# Data-Logger/51-C2 Kit Quick Start Guide

Document Revision: 1.05 Date: 13 November 2012



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WARRANTY:

BiPOM Electronics warrants Data-Logger/51-C2 Kit for a period of 1 year. If the board becomes defective during this period, BiPOM will at its option, replace or repair the board. This warranty is voided if the product is subjected to physical abuse or operated outside stated electrical limits. BiPOM Electronics will not be responsible for damage to any external devices connected to Data-Logger/51-C2 Kit. BiPOM Electronics disclaims all warranties express or implied warranties of merchantability and fitness for a particular purpose. In no event shall BiPOM Electronics be liable for any indirect, special, incidental or consequential damages in connection with or arising from the use of this product. BiPOM Electronics' liability is limited to the purchase price of this product.

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# 1. Overview

This document describes how to use the Data-Logger/51-C2 Kit for various data logging applications. Data-Logger/51-C2 Kit by BiPOM Electronics is a low-cost, yet powerful and flexible data acquisition and logging system. It supports multiple analog channels. The Data-Logger/51-C2 Kit is based on the MINI-MAX/51-C2 microcontroller board. The Data-Logger/51-C2 Kit can be customized for a variety of data logging applications. The complete application package for the Data-Logger/51-C2 Kit includes:

- MINI-MAX/51-C2 Microcontroller Board
- MMC-RTC-1 board
- DAQ-2543-DA1 board (11 analog channels, 12-bit ADC)
- 128 MB MMC (MultiMedia Card or SD Card, may be higher capacity based on availability)
- Open Source Software

# MMC-RTC-1 board

This board is designed specifically for storage/data logger applications. A Multi Media Card (MMC) with high capacities up to 2GB can be installed on the built-in MMC socket. MMC-RTC-1 board also includes a DS1307 low power, battery-backed Clock/Calendar.

# DAQ-2543-DA1 board

The DAQ-2543-DA1 board is an ADC/DAC peripheral board with TLC2543, 11-channel, 12-bit Analog-To-Digital Converter from Texas Instruments and a LTC1663, 10-bit Digital/Analog Converter from Linear Technology. All the channels are available on terminal blocks. The current version allows logging 11 analog signals from the DAQ-2543 board within 0V - 4V range along with timestamp. The logging period ( how frequently a sample is taken ) is programmable between 1 second and 65,535 seconds.

# 2. Hardware Setup

The individual boards that comprise the Data-Logger/51-C2 Kit are stacked together through the expansion connector (bus) of each board using plastic standoffs. The hardware implementation of the Data-Logger/51-C2 Kit is shown in the figure below:

- The MINI-MAX/51-C2 microcontroller board is the brain of the data logger and it is the bottom board of the Data-Logger/51-C2 Kit.
- The MMC-RTC-1 board is the middle board in the stack. This contains SD/MMC card and clock.
- The DAQ-2543-DA1 is the top board of the stack and contains the analog to digital converter.



- Connect one end of the RS232 serial cable to an available serial port (usually COM1) on the PC.
- Connect the other end of the serial cable (RS-232) to the Data Logger serial port.
- The MINI-MAX/51-C2 uses a 6V DC power adapter. The adapter is connected to the power jack of Data Logger.
- Current consumption of Data-Logger/51-C2 Kit is under 50mA. The data logger can be operated from a battery instead of a power adapter.



To COM port on PC

# 3. Software Setup

At first you should download Data-Logger/51-C2 Kit Software from BiPOM web:

http://www.bipom.com/files/data logger.exe

When you downloaded this file then run it.

You will see **Welcome** window of DataLogger setup. Click **Next** button to continue.



The next window will ask you for **Destination Folder**. You can select desired destination folder. When you entered **Destination Folder** path then click **Next** button.

