CANPCI-904 CAN Interface User Manual V1.02

Solution

Application Note

Datasheet

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General Notes

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Version History

Version	Data	Add/Del/Rev
V1.00	2011-03-04	New version
V1.01	2011-04-23	According to the SYSTECH manual template format
V1.02	2012-09-12	Increased Win7 operating system description

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1. Introduction

1.1 Description

CANPCI-904 CAN-bus interface card is the SYSTECH developed an industrial-grade computer PCI bus to CAN bus data transfer card, which uses A + B card design in the form of A card-based card, B card attached card, integrated 4-way CAN-bus interface. CANPCI-904 interface card supports 32-bit 33MHz PCI data bus compatible with the PCI 2.2 specification, Universal PCI connector, users can easily use it to complete the interconnection between the CAN-bus network and PC, you can easily, high-speed the collection of data of the CAN-bus.

CANPCI-904 for industrial-grade products can work in -20 ° C to +70 ° C temperature range. CAN port communication baud rate can be arbitrarily set in the 5k ~ 1Mbps. In order to ensure good EMC and EMI performance, CANPCI-904 using completely independent CAN-bus channel, effectively prevent the PC suffered the impact of the local circulation. , 4-channel CAN interface are integrated CAN-bus common mode filter and TVS bus protection circuit, to provide security to operate in the electromagnetic environment is more complex industrial applications.

CANPCI-904 interface card provides a simple API and multi-language version of the application routine, and debugging software, user-friendly control, the test CAN-bus on the bus to transfer data.

1.2 Features

- PC interface: 32bit 33M PCI data bus, conform to the PCI2.2 standard, plug and play;
- Controller：NXP SJA1000；
- Transceiver：Microchip MCP2551；
- Protocol：CAN 2.0B specification (compatible with CAN 2.0A);
- Communication baud rate：5K～1Mbps；
- Communication interface：DB9 pin type socket, conform to the DeviceNet and CANopen standard；
- Isolation voltage：Magnetic isolation DC 2500V；
- Operating temperature：-20℃～+70℃；

- Storage Temperature：-40℃～+85℃；
- Physical size：CANPCI-904-A，Short standard PCI card 130mm×90mm；
  CANPCI-904-B，25 mm×90mm.

2. Technical Support

If you want get technical support or the latest information about this product, please access the website: http:/www.sysembed.com.

3. About Function

3.1 Summary

CANPCI-904 intelligent CAN interface module made in SYSTECH. It is convenient to Using it for collecting data, and analysing data, and processing data in building CAN-bus laboratory, or industrial control, or intelligent community, or automotive electronics. CANPCI-904 has these characteristics, such as compact design and beautiful appearance and plug-and-play etc, and it is dependable assistant in matching equipment and debugging equipment and developing equipment.

3.2 Parameters

- PC interface: 32bit 33M PCI data bus, conform to the PCI2.2 standard, plug and play;
- Controller：NXP SJA1000；
- Transceiver：Microchip MCP2551；
- Protocol：CAN 2.0B specification (compatible with CAN 2.0A);
- Communication baud rate：5K～1Mbps；
- Communication interface：DB9 pin type socket, conform to the DeviceNet and CANopen standard；
- Supporting Operating System：Windows98/Me/2000/XP/2003/Win7；Linux 2.4、Linux 2.6.
- Adopts electrical isolation, the isolation voltage is : 2500Vrms;
- Max data flow for a single channel: 3000 fps (standard frame);
- Supports SysCanTool software.

