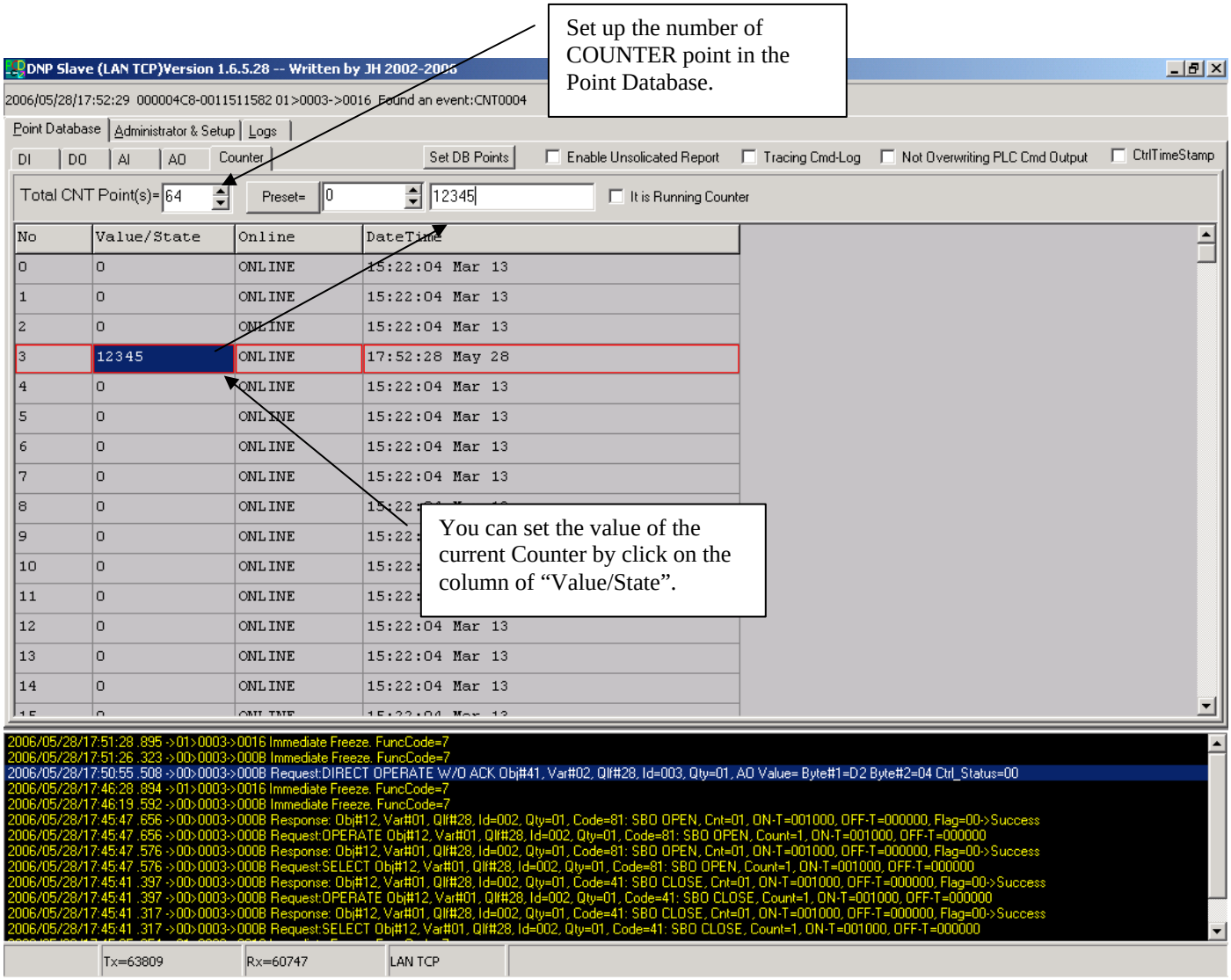


Figure 4-6

For DNP Slave, the following is the supported Object/Variation:

Objects	Variations	Qualifier (8/16-Bit Start/Stop)	Note
1	0,1,2	0x00,0x01,0x06	DI
2	0,1,2	0x00,0x01,0x06	DI Events, with T-Stamp
10	0,2	0x00,0x01,0x06	DO Status
12	1,2,3	0x00,0x01,0x06,0x17,0x27,0x28	DO Control
20	0,1,2,3,4,5,6	0x00,0x01,0x06	Counter 16/32-Bit
21	0,1,2,3,4,5,6	0x00,0x01,0x06	Counter Events, with T-Stamp
22	0,1,2,3,4,5,6	0x00,0x01,0x06	Frozen Counter
23	0,1,2,3,4,5,6	0x00,0x01,0x06	Frozen Counter Events
30	0,1,2,3,4,5	0x00,0x01,0x06	AI 16/32-Bit(floating)
32	0,1,2,3,4,5	0x00,0x01,0x06	AI Events, with T-Stamp
40	0,1,2,3,4	0x00,0x01,0x06	AO Status
41	1,2,3	0x00,0x01,0x06,0x17,0x27,0x28	AO Controls
50	0,1	0x00,0x01,0x06	D&T
60	1,2,3,4	0x06	Class data (Event-Poll)

The current Counter object var#2 (16-bit) can be changed to var#1(32-bit) when you input the data string with a suffix:"L".

