

# MerlinMCH Software Manual

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# 1 Introduction

*MerlinMCH* is a Windows based GUI test and simulation program for MIL-STD-1553 bus communications data. The program enables avionics equipment testers to send/receive messages in Bus Controller, Remote Terminal and Sequential Monitor modes by defining raw data. In Sequential Monitor mode the user has the additional option of defining data with engineering units.

Excalibur's powerful MIL-STD-1553 line of products include the following boards and modules:

EXC-1553PC/MCH	EXC-PCMCIA1553
EXC-1553PCI/MCH	M4K1553MCH module for the EXC-4000 family of
	carrier board

For the most up-to-date list of Excalibur products, check our website at <u>www.mil-1553.com</u>.

# **Overview of MerlinMCH**

Excalibur's 1553 boards provides the user compatibility with MIL-STD-1553A and MIL-STD-1553B protocols, including the McAir and F-16 derivative.

The GUI software is built around Excalibur's *MCH Software Tools* drivers. These drivers are delivered in the form of DLLs, enabling the use of a single executable for multiple boards and operating systems. *MerlinMCH* should always be downloaded with the drivers for the appropriate board.

*MerlinMCH* supports Bus Controller, Remote Terminal and Bus Monitor modes. On MCH boards and modules each channel can be a BC, RT, or BM, and function independently.

# **Getting Started**

## To Install MerlinMCH

- 1. Install *MCH Software Tools* either from the *Excalibur Installation CD* or download the software from our website: <u>www.mil-1553.com</u>
- 2. Run the **ExcConfig** utility program as described in the instructions for *MCH Software Tools*. The installer ensures that the Borland DLL is placed in the Windows System directory. If any changes are made to the DLL, the new DLL must be included either in the Windows System directory or in the same directory as *MerlinMCH*.

**Note:** *MerlinMCH* uses the *MCH Software Tools* DLL for Borland.

- 3. Install *MerlinMCH* either from:
  - the Excalibur Installation CD or
  - download the software from our website <u>www.mil-1553.com</u>, unzip the file and run **Setup.exe**.

If *MerlinMCH* does not come up on your screen or if you have problems while working with the software see **Chapter 5 Troubleshooting: Installation Problems**, page 5-1.

## To Start Working with MerlinMCH

- 1. From the Windows **Start** menu:
  - If *MerlinMCH* was installed from the *Excalibur Installation CD*, click **Programs > Excalibur >** *MerlinMCH*
  - If *MerlinMCH* was downloaded from the Excalibur website, click **Programs > Excalibur** *MerlinMCH*

The main *MerlinMCH* screen is displayed.

🐒 Merlin for MCH Family		
File Modules Setup Help		
	XCALIBUE	SYSTEMS
Card was initialized on device 29	Detected 1 channels	

Figure 1-1 Main MerlinMCH Screen

2. From the Menu bar, click Setup. A Drop-down menu of Excalibur boards is displayed.



Figure 1-2 Board/Module Drop-down menu

3. From the Drop-down menu, select the board/module to be tested. A board or **Device Number Submenu** is displayed.



Figure 1-3 Device Number Submenu

4. After selecting a device number, the **Status bar** indicates that board/module was initialized for the device selected and the number of channels detected.



Figure 1-4 Board/Module Initialization OK

## Selecting a Mode of Operation:

1. From the Main screen, select Modules. A Modules Drop-down menu is displayed.



Figure 1-5 Modules Drop-down menu

2. From the Module Drop-down menu select a module. A **Modes Submenu** is displayed.



Figure 1-6 Modes Drop-down menu

3. Select a mode from the Submenu.

You are now ready to set parameters and define data in the selected mode.

# 2 Bus Controller Mode

In Bus Controller mode, *MerlinMCH* emulates the Bus Controller. The user can send up to 200 messages on the bus either in one-shot or continuous mode.

*MerlinMCH* Bus Controller Mode operations can be performed from a single screen which controls defining messages and global setup options.

#### Defining Messages to:

- Design a 1553 message
- Run one time or continuously
- Enter data
- Select which bus to send messages on
- View the Status of the message
- Select Error Injections
- Retries

Global Setup Options to define board options in BC mode.

# **Running BC/Concurrent-RT Mode**

To display the BC mode screen, from the *MerlinMCH* main screen select **Modules>BC Mode**. (See *To Start Working with MerlinMCH* on page 1-3.)

🐒 B	C Mode - Mod	dule O								
File	File Edit Run Help									
Defin	ne <u>M</u> essages 🛛 🖸	<u>à</u> lobal Se	tup							
No.	Gap	From	To	CW	CW2	WC	Bus	Retries	Msg/Err Cnt	^
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										<b>Y</b>
Idle										

Figure 2-1 BC Mode screen

Select:		То:
File New		Clear all messages which were previously defined. These messages are cleared only on the screen, not in the memory of the board. New messages will be entered into the memory of the board when the user selects <b>Start</b> .
	Open	Load previously defined BC <b>*.mmf</b> [ <i>MerlinMCH</i> Message file] message file
	Save	Save defined BC messages and global setup information as <b>*.mmf</b> file
	Exit	Close the BC Mode window, return to <i>MerlinMCH</i> main screen
Edit	Cut Row [Ctrl+x]	To cut a message
	Copy Row [Ctrl+c]	To copy a message
	Paste Row [Ctrl+v]	To paste a message which was <b>cut</b> or <b>copied</b>
	Clear Msg/Err Count [Ctrl+Alt+c]	To clear the Message or Error count
Run	Start [F9]	To start board/module operation
	Stop	To stop board/module operation

From the **BC Mode** main screen menu bar:

# **Defining Messages**

To enter or edit a 1553 Message:

1. Double-click in any of the first 7 columns (**Gap**, **From**, **To**, **CW**, **CW2**, **WC**, **BUS**), in a defined message or the next available blank line, in the Define Messages grid, to display the **Define Message Dialog Box**.