🕞 DataLogger Setup		_ 🗆 🗙
Choose Install Location Choose the folder in which to install DataLogg	er.	
Setup will install DataLogger in the following fo and select another folder. Click Next to contin	older. To install in a different folde ue.	r, click Browse
Destination Folder C:\bipom\devtools\DataLogger	Bro	wse
Space required: 1.1MB Space available: 19.1GB		
Data Logger	< <u>B</u> ack <u>N</u> ext >	Cancel

Next window will ask you for Start Menu Folder name. Enter desired name (or leave it as is) and click **Install** button.

🐨 DataLogger Setup	_ 🗆 🛛
<b>Choose Start Menu Folder</b> Choose a Start Menu folder for the DataLogger shortcuts.	
Select the Start Menu folder in which you would like to create the program's shortcuts can also enter a name to create a new folder.	. You
DataLogger	
Accessories Administrative Tools Aspell AVG Free 9.0 CamStudio ClientAPI Data Logger Development Tools Digitickx EZ-APP FairStars Audio Converter Pro	
Do not create shortcuts	
Data Logger	Iancel

After this all Data Logger software files will be installed to your PC. Click **Close** button on last window to close installation program.

🐨 DataLogger Setup 📃 🗆 💟
Installation Complete Setup was completed successfully.
Output folder: C:\bipom\devtools\DataLogger\Help Extract: Log.htm Output folder: C:\bipom\devtools\DataLogger\Help\Images Extract: bullet.gif Extract: datalogger.gif Output folder: C:\bipom\devtools\DataLogger Create folder: C:\Documents and Settings\Igor Slepchenkov\Start Menu\Programs\D Create shortcut: C:\Documents and Settings\Igor Slepchenkov\Start Menu\Programs Create shortcut: C:\Documents and Settings\Igor Slepchenkov\Start Menu\Programs Created uninstaller: C:\bipom\devtools\DataLogger\uninstall.exe Completed
Data Logger

When DataLogger software is installed you can run it from Windows Start menu.

# Start à All Programs à DataLogger à Data Logger

Please see 4. Using Data Logger Software section for more information how to work with software.

# 4. Using Data Logger Software

A Windows application called **Log.exe** is the graphical user interface to the Data-Logger/51-C2 Kit. The voltage range applied to the logger is 0 - 4Volts. All the Analog channels are grounded except for Analog channel 0. If none of the channels are grounded then the logger will show some floating values at each channel. In order to obtain the precise value at either of the channel, apply 0 - 4Volts at the desired channel and ground the rest of the channels. The "Record" values are independent of the values at the channel.

In order to run Log.exe please to go to main Windows menu:

### Start à All Programs à Data Logger à Data Logger

This command will start Log.exe software.

Apply a known voltage to one of the channels of Data Logger and you should see the voltage reading for that channel in Log.exe software. For example, the voltage applied at **Channel 1** is around **1.059 Volts** and the result is as shown:

🚜 BiPOM Elect	ronics Data Logger	
File COM H	lelp	
Channel 1	1059 mV	Time: HH:MM:SS
Channel 2	0 mV	
Channel 3	0 mV	11 09 2012
Channel 4	0 mV	Status
Channel 5	0 mV	Connect O Start Log
Channel 6	0 mV	Clock O Stop Log
Channel 7	0 mV	, StorageHeset Log
Channel 8	0 mV	C Auto Scan Mode
Channel 9	0 mV	Record
Channel 10	0 mV	
Channel 11	0 mV	Previous Go To Next
	Period	5 seconds Set Period
	Time to log	seconds Update

The voltage applied at **Channel 1** is around **4.076 Volts** and the result is as shown. As mentioned earlier the values at the channel will be independent of the values in "Record", "Counter" and "Period" fields.

