

EMBC1000-USB1553B-1

(Simplified V 1.1)

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User's Manual Information

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Application of EMBC1000-USB1553B-1

EMBC1000-USB1553B-1 is a USB based device that provides new levels of performance and flexibility for systems interfacing to 1553B data bus, including data transmission, data receiving, real-time data display, data recording and replay, etc..



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Chapter 1 Overview

1.1 About EMBC1000-USB1553B-1



Figure 1-1 EMBC1000-USB1553B-1 Device

The EMBC1000-USB1553B-1 is multi-protocol USB Device that provides new levels of performance and flexibility for systems that interface to a MIL-STD-1553B data bus. Each 1553 channel can emulate a Bus Controller, a Remote Terminal, or a Bus Monitor.

EMBC1000- USB1553B-1 device is powered by an external power supply --- +12VDC power adaptor.

The EMBC1000-USB1553B-1 device comes with driver software, API (Application Programming Interface) library and user oriented application software, running under Windows 2000, Windows XP. The user oriented application software has been designed with the capabilities of simulating the outputs of various airborne systems, receiving inputs from these systems. API library is also provided together with example source code (Visual C++), which allows users to easily develop their own application software or project.

The manual uses Symbols and icons:





The Warning icon presents information pertaining to hazards that will cause damage to the product and possible injury to the user.



The Caution icon identifies important information that presents a possibility of damage to the product if not heeded.



The Note icon signifies important supplementary information that will be useful to the user.

1.2 Applications

EMBC1000-USB1553B-1 device is well suited for all types of ground support work (development, manufacturing test, on-site maintenance, etc.), as well as on-board data acquisition. LRU developers find that this device provides easy access for simulating and/or testing new systems prior to use with actual flight systems. Avionics maintenance and validation teams enjoy on-site testing and analysis with this device. It also used in sensor and control systems including prototype passenger cars, oil platforms subway control systems and the International Space Station.



Figure 1-2 Wide Applications

1.3 Characteristics

EMBC1000-USB1553B-1 device come in single-function configurations. Single-function





device allow operation in only one of the three 1553 modes at a time: Bus Controller, Bus Monitor, or Remote Terminal (up to 31 RTs). Although all three modes are available, the board can operate only in one mode at one time.

EMBC1000-USB1553B-1 device features with the following characteristics:

- USB 2.0 or USB1.1 Interface with PC
- Supports the six major categories of message types:
 - BC \rightarrow RT
 - $\mathsf{RT} \to \mathsf{BC}$
 - $\mathsf{RT} \to \mathsf{RT}$
 - Broadcast
 - Mode code
 - Broadcast Mode code
 - Enhanced BC/RT/BM Architecture
 - Supports MIL-STD-1553 A and B Notice 2
 - Transformer or Direct Coupled 1553B Channels
 - 64K-bytes RAM
 - One A/B Dual Redundant Mil-STD-1553 Channel
 - Programmable selected one of BC、RT or BM mode
 - Data Rate 1MHz
 - Programmable Time Tag resolution
 - Bus Controller
 - Programmable Message automatic retries
 - Programmable Frame Time
 - Loop and Single-shot for BC operation
 - Supports multiple Mode Codes
 - Programmable Response time-out and late response
 - Insert periodic messages into a running BC list
 - Supports Error detection
 - Supports Message Data and Status display
 - Supports Setting options and Data saved
 - Remote Terminal
 - One RT simulation
 - Programmable RT ID、Subaddress ID and Mode Code ID
 - Programmable Status Word
 - Programmable RT-RT response time
 - Selectable Broadcast Mode
 - Supports Setting options and Data saved
 - Bus Monitor
 - Capture 100% fully loaded bus traffic with:

DATA、Time-tagging、 Error status、Word status、 Message status and RT response time

- Filtering by Subaddress transmit or receive



- Individual DATA and COMMAND Stacks
- 32bit, microsecond resolution time-tagging
- Includes high-level API libraries for Windows 2000, XP and Source code
- USB1553B GUI bus analyzer provided
- Power:+12VDC:500mA
- Physical Size: 135mmx114mmx33mm(Length x Width X High)
- Operating temperature range: -40°C~+85°C

1.4 System Requirements

For a single-user system, EMBC1000-USB1553B-1 requires the following:

An IBM compatible PC equipped with USB 2.0 or USB1.1 Interface, Pentium processor 1.6GHz or better CPU, 2-Gbyte Minimum Hard Disk, 256-Mbyte Minimum RAM; CD-ROM drive, monitor, Windows XP or Windows 2000, etc.. Shall be required for installing the USB device and the associated software.

A cable assembly is required to interface to the 1553B bus target hardware or other discrete channels.