Define Message		
<u>B</u> C→RT <u>R</u> T->BC	Source Destination RT 0	<u>O</u> K
R <u>I</u> ->RT Mode	Sub 1	Define
	Gap Bus Word Count 1000 B I	Help

Figure 2-2 Define Message Dialog Box

- 2. Click a Command button to select the type of message to send.
  - a/ For a **BC > RT** message, select the destination RT and Subaddress (SA):

Define Messag	je	
<u>B</u> C->RT	Source	Destination
<u>B</u> T->BC	BC	RT
R <u>I</u> ->RT		Sub 1
<u>M</u> ode		

RT: Allowed values 0–31 SA: Allowed values 0–31

- BC->RT
   Source
   Destination

   BT->BC
   RT
   0
   ■

   RI->RT
   Sub
   1
   ■
- c/ For an **RT > RT** message, select the source **RT** and Subaddress and the destination **RT** and Subaddress:

Define Mess	age	
<u>B</u> C->RT	Source	Destination
<u>B</u> T->BC	RT 0 💌	RT O -
R <u>I</u> →RT	Sub 1 💌	Sub 1
<u>M</u> ode		

b/ For an RT > BC message, select the source RT and Subaddress:

d/ For a **Mode Command**, select the target RT, the Subaddress that identifies this as a Mode Code and the Mode Code type:

Define Mess	nge
<u>B</u> C->RT	
<u>R</u> T->BC	RT 0
R <u>I</u> ->RT	SA C 0 C 31
<u>M</u> ode	Mode Command Dynamic Bus Control
	Dynamic Bus Control Synchronize G Transmit Status Word Initiate Self Test 11 Transmitter Shutdown Override Transmitter Shutdown Inhibit Terminal Flag Bit Override Inhibit Terminal Flag Bit

3. Select the Intermessage Gap time between this message and the next one. Gap time is in microseconds. The minimum Gap time is 4 µsecs. This option may be ignored, if this is the last message in the list.

Gap	Bus	Word Count
1000	⊙ A ⊖ B	0

4. Select Bus **A** or **B** on which the message will be transmitted. Bus A is the default value.

5. To define, view or modify data of the message defined or received, click the **Define command button** in the **Define Message Dialog Box**. The **Define/Modify Data** dialog box is displayed.

T	Defin	e/Modi	fy Data						
Г	Enter/M	odify Dal	ta						
	E67D	65B8	FA7D	C8A	5A5E	A737	D235	5431	OK
	C987	EC16	22C8	696F	6C0F	5A8E	91AB	9951	
	5EF3	6626	E273	60A3	A6E5	1732	F87D	314	Cancel
	1392								
	,								<u>H</u> elp
									-
	Clear		Default	1	-> All	<u> </u> Ran	dom	Save	Load

Figure 2-3 Define/Modify Data Dialog Box

In the Define/Modify Data dialog box:

Click:	То:
Clear	Clear all the data in the grid, to enter new data.
Default	Starting with 0, fill all the cells with data according to the hexadecimal number of the cell.
1 > All	Copy the first Word to all the cells in the grid.
Random	Fill all cells with random data.
Save	Save data for later use.
Load	Load previously saved <b>*.mdb</b> [ <i>MerlinMCH</i> data file] from the disk.

Note:

- a Each message contains up to 32 Words of data.
- b Enter hexadecimal values only.
- c The number of words in a message *cannot* be more than the word count. For example: if word count = 5, up to 5 words can be entered into a message.
- 6. Click OK, to return to the Define Message Dialog Box.
- 7. Click **OK**, to return to the **BC Mode Message** grid.

8. To enter the number of **Retries**, double-click the Retries column, the **Retries popup menu** is displayed. Select the number of retries. The default setting is **No retries**.

No retries
1 retry
2 retries
3 retries

9. To view the Message and Error Information, double-click the Msg/ErrCnt Column. The Message Information Properties Box is displayed.

🐒 Message Information ( Message 1 )	- 🗆 🗙
RT31,30 -> RT0,2	· ·
Command Word(s) and Status Word(s)	
CW = 004A CW2=FBC8 SW = 0012 SW2=FC0C	Ok
Message Data	Previous
00:056C 0019 B004 0000 0000 0000 FCOC 00BD 08:0001 0000	
	Next
Message Errors	
Error in RT response	Help
•	

Figure 2-4 Message Information Properties Box

# **Global Setup Options**

To define global options for BC, select the  ${\bf Global}\ {\bf Setup}\ {\bf tab}$  from the BC mode main screen.

🐒 BC Mode - Module O	
File Edit Run Help	
Define Messages Global Setup	
Type Of Run	Military Standard C 1553 A <ul> <li>1553 B</li> </ul>
Broadcast Enabled (RT 31)	Retries T Alternate Bus
Idle	

Figure 2-5 Global Setup Options

In the Global Setup dialog box:

1. Select a Type of Run:

One Shot	Run <i>one time only</i> all messages defined on the BC mode screen
Continuous	Run <i>continuously</i> all messages defined on the BC mode screen

- 2. To enable RT31 to function as the **Broadcast RT**, select the **Enabled (RT 31)** checkbox.
- 3. Select Military Standard:

1553A	MIL-STD-1553A
1553B	MIL-STD-1553B

- 4. For **Retries** to operate on the Alternative Bus, select **Alternate Bus**:
  - **B** instead of A, then
  - A instead of B, then
  - **B** instead of A

# **Testing Data**

To Start test data, from the BC mode screen, select  $\mathsf{Run}$  > Start or click F9.

🐒 B	🕈 BC Mode - Module O												
File	Edit	Run	Hel	P									
Defi	Define Me Start F9 etup												
No.	Gap	St	op			To	CW	CW2	WC	Bus	Retries	Msg/Err Cnt	^
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11	_												_
12													~
Idle													//

Figure 2-6 BC Mode Testing Data

To **Stop** testing, select **Run > Stop**.