😹 BiPOM Elect	ronics Data Log	ger		
File COM H	lelp			
Channel 1 Channel 2 Channel 3 Channel 4	4076 0 0	mV mV mV mV mV	H:MM:SS 38 44 M-DD-YYYY 09 2012	Now Set Clock
Channel 5	0	mV Connect	0	Start Log Stop Log
Channel 7	0	mV Storage mV Log Even	0 t	Reset Log
Channel 8 Channel 9	0	mV Record-	O Auto Scan Mo	ode
Channel 10	0	mV Previou	0 Is Go To	Next
	Period Time to log	5 seconds 5 seconds	Set Period	

### Initial configuration:

As first step you should select correct serial port where Data Logger hardware is connected. By default Data Logger try to use COM1. But this can be not correct if you use another port. To change serial port go to menu **COM** à **Select COM Port...** The dialog will appear

The dialog will appear

COM Ports	x
COM1	OK.
COMS	Cancel

The list will include all available COM ports on your PC. Select correct one and click **OK** button. If you don't want change port then click **Cancel**. Software immediately opens new port and use it for communication.

In order to get the desired voltage at any one of the channels, follow the steps below:

- If you look at the above screenshot of the Log software, it shows voltage at analog channel 0 of DAQ2543; the voltage is applied at channel 0 and rests all the channels are grounded. Thus, one can apply 0-4 V at any of the channels that are required to be used and the channels are not required could be grounded.
- When the Log software file is opened for the first time, set the time. Click mouse inside black edit box in Time: HH:MM:SS section in top left corner of window. The first edit box set Hours (valid range is 0-23). Second edit box set Minutes (valid range is 0-59). The third edit box set Seconds (valid range is 0-59). Then enter date. Enter three numbers in Date MM-DD-YYYY section. The first edit box set Month (valid range is 1-12). Second edit box set Day (valid range is 1-31). The third edit box set Year (valid range is 2000-2099). You can fill all Date/Time boxes with current date / time just click Now button. Then click Set RTC and Log software will write entered values to the Data Logger RTC. For example on the screenshot above the time is 15:10:35 and date is 7 April 2010. Once the clock is set, it keeps ticking even when power to the Data-Logger/51-C2 Kit is lost because the clock is battery backed.
- Next click **Reset Log** in order to reset any previous data logged. This is not a requirement but should be done in order to get the precise reading on the channels in the application.
- Set logging period. Enter number of seconds into field **Period** on main window and click **Set Period** button. The allowed range is from 1 second to 65565 seconds. It is time after which next record will be written to storage.
- Apply 0-4V at any of the channels, grounding the rest of the channels. Click **Start Log**, enter '0' in the **Record** field and click **Update** or **Next**. This will show the output voltage on the channels the voltage is being applied to.

**Note:** In any case, if a problem occurs, restart the log.exe utility, disconnect the power to the board and reconnect the power.

#### Data Logger Modes:

The data logger software can work in two modes - standard and Auto Scan mode.

#### Standard mode

In this mode software doesn't watch the data logger hardware. You can start / stop logger, you can set clock on the board and read logged records with **Previous**, **Next** and **Go To** buttons. Also if logger is started you will see **Log Event** yellow LED activity when next record is written to the storage.

#### Auto Scan Mode

In this mode software watching data logger hardware and show following information:

- Number of current record in Record field
- Time to next record will be logged in Time to log field
- Log Event LED will be on when next record is logged

You can start/stop/reset log in this mode.

You can enable this mode clicking Auto Scan Mode radio button on main window.



### Saving Logged Data to PC:

In order to save the logged data, you can use commands from **File** menu.

File menu has the following commands:

Save As ... - Saves all selected records to file in text format. Save Records - Saves all selected records to file in packet format.

In order to select range of records to save, enter number of records in the **Record** field (or just leave it as is if it already contains the correct record number ).

The next screenshot shows how to save the first 1000 records:

🛃 BiPOM Electi	ronics Data Logger	
File COM H	lelp	
		Clock
Channel 1	4076 mV	Time: HH:MM:SS Now
Channel 2	0 mV	Date: MM.DD.XXXX
Channel 3	0 mV	11 09 2012
Channel 4	0 mV	Status
Channel 5	0 mV	Connect O Start Log
Channel 6	0 mV	Clock O Stop Log
Channel 7	0 mV	Log Event
Channel 8	0 mV	C Auto Scan Mode
Channel 9	Vm 0	Record
Channel 10	0 mV	1000
Channel 11	Vm 0	Previous Go To Next
	Period 5	seconds Set Period
	Time to log	seconds Update
		seconds Update

