JetBox 8152 Linux CANBus

User Manual

www.korenix.com

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Acknowledgments

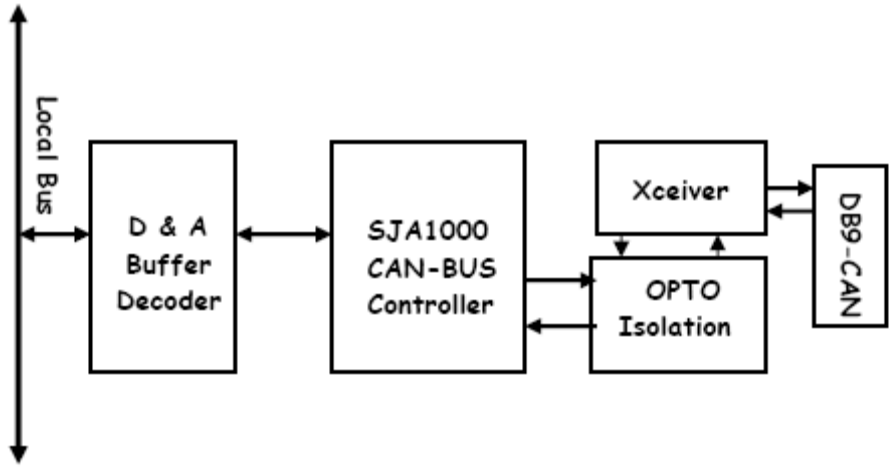
Table of Content

Chapter 1 Introduction

The JetBox 8152 has two ports for I/O communications, One RS-232/422/485 port and one CANBUS port. The CAN (Controller Area Network) is a serial bus system especially suited for networking "intelligent" I/O devices as well as sensors and actuators within a machine or plant. Characterized by its multi-master protocol, real-time capability, error correction, high noise immunity, and the existence of many different silicon components, the CAN serial bus system, originally developed by Bosch for use in automobiles, is increasingly being used in industrial automation.

CANbus

This section describes how to program and use the CANBUS. It provides a description of the I/O memory map of the chip and discussion of the internal registers to aid you in programming your CAN controller chip.



Defined Memory Mapping and Interrupt

The CANBUS occupies 2 bytes of memory space. You can set the base address and access to the internal resources of the SJA1000 CAN controller chip. The SJA1000 chip access is multiplexed in such a way that the host must first write to **300h** the internal address of the CAN chip and after that perform a write to address **301h** with the actual data to be written into the desired memory location. Address **302h** is a hardware-reset function of the SJA1000. Performing a read or write to this address

will cause a hardware reset to the CAN controller. You may need to reset the chip in case of an unrecoverable error in the CAN controller chip. And your can use interrupt the main processor when a message is received or transmitted if interrupts are enabled on the JetBox 8152. By using interrupts you can write powerful code to CAN.

Description	Factory Setting
Base Address	300H
Data Of Address	301H
Hardware Reset Of SJA1000 Chips	302H
Interrupt Require Quest	11

Example Programming

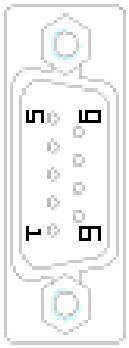
Write 300H to the CAN controller Control byte located in the on-chip address 0.
The Example is listed below:
Outportb (0x300, 0x00) : Write CAN Address 0 (Control Register)
Outportb (0x301, 0x78) : Write Data of CAN Address 0 (Control Register)

And please see “SJA1000.pdf” for further information of the SJA1000 chip.

Chapter 2 Hardware Configuration

2-1 Pin Assignment

The CANBUS is use DB9 standard connector. The following tables show the CANBUS signal connections of this connector.

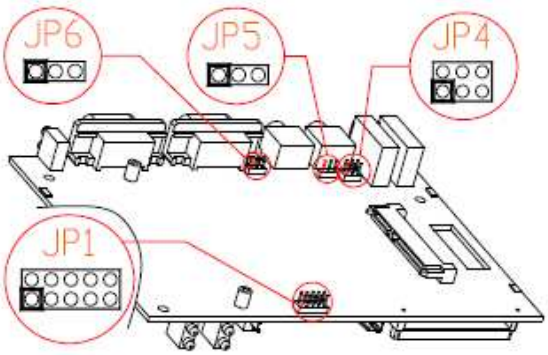


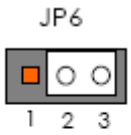
DB-9 CANBUS	CANBUS Signal	CANBUS Description
1	N.C	-
6	N.C	-
2	CAN-L	Dominant Low
7	CAN-H	Dominant High
3	CAN-Ground	Isolated Ground
8	N.C	-
4	N.C	-
9	N.C	-
5	Ground	Digital Ground
Case	Case Ground	

⚠ Note 1: The CANBUS DB9-pin out conforms to the ISO 11898/2 standard

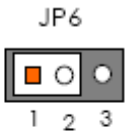
2-2 Jumper Setting: JP6

JP6: CANBUS Terminal Resistor Selection





CANBUS Terminator Disabled



CANBUS Terminator Enabled

Factory preset

⚠ Note 2: The JP6 is the CANbus termination jumper. Only two termination jumpers should be closed at the endpoints of the CANbus. Value Terminator Resistor (120 Ω). **The minimum speed is 20k bps. The maximum speed is 1M bps.** But when CANBUS terminator is **disabled**, the maximize speed of CANBUS is **125k bps**. If you want to use high speed (1M bps), please enable terminator.

Chapter 3 Software Configuration

3-1 Installation

- **Prerequisites**

  To make CANBus work correctly. We have to install three components first. Make sure your network is connected.

  1. GCC : call "**yum install gcc**"
  2. OpenSSL : call "**yum install openssl**"
  3. OpenSSL-devel : call "**yum install openssl-devel.i386**"

  After install these components, the CANBUS library and follow example code will work successfully.

- **Do the following steps to setup the driver**

  1. Login in as root. (username : root, password : korenix)
  2. Default CanBus code are built-in jetbox linux environment. Go to the path /CanBus and you will see the follow directory.

```
[root@localhost /]# cd /CanBus/
[root@localhost CanBus]# ls
example  library
```

  3. In the "library" directory. You will see the two files below.

```
[root@localhost library]# ls
libmycanbus.so.1.0.0  mycanbus.h
```

     libmycanbus.so.1.0.0 :

     It contains all CanBus functions that user can use it to program.

     mycanbus.h :

     It defines CanBus structure, message type and baud rates settings.

     All details will be shown in Chapter 4.

  4. In the "example" directory. You will see the files below.

```
[root@localhost example]# ll
total 20
-rwxr--r-- 1 root root 2131 2012-08-28 05:20 canrcv.c
-rwxr--r-- 1 root root 2538 2012-08-28 05:23 cantest.c
-rwxr--r-- 1 root root 1263 2012-08-10 13:11 cantest.h
-rwxr--r-- 1 root root   33 2012-08-28 22:28 lcankey
-rwxr--r-- 1 root root  211 2012-08-28 23:08 Makefile
```

Call “**make**” to compile files and “**make install**” to install library to /usr/lib.

All details will be shown in next session.

3-2 Example

CANBus example for Linux is a simple CAN monitor for viewing and transmitting CAN messages. When you call “make” and “make install” to compile/install all need files. It will generate two sample files, “**cantest**” and “**canrcv**”.

```
[root@localhost example]# ll
total 36
-rwxr-xr-x 1 root root 7148 2012-08-29 00:20 canrcv
-rwxr--r-- 1 root root 2131 2012-08-28 05:20 canrcv.c
-rwxr-xr-x 1 root root 6782 2012-08-29 00:20 cantest
-rwxr--r-- 1 root root 2538 2012-08-28 05:23 cantest.c
-rwxr--r-- 1 root root 1263 2012-08-10 13:11 cantest.h
-rwxr--r-- 1 root root   33 2012-08-28 22:28 lcankey
-rwxr--r-- 1 root root  211 2012-08-28 23:08 Makefile
```

- **cantest**

  There will be four command as below :

  cantest -i : Initial CanBus Chip and set baud rate to 125K.

  cantest -r : Reset CanBus Chip

  cantest -s : Get CanBus status

  cantest -w : Write CAN message. We use standard message type in this example.

- **canrcv**

  This example show you how to receive CAN message from other CANBus. Before to receive CAN messages, you have to reset CAN chip first and initial it.

```
[root@localhost example]# ./canrcv
CanID : 0x604, Type : 0x00, Length : 8
Data : 0x22 0x11 0x10 0x01 0x6c 0x6f 0x61 0x64
CanID : 0x704, Type : 0x01, Length : 0
Data :
CanID : 0x602, Type : 0x02, Length : 8
Data : 0x22 0x0c 0x20 0x00 0x01 0x00 0x00 0x00
CanID : 0x204, Type : 0x00, Length : 1
Data : 0xa0
```

Chapter 4 Korenix Library Reference

This section shows how to use Korenix CANbus Library to develop your program. When you call “make install” in the example directory, the library will be installed to the /usr/lib path.

4-1 How to Use Library

We use dlopen to load CANBus library. You will see it in the example. Like this

handle = dlopen ("/usr/lib/libmycanbus.so.1", RTLD_NOW);

Use **dlsym** to take a "handle" of a dynamic library returned by **dlopen** and the null terminated symbol name, returning the address where that symbol is loaded.

Init_CanBus = dlsym(handle, "Init_Can");

 **Call “man dlopen” to detail information of dlopen, dlsym.**

All functions (symbol) are listed in next session.

4-2 Functions

The CanPort library provides the following functions

- **Init_Can**

```
void Init_Can(BYTE BTR0, BYTE BTR1)
```

Parameters

BTR0

BUS TIMING REGISTER 0

BTR1

BUS TIMING REGISTER 1

This function sets configuration parameters to initialize the CAN controller. Configuration parameters include baud rate. Valid Baud rate codes can be taken from the Baud Rate Table.

This function will also set up the Interrupt Enable Register, Acceptance Code Register, Acceptance Mask Register and Output Control Register.

- **Can_Chip_Reset**

```
void Can_Chip_Reset(void)
```

This function resets the CAN controller to default state.
The transmitting and receiving of messages will be canceled, and messages in the driver buffer will be cleared as well.

- **Can_Send_Message**

```
void Can_Send_Message(CANMsg *MsgToSend)
```

Parameters

MsgToSend

Message to transmit. Please refer to Structure for details.

- **Can_Receive_Message**

```
void Can_Receive_Message(CANMsg *MsgToRead)
```

Parameters

MsgToRead

Returns a CAN message from the receive queue.

- **Can_Status_Report**

```
BYTE Can_Status_Report(void)
```

Return

Status of CAN controller

Get the current status of the CAN controller.

⚠Note 3: More information of Status is given in the data sheet of SJA 1000 in section 6.4.5 Status Register (SR).

❑ Can_Set_Filter

```
void Can_Set_Filter(DWORD dwACR, DWORD dwAMR)
```

This function sets the Acceptance Code and Acceptance Mask of the CAN controller. The CAN controller must set to reset mode when calling the function.

⚠Note 4: More information of Status is given in the data sheet of SJA 1000 in section 6.4.15 Acceptance Filter.

Parameters

dwACR

Acceptance Code Register

dwAMR

Acceptance Mask Register

Example

The following example shows the parameter values for *dwACR* and dwAMR in order to accept only the Data messages of standard frame in the range 110h to 113h.

dwACR:	001 0001 0000
dwAMR:	000 0000 0011
Valid IDs:	001 0001 00xx
ID 110h:	001 0001 0000
ID 111h:	001 0001 0001
ID 112h:	001 0001 0010
ID 113h:	001 0001 0011

So the value of dwACR is 0x221FFFFF and the value of dwAMR is 0x007FFFFF.

❑ Can_Reset_Filter

```
void Can_Reset_Filter(void)
```

This function reset the Acceptance Code and Acceptance Mask Register of the CAN to default value (It means accept all CAN message).

❑ Can_Interrupt_Status

```
BYTE Can_Interrupt_Status(void)
```

Return

The value of Interrupt Register

 Note 5: More information of Status is given in the data sheet of SJA 1000 in section 6.4.6 Interrupt Register (IR).

❑ Can_Mode_Set

```
void Can_Mode_Set(BYTE bMode)
```

Parameters

bMode

operation mode

Description	Value
SLEEP_MODE	0x10
ACCEPT_FILTER_MODE	0x08
SELF_TEST_MODE	0x04
LISTEN_ONLY_MODE	0x02
RESET_MODE	0x01
NORMAL_MODE	0x00

⚠Note 6: More information of Status is given in the data sheet of SJA 1000 in section 6.4.3 Mod Register (MOD).

❑ Can_Set_BTR

```
void Can_Set_BTR(BYTE BTR0, BYTE BTR1)
```

Parameters

BTR0

BUS TIMING REGISTER 0

BTR1

BUS TIMING REGISTER 1

This function only sets the baud rate to CAN controller.

❑ Can_Set_Command

```
void Can_Set_Command(BYTE bCmd)
```

Parameters

bCmd

Command mode

Description	Value
CLEAR_DATA_OVERRUN	0x08
RELEASE_RECEIVE_BUFFER	0x04
ABORT_TRANSMISSION	0x02
TRANSMISSION_REQUEST	0x01

⚠Note 7: More information of Status is given in the data sheet of SJA 1000 in section 6.4.4 Command Register (CMR).

❑ **Can_Get_ECR**

```
BYTE Can_Get_ECR(void)
```

Return

The value of Error Code Capture Register.