1.5 Resources on CD-ROM

The resources on CD-ROM include:

```
Directory: G:\
              (assume G:)
\setup
      USB1553B.exe
                         data analysis executable file
      1553DLL.dll
      1553DLL.lib
      setup.exe
                         setup file
      \UserDesign
                                          for user's development use
              \Include
                      EMBCAPI.h
              \Lib
                      1553DLL.dll
                      1553DLL.lib
              \Samples
                \VC++
                      \BCDemo1
                      \RTDemo1
                      \BMDemo1
        \Doc
```



EMBC1000-USB1553B-1 User Manual.pdf User manual

\Driver

\WINDOWS \driver EMBC1000-USB1553B.sys EMBC1000-USB1553B.inf

\training

Video files to show the operations

\BC.avi \RT.avi \BM.avi \INSTALL.avi

1.6 Special Handlings and Cautions

Since EMBC1000-USB1553B-1 device uses state-of-the-art components and connectors, properly handlings and cares must be taken to ensure that the device will not be damaged by Electrical Static Discharge (ESD), physical shock, or improper power surges.



- Turn off power to the PC completely;
- NEVER insert or remove device with power turned on;
- Ensure that standard ESD precautions are taken. At least, one hand should be grounded to the power supply in order to eliminate static potentials;
- Do not store the device in environment exposed to excessive heat, magnetic fields or radiation.



Chapter 2 1553B Bus Networking

2.1 Interface Description

The EMBC1000-USB1553B-1 interface description as shown in Figure2-1



Figure 2-1 Interface Description

Power Input:

+12VDC/500mA power adaptor input (the adaptor works between 100VAC and 240VAC).

RESET:

This key-press can be used to generate a system reset.

LED Indication:

POWER LED: Power indicator, GREEN or OFF

GREEN color when power is ON, OFF when power to the device is ABNORMAL;

STATUS LED: Device RUN status indicator, RED, Blinking RED, Blinking GREEN, BLUE or OFF

Table 2-1 STATUS LED Description

STATUS LED	Description
OFF	Power Down or self-testing failure
RED	USB device has not been enumerated
BLUE	USB device has been enumerated



Blinking GREEN	1553B communicate activity
Blinking RED	1553B communicate error

USB interface:

Standard USB 2.0 and USB1.1 port

J1: 1553B Bus Connector, Figure 2-2 show J1 and 1553B Connect Cable



Figure 2-2 1553B Bus Connector and Cable

C1 and C2 are TRB-0102 connector, Channel A and Channel B which can provide the link to outside 1553B network.

Pin	Signal	Direction	Description
1	1553B_CHAN	I/O	MIL-STD-1553B bus driver A, negative signal
2	1553B_CHA	I/O	MIL-STD-1553B bus driver A, positive signal
3	GND		POWER GND
4	NC		
5	NC		
6	GND		POWER GND
7	NC		
8	NC		
9	GND		POWER GND
10	GND		POWER GND
11	GND		POWER GND
12	GND		POWER GND
13	1553B_CHB	I/O	MIL-STD-1553B bus driver B,positive signal
14	1553B_CHBN	I/O	MIL-STD-1553B bus driver B,negative signal
15	GND		POWER GND

Table 2-2	11.1553B	Rus	Connector	Pin	Definition
	J I. I JJJJD	Dus	CONNECTOR	1 11 1	Deminion



EMBC1000-USB1553B-1 allows two software configurable bus coupling modes to connect it to the 1553B network:

- **Transformer coupling:** it can provide better isolation over long distances and noise immunity, in this mode, the external transformer couplers are needed.
- **Direct coupling:** this mode is often used in the laboratory and it do not require transformer couplers supported. But cable length less than 30 cm

2.2 1553B Cables and Connectors

The cables used for 1553B bus and stub connections are two-conductor twisted pair wires with twin-axial connectors.



Figure 2-3 1553B Cables and Connector Description

For the twin-axial connector, the center pin is the POSITIVE signal (connect the blue conductor of 1553B cable), and the ring is the NEGATIVE signal (connect the white conductor of 1553B cable). The shield is connected to ground.



2.3 1553B Networking



Figure 2-4 1553B Networks



Chapter 3 OPERATION AND SETUP

3.1 Hardware Installation

1. Connect the EMBC1000-USB1553B device to PC with the USB cable

2. Turn on the power adaptor (+12VDC)

3. Insert the provided CD-ROM into you PC with Windows XP/2000, now you are ready to install the drivers onto your PC

4. After the device has been installed into your PC, turn off the power, you should assemble the 1553B cables, and built the link between your device and the 1553B network

3.2 Software Driver Installation

When the hardware installation done, you need to install "Board oriented drivers" software from the provided CD-ROM, which are designed to run under Windows XP or Windows 2000.

Once EMBC1000-USB1553B-1 device installed into your PC, and the computer is powered on, the PC will perform the detection for all new hardware, and the "Add Hardware Wizard" window will be opened automatically (Figure 3-1).



Figure 3-1 Add Hardware Wizard window



Choose "**Yes, I have already connected the hardware**", then click the "**Next**" button, you will get:



Figure 3-2 Welcome to the Found New Hardware Wizard

Choose "Install from a list or specific location (Advanced)", then click the "Next "button, you will be asked to choose:

Found New Hardware Wizard				
Please choose your search and installation options.				
Search for the best driver in these locations.				
Use the check boxes below to limit or expand the default search, which includes local paths and removable media. The best driver found will be installed.				
Search removable media (floppy, CD-ROM)				
Include this location in the search:				
D:\EMBC1000-USB429-42 inver				
On't search. I will choose the driver to install.				
Choose this option to select the device driver from a list. Windows does not guarantee that the driver you choose will be the best match for your hardware.				
< <u>B</u> ack <u>N</u> ext> Cancel				





Choose **"Don't search. I will choose the driver to install**", then click the **"Next**" button, you will guide to:

Found New Hardware Wizard	
Hardware Type.	E.
Select a hardware type, and then click Next. Common <u>h</u> ardware type.	
Show All Devices	
Biuecoom Hadios Computer Solution Disk drives Display adapters	~
< <u>B</u> ack Next >	Cancel

Figure 3-4 select a hardware type

Choose "Show All Devices", then click the "Next" button, you will be asked to select:

Found New Hardware Wizard			
Select the device driver you want to install for this hardware.			
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.			
Manufacturer Model (Standard CD-ROM drives) CD-ROM Drive (force CDDA accurate) (Standard IDE ATA/ATAPI col (Standard keyboards) CD-ROM Drive (force CDDA inaccurate) (Standard system devices) CD-ROM Drive (force IMAPI disable) CD-ROM Drive (IMAPI settings 0,1) CD-ROM Drive (IMAPI settings 0,1) This driver is digitally signed. Have Disk			
< <u>B</u> ack <u>N</u> ext > Cancel			



Figure 3-5 Select the device driver

Click"**Have Disk...**" you will get:

Install F	rom Disk	
	Insert the manufacturer's installation disk, and then make sure that the correct drive is selected below.	OK Cancel
	Copy manufacturer's files from: D:\usb1553bDriver	Browse

Figure 3-6 Install From Disk

Click"**Browse..**" button to locate the driver software "EMBC1000_USB553B_driver.inf" (you can find it on the CD-ROM, directory \Driver\WINDOWS\usb1553bDriver\), then click "**OK**" button, you will get:

Add Hardware Wizard
Select the device driver you want to install for this hardware.
Select the manufacturer and model of your hardware device and then click Next. If you have a disk that contains the driver you want to install, click Have Disk.
Model
Orbita EMBC1000-USB1553B Board
Image: This driver is not digitally signed! Have Disk Tell me why driver signing is important Have Disk
< <u>B</u> ack <u>Next</u> Cancel

Figure 3-7 Select the device driver

Click "Next" button, you will get:





Figure 3-8 Finish

Click on "**Finish**" button to complete this installation procedure. Congratulations! Now you have installed the "Board oriented drivers" onto your PC successfully.

3.3 Application Software installation

Double click SETUP.EXE(you can find it on CD-ROM, \setup), then the setup initialization window will be opened, shown in Figure 3-9:





Figure 3-9 Application Software setup initialization windows

A moment later, the application software setup main window will be opened automatically, as shown in Figure 3-10.



Figure 3-10 Setup main interface

Click the "**Next**" button, then the "Software License agreement" window will be get, as shown in Figure 3-11



Software License Agreement	
Please read the following License Agreement. Press the PAG the rest of the agreement.	E DOWN key to see
To display your license agreement, replace the License.txt file currently located in the Language Independent\Operating System Independent folder of the Setup Files pane.	
NOTE: The text in your license file should contain hard returns after lines with more than 512 characters (on 16-bit platforms) or 1,024 characters (on 32-bit platforms).	
J Do you accept all the terms of the preceding License Agreement? If you will close. To install EMBC1000-USB1553B, you must accept this agr < <u>B</u> ack <u>Y</u> es	Mnoose No, Setup ment.

Figure 3-11 software License agreement

Click "Next", you will get the "User Information" window, Figure 3-12.

User Information		×
User Information	Type your name below. You must also type the name of the company you work for and the product serial number. Name: Microsoft Company: User Serial: 1 Input any character	
	< <u>B</u> ack <u>N</u> ext > Cancel	

Figure 3-12 User Information

Fill in your own information, then click the **"Next"** button, you will get the "Choose Destination Location" window, Figure 3-13.





Figure 3-13 Choose Destination Location

Choose the location of the destination of the application software, then click the "**Next**" button, you will get the "setup type" window, as shown in Figure 3-14.



Figure 3-14 Setup Type

Choose a setup type, and then click "Next", you will get the "Select Program Folder"



window, as shown in Figure 3-15.