After entering the number of records to save, go to **File** menu and select either **Save As** or **Save Records**. The following message window appears:



Click Yes. Select the filename to use:

Save As	? 🔀
Save jn: 📋 My Documents	
arduino 🚞	🚞 Micro-Sys
CPPTest	🛅 My Music
Downloads	C My Pictures
🔁 Fiddler	🚞 My Received Files
Fiddler2	🛗 My Shapes
<b>□</b> ICQ	📟 My Videos
	>
File <u>n</u> ame: records	Save
Save as type: Log Files (*.txt)	Cancel

Type file name and click **Save**. The records will be saved to file. The process will be shown on progress dialog like below:

Saving logged records		
	Record #348. Please wait	
	36%	
	Cancel	

You can click **Cancel** button to stop process. In this case the target file, which you selected on previous step, will be deleted.

**NOTE:** the actual record on data logger storage will not be deleted. You can import them later if need. **Cancel** button only stop saving data to file on PC. It doesn't do anything with data stored on hardware.

### **No Connection Error States**

BiPOM Electronics Data Logger File COM Help Clock Channel 1 Time: HH:MM:SS mΜ Now Channel 2 m٧ ate: MM-DD-Y000 Channel 3 mΥ Channel 4 mν Start Log 0 Connect Channel 5 m٧ Stop Log Clock ۲ Channel 6 mV Reset Log Storage Channel 7 mΥ Log Event 🔘 Channel 8 m٧ C Auto Scan Mode Channel 9 m٧ Record-Channel 10 mν n. Next Channel 11 Previous Go To mν Period Set Period seconds Time to log Update seconds

If you see red blinking Connect LED this means that software cannot get reply from Data Logger board.

Possible reasons:

- Data Logger board is not powered on
- Data Logger board is not properly connected to PC
- Wrong serial port selected in software
- Serial port is already opened by another program. The most possible case when you download latest Log firmware to the board and leave port opened in Micro-IDE
- Serial cable is broken

### Date Storage Error State

If you see red blinking Storage LED this means that firmware reported about problem with accessing SD/MMC card.

Channel	mγ	- Clock	1
Channel 2			Now
	IIIX	Date: MM-DD-YYYY	i <u>set Llock</u>
Channel 3	mγ		
Channel 4	mV	- Status	
Channel 5	mV	Connect 🧿	Start Log
Channel 8	mV	Clock 🧿	Stop Log
		Storage 🥥	Reset Log
Uhannel /	mγ	Log Event 🔘	
Channel 8	Wm	🔿 Auto Scan Mo	de
Channel 9	υM	Beord	
Channel 10	mγ	0	
Channel 11	mV	Pravious Lio Io	Next

Possible reasons:

- SD/MMC card is not inserted
- SD/MMC card is broken

- In rear cases SD/MMC card has previously stored data which detected as corrupted data format by logger firmware. In this case you can try to format SD/MMC card on PC before use with Data logger

# 5. Viewing Data Records Using Excel

These instructions apply to Excel 2007 but the instructions are similar for other versions of Excel.

Start Excel 2007 from Startà Programs:



Open File

Open				? 🔀
Look in:	My Documents My Music My Pictures	*	() - 🔰	·   X 📸 🏛 •
My Documents My Computer	E test6.txt			
My Network Places				
	File name:		~	•
	Files of type: Text Files (*.prn; *.txt; *.csv)		~	•
Too <u>i</u> s 🔻			Open '	Cancel

Select Files of type: **Text Files** ( \*.prn, \*.txt, \*.csv ) and open the log file ( a text file ) that was generated by **Data Logger**.