[ ] Obj_2_1_For_IntegrityPoll
Default is Unchecked. If Checked, the DNP Slave replies the integrity-poll with Obj1-Var2 instead of Obj1-Var1.

[ ] Enable_DNP Remote Forced Bit
Default is Unchecked. If Checked, the DNP Slave sets the bit of Remote Force when you change the value of the current point manually.

[X]Enable Frozing Command in DNP Slave so that the DNP Object #20 and #21 can be read respectively.

[ ] Sync AutoTest with Event-Poll
[ ] LocalForce Generates Events

DNP Muli-SBO points command (multi-points in the same DNP protocol frame - Select & Operation) is allowed.

4.2 Point Database of Modbus

The screenshots Figure 4-7 to 4-9 is the Point Database of Modbus.

The page of DI - Digital Input -- 1xxx is shown as follows:

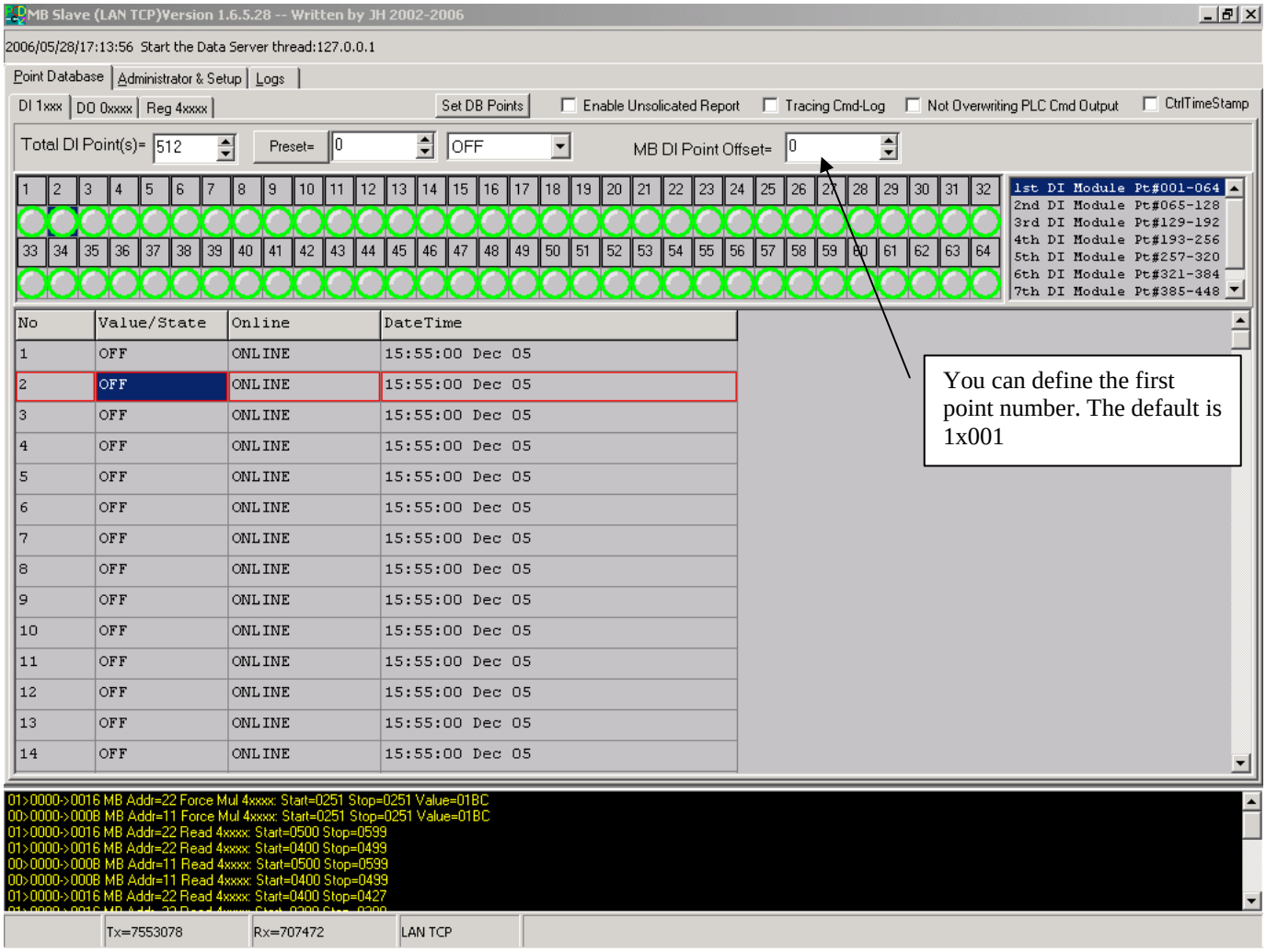


Figure 4-7

The page of DO - Modbus Coil -- 0xxx is shown as follows:

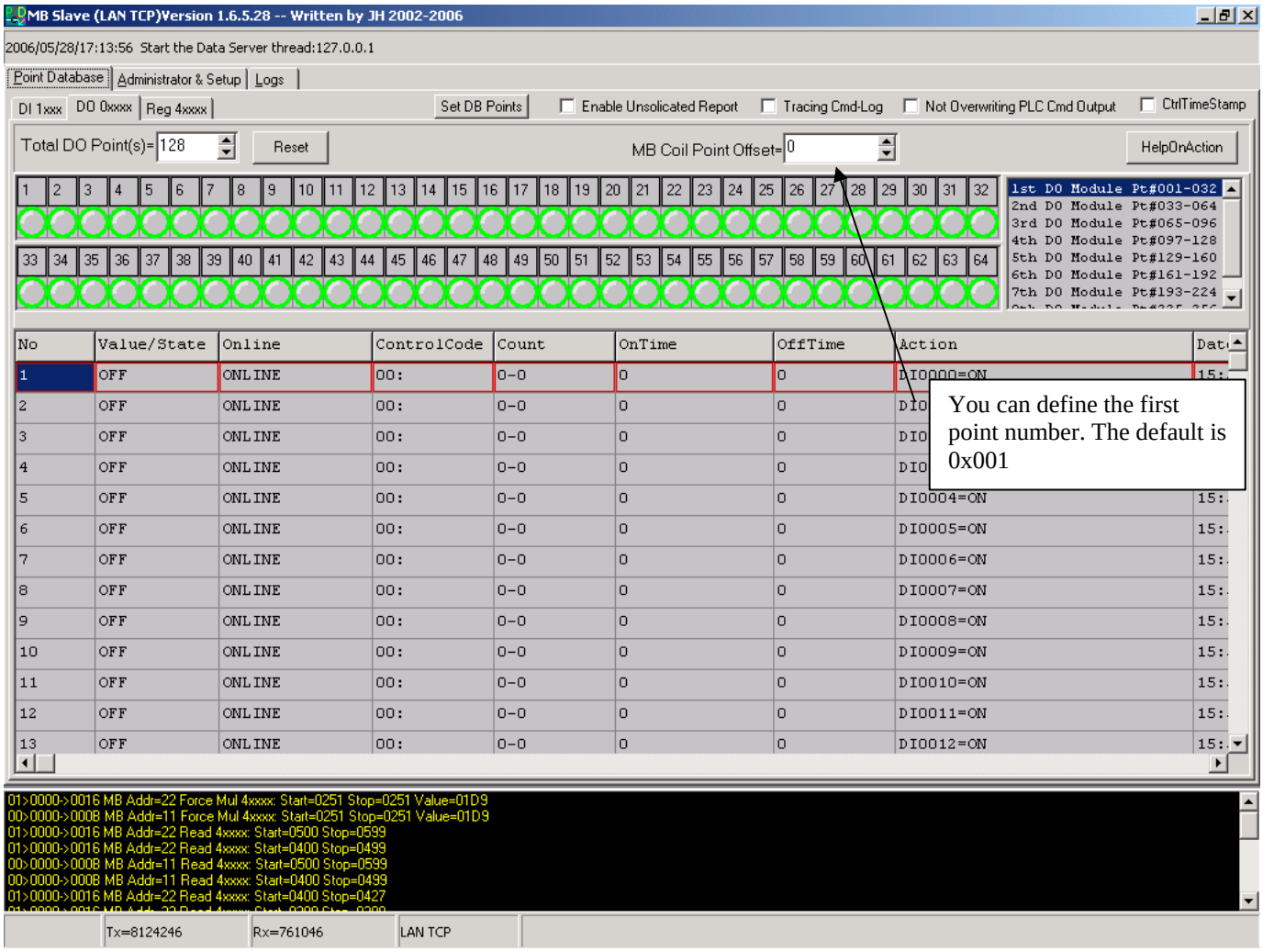


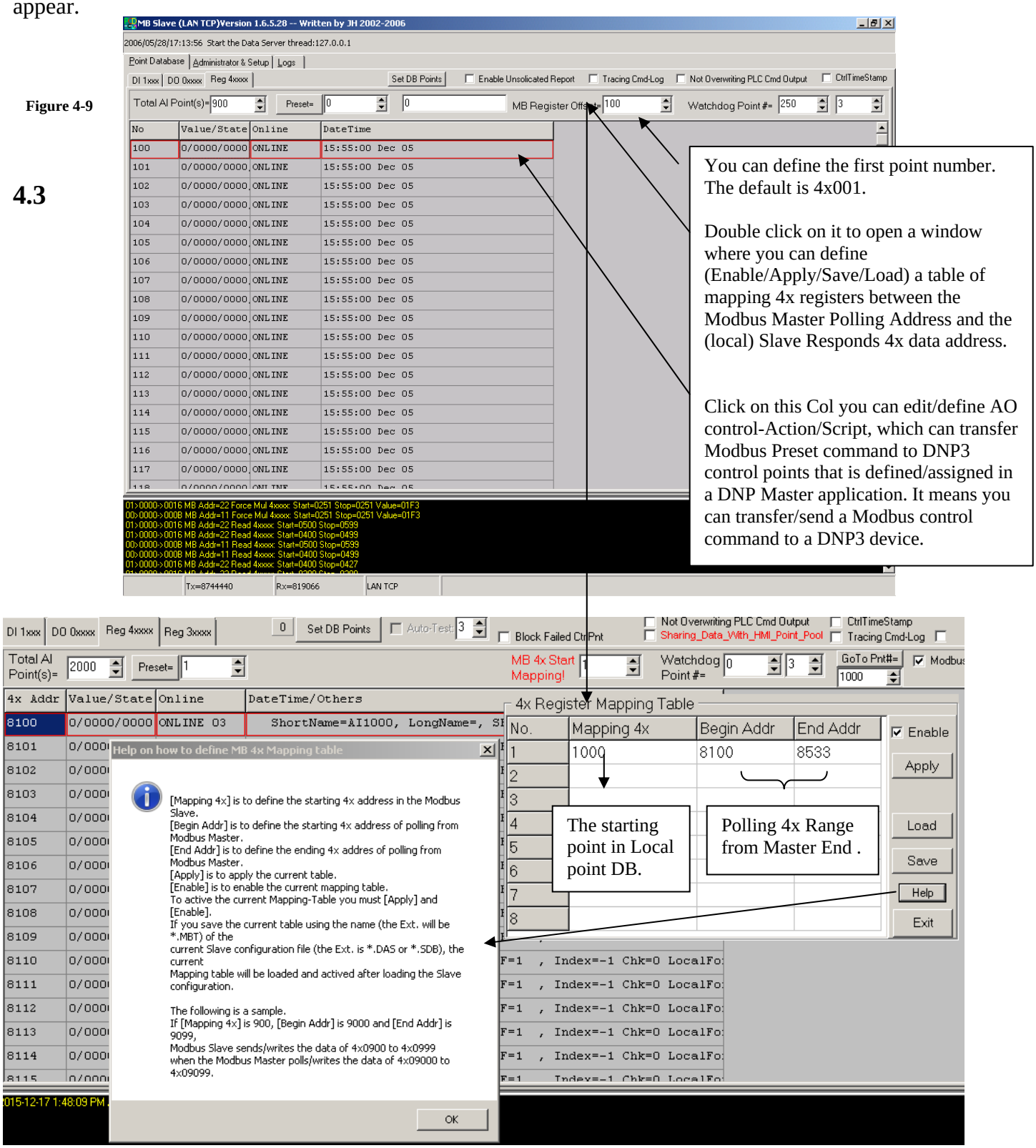
Figure 4-8

The page of AI/AO/COUNTER - Modbus Hold Registers -- 4xxx is shown as follows:

Note: By double-clicking on the label of [MB4x Start Address], the mapping table window will appear.

Figure 4-9

4.3



Processing the Tren-Points

The xSlave has the capability to process tren point and feed them into slave point database.
The file of Settings is xxxxx_tren_settings.txt. The contents of the file are described as follows:

```
A String: TheTrenPointFileName
A String: TheTrenPointFileSmpName
A String: TheTrenPointReadingProgram
A String: TheTrenPointReadingAckProgram
A DWord: TheTrenPointInterval (disable when 0)
A DWord: TrenPointOfflineTimeout (disable when 0)
A bool: NeedToDeleteTheTrenPointFile (enable when DELETETRENFILE)
```

If both files TheTrenPointFileName and TheTrenPointFileSmpName exist the TheTrenPointFileSmpName (and TheTrenPointFileName, if enabled) will be deleted after processing TheTrenPointFileName.
The following is a sample:

```
C:\xMaster\xSlaveAppl\dnpslave_tren_point.txt
C:\xMaster\xSlaveAppl\dnpslave_tren_smp.txt
*
*
1000
0
N
```

The file of Tren Point Setup is xxxxxx_setup.txt.
The format of the file of Tren Point Setup:

```
DI:dddd[TAB]vvvvvv[TAB][*][TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
AI:dddd[TAB]vvvvvv[TAB][*][TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
CNT:ddd[TAB]vvvvvv[TAB][*][TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
REG:ddd[TAB]vvvvvv[TAB][*][TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
The format of the file of Tren Point Data:
DI:dddd[TAB]vvvvvv[TAB]DateTimeString(or [*])[TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
AI:dddd[TAB]vvvvvv[TAB]DateTimeString(or [*])[TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
CNT:ddd[TAB]vvvvvv[TAB]DateTimeString(or [*])[TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
REG:ddd[TAB]vvvvvv[TAB]DateTimeString(or [*])[TAB]LongName[TAB]Scaling-A[TAB]Scaling-B[TAB]
Where [TAB] is the key of TAB and [*] is the Key *. DateTimeString is the time
stamp referring the sample 11/9/2007 8:46:37 PM
```

Note: above prefix of the file name is defined by the current xSlave configuration file name that is created when you press the button of [Save Config]. For example, if you save the current configuration into (c:\xMaster\xSlaveAppl\)ABCD.DAS, the xxxxx_tren_settings.txt will be ABCD_tren_settings.txt and the xxxxxx_setup.txt will be ABD_setup.txt. The files of Tren-Points are text-based file. User has to create/edit it manually (i.e. by using NotePad.exe, etc.). It will be loaded/detected/processed by xSlave automatically after *.DAS/*.SDB is loaded. User program now can run and generates the TheTrenPointFileSmpName (C:\xMaster\xSlaveAppl\dnpslave_tren_smp.txt) after the TheTrenPointFileName (C:\xMaster\xSlaveAppl\dnpslave_tren_point.txt) is created. The xSlave will read the data of Tren Point from dnpslave_tren_point.txt when dnpslave_tren_smp.txt is found and delete dnpslave_tren_smp.txt. User program start preparing/updating the Tren Point data file when finds dnpslave_tren_smp.txt is deleted. Again user program creates a new dnpslave_tren_smp.txt when finishes a new data file for all Tren Points.

5 Running and Log Information

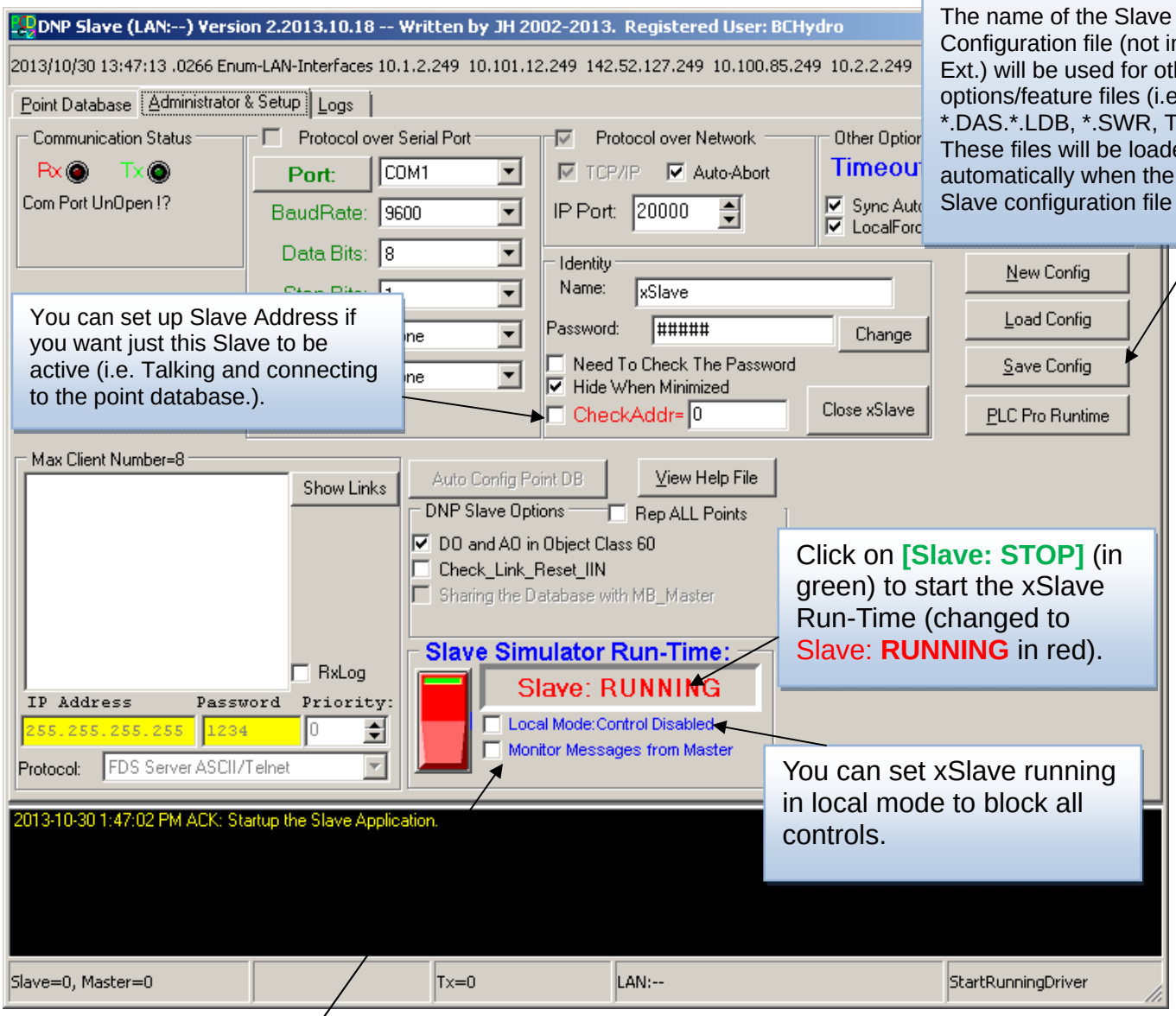


Figure 5-1

To only monitor the polling and control commands from the xMaster (i.e DNP_Master or MB_Master) over a serial communication link by using 2-wire RS232 cable (Rx and GND), you can check [X] Monitor Messages from Master. In this case xSlave won't response and polling/control command.