# 3 Remote Terminal Mode

In Remote Terminal (RT) Mode, *MerlinMCH* enables the user to:

- Simulate one RT
- Define data blocks and bind them to any RT id.
- Enter and view data in data blocks

# **Running RT Mode**

To display the RT mode screen, from the *MerlinMCH* main screen select **Modules>RT Mode**. (See *To Start Working with MerlinMCH* on page 1-3.)

N	' RT	Mode - Module	0											
Fi	e R	un Help												
M	Messages RT Setup													
N	um	Time	From	То	CW	CW2	WC	Bus	Comment	^				
L														
L														
L														
Ŀ														
Ŀ														
1														
Bo	ard is	idle								//				

Figure 3-1 Remote Terminal Mode Messages Grid

The **RT Messages Grid**, shown in Figure 3-1, displays a list, in chronological order, of received messages. Each line shows the type of message, RT number, subaddress and Word count associated with the message, along with a time stamp, a primary/ secondary bus indicator and an error status if applicable.

Select:		То:
File	Clear Screen	Clear all received messages
	Load Parameters	Load RT mode setup <b>*.rtp</b> file – includes all defined RT parameters
	Save Parameters	Save current RT setup as <b>*.rtp</b> file
	Exit	Close the RT mode window, return to <i>MerlinMCH</i> main screen
Run	Start	Run the board in RT mode
	Stop	Stop the board operation

From the **RT Mode** main screen Menu bar:

# View Status of Messages

To see a message in greater detail, double-click any column. The Message Information Properties box is displayed.

S	Message Information (Message 6)	- 🗆 🗙
	BC -> 0	<u> </u>
	Command Word(s) and Status Word(s)	
	CW = 0000 SW = 0800	Ok
	Message Data	Previous
		Next
	Message Errors	
		Help
4		
•		

Figure 3-2 Message Information Properties Box

# **RT Setup**

To set up an RT:

1. In **RT Mode**, click the **RT Setup** tab, to display the **RT Setup Properties box**.

🐒 RT Mo	de - M	odu	le (	0																			×
File Run	Help																						
Messages	RT S	etup																					
			[	Acti O	ive l	RT-		2		3	4	1	5	1	6	1	7	1		1			
				8		9		10	-	11	12	+	13	┥	14	┽	15	+					
				16	6	17	,	18	-	19	20		21		22	+	23						
				24	ļ	25	j	26		27	28		29		30		31						
		_Su	bad	iare F	essit Rec	oetu eive	p :Da	itabl	ock:	s				Trar	nsmil	t Da	itabl	ock	s				
			0	1	2	3	4	5	6	7		0	1	2	3	4	5	6	7				
		1	8	9	10	11	12	13	14	15		8	9	10	11	12	13	14	15				
		1	16	17	18	19	20	21	22	23		16	17	18	19	20	21	22	23				
			24	25	26	27	28	29	30	31		24	25	26	27	28	29	30	31				
			oad	lca: Ena	st — able	d (R	ТЗ	1)									Insti Serv	rume vice	enta Rei	tion quest	 -		
		- M ( ) ( )	ilitar, 15 15	у S 53. 53	tano A B	dard											Bus Sub Terr	y isyst mina	em al Fla	Flag ig			
Board is idle				_																		 	

Figure 3-3 RT Setup Properties Box

- 2. Activate an RT in the Active RT grid. Click any RT button.
- 3. Assign a data block to the selected Subaddress in the Subaddress Setup grid.
  - a **Receive Subaddresses**: left-click a button to select or deselect a receive subaddress.

b Transmit Subaddresses: left-click a button to select or deselect a Transmit Subaddress. *After selecting a transmit subaddress,* right-clicking the button displays a Define/Modify Data dialog box that permits the user to select and modify the data that should be sent in response to an RT to BC command directed to that subaddress.

S.	Defin	e/Modi	f <mark>y</mark> Data						(	
Г	Enter/M	lodify Da	ta							
	E67D	65B8	FA7D	C8A	5A5E	A737	D235	5431		OK
	C987	EC16	22C8	696F	6C0F	5A8E	91AB	9951		
	5EF3	6626	E273	60A3	A6E5	1732	F87D	314		Cancel
	1392									
L	,									
	Clear		Default	1	-> All	Ran	dom	Save		Load

Figure 3-4 Define/Modify Data Properties Box

Click:	То:
Clear	Clear all the data in the grid, to enter new data.
Default	Starting with 0, fill all the cells with data according to the hexadecimal number of the cell.
1 > All	Copy the first Word to all the cells in the grid.
Random	Fills all cells with random data.
Save	Save data for later use.
Load	Load previously saved <b>*.rtf</b> [ <i>MerlinMCH</i> data file] from disk.

Note:

a Each message contains up to 32 Words of data.

b Enter hexadecimal values only.

- 4. To enable RT31 to function as the **Broadcast RT**, select the **Enabled (RT 31)** checkbox.
- 5. Select either 1553A or 1553B, to designate a Military Standard protocol.
- 6. Check zero or more information bits to be included in the RT message Status Word.

Instrumentation
Service Request
Busy
Subsystem Flag
🗌 🗌 Terminal Flag

See MIL-STD-1553 Word Formats on page A-1.

# **Testing Data**

To receive test data, select  ${\sf Run}$  > Start, from the  ${\sf RT}$  mode screen.

T	RT	Mode - I	Module	e O						_ 0	
File	Ru	un Help	_								
Me	s	Start	etup								
Nu	n _	Stop		From	То	CW	CW2	WC	Bus	Comment	^
	_										
╟─	-										
	-										
	_										
	_										
Boar	d is i	idle									//

Figure 3-5 RT Mode Testing Data

To **Stop** receiving data, select **Run > Stop**.