Select **Delimited** as the separator option:

Text Import Wizard - Step 1 of 3	?×
The Text Wizard has determined that your data is Delimited.	
If this is correct, choose Next, or choose the data type that best describes your data.	
Choose the file type that best describes your data:	
Characters such as commas or tabs separate each field.     Single with a closed in schwarz with several between each field.	
	]
Start import at row: 1 🕞 File grigin: 437 : OEM United States	~
Preview or file C: (Documents and Settings(oguz(My Documents(test6.txt.	
10,08:41:16 04-25-2010,699,617,779,292,315,514,340,289,247,552,477 21,08:41:27 04-25-2010,450,361,744,447,299,512,547,219,220,485,440	
32,08:41:28 04-25-2010,456,392,273,178,540,494,305,376,557,328,180 43,08:41:29 04-25-2010,267,285,622,571,285,260,548,405,306,420,384	
<u>5</u> 4,08:41:30 04-25-2010,237,505,606,444,313,543,511,442,227,314,426	▼
	<u> </u>
Cancel < Back <u>N</u> ext > <u>F</u>	inish

Click Next.

Checkmark **Comma** as the delimiter :

Text Import Wizard - Step 2 of 3	?	×
This screen lets you set the delimiters your dat below.	ata contains. You can see how your text is affected in the preview	
Delimiters		
Semicolon Treat consecutive	e delimiters as one	
✓ Comma	<b>~</b>	
Other:		
-Data preview		
0 08:41:16 04-25-2010 699	617 779 292 315 514 340 289 247 552	~
1 08:41:27 04-25-2010 450 2 08:41:28 04-25-2010 456	361 744 447 299 512 547 219 220 485 392 273 178 540 494 305 376 557 328	9
3 08:41:29 04-25-2010 267 :	285 622 571 285 260 548 405 306 420	
4 p8:41:30 04-25-2010 237	505 606 444 313 543 511 442 227 314	
	Cancel < <u>B</u> ack <u>N</u> ext > <u>F</u> inish	

Click Next.

Click on the second column that shows timestamps:

Text Import Wizard - Step 3	of 3									2	
This screen lets you select each color Column data format <u>G</u> eneral <u>I</u> ext <u>D</u> ate: MDY Do not import column (skip)	umn and s 'General' remainin	et the I ' conve g value	Data Fo rts num is to te:	ırmat. eric val kt.	ues to r <u>A</u> dva	umber: anced	s, date ·	values t	o date	s, and a	all
Data preview	Cener	Coner	Cener	Cono	Cener	Conor	Cener	Canar	Cener	rCono	1
Center General           0         08:41:16         04-25-201           1         08:41:27         04-25-201           2         08:41:28         04-25-201           3         08:41:29         04-25-201           4         08:41:30         04-25-201	0 699 0 450 0 456 0 267 0 237	617 361 392 285 505	779 744 273 622 606	292 447 178 571 444	315 299 540 285 313	514 512 494 260 543	340 547 305 548 511	289 219 376 405 442	247 220 557 306 227	552 485 328 420 314	<
			Cancel		< <u>B</u> a	ck	Ne	ext >		> Einist	

Click the radio button that says **Date:** 

Text Import Wizard - Step 3	B of 3									1	2×
This screen lets you select each col Column data format General Iext Date: MDY Do not import column (skip)	lumn and : 'Genera remainir	set the I' conve ng valu	Data Fo erts num es to te	ormat. neric va xt.	lues to <u>A</u> dv	number vanced.	s, date 	values	to date	es, and a	all
Data preview	Gene	rGene									
0 08:41:16 04-25-201 1 08:41:27 04-25-201 2 08:41:28 04-25-201 3 08:41:29 04-25-201 4 08:41:30 04-25-201	LO 699 LO 450 LO 456 LO 267 LO 237	617 361 392 285 505	779 744 273 622 606	292 447 178 571 444	315 299 540 285 313	514 512 494 260 543	340 547 305 548 511	289 219 376 405 442	247 220 557 306 227	552 485 328 420 314	
			Cancel		< <u>B</u> é	ack		lext >		> Einist	<u> </u>

Click Finish.