 Note 8: Please refer to Error Code Table for details.

 Note 9: More information of Status is given in the data sheet of SJA 1000 in section 6.4.9.

❑ **Can_Get_ALC**

```
BYTE Can_Get_ALC(void)
```

Return

The value of Arbitration Lost Capture Register.

❑ **Can_Get_EWL**

```
BYTE Can_Get_EWL(void)
```

Return

The value of Error Warning Limit Register.

The error warning limit can be defined within this register. The default value (after hardware reset) is 96.

 Note 10: More information of Status is given in the data sheet of SJA 1000 in section 6.4.10.

❑ **Can_Get_TXERROR_COUNTER**

```
BYTE Can_Get_TXERROR_COUNTER(void)
```

Return

The value of transmit error.

The TX error counter register reflects the current value of the transmit error counter.

 Note 11: More information of Status is given in the data sheet of SJA 1000 in section 6.4.12.

❑ **Can_Get_RXERROR_COUNTER**

```
BYTE Can_Get_RXERROR_COUNTER(void)
```

Return

The value of receive error.

The RX error counter register reflects the current value of the receive error counter.

 Note 12: More information of Status is given in the data sheet of SJA 1000 in section 6.4.11.

4-3 Structure

The CanPort API defines the following structures

CANMsg ：Defines a CAN message

```
typedef struct {
    DWORD ID;
    BYTE    MSGTYPE;
    BYTE    LEN;
    BYTE    DATA[8];
} CANMsg;
```

- ID
  11/29-bit CAN identifier.

- MSGTYPE
  Bit mask indicating the type of the message. Several message types can be combined.

Identifer	Value	Description
MSGTYPE_STANDARD	00h	Data Frame. CAN message with data contents and an 11-bit CAN ID.
MSGTYPE_RTR	01h	Remote Transmit Request (RTR).
MSGTYPE_EXTENDED	02h	Data Frame. CAN message with data contents according to CAN 2.0B standard (29-bit CAN ID).

- LEN
  Number of data bytes in a data message (Data Length Code).

- DATA
  Data bytes of a CAN message. The size can be 0 to 8 bytes.

Chapter 5 Appendix

5-1 Baud Rate Table

Baud Rate (bps)	Predefined BTR0 BTR1	BTR0	BTR1
5K	BAUD_5K	7F	7F
10K	BAUD_10K	67	2F
20K	BAUD _20K	53	2F
50K	BAUD _50K	47	2F
100K	BAUD _100K	43	2F
125K	BAUD _125K	03	1C
250K	BAUD _250K	01	1C
500K	BAUD_500K	00	1C
1000K	BAUD_1M	00	14

The following Baud Rates are also common:

Baud Rate (bps)	BTR0	BTR1
33.33K	1D	14
47.6K	14	14
83.33K	4B	14
95.23K	C3	4E
800K	00	16

⚠Note 13: More information on setting the bit rate is given in the data sheet of SJA 1000 in section 6.5.

5-2 Error Code Table

BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	Description
0	0							bit error
0	1							form error
1	0							stuff error
1	1							other type of error
		0						error occurred during reception
		1						error occurred during transmission
			0	0	0	1	1	start of frame
			0	0	0	1	0	ID.28 to ID.21
			0	0	1	1	0	ID.20 to ID.18
			0	0	1	0	0	bit SRTR
			0	0	1	0	1	bit IDE
			0	0	1	1	1	ID.17 to ID.13
			0	1	1	1	1	ID.12 to ID.5
			0	1	1	1	0	ID.4 to ID.0
			0	1	1	0	0	bit RTR
			0	1	1	0	1	reserved bit 1
			0	1	0	0	1	reserved bit0
			0	1	0	1	1	data length code
			0	1	0	1	0	data field
			0	1	0	0	0	CRC sequence
			1	1	0	0	0	CRC delimiter
			1	1	0	0	1	acknowledge slot
			1	1	0	1	1	acknowledge delimiter
			1	1	0	1	0	end of frame

			1	0	0	1	0	intermission
			1	0	0	0	1	active error flag
			1	0	1	1	0	passive error flag
			1	0	0	1	1	tolerate dominant bits
			1	0	1	1	1	error delimiter
			1	1	1	0	0	overload flag

5-3 Notes

Note: You can get the SJA1000 datasheet from following website:
http://www.nxp.com/documents/data_sheet/SJA1000.pdf

5-4 Revision history

V0.1 by 2012/9/4

- Change default CANbus terminator jump setting (JP6) to enable

5-5 Customer Service

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