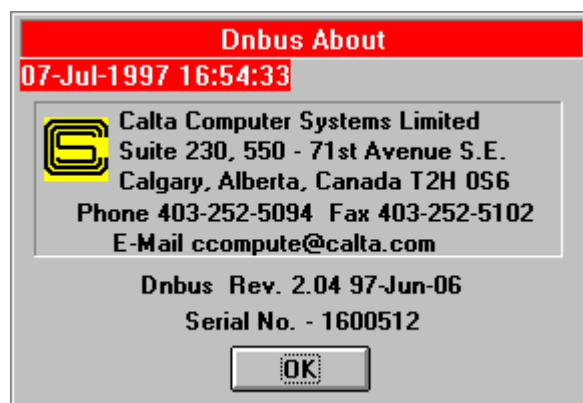GETTING STARTED

MODBUS SIMULATOR (Dnbus) FOR WINDOWS

Daniel Industries, Inc. 2500 Host-Slave Communications Version

Dnbus About

07-Jul-1997 16:54:33

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Serial No. - 1600512

OK

The program can be installed on any IBM or compatible PC equipped with a 386 or higher microprocessor. The machine must be running Windows 3.1 or higher with a least one available serial communications port. The 3 1/2 inch floppy contains an install program which can invoked via the "FILE - RUN" option of the Windows Program Manager by typing either A:\install or B:\install in the Command Line as required.

For test purposes two instances of the program can be run in the same machine and communicate if two serial ports are available and TX and RX are interconnected from one port to another. One instance needs to be configured as a Master and the other as a Slave. It is possible to invoke up to four instances of the program simultaneously if memory and serial ports are available. The first instance of DNBUS is named DNBUS, the second - DNBUS0, the third DNBUS1, and the fourth - DNBUS2.

When the program is invoked for the first time, the Configuration Window appears. If the Ok button is pressed, the following conditions will apply. The Mode will be MASTER (ie. will poll a Slave). The Slave will be polled via communications port one at 1200 baud with no parity and RTU format. The Slave polled will have an address of 1. Dnbus will raise RTS for 55 milliseconds before any characters are transmitted (in case communications is via a 202 type modem). It will poll for 2000 Booleans starting at point 1001, 600 Integer 16 registers starting at point 3001, 300 Integer 32 registers starting at point 5001, and 300 floating point registers starting at point 7001. It will attempt each poll three times if necessary for a successful response. If the default configuration is not desired, it can be changed. Pressing the Help button will bring up the Windows Help Facility program. Via the Search feature of this window, an full explanation of each configuration item can be obtained. If the Main Always On Top box is checked, the Main DNBUS Window will always be on Top of all Windows for quick reference. Unique Configurations can be kept via the Master/Slave Configuration- Database File (i.e. enter master1 for the File Ident. and press the Save File(s) button. This file can be later recalled by entering master1 in the File Ident. and pressing the Load File(s) button. Archive points are only valid in Master mode and the default is none are implemented.

If the On menu item on the Main Window is invoked, DNBUS will begin polling the Slave. The word after Comm. on the second line of the Main Window should be Nrml (steady). If it is Fail (steady), no successful communications is occurring. If it alternates between Fail and Nrml, one or more of a Database types's configuration is wrong for the slave being polled. To determine the problem, select Off on the Main Window. Under the Display Menu, the various Windows for displaying the values for the different Data Types can be invoked. If the Header line of a Window is displayed in Red, the data was not successfully retrieved. The Configuration should now be checked to ensure that the number and start of the errant type is correct.

The data retrieved from a Slave can be viewed by invoking the appropriate Window via the Displays menu item. Any Data type with a Number entry of zero will be grayed. The Monitor display is always grayed in any mode but Monitor. Communication statistics can be viewed by invoking the Statistics Menu item. Statistics can be reset by Double clicking anywhere on the Statistics Window. Data in any Display Window can be viewed by using the scroll buttons, the page up/down keys, the cursor up/down/right/left keys, tab, and the ctrl home/end keys. Any display window can be printed by invoking the - menu in the upper left hand corner and selecting the Print menu item. If Dnbus is in Master mode and Archive points are implemented, its window will be able to be invoked via the Displays menu item.

Control commands (Booleans, Integer 16, Integer 32, and Floating Point) can be sent to the Slave by selecting the Control menu item.

If DNBUS is configured as a SLAVE and the appropriate serial port is specified, it will respond to requests from a Master. It responds to requests for the address contained in the Modbus Slave No. in the Configuration Window when the On menu item is invoked. Data sent to the Master can be changed via a data display. Double clicking on a point in a Data Display Window will bring up a Change Window for altering the value. The Change Window also allows data values to be perturbed for a few scans or continuously for testing how the Master responds to changes. If the Control Menu Item is selected, the controls sent from a Master can be viewed in a Window complete with time, type, and value.

If DNBUS is configured for MONITOR mode, messages incoming on the RX line of a serial port can be viewed. Both TX and RX lines of a communications port can be monitored if they are diode coupled before being connected to the RX of the port configured to monitor. Selective messages can be configured for viewing based upon Slave number, Function code, and CRC errors. Messages can also be logged to a capture file.

DDE

Dnbus in Master Mode can be easily set up to poke its data into an Excel Spread Sheet. This includes all the Database values, History values as well as Time and Poll Statistics. Each Database type is stored in a column under a heading defining the Dnbus Instance and the type. If the Heading includes a *, the data has not been successfully retrieved from the Slave. To enable this feature, check the Excel DDE box and supply an Excel spreadsheet name in the Configuration Window. When Mdbus is turned On, it will make a connection with Excel so Excel must be up and running with the specified spreadsheet. In both Master or Slave Mode Dnbus can be made to turn On or Off via pokes from Excel or any other program supporting pokes. The Slave number and the Database points (start and number) can also be changed. These changes are temporary and are not saved but remain in effect until Dnbus is closed. Via pokes, Dnbus in Master Mode can be made to send out control commands to a Slave. Dnbus can execute a Macro in another application that supports DDE Execute. Examples of Macro Applications are Excel, Access, and Word for Windows. Dnbus will also respond to DDE Requests for data. Requested data can be Database values, time, polling statistics, and communication status. Dnbus does not support DDE Hot Links.

For all poke/request commands the DDE application name is DNBUS, DNBUS0, DNBUS1, and DNBUS2 depending on the instances in use. The DDE topic is always POKE.

The following details the poke commands (Item and Data) which Dnbus will accept.

Item	Data	Meaning
STATE	ON	Turn Dnbus on
STATE	OFF	Turn Dnbus off
STATE	CLOSE	Close Dnbus
SLAVE	xxx	Sets Slave number to xxx (0 to 255)
PHONE	ATxxxxxxx	Sets Phone no. - must start with AT
STATISTICS	1	Clears Statistics
BOOL yyy	x	Control/Set Bool yyy to x (either 1 or 0) (Dnbus must be ON in Master Mode or in Slave Mode)
IT16 yyy	xxxx	Control/Set Integer 16 yyy to xxxx (+ or - 32767) (Dnbus must be ON in Master Mode or in Slave Mode)
IT32 yyy	xxxx	Control/Set Integer 32 yyy to xxxx (+ or - 2147483647) (Dnbus must be ON in Master Mode or in Slave Mode)
FLOA yyy	xxx.xxx	Control/Set Float yyy to xxx.xxx (Dnbus must be ON in Master Mode or in Slave Mode)
NOBOOL	xxxx	Sets no. of Booleans to xxxx
STBOOL	xxxx	Sets start no. of Booleans to xxxx
NOIT16	xxxx	Sets no. of Integer 16 Regs. to xxxx
STIT16	xxxx	Sets start no. of Integer 16 Regs. to xxxx
NOIT32	xxxx	Sets no. of Integer 32 Regs. to xxxx
STIT32	xxxx	Sets start no. of Integer 32 Regs. to xxxx
NOFLOA	xxxx	Sets no. of F.P. Regs. to xxxx
STFLOA	xxxx	Sets start no. of F.P. Regs. to xxxx
AT212	ON	Enable 212 AT modem
AT212	OFF	Disable 212 AT modem
CONFIG	xxxxxxxx	Where xxxxxxxx is the File Ident. Config. to load. xxxxxxx must have been previously saved via the Configuration Window. (Dnbus must be OFF, and the Configuration Window must be closed.)
ARCH	ON	Poll for configured Archive data. (Dnbus must be ON and in Master Mode)
GNOREC	xxx	Where xxx is the number of records to retrieve for all Archives

The following details the valid data request commands which Dnbus will accept. Some request commands support multiple values. In multiple value cases, the values are separated by commas.

Item	Meaning
TIME	Returns time in the following format dd-mmm-yyyy hh:mm:ss.
ONOF	Returns the state of Dnbus, either ON or OFF.
ARTM	Returns the time the last Archive data was retrieved. Dnbus must be in Master Mode.
STTS x y	Returns Communication Statistics where x=1, 2, 3, or 4 for Requests, Incompletes, CRC errors, No Responses respectively and y is the number to return. If all are required, set x to 1 and y to 4. If only requests are required, set x to 1 and y to 1.
COMM xxxx	Returns Communication state where xxxx is BOOL, IT16, IT32, FLOA, or ARCH. A 0 (comm. O.K.) or a 1 (comm. bad) is returned for the database type selected.
BOOL xxxx yyy	Returns the database values starting at BOOL xxxx. The values are 0 or 1. yyy is the number of Booleans requested.
IT16 xxxx yyy	Returns the database values starting at Integer 16 reg. xxxx. The values range from a maximum /minimum of + or - 32767. yyy is the number of Integer 16 registers requested.
IT32 xxxx yyy	Returns the database values starting at Integer 32 reg. xxxx. The values range from a maximum /minimum of + or - 2147483647. yyy is the number of Integer 32 registers requested.
FLOA xxxx yyy	Returns the database values starting at Floating reg. xxxx. The values consist of a maximum of 15 digits. yyy is the number of Floating Point values requested.
ARCH xxx yyy	Returns data for Archive xxx and Record yyy. Dnbus must be in Master Mode.

This page is an example of an Excel 4.0 spreadsheet showing the data which has been poked into it by Dnbus.

	1	2	3	4	5
1	Time	No. of Requests	No. of Incompletes	No. of CRC Errors	No. of No Resp./Inv.
2	29-Sep-1995 14:04:00	4282	0	0	74
3	Dnbus Booleans	Dnbus Integer 16	Dnbus Integer 32	Dnbus Floats	
4	0	0	0	0	
5	0	0	0	0	
6	1	0	0	0	
7	0	-1234	0	0	
8	0	0	0	0	
9	0	0	1234567	0	
10	0	0	0	0	
11	0	0	0	1234.567017	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	

This page is an example of an Excel 4.0 spreadsheet showing the Archive data which has been poked into it by Dnbus.

	1	2	3	4	
2099					
2100	Time	Archive	Records		
2101	05-Feb-1996 16:17:15	701	10		
2102	32086	704643072	0	0	
2103	32086	704643072	0	0	
2104	32086	704643072	0	0	
2105	32086	704643072	0	0	
2106	32086	704643072	0	0	
2107	32086	704643072	0	0	
2108	32086	704643072	0	0	
2109	32086	704643072	0	0	
2110	32086	704643072	0	0	
2111	32086	704643072	0	0	
2112	Time	Archive	Records		
2113	05-Feb-1996 16:17:15	702	9		
2114	-1191150250	0	0	0	
2115	-1191150250	0	0	0	
2116	-1191150250	0	0	0	
2117	-1191150250	0	0	0	
2118	-1191150250	0	0	0	
2119	-1191150250	0	0	0	
2120	-1191150250	0	0	0	
2121	-1191150250	0	0	0	
2122	-1191150250	0	0	0	
2123	Time	Archive	Records		
2124	05-Feb-1996 16:17:15	703	8		
2125	32086	704643072	0	0	
2126	32086	704643072	0	0	

DNBUS.XLS

The following are examples of Excel 4.0 macros used to poke commands into Dnbus.

	1	2	3	4
36	set_up_dnbus		Set Up dnbus for Poll	**Set Up Dnbus**
37	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
38	=POKE(R37C1,"state",R38C2)	Off	Turn dnbus off	Button to Invoke Macro
39	=POKE(R37C1,"slave",R39C2)	3	Set Slave Address to 3	
40	=POKE(R37C1,"nobool",R40C2)	5	Set no. of Bool pts. to 5	
41	=POKE(R37C1,"stbool",R41C2)	1003	Set st. of Coil pts. to 1003	
42	=POKE(R37C1,"noit16",R42C2)	12	Set no. of Int 16 Reg. Pts. to 12	
43	=POKE(R37C1,"stit16",R43C2)	3005	Set st. of Input Reg. Pts. to 3005	
44	=POKE(R37C1,"noit32",R44C2)	13	Set no. of Int 32 Reg. Pts. to 13	
45	=POKE(R37C1,"stit32",R45C2)	5006	Set st. of Int 32 Reg. Pts. to 5006	
46	=POKE(R37C1,"nofloa",R46C2)	14	Set no. of Float Pts. to 14	
47	=POKE(R37C1,"stfloa",R47C2)	7007	Set st. of Float Pts. to 7007	
48	=POKE(R37C1,"phone",R48C2)	ATDT-403-555-	Set Phone no.	
49	=POKE(R37C1,"statistics",R49C2)	1	Clear Statistics	
50	=POKE(R37C1,"state",R50C2)	On	Turn dnbus on	
51	=RETURN()		End Macro	
52				
53	dnbus_bool		dnbus Boolean Control	**Dnbus Bool**
54	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
55	=POKE(R54C1,"bool 1003",R55C2)	1	Turn Bool 1003 On	Button to Invoke Macro
56	=RETURN()		End Macro	
57				
58	dnbus_it16		dnbus INT 16 Reg. Control	**Dnbus Int16**
59	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
60	=POKE(R59C1,"it16 3004",R60C2)	-1234	Set IT16 Reg. 3004 to -1234	Button to Invoke Macro
61	=RETURN()		End Macro	
62				
63	dnbus_it32		dnbus INT 32 Reg. Control	**Dnbus Int32**
64	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
65	=POKE(R64C1,"it32 5006",R65C2)	1234567	Set IT32 Reg. 5006 to 1234567	Button to Invoke Macro

The following are examples of Excel 4.0 macros used to request data from Dnbus.

73	get_poll_requests		Get Poll Statistics from dnbus	Req. Poll Stats
74	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
75	=SET.VALUE(R78C1:R78C4,REQUEST(R74C1,"stts 1 4"))		Get all 4 poll stats in R78 C1 to C4	Button to Invoke Macro
76	=RETURN()		End Macro	
77				
78	952	0	0	0
79				
80	get_it16_register		Get Input Reg. from dnbus	Get Int 16 Reg.
81	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
82	=SET.VALUE(R85C1:R85C4,REQUEST(R81C1,"it16 3003 4"))		get input reg. 3003-3007	Button to Invoke Macro
83	=RETURN()		End Macro	
84				
85	0	-1234	0	0
86				
87	get_data_valid		Get In. Reg valid flag from dnbus	Get Comm. St.
88	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
89	=REQUEST(R88C1,"comm it16")		get comm. state for it16 reg.	Button to Invoke Macro
90	=FORMULA(R89C1,R90C2)	1	Display Comm. State	
91	=RETURN()		End Macro	
92				
93	get_dnbus_state		Get State from dnbus	Get Dnbus St.
94	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
95	=REQUEST(R94C1,"onof")		get dnbus state	Button to Invoke Macro
96	=FORMULA(R95C1,R96C2)	ON	Display dnbus State	
97	=RETURN()		End Macro	
98				

The following portion from the Configuration Window shows that data will be poked into an Excel 4 spreadsheet mdbus.xls (name at top of spreadsheet) and an Excel 4 macro called beep will be executed.

The following portion from the Configuration Window shows that data will be poked into an Excel 5 Workbook mdbus.xls and Worksheet scada and an Excel 5 macro called beep will be executed.

The following portion from the Configuration Window shows that data will be poked into an Excel 5 Workbook mdbus.xls and Worksheet scada and an Access macro called macro1 will be executed in the database db1.mdb. Note that the database extension is not used.

```
┌─Master Only DDE──────────────────────────────┐   ┌──────────┐
│  ☒ Excel DDE   Excel Sprdsht │[mdbus.xls]scada│  DDE T.O. (sec.) │15│   │   Help   │
│                                                              ├──────────┤
│  ☒ Macro DDE Appl,Topic │msaccess,db1│    Macro │macro1│    │  Cancel  │
│                                                              ├──────────┤
│                                                              │    Ok    │
└──────────────────────────────────────────────┘   └──────────┘
```

The following portion from the Configuration Window shows that data will be poked into an Excel 5 Workbook mdbus.xls and Worksheet scada and a Word macro called macro1 will be executed in the document doc1.doc.

```
┌─Master Only DDE──────────────────────────────┐   ┌──────────┐
│  ☒ Excel DDE   Excel Sprdsht │[mdbus.xls]scada│  DDE T.O. (sec.) │15│   │   Help   │
│                                                              ├──────────┤
│  ☒ Macro DDE Appl,Topic │winword,doc1.doc│    Macro │macro1│    │  Cancel  │
│                                                              ├──────────┤
│                                                              │    Ok    │
└──────────────────────────────────────────────┘   └──────────┘
```

The following are examples of Excel 5.0 Visual Basic Macros to start Dnbus, turn Dnbus On/Off and load the configuration "TEST".

```
┌─────────────────────────────── DNBUS.XLS ───────────────────────────────┐
│ Sub dnbus_on()                        'turn dnbus On                     │
│ Dim chan As Integer                                                      │
│                                                                          │
│ chan = DDEInitiate("dnbus", "poke")                                      │
│ DDEPoke chan, "STATE", "Pushbuttons!r3c1"  'Pushbuttons r1c1 contains ON │
│ End Sub                                                                   │
│                                                                          │
│ Sub dnbus_off()                       'turn dnbus Off                    │
│ Dim chan As Integer                                                      │
│                                                                          │
│ chan = DDEInitiate("dnbus", "poke")                                      │
│ DDEPoke chan, "STATE", "Pushbuttons!r4c1"  'Pushbuttons r2c1 contains OFF│
│ End Sub                                                                   │
│                                                                          │
│ Sub dnbus_config()                    'load saved conf. called test      │
│ Dim chan As Integer                                                      │
│                                                                          │
│ chan = DDEInitiate("dnbus", "poke")                                      │
│ DDEPoke chan, "config", "Pushbuttons!r2c1" 'Pushbuttons r3c1 contains test│
│ End Sub                                                                   │
│                                                                          │
│ Sub dnbus_start()                     'start up dnbus                    │
│                                                                          │
│ Shell ("c:\dnbus\dnbus.exe")                                             │
│ End Sub                                                                   │
└──────────────────────────────────────────────────────────────────────────┘
```

The following are examples of Excel 4.0 macros used to request initiate and obtain Archive data from Dnbus.

	1	2	3	
	R120C2	1996/02/06 14:57:02		
	DNBUS.XLM			
98				
99	dnbus_archive	**Retrieve Archive**	Initiate Archive poll by Dnbus	
100	=INITIATE("dnbus","poke")		Dnbus must be On and Master	
101	=POKE(R100C1,"arch",R101C2)	on		
102	=RETURN()			
103				
104	dnbus_comm	**Archive Comm.**	Get Archive Poll Comm. Status	
105	=INITIATE("dnbus","poke")		Dnbus must be Master	
106	=REQUEST(R105C1,"comm arch")			
107	=FORMULA(R106C1,R107C2)	0		
108	=RETURN()			
109				
110	get_arch_record	**Get Archive Record**	Get Archive record from dnbus	
111	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
112	=SET.VALUE(R115C1:R115C26,REQUEST(R111C1,"arch 701 1"))		get Arch. data arch 701 record 1	
113	=RETURN()		End Macro	
114				
115	15890	-318767104	0	0
116				
117	get_arch_time	**Get Archive Time**	Get Archive Time from dnbus	
118	=INITIATE("dnbus","poke")		Inititate DDE Comm. with dnbus	
119	=REQUEST(R118C1,"artm")		get Archive Time	
120	=FORMULA(R119C1,R120C2)	35101.6229398148	Display Archive Time	
121	=RETURN()		End Macro	
122				

For technical support or suggestions for future enhancements to Dnbus, please contact

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