You should now see all the values from the log file in **Excel**:

	<b>9</b> • <b>1</b>	(% × ) #								test6.	bt - Micr	osoft Excel no	n-comm	ercial use	2									-	σx
•	Home	Insert Page	Layout Fo	rmulas D	ata Revi	iew View	w Add	-Ins																0 -	σx
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2	1	4/25/2010 8:41	450	361	744	447	299	512	547	219	220	485	440												
3	2	4/25/2010 8:41	456	392	273	178	540	494	305	376	557	328	180												
4	3	4/25/2010 8:41	267	285	622	571	285	260	548	405	306	420	384												
5	4	4/25/2010 8:41	237	505	606	444	313	543	511	442	227	314	426												
6	5	4/25/2010 8:41	240	291	599	293	328	565	408	308	329	401	423												
7	6	4/25/2010 8:41	366	346	512	503	240	353	601	542	255	469	457												
8	7	4/25/2010 8:41	256	235	526	451	383	357	454	430	179	249	412												
9	8	4/25/2010 8:41	431	371	416	339	396	223	558	363	362	415	454												
10	9	4/25/2010 8:41	300	231	655	419	355	382	435	459	205	254	393												
11	10	4/25/2010 8:41	321	412	568	452	389	317	423	250	347	344	399												
12	11	4/25/2010 8:41	376	357	614	587	333	248	404	323	195	368	533												_
13	12	4/25/2010 8:41	385	359	468	369	389	198	563	519	156	363	383												
14	13	4/25/2010 8:41	414	310	004	418	238	413	011	470	103	400	200												
15	14	4/25/2010 8:41	240	427	399	451	433	192	394	490	287	234	432												
10	15	4/25/2010 8:41	428	387	502	200	311	404	4/1	309	200	349	320												
1/	10	4/25/2010 8:41	432	498	620	309	430	282	528	303	3//	419	307												
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19	10	4/25/2010 8:41	400	452	400	341	301	4/5	457	429	200	415	202												_
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21	25	4/25/2010 8:41	432	4/1	202	222	321	204	441	403	272	234	226												
22	21	4/25/2010 8:41	5/0	25/	372	204	430	204	405	202	373	270	200												
32	22	4/25/2010 8:41	249	264	470	350	330	200	201	452	250	320	420												
24	22	4/25/2010 8:41	200	194	256	372	229	447	200	401	242	240	405												
14.4. >	▶ test6	2													4										$\rightarrow$
Ready																							100% 😑		•

Click on a column header on any of the columns that have the channel values:

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	🖌 🔏 Cut		Calibri	* 11	* A *	= = ;	- **	📑 Wrap	Text	General				Norm	al	Bad		Good	Neutra	il 🗎		= ই i		AutoSum *	77 #	à 👘
Pas	L Copy		D T		A.A.					e _ 0/		Conditio	anal Format	Calcu	lation	Chock C	oll	Explanatory	Innut		Inse	ert Delete F	ormat	Fill *	Sort & Find	18
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9	8	4/25/2	010 8:41	431	371	416	339	396	223	558	363	362	415	454												
10	9	4/25/2	010 8:41	300	231	655	419	355	382	435	459	205	254	393												
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17	15	4/25/2	010 8:41	428	307	502	269	311	404	471 539	309	200	349	320												
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19	18	4/25/2	010 8:41	445	405	610	541	381	475	437	432	215	419	383												
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11	10	4/25/2010 8:41	321	412	568	452	38	39	317	423	250	347	344	399			
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19	18	4/25/2010 8:41	438	432	610	541	38	31	475	437	429	238	419	383			

Select Insert tab, click the Line button in the charts area and select the 2-D Line chart:

You will see the data plotted:



# 6. Data Logger Record Structure

### Text format description:

Each record is written on a separate line. The line has the following format:

RecordNumber, Hour: Minute: Second Month-Day-Year, Channel1, ..., Channel11<LF><CR>

RecordNumber Hour:Minute:Second Month-Day-Year Channell,...,Channell1 Number of record Time when this record was logged Date when this record was logged Data for each of 11 channels

### Example:

**Note:** Record #3 has **BAD** instead of values. This means that this record was not read from Data Logger correctly ( some error occurred or the record was not logged ).