Select Program Folder	Σ	<
Select Program Folder	Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing Folders list. Click Next to continue. Program Folders: EMBC1000-USB1553B Existing Folders: Accessories Administrative Tools Games Microsoft Office Startup WinRAR	
<u> </u>	< <u>Back</u> Next> Cancel	

Figure 3-15 Select Program Folder

Fill in the "Program Folder", and then click "**Next**", the setup will be started, as shown in Figure 3-16.





Figure 3-16 Setup in progress

When the setup is done, the "Setup Complete" window will be opened automatically, shown in Figure 3-29, you can click the "Finish" button to complete this installation procedure. *Congratulations!* Now you have installed the application software of EMBC1000-USB1553B-1 onto your PC successfully.





Figure 3-18 setup finish



Chapter 4 Application Software Operation

When the Application Software Installation done, Double click USB1553B.EXE(you can find it on Desktop), then the "Device Setup" window will be opened, shown in Figure 4-1:

Device Setup	
Invalidation Options	Bus Protocol:MIL-STD-1553B Device type Options
-Device Number	Device Configuration
Device #1 O Device #5	
O Device #2 O Device #6	© EMBC1000-USB1553B-2
C Device #3 C Device #7	
C Device #4 C Device #8	
Coupling Options © Direct Coupling © Trans	sformer Coupling Cancel

Figure 4-1 EMBC1000-USB1553B Device Setup

Click the "OK" button, you will get USB1553B Main Window, Figure 4-2:

USB1553B Main Window screen is split into four sections. These sections consist of the Topic Bar, Menu Bar, Tools Bar, Working Editor.





Figure 4-2 USB1553B Main Window

4.1 Bus Control(BC)



Double-click (you can find it on the "USB1553B Main Window"),then the "BC Main Widow" window will be opened, shown in Figure 4-3:

The Bus Controller mode provides the ability to create valid MIL-STD-1553B bus controller messages by simple parameter selection in a major and minor message data format.

BC Operation Steps including:

- a. Message Editor
- b. Frame Editor
- c. BC Setup
- d. BC Run





4.1.1 Message Editor

Next, click the icon; you will get Figure 4-4:



Figure 4-4 BC Message Editor



BC Message Editor Steps:

- 1) Create Message Name
- 2) Set Data Words Counts
- 3)Set Data Words Contents

4) Set Command Words Contents. It allows for the selection of the destination Remote Terminal address and subaddresses, channel (A or B) selection and transmit message types. Transmit message types consist of BC to RT Transfer, RT to BC Transfer, RT to RT Transfer, Mode Code, Broadcast, and Broadcast Mode Code.

Next, click Create Message , to saving the message and create new the message.

4.1.2 Frame Editor

Frame editing is accomplished via selection of previously created messages in the Message Name and adding or inserting them to the Frames list.

Figure 4-5 shows Message1 are added to the list with the Add _____. To add a message to the list, select the message to be added from the Message list and click on



delete messages of your frame. We is used to

is used to repeat your frame.



✓ EMBC1000 - USB1553B	_	8 ×
Eile Edit BC RT BM Help		
🗋 💕 🛃 🐰 🖻 🛍 😤 🏆 🦹		
BC-Control BC-Frame Messages message1 message2 message3	Image: state	
Ready	CAP NUM	1 SCRL

Figure 4-5 Frame Editor

4.1.3 BC Setup

Double-click (you can find it on the "Frame Editor" Window),then the "BC Setup" window will be opened, shown in Figure 4-6:

This screen has been designed to provide the user with the ability to setup the Bus Controller parameters needed in controlling response timing time tag resolution and error handling.

When the Retry Enable, Retry (Single or Double) option selects whether the Bus Controller will do a Single or a Double retry on message errors. Change-Channel option selects whether the Bus Controller will change channel retry at Single retry. Change-Channel (1st) and Change-Channel (2nd) option select whether the Bus Controller will change channel at First retry or at Second retry.



😻 EMBC1000 - USB1553B					_ _ _ _ _
Ele Edit BC BT BM Help					
BC-Setup	Response Timeout © 18.5 µs © 22.5 µs © 50.5 µs © 128 µs	Retry T Enable Retry	© Single □ Char © Double □ Char □ Char	nge Channel nge Channel (1st) nge Channel (2st)	
	- Time Tag Set	С 4µs С 64µs	С 8µs С 128µs		
Ready					

Figure 4-6 BC Setup

4.1.4 BC Run

Double-click (you can find it on the "Frame Editor" Window), then the "BC Run" window will be opened, shown in Figure 4-7:

The Save Frame Option section used to select Frame information is being stored or not. The Save Frame, which will be examined in greater detail later, contains detailed information about the MIL-STD-1553B bus activity which has already taken place. In the stack section of this screen, the file name that was selected upon entry into this screen is displayed. This is the file which will hold the Communication Stack for later display and

use. Next, if you want open this file please click icon.



Sector Se	BC1000 - USB1553B	
Eile	Edit BC RT BM Help	
	D 😂 🛃 🔏 🖹 🞇 📡 BC run status display	
	BC-Run	
	Format Delay Hex Label Data	
	Channel: CACB Mode: CRX CTX	
	RT: SA: WC/MC:	
	Status: 🗖 me 🗖 ins 🗖 src 🗖 bor	
	Msg: Err: Data Content	s
Save Frame	Int:	
option		
	C Save browse	
	© No Save	
	Return BC Main	
BC Run and	window	
Stop button		

Figure 4-7 BC Run Status Display

4.2 Remote Terminal(RT) Receiving

Double-click ^{RT} (you can find it on the "USB1553B Main Window"),then the "RT Main Widow" window will be opened, shown in Figure 4-8:

RT Receiving Operation Steps including:

Y

a. RT Setup

b. RT Run

	ita HBEDDED			EMBC1000-US	SB1553B-1 User M	lanual
×.	USB1553B					_ 8
	<u>Eile E</u> dit <u>B</u> C <u>R</u> T B <u>M</u>	Help	P	TEditor		
Tool-bar	🗋 📁 🛃 🎖	k 🗈 🛍 👺 🏋				
	RT-Control	RT-Edit				
		0: <u> [None]</u>	8: 🛐 [None]	▼ 16: ▼ [None] ▼	24: 👔 [None]	E
		1: 👔 [None]	9: 🛐 [None]	▼ 17: ▼ [None] ▼	25: 👔 [None]	3
	RUN	2: 👔 [None]	💌 10: 🥡 [None]	▼ 18: ▼ [None] ▼	26: 👔 [None]	E
		3: 🛐 [None]	✓ 11: [None]	▼ 19: ▼ [None] ▼	27: 👔 [None]	E
		4: 👔 [None]	✓ 12: [None]	 20: [None] 	28: 🕎 [None]	3
	*	5: 🥎 [None]	💌 13: 🕎 [None]	▼ 21: ▼ [None] ▼	29: ү [None]	E
		6: 👔 [None]	✓ 14: (None)	💌 22: 🕎 [None] 💌	30: 👔 [<u>[None]</u>	3
		7: 🛐 [None]	🔽 15: 🕎 [None]	💌 23: 🕎 [None] 💌	31: 🥎 [None]	Ð
	aadu					

Figure 4-8 RT Main Window

4.2.1 RT Setup

Double-click (you can find it on the "RT Main Window"),then the "RT Receiving Setup" window will be opened, shown in Figure 4-9:

🧇 EMBC1000 - USB1553B				
Eile Edit BC RT BM H	əlp			
🗋 😂 🔜 🐰	🕒 🛍 👺 🕺 谢	RT Address set		
KI-Control	RI-Setup RI Address: 0 RI To RI Message Response Timeout © 18.5 μs	☐ Clear TimeTag Synch ☐ Load TimeTag on Syn	ronicity	Enable or Disable Model code
	С 22.5 µs С 50.5 µs С 128 µs	Time Tag Set Ο 1μs Ο 2μs Ο 16μs Ο 32μs	С 4µз С 8µз С 64µз С 128µз	Time Tag Time Resolution Set
RT Return Status	Status Word	□ Dynamic Bus Control Acceptar □ Busy	Invalidation Options	n
Word set				
Ready				CAP NUM SCRL



Figure 4-9 RT Receiving Setup

4.2.3 RT Run

I	Double-click 🧰 (you can find it on th	e "RT Receiving Setup" Window),th	en the "RT
F	Run" window will be opened, shown in I	Figure 4-10. Next, Click 🤘 ,then R ⁻	T is active.
	EMBC1000 - USB1553B		
	Eile Edit BC RT BM Help		
	🗋 🖻 🛃 🐰 🗈 🛍 💱 🏆 📡		
	RI-Run RT: SA: WC/MC:	Hex Label Data	1
Receiving	Status 🗌 Me 🗖 inf 🗖 srg 🗖 bor		RT Receiving
RT Status	□ bsy □ sf □ dba □ tf C Rey C Xmit		Data
	Int		
Save RT			
Result option	Save Drowse		
	Return RT Main		
RT Run and	window		
Stop button	dy		

Figure 4-10 RT Receiving Run

4.3 Remote Terminal(RT) Transmit

Double-click ^{RT} (you can find it on the "USB1553B Main Window"),then the "RT Main Widow" window will be opened, shown in Figure 4-8:

RT transmit Operation Steps including:

- a. RT Setup
- b. RT Message Editor
- c. RT Run



4.3.1 RT Setup

Double-click ^(w)(you can find it on the "RT Main Window"), then the "RT Transmit Setup" window will be opened, shown in Figure 4-11:



Figure 4-11 RT Transmit Setup

4.3.2 RT Message Editor

Double-click (you can find it on the "RT Main Window"), then the "RT Message Editor" window will be opened, shown in Figure 4-12:



EMBC1000-USB1553B-1 User Manual

	RT Mes	sage				
						Message Name
Set Data words	Word	Data	Word	Data	Data set	
Contonto	01:	0000	17:	0000		Data Wanda
Contents	02:	0000	18:	0000	Message name	Data words
	03:	0000	19:	0000		Counts
	04:	0000	20:	0000		
	05:	0000	21 :	0000	Set Data Words Utex,	
	06:	0000	22:	0000	Accession Wands 0000	
	07:	0000	23:	0000	Ascending words (Hex.	
	08:	0000	24:	0000	Increment Words 0000 (Hew	
	09:	0000	25:	0000		
	10:	0000	26:	0000		
	11:	0000	27:	0000	·	
	12:	0000	28:	0000		
	13:	0000	29:	0000		
	14:	0000	30:	0000	Create Message	
	15:	0000	31:	0000		
	16:	0000	32:	0000	Cancel	
	_				4	

Figure 4-12 RT Message Editor

RT Message Editor Steps:

- 1) Create Message Name
- 2) Set Data Words Counts
- 3)Set Data Words Contents

Next, click Create Message , to saving the message and create new the message.

4.3.3 RT Run

Double-click (you can find it on the "RT Receiving Setup" Window), then the "RT

Run" window will be opened, shown in Figure 4-13. Next, Click ,then RT is active.



C EMI	IBC1000 - USB1553B Edit BC BT BM Help) 😂 🛃 💥 🗈 💼 🧱 🌠 🦉	-BX
	RI-Run RI: SA: WC/MC: Hex Label Data	
Transmit RT	Status 🗌 Ne 🔲 inf 🔲 srg 🔲 bor	RT Data
Status	🗆 bsy 🗖 sf 🗖 dba 🗖 tf	Display
	C Roy C Xmit	
	Int	
	Time	
	Channel CA CB	
Save RT	- Sava Data	
Result option	C Save	
	© No Save	
	Return RT Main	
RT Run and	window	
Stop buttop		
		CAP NUM SCRL

Figure 4-13 RT Transmit Run

4.4 Bus Monitor (BM)

-

Double-click (you can find it on the "USB1553B Main Window"),then the "BM Main Widow" window will be opened, shown in Figure 4-14:

BM Operation Steps including:

- a. BM Filter Options
- b. BM Setup
- c. BM Run



4.4.1 BM Filter Options

-BM-Control BM Filter	
KI TIITET	
Iransmit Keceive	
I SA0 I SA8 I SA16 I SA24 I SA0 I SA8 I SA16 I SA24	
RUN V SA1 V SA9 V SA17 V SA25 V SA1 V SA9 V SA17 V SA25	
SA2 V SA10 V SA18 V SA26 V SA2 V SA10 V SA18 V SA26	
Set All Clear All Set All Clear All	
ool-bar	
RT Subaddress Filter	
Option. This option	
selects is not filter	
sciects is not inter.	

Figure 4-14 BM Main Window

4.4.2 BM Setup

Double-click ^{(you} can find it on the "BM Main Window" Window),then the "BM Setup" window will be opened, shown in Figure 4-15:

This screen has been designed to provide the user with the ability to setup the Bus Monitor parameters needed in controlling response timing time tag resolution.





Figure 4-15 BM Setup

4.4.3 BM Run

rbita

Double-click (you can find it on the "BM Main Window" Window), and then the "BM

Run" window will be opened, shown in Figure 4-16. Next, Click , then BM is active.



Set and the set of the	D00 - U5B1553B	
Eile <u>E</u> d	lit <u>B</u> C <u>R</u> T B <u>M</u> <u>H</u> elp	
	🚔 🛃 🕺 🗈 🛍 🞇 🏆 📡	
-BM-R	un	
BM Status	MIL-STB-1553B Channel C A C B Hex Label Data	
	RT: SA: WC/MC:	
	Status: _ me _ ins _ src _ bor	
	🗖 bsy 🗖 sf 🔲 dba 🗖 tf	
	Msg: Time:	
	Int:	
Save BM	C RX C TX	
Result option	Save Data	
	© No Save	
	Return BM Main	
RT Run and Stop	window	
button		AP NUM SCRL

Figure 4-16 BM Run



Chapter 5 Develop Your Application Software

To allow the user to develop his own application software or project, EMBC1000-USB1553B-1 device comes with software drivers, API (Application Programming Interface) library and user oriented application software, running under Windows 2000 or Windows XP. The user oriented application software has been designed with the capabilities of simulating the outputs of various airborne systems, receiving inputs from these systems, and providing bus data analysis functions. API library is also provided together with example source code (Visual C++), which allows users to easily develop their own application software or project based on the real world applications.

5.1 API Library

When you begin to develop your own application software for this USB device, you should finish the settings below in you project (build in Visual C++ 6.0):

Copy 1553DLL.dll、1553DLL.lib、1553BUSBhead.h (you can find them on CD-ROM \setup\UserDesign\Lib) to your project working directory.

Project Settings	?×
Settings For: Win32 Debug	General Debug C/C++ Link Resources M< (▶) Category: General Reset Output file name: Debug/1553B.exe Object/library modules: 1553DLL.lib ✓ Generate debug info Ignore all default libraries ✓ Link incrementally Generate mapfile Enable profiling Project Options: 1553DLL.lib /nologo /subsystem:windows /incremental:yes /pdb:''Debug/1553B.exe'' /pdbype:sept Machine:1386 /out:''Debug/1553B.exe'' /pdbype:sept
	OK Cancel

Add the 1553DLL.lib to the project: Project→Setting→Link, as shown in Figure 5-1.

Figure 5-1 Add the 1553DLL.lib to the project

Edit the head file; refer to the source code below:

#include "1553BUSBhead.h "



Now the API setup is done. When you build your project, VC++ will link the APIs automatically and add them to your project.

5.2 Function Describe

1. USB1553B_Init

function	BOOL USB1553B_Init(int Coupling)
Purpose	initialization
parameter	Coupling:0-Direct Coupling ,1-Transformer Coupling
Return	true-succeed
	false -fault

2. Set_BoardMode

function	void Set_BoardMode(int mode)
Purpose	Set EMBC1000-USB1553B Mode
parameter	Mode: (BCMODE/RTMODE/BMMODE)
Return	NULL

3. Set_BCInit

function	void Set_BCInit(int enable_retry,int retry_num,int change1,int
	change2,int timeout,int time_precision)
Purpose	Initialize Bus Controller Mode
	enable_retry: 0-enable, 1-disable
	retry_num: 0-single, 1-double
parameter	change1、 change2: 0-disable change, 1-enable change
parameter	timeout: 0-18.5 uS, 1-22.5uS, 2-50.5 uS, 3-128 uS
	time_precision: 0-1uS,1-2uS,2-4uS,3-8uS,4-16uS,5-32uS,6-
	64uS,7—128uS.
Return	NULL

4. Set_RTInit

function	void Set_RTInit(int timeout,int time_precision,int rt_address,int subsys,int
	dynbus,int terflag,int service,int busy,int cleartt,int loadtt,int rxmode16)



Purpose	RT initialization
parameter	timeout: $0-18.5 \text{ uS}$, $1-22.5 \text{uS}$, $2-50.5 \text{ uS}$, $3-128 \text{ uS}$ time_precision: $0-1 \text{uS}$, $1-2 \text{uS}$, $2-4 \text{uS}$, $3-8 \text{uS}$, $4-16 \text{uS}$, $5-32 \text{uS}$, $6-64 \text{uS}$, $7-128 \text{uS}$. rt_address: $0x00 \sim 0x1F$ subsys: $0-false$, $1-true$ dynbus: $0-false$, $1-true$ terflag: $0-false$, $1-true$ terflag: $0-false$, $1-true$ busy: $0-false$, $1-true$ busy: $0-false$, $1-true$ cleartt: $0-false$, $1-true$ loadtt: $0-false$, $1-true$ rxmode16: $0-false$, $1-true$
Return	NULL

5. Set_BMInit

function	void Set_BMInit(int* Transmit_SA,int* Receive_SA,int timeout,int time_precision)
Purpose	BM initialization
parameter	Transmit_SA: 1-enable, 0-disable Receive_SA: 1-enable, 0-disable timeout: 0-18.5 uS, 1-22.5uS, 2-50.5 uS, $3-128$ uS time_precision: 0-1uS,1-2uS,2-4uS,3-8uS,4-16uS,5-32uS,6- 64uS,7-128uS.
Return	NULL

6. Send_BCData

function	void Send_BCData(BC_MsgBlock &BC_Msg)
Purpose	BC mode ,write a message to EMBC1000-USB1553B memory
parameter	BC_Msg :the struct of BC Message
Return	NULL

7. Read_BCdata

function	int Read_BCdata(int msgnum,BC_STATUS &BC_set)
----------	---



Purpose	BC mode ,read single message
parameter	msgnum: message number (0-63) BC_set : the pointer of message struct
Return	1-succeed 0-fault

8. Send_RTData

function	void Send_RTData(unsigned int *RTdata,int msgnum)
Purpose	Write data to designate address
parameter	msgnum : designate sa-address RTdata: pointer of data memory
Return	NULL

9. Read_RTdata

function	int Read_RTdata(RT_STATUS &RT_set)
Purpose	RT mode,read single message
parameter	RT_set : message struct pointer
Return	1-succeed
	0-fault

10. Read_BMdata(BM_STATUS &BM_set)

function	int Read_BMdata(BM_STATUS &BM_set)
Purpose	BM mode, read single message
parameter	BM_set : message struct pointer
Return	1-succeed
	0-fault

5.3 Samples

This example source code will show you how to use the API. You can get the details from the CD-ROM (G:\Samples) directory. (VC++ 6.0 environment),





Chapter 6 PRODUCT ORDERING INFO

Product Number	Description	Baud rate	Software support
EMBC1000-1553B-1	Single-function boards allow operation in only one of the three 1553 modes at a time: Bus Controller, Bus Monitor, or Remote Terminal (up to 31 RTs). Although all three modes are available, the board can operate only in one mode at any one time.	1Mbps	Windows 2000 or Windows XP based drivers and application software

Table 6-1 Product ordering information



Appendix A: MIL-STD-1553B Introduction

A.1. MIL-STD-1553B Defined

So now that we understand the driving need for the development of a data bus, and a little of its history and application, what exactly is MIL-STD-1553B/A summary of the characteristics of MIL-STD-1553B is found in Table A-1.

	,
Data Rate	1 MHz
Word Length	20 bits
Data Bits / Word	16 bits
Message Length	Maximum of 32 data words
Transmission Technique	Half-duplex
Operation	Asynchronous
Encoding	Manchester II bi-phase
Protocol	Command/response
Bus Control	Single or Multiple
Fault Tolerance	Typically Dual Redundant, second bus in "Hot Backup" status
Message Formats	Controller to terminal Terminal to controller Terminal to terminal Broadcast System control
Number of Remote Terminals	Maximum of 31
Terminal Types	Remote terminal Bus controller Bus monitor
Transmission Media	Twisted shielded pair
Coupling	Transformer and direct

Table A-1. Summary of MIL-STD-1553 Characteristics

The primary purpose of the data bus is to move data between black boxes. How these boxes are connected and the methodology with which the communication is accomplished is central to the operation of the data bus. However, before we delve into the protocol, it is necessary to understand a little of the data bus hardware.



A.2. Hardware Elements

MIL-STD-1553 defines certain aspects regarding the design of the data bus system and the black boxes to which the data bus is connected. The standard defines four hardware elements. They are:

- The transmission media
- Remote terminals.
- Bus controllers.
- Bus monitors.

A.2.1 Transmission Media

The transmission media, or data bus, is defined as a twisted shielded pair transmission line consisting of the main bus and a number of stubs. There is one stub for each terminal connected to the bus. The main data bus is terminated at each end with a resistance equal to the cable's characteristic impedance (plus or minus two percent). This termination makes the data bus behave electrically like an infinite transmission line.

A.2.2 Remote Terminals

Remote terminals are defined within the standard as "All terminals not operating as the bus controller or as a bus monitor". Therefore if it is not a controller, monitor, or the main bus or stub, it must be a remote terminal. The remote terminal comprises the electronics necessary to transfer data between the data bus and the subsystem. So what is a subsystem. For 1553 applications, the subsystem is the sender or user of the data being transferred.

A.2.3 Bus Controller

The bus controller is responsible for directing the flow of data on the data bus. While several terminals may be capable of performing as the bus controller, only one bus controller may be active at a time. The bus controller is the only one allowed to issue commands onto the data bus. The commands may be for the transfer of data or the control and management of the bus (referred to as mode commands).

A.2.4 Bus Monitor

A bus monitor is a terminal that listens (monitors) to the exchange of information on the data bus. The standard strictly defines how bus monitors may be used, stating that the information obtained by a bus monitor be used "for off-line applications (e.g., flight test recording, maintenance recording or mission analysis) or to provide the back-up bus controller sufficient information to take over as the bus controller." A monitor may collect all the data from the bus or may collect selected data. The reason for restricting its use is that while a monitor may collect data, it deviates from the command-response protocol of the



standard, in that a monitor is a passive device that doesn't transmit a status word and therefore cannot report on the status of the information transferred. Bus monitors fall into two categories:

- A recorder for testing.
- A terminal functioning as a back-up bus controller.

A.3. Protocol

Now that you understand a little of the hardware requirements, it's time to discuss the methodology by which the information transfer occurs. The rules under which the transfers occur are referred to as "protocol". The control, data flow, status reporting, and management of the bus are provided by three word types.

A.3.1 Word Types

Three distinct word types are defined by the standard. They are:

- Command words.
- Data words.
- Status words.

Each word type has a unique format, yet all three maintain a common structure. Each word is twenty bits in length. The first three bits are used as a synchronization field, thereby allowing the decode clock to re-sync at the beginning of each new word. The next sixteen bits are the information field and are different between the three word types. The last bit is the parity bit. Parity is based on odd parity for the single word. The three word types are shown in Figure A-1.





Figure A-1 1553B Word Formats