# 4 Sequential Monitoring Mode

In Sequential Monitor Mode, MerlinMCH enables the user to observe activity on the 1553 bus. Data can be viewed using the Standard Monitor Mode Screen or the Engineering Units Monitor Mode Screen.

**Standard Monitor Mode Screen** observes transmissions on the data bus. Standard mode displays message direction, Command words and Word Count.

**Engineering Units Monitor Mode Screen** displays data elements which were previously defined in a database. The user selects which elements to display and in what order to display them on the screen. The values may be displayed in hexadecimal, binary or decimal selectable in realtime.

# **Running Sequential Monitor Mode**

To display the Sequential Monitor mode screen, from the *MerlinMCH* main screen select Modules>Monitor Mode. (See *To Start Working with MerlinMCH* on page 1-3.)

🐒 s	🕈 Sequential Monitor - Module O										
File	File Run Options Setup Help										
Star	Standard Real Time RT Summary Properties										
Num	Time (ms)	From	To	CW	CW2	WC	Bus	Error	^		
<u> </u>											
<u> </u>											
-											
									~		
1											
Board	is idle			Read	from 1553	bus			11		

Figure 4-1 Sequential Monitor Mode Grid Screen

The Standard Sequential Monitor mode is the default screen.

Select:		То:			
Standaro	l Monitor and Engineeri	ng Units mode screen:			
File	Clear	Clear all previously received messages from the Standard mode grid.			
	Load Parameters	Load previously saved Trigger Setup parameters from a file. The <b>Load Sequential Mode Parameter</b> dialog box is displayed.			
	Save Parameters	Save parameters from <b>[Trigger/Properties] screen</b> . The <b>[Save] Sequential Mode Parameters</b> dialog box is displayed. Enter a file name: <b>*.smp</b> (Sequential Monitor parameters default extension).			
	Exit	Exit the Sequential Monitor mode, return to the <i>MerlinMCH</i> main screen.			
For Engi	neering Units Mode Scr	een only			
	New Database	Displays the <b>New</b> dialog box. Enter a name and path to create a new Engineering Units database.			
	Open Database	Displays the <b>Open Microsoft Database File dialog box.</b> Select an existing Engineering Units database.			
	Save Database As	Displays the Save as Microsoft Database File dialog box. Save or Create the current database with a different name and /or path. Note: This option will not change the current database.			
Run	Start	Run the board in Sequential Monitor Mode.			
	Stop	Stop the board operation.			
Options	Standard Monitor	View message activity on the 1553 bus in Standard mode.			
	Engineering Units Monitor	View messages in Engineering Units mode. If a message word is defined in the Engineering Unit database, the raw data is converted into an engineering unit.			
	Read from 1553 bus	Read message directly from the bus.			
	Read from File	Reads messages from a file either <b>One-Shot</b> $or$ <b>Continuous.</b> See <b>Transferring Messages One-Shot</b> or <b>Continuous</b> on page 4-5.			
	Convert Binary $\rightarrow$ ASCII	Converts a <i>MerlinMCH</i> monitor file from binary to ASCII. Converting Binary Files to ASCII Files on page 4-4.			

 $From \ the \ Sequential \ Monitor \ Screen \ Menu \ Bar:$ 

Select:		То:
For Eng	ineering Units Mode Scr	reen only
	Display Rate	Displays the <b>Display Rate</b> dialog box. The display rate may be defined in milliseconds.
Setup	Edit Database	Displays the <b>Engineering Units – Data Entry</b> tables where updates may be made to Devices and Elements. See <b>Selecting Devices and Elements</b> on page 4-14.
	Edit Display	Displays the <b>Order</b> dialog box, to change the order of data elements displayed in the Engineering Units screen. See <b>Ordering the Data</b> on page 4-17.
Setup	Read File	Displays the <b>Open Binary File</b> dialog box, to select a file from which to read saved messages.
	RT Summary	Displays the <b>RT Summary Define</b> dialog box, to designate user-friendly names to RTs displayed in the <b>RT Summary screen</b> . See <b>Displaying the System</b> <b>Status</b> on page 4-8.

## **Converting Binary Files to ASCII Files**

*MerlinMCH* allows the user to save messages in binary format and later convert the file to ASCII format. The *MerlinMCH* ASCII file is:

- · Delimited with commas between fields
- Formatted windows (ANSI)
- First row header with field names

The ASCII file may be imported into *Microsoft Excel™* and *Access™*.

To convert binary files to ASCII files

1. From the Sequential Monitor Mode Menu Bar, select Options > Convert Binary  $\rightarrow$  ASCII, to display the Convert to ASCII dialog box.

Convert To ASCII	
Binary file name: ASCII file name:	info.dmp
	<ul> <li>Write data as Hexadecimal</li> <li>Write data as Decimal</li> </ul>
Messa	ages Converted:
<u>C</u> onvert	Help Cancel

Figure 4-2 Convert to ASCII Dialog Box

2. To select a particular binary file to convert *either*:

In the **Binary file name** text box, type the complete **path\filename** of the binary file.

or

Click the browse button, to display the **Open Binary file** dialog box. Select the binary file to convert. Click OK, to return to the Binary file name text box.

- 3. To name the ASCII file, repeat step 2 using the ASCII file name text box.
- 4. The data may be saved either in hexadecimal or decimal format. Select *either*:

Write data as hexadecimal to save in hexadecimal format, or

Write data as decimal to save in decimal format.

- 5. To implement the conversion, select **Convert**. The number of messages converted is displayed in the **Messages Converted** text box.
- 6. To return to the Sequential Monitor screen, click the **Cancel** button.

Label	Content	Label	Content
No	Message number	Bus	A or B
Туре	Type of message	CW2	Command word 2
Gap	Gap Time	SW2	Status word 2
CW1	Command word 1	WC2	Word count 2
SW1	Status word 1	RT2	Remote terminal 2
WC1	Word count 1	SA2	Subaddress 2
RT1	Remote terminal 1	Data(0-31)	Data Words 0 through 31
SA1	Subaddress 1		

The converted ASCII file includes a header row with the following order and names:

A comma separates each field. Every message is written on a separate line.

#### **Transferring Messages One-Shot or Continuous**

*MerlinMCH* reads data from a file either in:

**One-shot Mode:** MerlinMCH reads the file once, until the end and stops, or

**Continuous Mode:** After reading the file, *MerlinMCH* loops back to the beginning and is continuously looped until the user stops the reading.

To select One-shot mode or Continuous Loop Mode:

1. From the Sequential Monitor Screen Menu Bar, select Options > Read From File > [Oneshot/ Continuous]:

🐒 s	🕈 Sequential Monitor - Module O											
File	Run	0	ptions	Setup Hel	P							
Stan	dard )	~	Standar	rd Monitor		rties						
Num	Time		Enginee Read fr	ring Units M om 1553 bu	1onitor Is	CW		CW2	WC	Bus	Error	<u> </u>
		~	Read fr	om File	۱.	🗸 Or	ne-Sho	t –				
			Conver	t Binary->A	SCII	Co	ntinuc	us				- 11
			Display	Rate								- 11
<u> </u>												- 11
<u> </u>	-											- 11
<u> </u>	-											
<u> </u>												- 11
<u> </u>	-											
-												-
<u> </u>												~
Board	is idle						Read	from File				

Figure 4-3 One-Shot or Continuous Message Transfer

# **Standard Sequential Monitor Mode**

In Sequential Monitor mode, the default mode is Standard Sequential Monitor mode. The monitor shows a screen containing one line per received message in the order they arrive.

To display the Sequential Monitor mode screen, from the *MerlinMCH* main screen select Modules>Monitor Mode. (See *To Start Working with MerlinMCH* on page 1-3.)

🐨 s	🕈 Sequential Monitor - Module O										
File	File Run Options Setup Help										
Star	Stan <u>d</u> ard Real Time RT Summary Properties										
Num	Time (ms)	From	To	CW		CW2	WC	Bus	Error	^	
<u> </u>										~	
Board	Board is idle Read from File										

Figure 4-4 Standard Sequential Monitor mode

Two additional methods to display message are:

- **Realtime Updates**: displays up to ten messages with the message data in realtime. See **Displaying Messages in Realtime** on page 4-7
- System Status: displays a running count of messages received as well as errors encountered for each RT. See Displaying Messages in Realtime on page 4-7

To setup 1553 messages to be received by the monitor, see Sequential Monitor Properties on page 4-10.

#### **Displaying Messages in Realtime**

To display messages in realtime:

1. From the Sequential Monitor Screen Menu Bar, select the Real Time Tab, to display the Realtime screen.

🐒 Sequential Monitor - Module O			
File Run Options Setup Help			
Standard Real Time RT Summary Properties			
	·		a
Select Msg CW: TimeTag:	SW: WC:	Errors: 0 Count: 0	Status:
Select Msg CW: TimeTag:	SW: WC:	Errors: 0 Count: 0	Status:
Board is idle	Read from File		

#### Figure 4-5 Realtime Screen

2. Click Select Msg, to display the Define CW dialog box.

Define CW	
RT: 0 💌 SA: 0 💌	Direction Receive Transmit
OK.	Cancel

Figure 4-6 Define CW dialog box

- 3. From the **RT combo box**, select a Remote terminal.
- 4. From the **SA combo box**, select a Subaddress.
- 5. Select a Direction, Receive or Transmit.
- 6. Click **OK**, to return to the **Realtime** screen.
- 7. Repeat steps 2-6 for each message.

## **Displaying the System Status**

From the Sequential Monitor Screen Menu Bar, select the RT Summary Tab, to display the RT Summary screen.

🐒 Sequenti	🕈 Sequential Monitor - Module O 📃 🗖 🔀								
File Run Options Setup Help									
Standard Real Time RT Summary Properties									
RT0 - Temper	rature	RT1 - Engine		RT2 · Wing		RT3 - Flap			
Msgs-0	0-m3	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0		
RT4 ·		RT5-		RT6-		RT7·			
Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0		
RT8-		RT9-		RT10-		RT11 -			
Msgs-0	O-m3	Msgs-0	Errr-0	Msgs-0	Errr-O	Msgs-0	Errr-0		
RT12 ·	_	RT13 -		RT14 ·		RT15 -			
Msgs-0	O-m3	Msgs-0	Errr-0	Msgs-0	Errr-O	Msgs-0	Errr-0		
RT16-	_	BT17 -		RT18-		RT19-			
Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0		
RT20-		RT21 -		RT22 -		RT23 -			
Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0		
RT24 -	-	RT25 -		RT26 -		RT27 -			
Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0		
RT28-	_	RT29-		RT30-		RT31 -			
Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	Errr-0	Msgs-0	0-m3		
Board is idle Read from File									

#### Figure 4-7 RT Summary screen

The RT Summary screen displays a running count of messages received and errors encountered for each RT. Each cell represents one RT displaying the RT number, a designated name, the total number of messages received by the RT and the total number of errors.

To designate names in the RT summary screen:

1. From the Sequential Monitor Screen menu bar, select Setup > RT Summary, to display the RT Summary Define text box.

RT Summary Define			
RT 0 : Temperature	RT 8 :	RT 16 :	RT 24 :
RT 1 : Engine	RT 9 :	RT 17 :	RT 25 :
RT 2 : Wing	RT 10 :	RT 18 :	RT 26 :
RT 3 : Flap	RT 11 :	RT 19 :	RT 27 :
BT 4 :	RT 12 :	RT 20 :	RT 28 :
RT 5 :	RT 13 :	RT 21 :	RT 29 :
RT 6 :	RT 14 :	RT 22 :	RT 30 :
RT 7 :	RT 15 :	RT 23 :	RT 31 :
			,
_	OK <u>A</u> pply	Cancel <u>H</u> el	P

Figure 4-8 RT Summary Define Text Box

- 2. To name an RT:
  - a. Type a meaningful name in an **RT Text box.**
  - b. Click Apply, to save the data and remain in the RT Summary Define dialog box, or

 $\operatorname{Click}\nolimits \mathsf{OK},$  to save the data and return to the RT Summary screen.

#### **Sequential Monitor Properties**

1. From the Sequential Monitor Screen Menu Bar, select the Properties Tab, to display the Properties dialog box.

🐒 Sequential Monitor -	Module	0									
File Run Options Setup	Help										
Stan <u>d</u> ard Real Time RT S	ummary (F	<sup>5</sup> ropertie	es								
		-	2	3	4	10	0	(   15			
	8	9	10	11	12	13	14	15	All RTs monitored		
	16	17	18	19	20	21	22	23			
	24	25	26	27	28	29	30	31	No RTs monitored		
									·		
Save to				~	~						
<ul> <li>Screen Unly</li> </ul>	}			0	Screen	and File	з		C File Unly		
, ⊟ Militaru Standa	rd							Broadea	aot		
C 1553 A	u .	G	1553	D				Enabled (BT 31)			
, 1555 A			10001	2							
- Monitor Pospa	nao Timo -							Filo nor	ee te eque data		
Monitor respo									File name to save data Merlin dmp		
Response Lim	e:  14								Change		
De and is idle			Des	J 6	<b>F</b> 1-						

#### Figure 4-9 Sequential Monitor Properties Dialog Box

- 2. Select **RTs to Monitor**.
  - a. To monitor individual RTs, click the  ${\bf RT}$  number for each RT. To deselect, click the  ${\bf RT}$  number again.
  - b. To monitor all the RTs, click the  $\ensuremath{\mathsf{AII}}\xspace$  RTs monitored command button.
  - c. To deselect all the RTs, click the No RTs monitored command button.
- 3. Select Save to:

Screen Only	Displays messages on the screen.
Screen and File	Displays messages on the screen and writes to a file.
File Only	Save data to file.
	To save the data to a file:
	a. Click the Change command button in the File name to save

- box. The Save as dialog box is displayed.
- b. Enter a *new* file name in the File name text box.
- c. Click Save, to return to the Properties screen.
- 4. Select either **1553A** or **1553B**, to designate a Military Standard protocol.
- 5. To enable RT31 to function as the **Broadcast RT**, select the **Enabled (RT 31)** checkbox.
- 6. Insert the Monitor Response Time in the Response Time Text box (in microseconds). The default is  $14 \mu$ sec.

# **Engineering Units Monitoring Mode**

The Engineering Units Monitor Mode screen displays messages which were previously defined in a database. The user selects which units to display and in what order to display them on the screen.

To display the Engineering Units Monitor mode, from the Sequential Monitor Screen Menu Bar, select Options > Engineering Units Monitor.

🕈 Sequential Monitor - Module O									
File Run Options Setup Help									
Engineering Units Re.	Engineering Units Real Time RT Summary Properties								
Name	RT	SA	T/R	Value	Units	Last Error	Error Cou	Time (ms)	^
Velocity/Velocity	12	13	R		Knots				
Pressure/Temperature	10	2	R		Degrees				
Pressure/Discharge	10	7	R		Feet/Sec				
Engine 1/Temperature	5	21	Т		Degrees				
Engine 1/Fuel Tempera	5	2	R		Degrees				
Pressure/Static	10	2	R		PSI				
Engine 1/Pitch	5	26	Т		Degrees				
Engine 1/Pressure	5	6	R		PSI				
Engine 1/Air Temperatu	5	6	Т		Degrees				~
DATABASE NAME=C:\P	DATABASE NAME=C:\Program Files\Excalibur\Merlin\merlin.mdb Display Rate :								
Board is idle	3oard is idle Read from File								

#### Figure 4-10 Engineering Units Monitor Mode Screen

Two additional methods to display message are:

- Realtime Updates: displays ten messages with the message data in realtime. See Displaying Messages in Realtime on page 4-7
- System Status: displays a running count of messages received as well as errors encountered for each RT. See Displaying the System Status on page 4-8

To specify which 1553 messages will be received by the monitor, see Sequential Monitor Properties on page 4-10.

## Changing the Display Type

In the Engineering Units Mode Screen values may be displayed in hexadecimal, binary or decimal, selectable in realtime. The user may also select values for each element: legitimate values (values within the selected bounds) are shown in blue; values outside these bounds are displayed in red. See Enter a Valid Range on page 4-16.

To change the numerical display type, right-click in the row to change. A **Popup menu** is displayed, select a display type.

🕈 Sequential Monitor - Module O										
File Run Options Setup Help										
Engineering Units Re.	Engineering Units Real Time RT Summary Properties									
Name	RT	SA	T/R	Value	Units	Last Error	Error Cou	I Time (ms)	^	
Velocity/Velocity	12	13	R		Knots					
Pressure/Temperature	10	2	R		Degrees					
Pressure/Discharge	10	7	R		Feet/Sec					
Engine 1/Temperature	5	21	T	Deci	n al					
Engine 1/Fuel Tempera	5	2	R	Binar	'Y					
Pressure/Static	10	2	R	Hexa	adecimal					
Engine 1/Pitch	5	26	T		Degrees					
Engine 1/Pressure	5	6	R		PSI					
Engine 1/Air Temperatu	5	6	T		Degrees				~	
DATABASE NAME=C:\Program Files\Excalibur\Merlin\merlin.mdb Display Rate :										
3oard is idle Read from File										

Figure 4-11 Numerical Display types

### Setting the Display Rate

The **Display Rate** is the rate new messages are displayed on the screen. To select a **Display Rate**:

- 1. From the Sequential Monitor Mode Screen Menu Bar, select Options > Engineering Units.
- 2. From the menu bar, select Options > Display Rate, to display the Display Rate Dialog Box.

nk 0 📃 🗆 🔀						
100 👻						
kit <u>H</u> elp						

Figure 4-12 Display Rate Dialog Box

- 3. Select a value [100 5000] from the **Drop-down list**.
- 4. Click OK, to return to the Engineering Unit Monitor Screen.

## **Display Rate in Read from Bus**

If a file is read from a bus, *MerlinMCH* will read all messages from the bus but *only* display the new message if the time elapsed since the last message is greater than or equal to the **Display Rate**. Messages that are not displayed are lost.

Example:	Last message time	39000
	Current message time	39200
	Display rate	100
	If the Current message tim than or equal to the Display	e minus the Last message time is greater y Rate, new messages are displayed.

#### **Display Rate in Read From File**

If messages are read from File, *MerlinMCH* displays all the messages. The **Display Rate** represents the delay between displaying each message to the screen.

#### **Selecting Devices and Elements**

Each Device may have several Elements associated with it.

To select **Devices**:

- 1. From the Sequential Monitor Mode Screen Menu Bar, select Options > Engineering Units.
- 2. From the menu bar, select Setup > Edit Database. The Engineering Units Data Entry dialog box is displayed.

🐒 Engineering Units - Data Entry 📃 🚽									- 🗆 🗙
Devices	рт		Elements	CA	Trans/Res	Display	Word	Unito	
Engine 1	5	<u> </u>	Air Temperature	5 <b>A</b> 6	Transmit	Тпе	<b>Wold</b>	Degrees	
Pressure	10		Pressure	6	Receive	True	12	PSI	
Velocity	12		Temperature	21	Transmit	True	3	Degrees	_
Engine 2	4		Heading	7	Transmit	True	1	Degrees	
Temperature	1		Pitch	26	Transmit	True	11	Degrees	
dedede	1	_	Fuel Flow	8	Receive	False	2	Lbs/Min	
			Fuel Quantity	14	Transmit	False	3	gallons	
			Fuel Temperature	2	Receive	True	1	Degrees	
			Temperature 2	24	Receive	True	5	Centimeters	
		~	AirTemperature	2	Receive	True	4	Degrees	<b>v v</b>
4			•						

Figure 4-13 Engineering Units – Data Entry Properties Box

3. In the Devices combo box, double-click, the Device Dialog box is displayed:

T	Devices	
-		
	Name: Velocity	_
	RTaddress: 12	
	New OK Apply Delete Cancel	<u>H</u> elp

Figure 4-14 Devices Combo Box

- 4. Click **New**, to insert a new record.
- 5. Enter:
  - $a.\ a$  Device name [Velocity] in the Name text box.
  - b. select an RT address [a value between 0 30] from the drop-down combo box.

Note: RT Address 31 [11111] is reserved for the enable Broadcast option.

- 6. Click **OK** to save and exit the **Devices Combo Box**, or **Apply** to save and add more devices.
- 7. Repeat steps 4 6 to add more devices.

To enter **Elements**:

1. Double-click any row in the Elements combo box in the Engineering Units – Data Entry Properties Box, to display the Elements Properties Box.

E	lements 🛛 🔀
	Element Name :
	SubAddress : 0
	Direction : 🔿 Transmit 💿 Receive
	Data Definition
	Data Word : Data Type :
	Display : Display Type :
	Display Units :
	Conversion Factors Offset : 0 Scale : 1
	Valid Range
	Alarm: Min: UMax: U
	New OK Apply Delete Cancel Help

Figure 4-15 Elements Properties box

- 2. To enter a new record:
  - a. (i) If this is an additional element click the New command button, a blank Elements Properties box is displayed. Proceed with steps a.(i) g.
  - a. (ii) If this is the *first* element enter a description of the element in the **Element Name text box**.
  - b. Select a Subaddress [between 0 31] in the Subaddress combo box.
  - c. Select a direction of the message: Transmit [RT-to-BC] or Receive [BC-to-RT and RT-to-RT]
  - d. Select Data Definition:
    - Select a Data Word from the Data Word combo box
    - Select a Data Type from the Data Type combo box.

- e. Select **Display Information**:
  - Select Display, to display the element on the Engineering Units Monitor;
  - Select a **Display Type**, to display the value in binary or decimal or hexadecimal;
  - Select a **Display Units** centimeters, meters, knots, degrees, feet, miles/ hour or any user-defined unit.
- f. Enter **Conversion Factors**: If the raw data to be viewed needs to be manipulated, change the value using **Offset** and **Scale**.

**Example:** To convert raw data received in Centigrade to an engineering unit in Fahrenheit: set **Offset** to 32 and **Scale** to 1.8

- g. Enter a Valid Range
  - Select Alarm
  - Enter a minimum range in the Min text box;
  - Enter a maximum range in the Max text box.

Values falling within the selected range are displayed in blue; values falling outside this range are displayed in red.

- 3. Click **OK** to save and exit the **Elements Properties Box**, or **Apply** to save and add more elements.
- 4. Repeat steps 1–3 to add more elements.
- 5. Click OK, to save and return to the Engineering Units Data Entry Properties box.

#### **Editing Devices and Elements**

To change the values for **Devices** and **Element**:

- From the Sequential Monitor Mode Screen Menu bar, select Setup > Edit Database, to display the Engineering Units - Data Entry Properties box. See Figure 4-13: Engineering Units - Data Entry Properties Box.
- 2. Double-click a Device or Element, to display the Devices or Elements Properties boxes.
- 3. Edit the data.
- 4. Click OK, to return to the Engineering Units Data Entry Dialog box.

### Ordering the Data

To arrange the order of the rows displayed in the  $\ensuremath{\mathsf{Engineering Units Monitor Screen}}$  :

- 1. From the Sequential Monitor Menu Bar, select Options > Engineering Units Monitor.
- 2. From the menu bar, select Setup > Edit Display, to display the Order Dialog Box:

9	Örder - Bank O		
	Velocity/Velocity Pressure/Temperature Pressure/Discharge Engine 1/Temperature	^	<u>U</u> p Down
	Engine 1/Fuel Temperature Pressure/Static Engine 1/Pitch Engine 1/Pressure		
	Engine 1/Air Temperature Pressure/Engine Oil Temperature/Fuel inlet		Cancel
	Temperature/Outside Air Engine 1/Temperature 2	~	<u>H</u> elp

Figure 4-16 Order Dialog Box

- 3. Select a **Device/Element**, click the **Up / Down button**, to move the element the desired position.
- 4. Repeat step 3, until all the **Device/Elements** are in the desired order.
- 5. Click **OK**, to save and return to the **Engineering Units Monitor Screen**.

#### **Testing Data**

To Start testing data, from the Standard/ Engineering Units Monitor screen, select Run > Start.

🕷 Sequential Monitor - Module O													
File		Run	Optio	ns S	etup	Help							
<u>E</u> n	Eng Start Real Tim				al Tim	e   RT Summary   Properties							
Na	n	St	ор		RT	SA	T/R	Value	Units	Last Error	Error Cou	Time (ms)	
Ve	Velocity/Velocity				12	13	R		Knots				
Pre	Pressure/Temperature			10	2	R		Degrees					
Pre	Pressure/Discharge			10	7	R		Feet/Sec					
En	Engine 1/Temperature			5	21	Т		Degrees					
Engine 1/Fuel Tempera			5	2	R		Degrees						
Pressure/Static			10	2	R		PSI						
En	Engine 1/Pitch			5	26	Т		Degrees				~	
DATABASE NAME=C:\Program Files\Excalibur\Merlin\merlin.mdb Display Rate :													
Boar	Board is idle Read from File												

Figure 4-17 Engineering Units Testing Data

To Stop testing data, select Run > Stop.

# 5 Troubleshooting: Installation Problems

Before running *Merlin*, install *Software Tools* for the Excalibur 1553 Board you are using, and run **ExcConfig** as described in the installation instructions. Make sure the Borland DLL is in the Windows System folder for use by *Merlin*. If you make any changes to the DLL, check that the new version is either in the Windows System folder or in the same folder as *Merlin*.

- Note 1. Merlin uses the DLL compiled under Borland C++.
  - 2. *Merlin* is used as a generic term. It applies to both *MerlinMCH* and *MerlinPlus*.

## **Excalibur CD Installation Troubleshooting**

If you install *Merlin* from the *Excalibur Installation CD*, you may encounter the following:

- 1. Problem Messages: Rename File Failed or Copy File Failed
  - ExplanationAt the end of the installation, you may get a message that states<br/>Rename File Failed. This is normal behavior. This is a result of the<br/>method used when installing and configuring the BDE module for<br/>use with one of our *Merlin* products.

By default, we install the Borland Database Engine (BDE) and set up a configuration file for *Merlin* (common to all *Merlin* programs). The BDE uses a default configuration file called either idapi.cfg or idapi32.cfg. These files are renamed, if they exist, (to idapiOld.cfg and idapi32Old.cfg) so that they can later be loaded into the BDE if they have been set up for other applications. A *Merlin* compatible configuration file is copied to both idapi.cfg and idapi32.cfg, and another copy is saved as merlin.cfg. This merlin.cfg configuration file is also stored in the folder <INSTALLDIR>\Excalibur\Merlin.

If the **BDE** was not previously installed on your PC, the files that did not exist cannot be renamed, so this error **Rename File Failed** message can be ignored.

If the **BDE** is already installed on your computer, you may get an additional message that **Copy File Failed**. This may cause problem #2 to occur. See below for a solution.

2.	Problem	Message: Unknown database, Alias: $\mbox{DevDB}\_\mbox{BDE}$ when first running a $Merlin.$					
	Cause	The configuration file was not properly copied to the <b>BDE</b> folder.					
	Solution	<ul> <li>a. Select Control Panel   BDE Administrator   Object   Open Configuration, to display the Open dialog box.</li> <li>b. From the Look in drop-down list, locate the <installdir>\Excalibur\Merlin, and select merlin.cfg.</installdir></li> <li>c. Exit the BDE Administrator and save this as your default configuration.</li> </ul>					
		The database file ( <b>merlin.mdb</b> ) must always be installed in the <b><installdir>\Excalibur\Merlin</installdir></b> folder.					

# Website Installation Troubleshooting

If you install *Merlin* from the ZIP file on the Excalibur website [www.mil-1553.com], you may encounter the following:

1.	Problem	During setup you will receive the following error: "String variable is not large enough for string. Check the string declarations. Error 401"				
	Solution	Ignore error; Press enter to continue.				
2.	Problem	Error messages relating to:				
		- Alias: DevDB_DBE - General SQL error - Alias <i>abc</i> not found - Key Violation				
	Cause	These errors are due to database files not found in the expected place.				
	Solution	<ul> <li>a. Select Control Panel   BDE Administrator   Object   Open Configuration, to display the Open dialog box.</li> <li>b. From the Look in drop-down list, locate the <installdir>\Excalibur\Merlin, and select merlin.cfg.</installdir></li> <li>c. Exit the BDE Administrator and save this as your default configuration.</li> </ul>				
		The database file (merlin.mdb) must always be installed in the <installdir>\Excalibur\Merlin folder.</installdir>				





#### Figure A-1 MIL-STD-1553 Word Formats

**Note:**T/R = Transmit/Receive P = Parity

Appendix B MIL-STD-1553 Message Formats



Figure B-1 MIL-STD-1553 Message Formats

Note: \* = Response time • = Intermessage Gap

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