#### Packet format description:

Each record is written on a separate line. The line has following format:

Record = RECORD\_NUMBER ec = ERROR\_CODE ERROR\_DESCRIPTION<LF><CR> BINARY\_DATA<LF><CR>

**RECORD\_NUMBER** - record number (decimal number)

**ERROR\_CODE** - error code (decimal number)

**ERROR\_DESCRIPTION** - text description of the error of last operation. This can be one of following:

#### \*0K\*

Record was read successfully.

#### \*LOG CHECKSUM\*

Checksum of LOG data is incorrect.

#### \*REPLY\*

Wrong command in reply. Data may be corrupted.

#### \*STATUS\*

Reply packet is correct but Data Logger hardware was not able to read the record.

\*PACKET CHECKSUM\*

Checksum of reply packet is wrong.

#### \*COMMUNICATION\*

Error when reading/writing data through the communication port ( COM port is not opened, not initialized or timeout ).

**BINARY\_DATA** - ASCII string which represents each byte of reply packet from data logger as a HEX byte value. Each reply packet has 34 bytes in binary packet:

Byte	Description
1	Always is 8
2	Should be 0 if record was read successfully or 1 if some error occurred
3-34	32 byte Log Record

The following table describes the 32-byte Log Record Structure:

Byte	Description
0	Channel 0 Reading High Byte
1	Channel 0 Reading Low Byte
2	Channel 1 Reading High Byte
3	Channel 1 Reading Low Byte
4	Channel 2 Reading High Byte
5	Channel 2 Reading Low Byte
6	Channel 3 Reading High Byte
7	Channel 3 Reading Low Byte
8	Channel 4 Reading High Byte
9	Channel 4 Reading Low Byte
10	Channel 5 Reading High Byte
11	Channel 5 Reading Low Byte
12	Channel 6 Reading High Byte
13	Channel 6 Reading Low Byte
14	Channel 7 Reading High Byte
15	Channel 7 Reading Low Byte
16	Channel 8 Reading High Byte
17	Channel 8 Reading Low Byte
18	Channel 9 Reading High Byte
19	Channel 9 Reading Low Byte
20	Channel 10 Reading High Byte
21	Channel 10 Reading Low Byte
22	Seconds (0 to 59)
23	Minutes (0 to 59)
24	Hours ( 0 to 23 )
25	Month (1 to 12)
26	Day ( 1 to 31 )
27	Year ( e.g. 2010 is 10 )
28	Current Address Low Byte
29	Current Address Middle Byte
30	Current Address High Byte
31	Checksum ( sum of all bytes )

**NOTE:** In order to calculate Record Number from 3 bytes you should use following formula:

REC\_NUMBER = BYTE33 \* 65536 + BYTE32 \* 256 + BYTE31 / 32

**NOTE:** In order to calculate correct channel value from 2 bytes you should use following formula:

CHANNEL\_VALUE\_01 = BYTE3 \* 256 + BYTE4 CHANNEL\_VALUE\_02 = BYTE5 \* 256 + BYTE6 CHANNEL\_VALUE\_03 = BYTE7 \* 256 + BYTE8 CHANNEL\_VALUE\_04 = BYTE9 \* 256 + BYTE10 CHANNEL\_VALUE\_05 = BYTE11 \* 256 + BYTE12 CHANNEL\_VALUE\_06 = BYTE13 \* 256 + BYTE14 CHANNEL\_VALUE\_07 = BYTE15 \* 256 + BYTE16 CHANNEL\_VALUE\_08 = BYTE17 \* 256 + BYTE18 CHANNEL\_VALUE\_09 = BYTE19 \* 256 + BYTE20 CHANNEL\_VALUE\_10 = BYTE21 \* 256 + BYTE22 CHANNEL\_VALUE\_11 = BYTE23 \* 256 + BYTE24

Example: