CAN Bus Analyzer

User Manual

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1 Features Highlights

- Support J1939 and CANOpen Protocol
- Support Windows 7/8/10/11 and above.
- Support as many as 8 CAN bus transmitting periodically. The timer is based on hardware, not based on PC software. Data value can be increased/decreased automatically,
- Provide .Net Component, MATLAB/Simulink and LabVIEW library for customized GUI development. Easily develop in VB.net/ C# /C++ under .net environment or in MATLAB/Simulink and LabVIEW
- Support CAN BUS 2.0A and 2.0B.
- Support Remote Frame transmitting and receiving.
- Support Capture special CAN ID group
- Support Log file to save all frames. All hardware Setting can be stored into PC file
- CAN Bus baud rate is some values from 25K to 1M bps
- 3 KV Isolation between CAN Bus and PC
- Power by external supply range is 5.5V to 28VDC or/and USB Connection.

***Notes**: Alternatively, if you have MATLAB/Simulink License, you can use MATLAB/Simulink library and create your Analyzer Software directly, just read our [MATLAB/Simulink datasheet](). Or if you have Labview License, you can directly use our Labview subVI library to implement any function, please read our [LabVIEW datasheet]().*

2 Hardware

Fig.1 Hardware of CAN Bus Analyzer

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2.1 Pin Assignment

Fig.2 DB9 Pinout

Table 1 Pinout

Pin	Name	Description
1	Reserved	Leave it unconnected.
2	CANL	CAN Bus Signal: CAN Low
3	CAN BUS Signal Ground	CAN Bus Signal and Power ground. 5.5 to 28V DC Power supply input - Side.
4	Reserved	Leave it unconnected.
5	Shield Ground	Connect earth ground or Leave it unconnected.
6	CAN BUS Signal Ground	CAN Bus Signal and Power ground. 5.5 to 28V DC Power supply input - Side.
7	CANH	CAN Bus Signal: CAN High
8	Reserved	Leave it unconnected.
9	5.5 to 28V Power (+)	This is option. 5.5 to 28V DC Power supply input + Side. You can leave it unconnected, just use USB connection Power supply. The power supply negative side is pin6 (CAN BUS Signal Ground).

2.2 LED Indication

There are 4 LEDs to indicate the CAN Bus Analyzer/Simulator state. 2 LEDs' color is Green. 2 LEDs' color is Red

1 Supported Function LED (Red color)

If this LED is bright, it means CAN BUS Simulator. No echo for transmitting CAN Frame.

If this LED is blinking, it means CAN BUS Analyzer. It has echo receiving for transmitting CAN Frame.

2 Enable LED (Red Color)

If this LED is Dark, it means CAN Bus is Disabled, It can not send CAN Acknowledge bit

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If this LED is bright, it means CAN Bus is enabled, It can send CAN Acknowledge bit

3 CAN TX LED (Green color)

When CAN Bus Analyzer/Simulator transmits any CAN Frame, this LED will be on.

4 **CAN RX LED (Green color)**

When CAN Bus Analyzer/Simulator receives any CAN Frame, this LED will be on.

3 Software Interface

CAN Bus Analyzer software has 3 areas, Menu, Tool bar and Status bar as Fig.1 below:

Fig.1 Software Interface

You operate software by click Menu item and Tool bar. You will see software Status in "Status bar" such as COM port number, CAN bus Enable/Disable (CAN Bus Analyzer Started / Stopped), CAN baud Rate, Error counter value, which Protocol, and 120 Ohms terminator on/off.

In the Menu area, there are "File", "View", "Tools", "Setup" and "Help" items.
For Menu item "File", it has "Open Log File",Use Config File", "Save Config File", "Save Config File As", and "Exit" as Fig.2 below:

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Fig.2 File menu

Item "Open Log File" is used to open Log file of CAN BUS frame. It is only available when CAN BUS Analyzer Stopped (CAN Bus Disabled).

Item "Use Config File " is loading CAN BUS Analyzer hardware settings from PC file. CAN BUS Analyzer hardware settings include CAN BUS baud rate, protocol name, CAN BUS ID for periodically transmitting or one-time transmitting.

Item "Save Config File" is save CAN BUS Analyzer hardware settings to PC file. File name is previous name you chose.

Item "Save Config File As" is save CAN BUS Analyzer hardware settings to PC file. File name is decided by popup dialog.

Item "Exit" will exit this application software, all settings will kept automatically for next time running.

For Menu item "View", if protocol is CAN BUS, it has "CAN id in Hex" or "CAN id in DECIMAL", "CAN Data in Hex" or "CAN Data in DECIMAL", "Close All Tool Windows", and "Open All Tool Windows" as Fig.3 below:

Fig.3 View menu

The 1st item is changed as different Protocol.

If Protocol J1939 is used, the 1st item is "PGN/PS/PF/SA in Hex " or "PGN/PS/PF/SA in DECIMAL".

If Protocol CANOpen is used, the 1st item is "COB-ID/Node ID in Hex " or "COB-ID/Node ID in DECIMAL".

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Let's explain CAN BUS protocol for these items. It is the same for J1939 and CANOpen.

Item "CAN id in Hex" means that CAN id is now displayed in decimal for receiving sub-windows or typed in decimal for transmitting sub-window, it will changed to "in Hex" if you click it.
Item "CAN id in DECIMAL" means that CAN id is now displayed in hex for receiving sub-windows or typed in decimal for transmitting sub-window, it will changed to "in DECIMAL" if you click it.

Item "CAN Data in Hex" means that CAN Data is now displayed in decimal for receiving sub-windows or typed in decimal for transmitting sub-window, it will changed to "in Hex" if you click it.
Item "CAN Data in DECIMAL" means that CAN data is now displayed in hex for receiving sub-windows or typed in decimal for transmitting sub-window, it will changed to "in DECIMAL" if you click it.

Item "Close All Tool Windows" will close all opened sub-windows such as receive/transmit sub-windows
Item "Open All Tool Windows" will open all opened sub-windows such as receive/transmit sub-windows

For Menu item "Tools", it has "Rolling Trace" , "Fixed Trace", "Transmit Periodically" , "Transmit Once", "Start" or "Stop", and "Capture CAN ID" as Fig.4 below:

Fig.4 Tools menu

Item "Rolling Trace" means that you will open a CAN BUS receiver sub-window which displays all CAN Bus received frames in order of first-come first-display.
Please see Fig. 5 for Rolling trace window below when protocol is CAN Bus.

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Trace	CAN ID	DLC	D1	D2	D3	D4	D5	D6	D7	D8	Rtr	Time Stamp(sec)	Time Delta(sec)
RX	0x18FEE000x	8	0x0F	0x00	0x00	0x00	0x0F	0x35	0x0C	0x00	No	1185.0090	0.0009
RX	0x18FEF100x	8	0xFF	0x80	0x7D	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.0090	0.0006
RX	0xCF00300x	8	0xFF	0x7D	0x3E	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.0470	0.0380
RX	0x18FE6C00x	8	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x80	0x7D	No	1185.0480	0.0005
RX	0xCF00300x	8	0xFF	0x7D	0x3E	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.0970	0.0495
RX	0x18FE6C00x	8	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x80	0x7D	No	1185.0980	0.0009
RX	0xCF00400x	8	0xFF	0xFF	0x7D	0x80	0x7D	0xFF	0xFF	0xFF	No	1185.1070	0.0090
RX	0x18FEF200x	8	0x80	0x7D	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.1080	0.0006
RX	0x18FEE000x	8	0x0F	0x00	0x00	0x00	0x0F	0x35	0x0C	0x00	No	1185.1090	0.0009
RX	0x18FEF100x	8	0xFF	0x80	0x7D	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.1090	0.0006
RX	0xCF00300x	8	0xFF	0x7D	0x3E	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.1470	0.0380
RX	0x18FE6C00x	8	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x80	0x7D	No	1185.1480	0.0006
RX	0xCF00300x	8	0xFF	0x7D	0x3E	0xFF	0xFF	0xFF	0xFF	0xFF	No	1185.1970	0.0494
RX	0x18FE6C00x	8	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x80	0x7D	No	1185.1980	0.0009

Fig.5 Rolling Trace

In above Fig.5, for CAN ID column, the suffix "x" or "X" denotes 29 bits extended frame. All prefix "0x" denotes hex digit. The column "Trace" tells us CAN bus frame is transmitted frame (TX) or received frame (RX).

Item "Fixed Trace" means that you will open a CAN BUS receiver sub-window which displays all CAN Bus received frames, however, the same CAN Bus ID only displays once and content is the latest frame, Time difference is time interval for this CAN ID.

Item "Transmit Periodically" means that you open a CAN BUS transmitter sub-window which transmits CAN BUS frame periodically. This item is only available when CAN BUS stopped (Disabled).

Item "Transmit Once" means that you open a CAN BUS transmitter sub-window which transmits CAN BUS frame by click "Send" button. It will transmit once when you click "Send" button once.

Item "Start" or "Stop" means that you will start CAN Bus Analyzer (Enable CAN bus) or you will stop CAN Bus Analyzer (Disable CAN bus). The bottom "Status" bar will display "CAN bus Analyzer Started or Stopped"

You can use tool bar's "Start/Stop" button to replace it alternatively.

Item "Capture CAN ID" means that you can capture special CAN ID which is received by CAN Analyzer, it will display in " Fixed Trace" window in yellow background color. So user easily knows that CAN Bus Analyzer receives special CAN ID.

For Menu item "Setup", it has "Log File Setup", "Hardware Setup" , and "Protocol Setup" as Fig.6 below:

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Fig.6 Setup menu

Item "Log File Setup" will enable/disable log file and tells software log file name and directory. Log file content is text file, you can use any text editor software to read it.

Item "Hardware Setup" will setup "Uart port number", "CAN bus baud rate", and enable/disable terminator resistor. Please see Fig.7 below:

Fig.7 Hardware Setup

If you click "USB COM Port Number", it will popup an dialog for you to get COM port number. At the same time, Status bar will display which com port you used.

If you click "CAN baud rate", it will popup an dialog for you to input CAN Bus baud rate. You can use "K" or "M" suffix to simplify typing. For example, 250000 can be 250K. At the same time, Status bar will display CAN bus baud rate you used.

If "Bus Termination On" has "check mark", it means you turn on 120 ohms terminator. At the same time, Status bar will display "Terminator Resistor On"

Item "Protocol Setup" will setup protocol. Please see Fig.8 below:

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Fig.8 Protocol Setup

You can select one of "CAN Bus"/J1939/CANOpen. And Status bar will display protocol you used.

There are 2 buttons in tool bar. One is Start/stop button. Please see Fig.9 below:

Fig.9 tool bar Start/Stop button

It is the same as menu Tools/ Start or Stop item. When CAN bus Analyzer stopped (Disabled CAN Bus), you can click it for "Start CAN Bus Analyzer" (Enable CAN Bus), and you will see information "CAN Bus Analyzer Started" in Status bar.

When CAN bus Analyzer started (Enabled CAN Bus), you can click it for "Stop CAN Bus Analyzer" (Disable CAN Bus), and you will see information "CAN Bus Analyzer Stopped" in Status bar.

The other button in tool bar is "Pause/Resume" button, please see Fig.10 below:

Fig.10 tool bar pause/Resume button

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This button is used to pause all CAN Bus receiver windows (Rolling Trace and Fixed Trace) display. However, Log file still record received CAN Bus frames. Some times too many received CAN BUS frames make receiver windows display flicker, you can use this button to pause display. Alternatively, every receiver window has right click menu to pause display.

4 How to use our software

Firstly, you have to plug CAN Bus Analyzer into USB port of PC. (Of cause you can plug in later, but you have to plug in before you select USB COM port).

Double click file "CAN_Analyzer.exe" to run this software.

And then if existing settings are not correct, you should set up CAN BUS by "Set up" menu item. Or you can use "File/Use Config File..." menu item to load all settings from other computer.

After settings done, you just use "Tools"/Fixed trace to view Fixed CAN bus receive. Or/ And use "Tools"/Rolling trace to view rolling CAN bus receive.

Of cause, it starts when you click "Start/Stop" button in tool bar.

Put mouser inside "Fixed Trace" or "Rolling Trace" window, and right click, it will display context menu as Fig. 11 below

Trace	CAN ID	DLC	D1	D2	D3	D4	D5	D6	D7	D8	Rtr	Time Stamp(sec)	Time Delta(sec)	Counter
RX	0xCF00300x	8	0xFF	0x7D	0x3E	0xFF	0xFF	0xFF	0xFF	0xFF	No	2874.7140	0.0501	2423
RX	0x18FE6C00x	8	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0x80	0x7D	No	2874.7140	0.0500	2423
RX	0xCF00400x	8	0xFF	0xFF	0x7D	0x80	0x7D	0xFF	0xFF	0xFF	No	2874.6740	0.1001	1214
RX	0x18FEF200x	8	0x8	[illegible]	[illegible]	[illegible]	0xFF	0xFF	0xFF	0xFF	No	2874.6750	0.1004	1213
RX	0x18FEE000x	8	0xE	[illegible]	[illegible]	[illegible]	0xE5	0x36	0x0C	0x00	No	2874.6750	0.1001	1215
RX	0x18FEF100x	8	0xF	[illegible]	[illegible]	[illegible]	0xFF	0xFF	0xFF	0xFF	No	2874.6760	0.1000	1214
RX	0x18FEEE00x	8	0x7D	0x78	0x80	0x7D	0xFF	0xFF	0xFF	0xFF	No	2873.9760	1.0005	124
RX	0x18FEF500x	8	0x7D	0xFF	0xFF	0x40	0x25	0x4B	0xFF	0xFF	No	2873.9770	1.0006	123
RX	0x18FEE900x	8	0x15	0x06	0x00	0x00	0x15	0x06	0x00	0x00	No	2873.9770	1.0006	123
RX	0x18FEF700x	8	0xFF	0xFF	0xFF	0xFF	0xE0	0x01	0xFF	0xFF	No	2873.9780	1.0006	123
RX	0x18FEFC00x	8	0x7D	0x7D	0xFF	0xFF	0xFF	0xFF	0x7D	0xFF	No	2873.9790	1.0006	123
RX	0x18FECA00x	8	0x03	0xFF	0x00	0x00	0x00	0x00	0x00	0x00	No	2873.9790	1.0006	123
RX	0x18FEF600x	8	0xFF	0x7D	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	No	2874.5940	0.5003	243
RX	0x18FEEF00x	8	0x7D	0xFF	0xFF	0x7D	0xFF	0xFF	0x7D	0xFF	No	2874.5940	0.5003	244
RX	0x18FEF300x	8	0x00	0x00	0x80	0x7D	0x00	0x00	0x80	0x7D	No	2872.8130	5.0029	26

Fig.11 Pause/Resume Context menu

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You can click "Pause" to freeze display, and right click, popup menu will contain "Resume" to start display again.
If you click "Clear Trace", it will clear all display. However, these "Pause" and "Clear Trace" have no any effect on Log File. Log File still record what it receives.

If you want to see whether "special CAN ID" is received, you can use menu "Tools/Capture CAN ID" to set up which group of CAN ID can be captured.
When your interesting CAN ID is captured, it will display in yellow color in "Fixed Trace" window.
(Rolling Trace window does not display in yellow color for captured CAN bus frame)

You can transmit any CAN bus frame as you like by "Tools/Transmit Once" or "Tools/Transmit Periodically" menu.
Because "Transmit Periodically" is operated directly by hardware, so you only can open it before you "Start CAN BUS Analyzer".

Notes: You have to pay more attention to transmit CAN bus frame. It will damage your CAN bus equipment if you don't understand data meaning of transmitted CAN BUS frame, And it may cause disaster.

Let's take CAN Bus protocol as an example. Open "Transmit Once" window by click "Tools/Transmit Once". (We don't care when you open it, you can do it before or after you "Start CAN BUS Analyzer").
Please see Fig.12 below:

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Fig.12 Transmit Once

In the first Row, CAN ID= 0x677x (it means extended frame due to suffix "x"), prefix "0x" is option, you can use it or not. Hex/Decimal is decided by view menu.
DLC=0, and RTR is true which means this is remote frame. When CAN bus is enabled, you click "Send" button in this row, you can transmit this CAN bus Remote frame.

In the Second Row, CAN ID= 0x399 (it means standard frame due to without suffix "x"), DLC=2, and RTR is false which means this is Data frame. D1=0x45, D2=0x67. prefix "0x" is option, Hex/Decimal is decided by view menu. When CAN bus is enabled, you click "Send" button in this row, you can transmit this CAN bus data frame.

Maximum of row is 10, so you can prepare 10 CAN frames to transmit. If more than 10, you can change the other row next time.

Let's see to transmit periodically. You must disable CAN BUS firstly, and then Open "Transmit Periodically" window by click "Tools/Transmit Periodically".
Please see Fig.13 below:

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Fig.13 Transmit periodically

In the 1st row, CAN ID=0x38x which means extended frame, DLC=8 means frame's data length=8 bytes, Value mode is Increment which means the value we are interested in is increased 1 automatically in each period. Start Position=1 and Byte QTY=2 means that value we are interested in is 2 bytes value and started at first byte of data field (1- based) , and it is little-endian. So we see D1 and D2 are "Auto-I". Periods=500ms. It means that transmit automatically every 500ms. Sync is false (If Sync= True, it means that all other CAN BUS frames will transmit after this Sync Frame Transmits, that is to say, transmitting is synchronous with this frame) . Because the value we are interested in is updated automatically, Column "Command" is Empty.

In the 2nd row, CAN ID=0x8220223x which means extended frame, DLC=8 means frame's data length=8 bytes, Value mode is Manual which means the value we are interested in is input manually. Start Position=1 and Byte QTY=1 means that value we are interested in is 1 byte value and started at first byte of data field (1- based) . D1=0x98. Periods=500ms. It means that transmit automatically every 500ms. Sync is false. Because the value we are interested in is updated manually, Column "Command" is Update button. This button is grey color because CAN BUS is disabled. It will become black (Enable) when CAN BUS is enabled by Start button.

In the 3rd row, CAN ID=0x345 which means standard frame, DLC=8 means frame's data length=8 bytes, Value mode is Manual which means the value we are interested in is input manually. Start Position=1 and Byte QTY=2 means that value we are interested in is 2 bytes value and started at first byte of data field (1- based). D1=0x77 D2=0x99. Periods=690ms. It means that transmit automatically every 690ms. Sync is false. Because

the value we are interested in is updated manually, Column "Command" is Update button. This button is grey color because CAN BUS is disabled. It will become black (Enable) when CAN BUS is enabled by Start button.

Maximum of row is 8, so you can use 8 CAN frames to transmit periodically.

5 Notice

IMPORTANT NOTICE

The information in this manual is subject to change without notice.

Dafulai's products are not authorized for use as critical components in life support devices or systems. Life support devices or systems are those which are intended to support or sustain life and whose failure to perform can be reasonably expected to result in a significant injury or death to the user. Critical components are those whose failure to perform can be reasonably expected to cause failure of a life support device or system or affect its safety or effectiveness.

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