3.3 Appearance

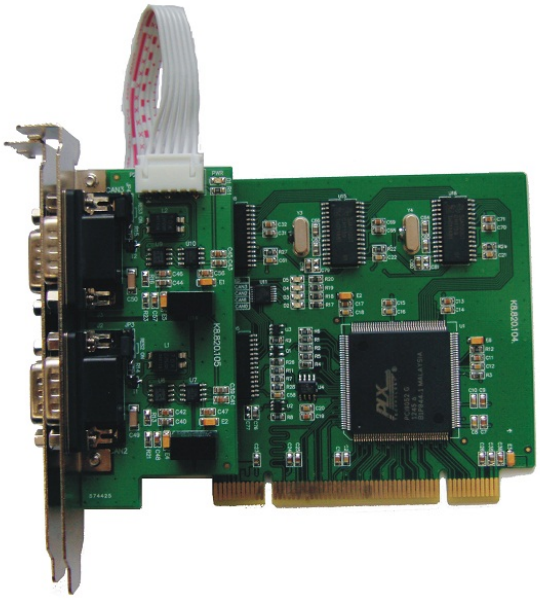


Fig. 1 Appearance

4. The hardware installation and wiring

4.1 The hardware installation

In order to ensure CANPCI-904 interface card to normal use, installation and removal, make sure the computer is off and the power-down state. CANPCI-904 interface card is an electrostatic-sensitive board, please note that in the installation and removal of electrostatic protection, wear an antistatic gloves or hand-held card edge, avoid direct contact with components.

Specific installation steps are as follows：

1）Power off the PC；

2）Open the lid of the PC；

3）Insert CANPCI-904 interface card into a free slot；

4）Tightening the fixed card of bolt；

5）With the equipment included 6p ribbon cable will be the A card P2 socket and B card P2 socket connection；

6）Open the PC power supply, At this point BIOS will automatically give the the allocation of CANPCI-904 interface card interrupt and I / O address.

4.2 Interface definition

CANPCI-904 integrated 4 CAN channels (channel defined sequence is shown in Fig. 2), connect DB9 pin-type connectors and CAN-bus network. The DB9 pin type connector pin signal definition is shown in Fig.3. The pin definition is consistent with the DeviceNet and CANopen standard.

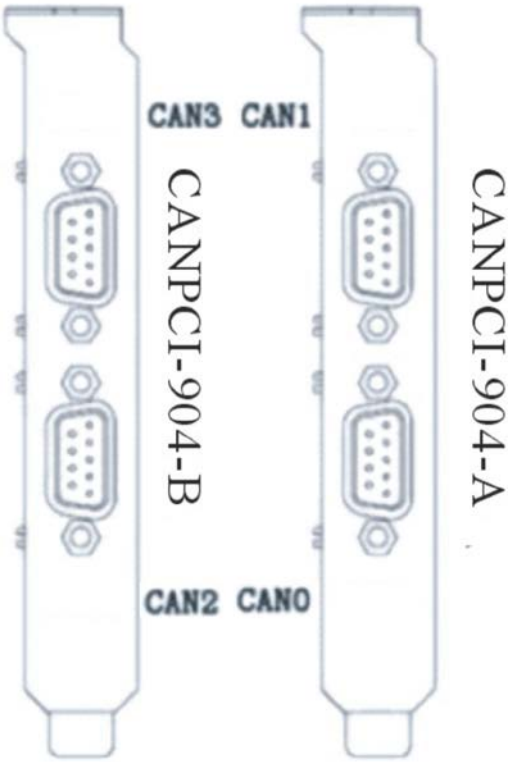
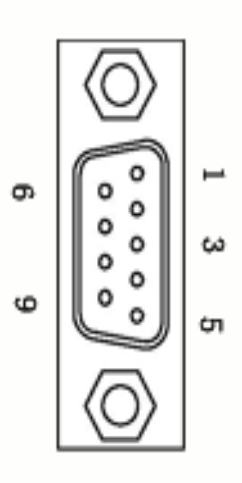


Fig. 2 The CAN channel defined sequence



pin	Signal	describe
1		No connection
2	CAN_L	CAN_L The signal line
3	CAN_GND	reference ground
4		No connection
5	CAN_SHIELD	shield wires
6	CAN_GND	reference ground
7	CAN_H	CAN_H The signal line
8		No connection
9		No connection

Fig. 3 The CAN interface terminal definition

4.3 Termination resistor

Such as the CAN network using the straight-line topology, the two terminals of the bus need to install a 120-ohm terminating resistor. If the number of nodes is greater than 2, the intermediate nodes do not need to install a 120-ohm terminating resistor in Fig.4.

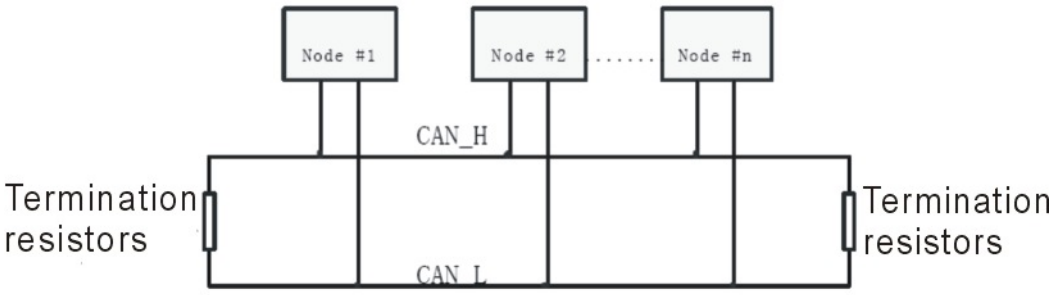


Fig. 4 bus topology

CANPCI-904 interface card for each CAN channels are integrated on-board 120-ohm terminating resistor can be set by jumper JP1 to JP4 the corresponding CAN channels using the resistance. CANPCI-904 interface card corresponding CAN channel is located in a CAN network endpoint, set the corresponding the channel jumper short circuit. Factory, 4-channel in a short-circuit condition, using an integrated 120-ohm terminating resistor.

4.3 Signal indicator LED

CANPCI-904-A card onboard D2 to D5 four LEDs, which indicate the status of data transmission and reception of the four CAN channels, when the CAN channel data transceiver, the corresponding channel indicator will flash data transceiver frequency,corresponding to the sequence as shown in table 2-4.

No	LED	CAN channel
1	D5	CAN3
2	D4	CAN2
3	D3	CAN1
4	D2	CAN0

Table 1 The LED corresponding to the order

CANPCI-904-B card board integration the D1 indicator, indicating that the power connection status of the B card the D1 indicator light is, when the power is turned on.

Appendix

A: Related Documents

SN	Document name	Remark
1	The Frame Format of CAN2.0	The length for CAN standard frame message is 11 bytes; The length for CAN extended frame message is 13 bytes.
2	SJA1000 Standard Baud Rate	standard of baud rate setting
3	Configuration for CAN Message Filter	The CAN message filter of the converter is designed based on the PeliCAN mode of the CAN controller SJA1000 (made by PHILIPS).
4	CAN-bus Communication distance	CAN-bus Communication distance corresponding to the table

Appendix1: The Frame Format of CAN2.0

CAN2.0B standard frame:

The length for CAN standard frame message is 11 bytes, including two parts: message and data. The first 3 bytes are used for message.

Table 2 The CAN standard frame information

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	×	×	DLC(Data Length)			
Byte 2	ID.10	ID.9	ID.8	ID.7	ID.6	ID.5	ID.4	ID.3
Byte 3	ID.2	ID.1	ID.0	×	×	×	×	×
Byte 4	Data1							
Byte 5	Data 2							
Byte 6	Data 3							
Byte 7	Data 4							
Byte 8	Data 5							
Byte 9	Data 6							
Byte 10	Data 7							
Byte 11	Data 8							

Notes：

1. *Byte 1 is frame information. Bit 7 (FF) denotes frame format, FF=0 in the standard frame. Bit 6 (RTR) denotes the frame type, 0 for data frame and 1 for remote frame. DLC stands for the data length in data frame mode.*
2. *Byte 2 and 3 are message identifiers, 11 bits are effective.*
3. *Byte 4 to 11 is the data for data frame, invalid for remote frame.*

CAN2.0B extended frame

The length for CAN extended frame message is 13 bytes, including two parts: message and data. The first 5 bytes are used for message.

Table 3 The CAN extended frame information

	7	6	5	4	3	2	1	0
Byte 1	FF	RTR	×	×	DLC(Data Length)			
Byte 2	ID.28	ID.27	ID.26	ID.25	ID.24	ID.23	ID.22	ID.21
Byte 3	ID.20	ID.19	ID.18	ID.17	ID.16	ID.15	ID.14	ID.13
Byte 4	ID.12	ID.11	ID.10	ID.9	ID.8	ID.7	ID.6	ID.5
Byte 5	ID.4	ID.3	ID.2	ID.1	ID.0	×	×	×
Byte 6	Data 1							
Byte 7	Data 2							
Byte 8	Data 3							
Byte 9	Data 4							
Byte 10	Data 5							
Byte 11	Data 6							
Byte 12	Data 7							
Byte 13	Data 8							

Notes:

1. *Byte 1 is frame information. Bite 7 (FF) denotes the frame format, FF=1 for extended frame. Bite 6 (RTR) denotes the frame type, 0 for data frame and 1 for remote frame. DLC stands for the data length in the data frame.*
2. *Byte 2 and 5 are message identifiers, the higher 29 bits are effective.*
3. *Byte 6 to 13 is the data for data frame, invalid for remote frame.*

Appendix 2: SJA1000 Standard Baud Rate

Table 4 **standard of baud rate setting**

	Baud Rate(Kbps)	BTR0(Hex)	BTR1(Hex)
1	5	BF	FF
2	10*	31	1C
3	20*	18	1C
4	40	87	FF
5	50*	09	1C
6	80	83	FF
7	100*	04	1C
8	125*	03	1C
9	200	81	FA
10	250*	01	1C
11	400	80	FA
12	500*	00	1C
13	666	80	B6
14	800*	00	16
15	1000*	00	14

Note: Those with "*" are the Baud rates that recommended by CIA union.

Appendix 3: Configuration for CAN Message Filter

The CAN message filter of the converter is designed based on the PeliCAN mode of the CAN controller SJA1000 (made by PHILIPS). SJA1000 filter is composed of 4 sets (4 Bytes) of acceptance code registers (ACR) and 4 sets (4 Bytes) of acceptance mask registers (AMR). The value of ACR is the preset acceptance code, and the value of AMR indicates that if the corresponding value of ACR is used for acceptance filtering. When SJA1000 is in some certain modes, part of registers in the filter will be left unused. For convenience, we only care about the actual value for the filter and discard the unnecessary value.

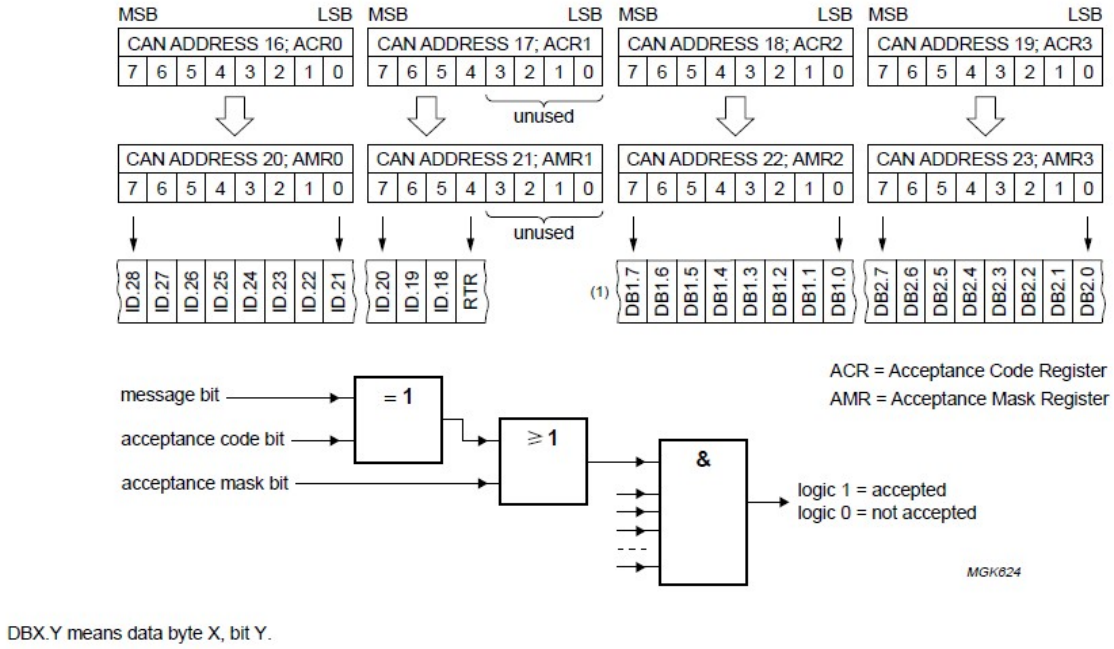
The general rules for filtering are: Every acceptance mask bit is corresponding to each acceptance code bit respectively. When the mask bit is 1 (namely set to irrelative), then no matter if the corresponding acceptance frame ID bit is the same to the corresponding acceptance code bit or not, it will denotes an acceptance. But when the mask bit is 0(namely set to relative), it will not indicate an acceptance unless the two correspond bits above have the same value. And CAN controller receives this frame message only when all the bits denote acceptance. There are two filter configuration modes: single filter and dual filter. And the filtering for standard frame and extended frame is a little different. Open all the filter functions under “customize filter mask code” in the configuration software.

1. Single filter configuration

This kind of filter configuration can be defined as a long filter. The relationships for the corresponding bits between the filter byte and the message byte are dependent on the current frame format.

Standard frame: When the frame format is standard, only part of the data bits (lower 11 bits) from the first two bytes in ACR (ACR3 and ACR4) will be used to store the filter acceptance code. Also, filter mask code only use the lower 11 bits from AMR3 and AMR4.

When the bits in AMR are 0 (relative), if the corresponding bits between ACR and acceptance frame ID (eg.ACR1.0 and AMR1.0 and ID.00) are the same, it indicates “acceptable” (logic 1), otherwise it indicates “unacceptable” (logic 0). When the bits in AMR are 1, it always indicates “acceptable” (logic) regardless of the discussions above. For a successfully received message, receiving signals must be sent after comparing each single bit. See Fig.5.



DBX.Y means data byte X, bit Y.

Fig. 5 Single filter configuration, receiving standard frame messages

Extended frame: When the frame format is extended, the length for the frame identifier is 29 bits, so the lower 29 bits of the four bytes of ACR are used to store the filter acceptance code. And it is similar to the AMR. The acceptance logic relationship is the same to that of standard frame. See Fig.6.

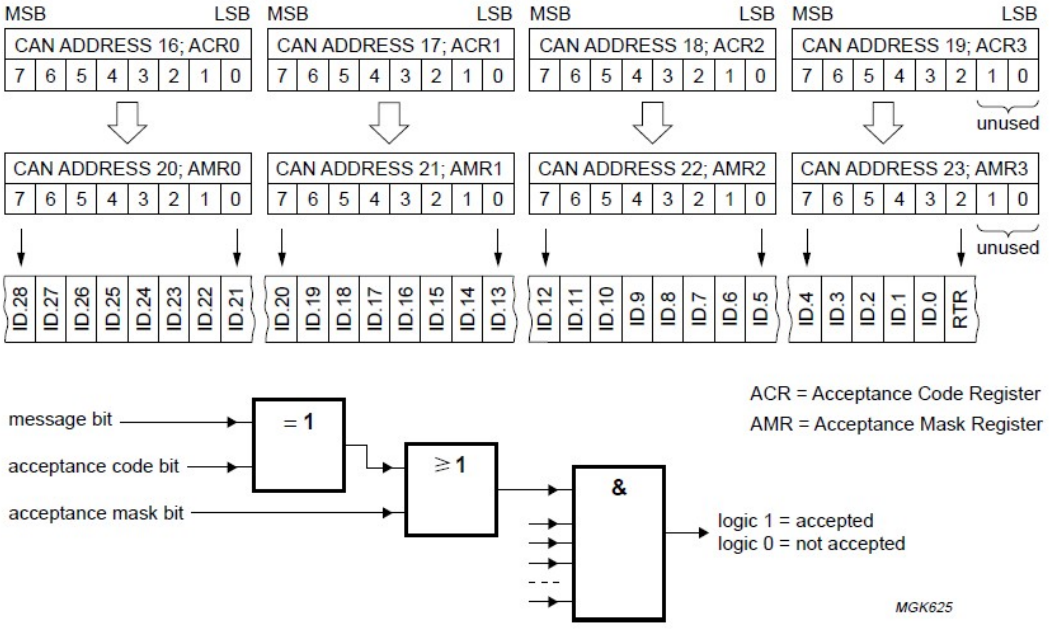


Fig. 6 **Single filter configuration, receiving extended frame messages**

2. Dual filter configuration.

This configuration mode is able to define two short filters. A message to be received has to compare with two filters before it can be stored into the receiving buffer. The message received is valid only when at least one filter sent out an acceptance signal.

The relationships for the corresponding bits between the filter byte and the message byte are dependent on the current frame format.

Standard frame: For standard frame, it can be considered that the acceptance frame identifier is filtered with two single filters. See Fig.7.

To successfully receive message, all the bit comparisons should indicates “acceptable”. This frame can be received only when at least one filter of two indicates “acceptable”.

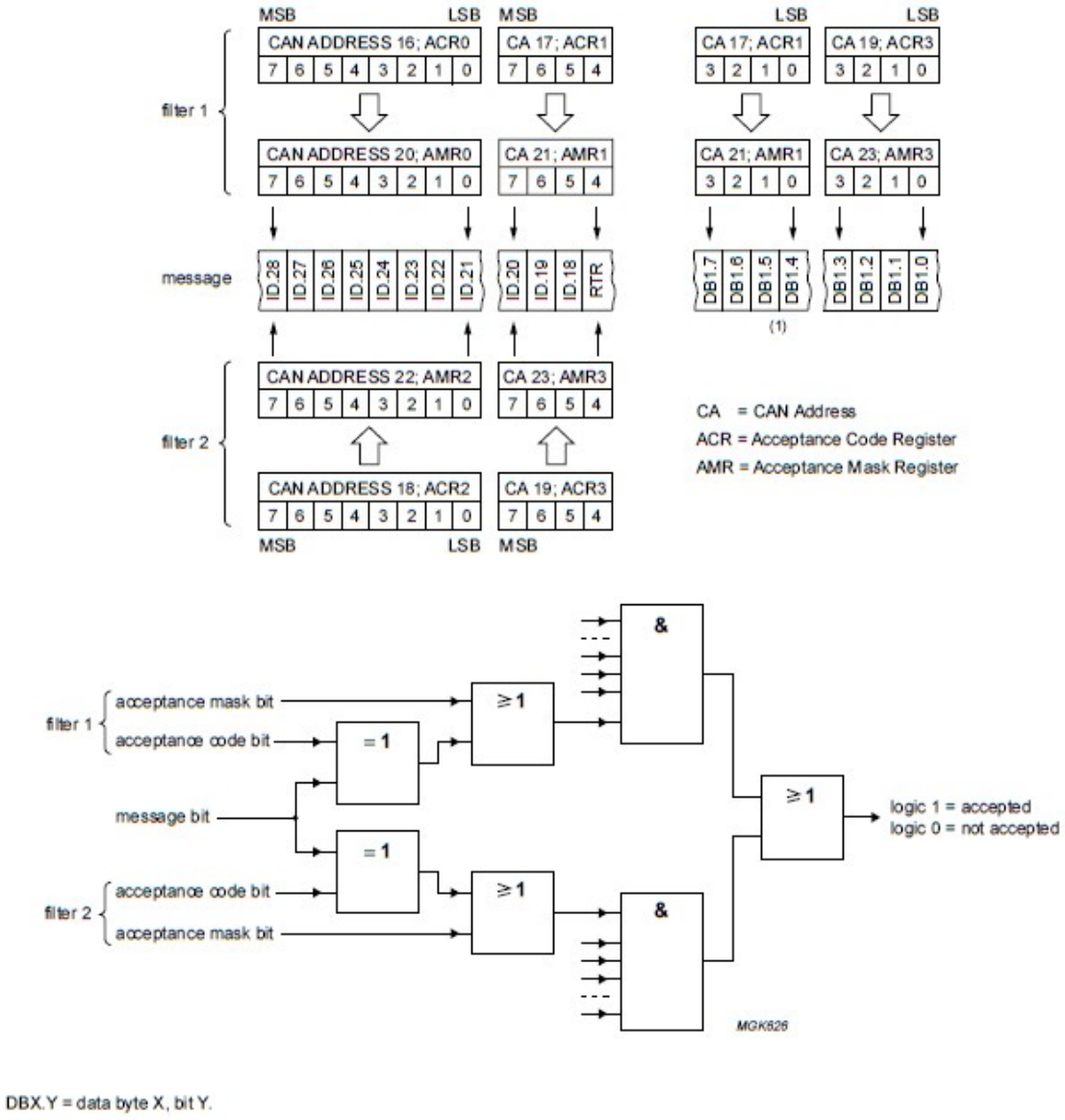


Fig. 7 Dual filter configuration, receiving standard frame messages

Extended frame: For extended frame, the two filters defined are the same. It only compares the first two bytes of the extended identifier (ID.28 to ID.13) for the two filters. See Fig.8. To successfully receive message, all the bit comparisons should indicates “acceptable”. This frame can be received only when at least one filter of two indicates “acceptable”.

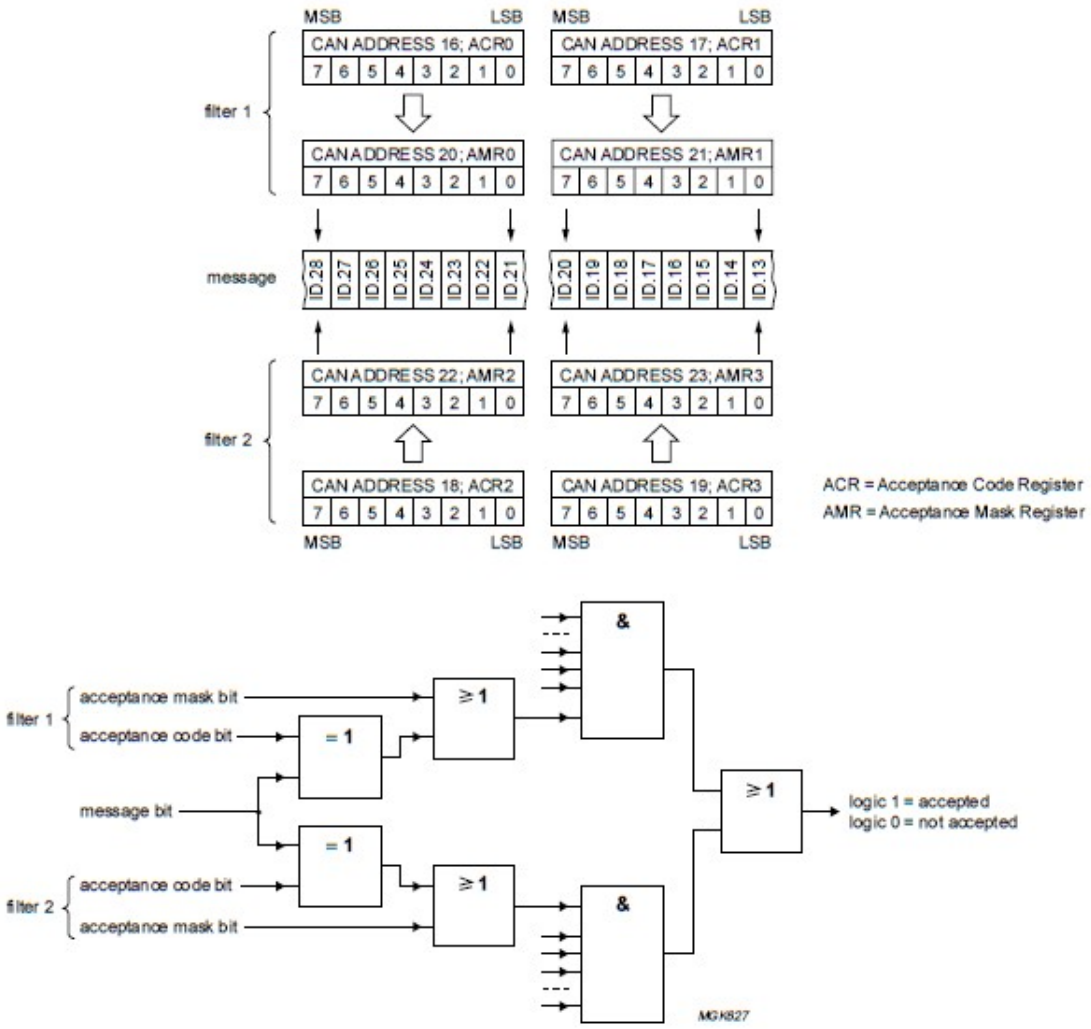


Fig. 8 Dual filter configuration, receiving extended frame messages

Appendix 4: CAN-bus Communication distance（Reference Value）

Table 5 Communication distance

Baud Rate （kbps）	Max Distance （m）
1000	40
500	130
250	270
125	530
100	620
50	1300
20	3300
10	6700
5	10000

B. Terms and Abbreviations

Abbreviation	Description
CAN	Controller Area Network
CAN-BUS	Controller Area Network-BUS
MSB	Most Significant Bit
LSB	Least Significant Bit
RTR	Response Time Reporter
PCI	Peripheral Component Interconnect
AMR	Acceptance Mask Register
ACR	Acceptance Code Register

C. Safety Caution

In the process of use or repair any equipment by SYSTECH need to pay attention to the following safe guard. Terminal equipment shall inform the security of user information below. Otherwise, SYSTECH technology will not bear any because the user did not press these warnings and consequences.

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