There is an option to force replying all polling with ALL Points in the current point database. if Auto-Test is checked, all DI data will be toggled and all AI data will be increased by ONE.

Figure 5-2

Double-Click on the Control-Commands log window to change the size of Font 8 <--> 12.

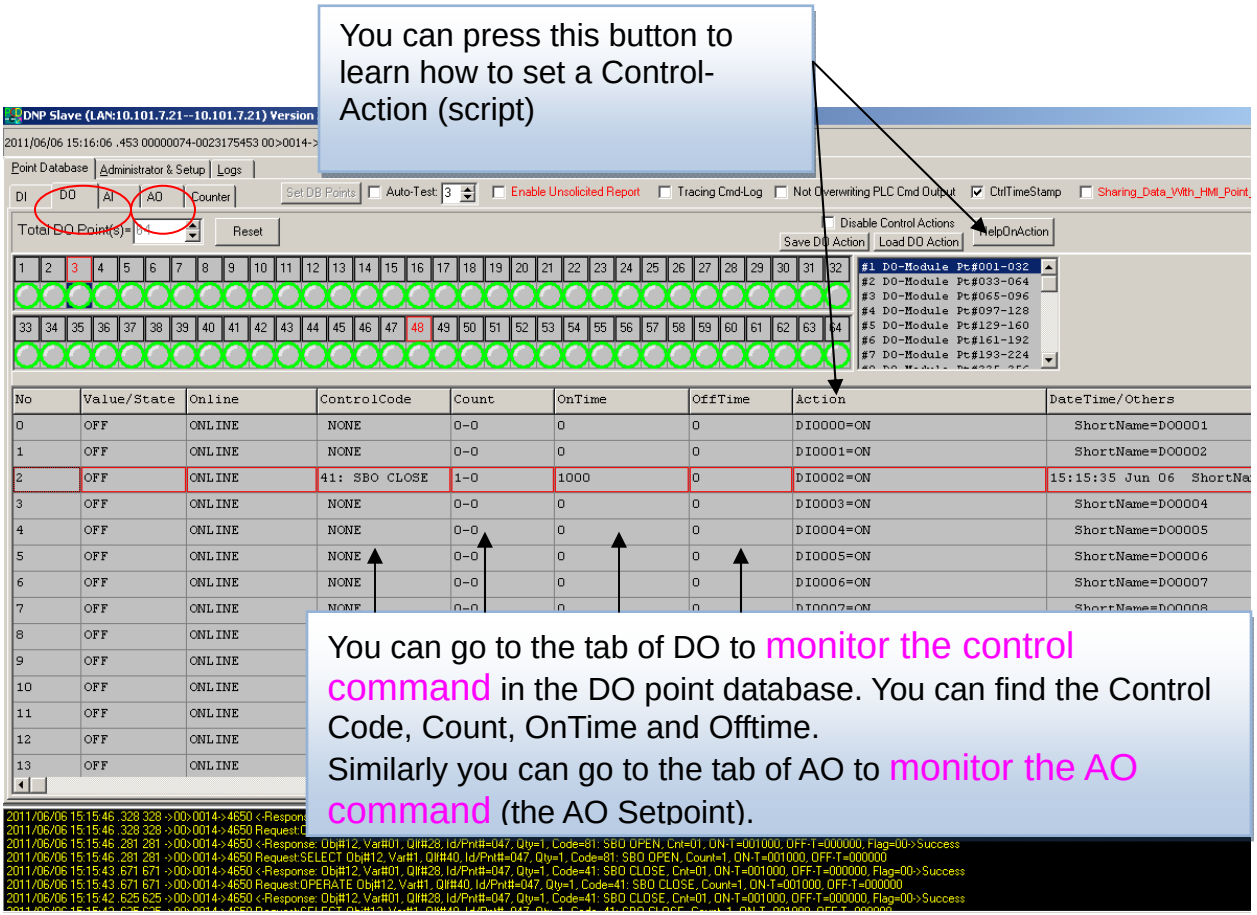

You can press this button to learn how to set a Control-Action (script)
You can go to the tab of DO to monitor the control command in the DO point database. You can find the Control Code, Count, OnTime and Offtime.
Similarly you can go to the tab of AO to monitor the AO command (the AO Setpoint).

Figure 5-3

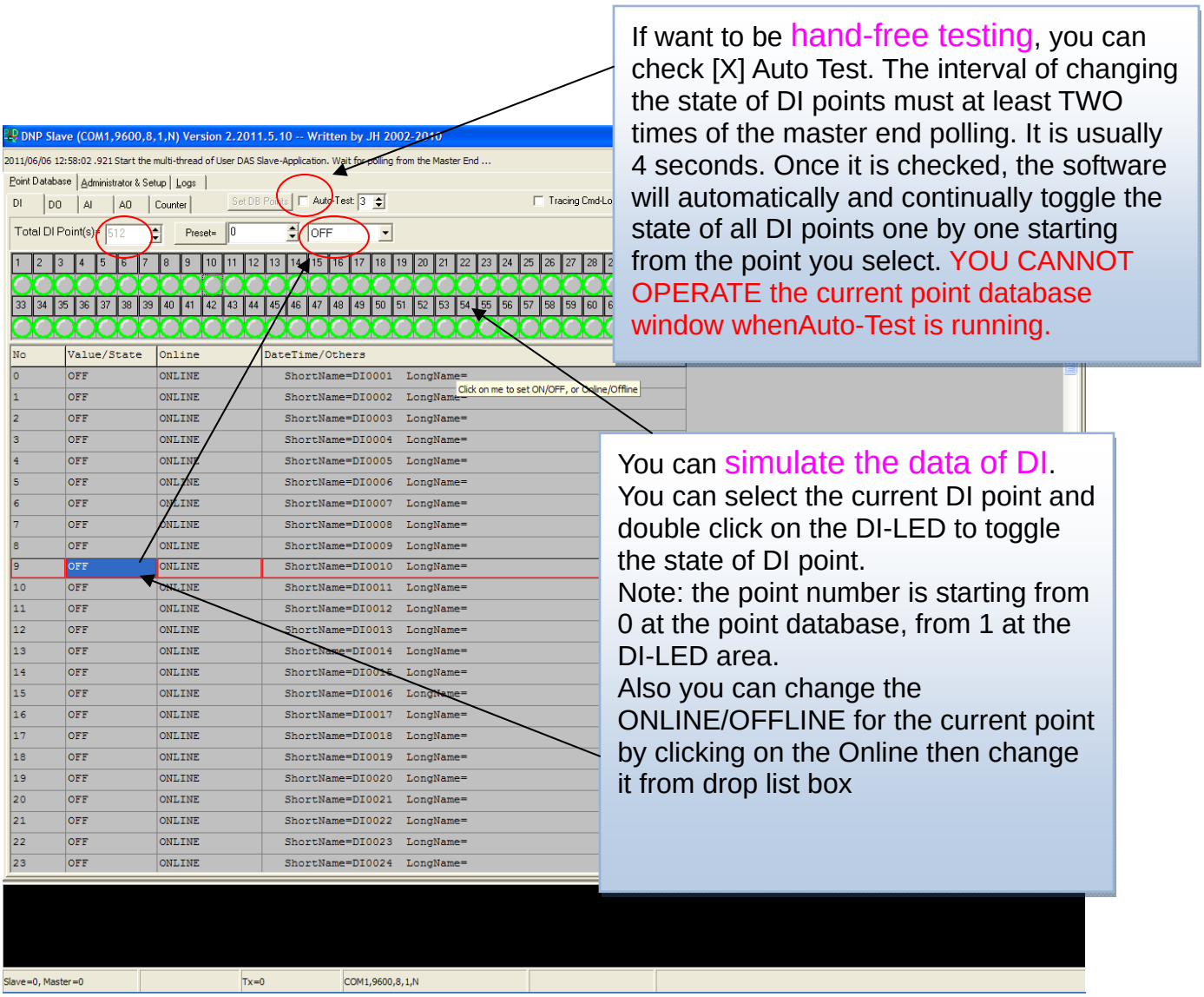
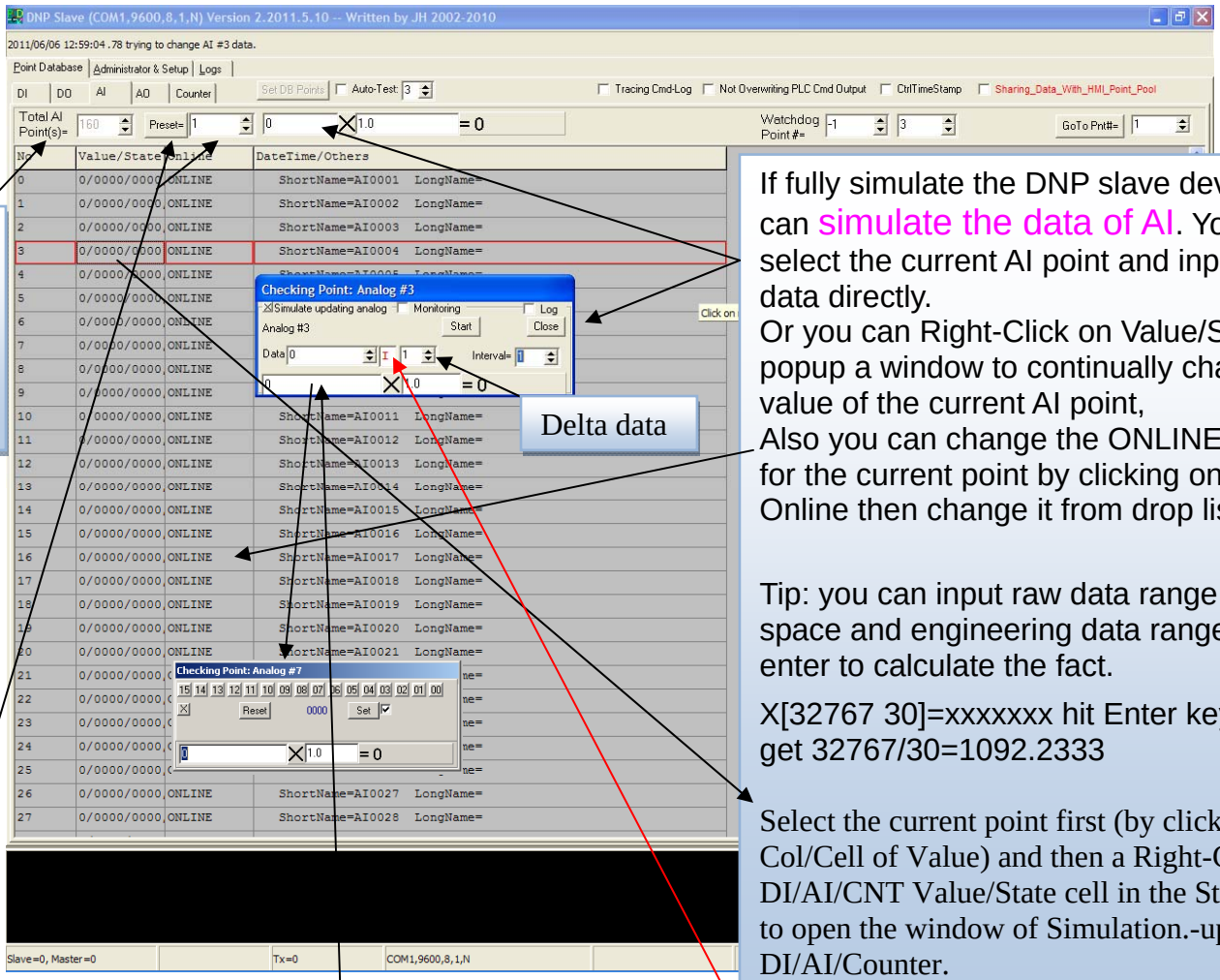

If want to be hand-free testing, you can check [X] Auto Test. The interval of changing the state of DI points must at least TWO times of the master end polling. It is usually 4 seconds. Once it is checked, the software will automatically and continually toggle the state of all DI points one by one starting from the point you select. YOU CANNOT OPERATE the current point database window whenAuto-Test is running.
You can simulate the data of DI.
You can select the current DI point and double click on the DI-LED to toggle the state of DI point.
Note: the point number is starting from 0 at the point database, from 1 at the DI-LED area.
Also you can change the ONLINE/OFFLINE for the current point by clicking on the Online then change it from drop list box
DNP Slave (COM1,9600,8,1,N) Version 2.2011.5.10 -- Written by JH 2002-2010
Point Database
Administrator & Setup
Logs
DI
DO
AI
AO
Counter
Auto-Test:
Tracing Cmd-Lo
Total DI Point(s):
Preset=
OFF
No
Value/State
Online
DateTime/Others
Click on me to set ON/OFF, or Online/Offline
Slave=0, Master=0
Tx=0
COM1,9600,8,1,N

Figure 5-4



You can double-click on it to open a separate window.

If fully simulate the DNP slave device, you can simulate the data of AI. You can select the current AI point and input the data directly.
Or you can Right-Click on Value/State to popup a window to continually change the value of the current AI point,
Also you can change the ONLINE/OFFLINE for the current point by clicking on the Online then change it from drop list box.

Tip: you can input raw data range and space and engineering data range and enter to calculate the fact.

X[32767 30]=xxxxxxx hit Enter key you can get 32767/30=1092.2333

Select the current point first (by clicking on the Col/Cell of Value) and then a Right-Click on DI/AI/CNT Value/State cell in the String Grid to open the window of Simulation.-updating-DI/AI/Counter.

Figure 5-5

You can preset the value for the AI points with either ALL-SAME, Increased by 1, or RANDOM. You may have to set up the starting value. The default is 1 as shown. You can change to 1000, for example, you select [INC+1], then the AI#0 is 1000, AI#1 is 1001, AI#3 is 1002 and so on.

You can double-click on the editor of Data Value to open a Bit-Based Data Preset window where you can click on a bit-button to change the value of data by a bit. Click on the button of [Set] to preset the data.

Here is to define the data type as follows:
I: is to define an Integer (16Bit).
L: is to define a Long Integer (32Bit).
F: is to define a Floating (32Bit).

Note: if Delta (Inc/Dec) data is 0, the data of the current point will be changed by random +/- 5% of the value in the field of [Data=].

The Simulation Window can be registered/removed/saved (*.SWR). It can be loaded automatically when the current Slave Configuration file (*.DAS or *.SDB) is loaded.