ICM+ Standard of Procedures



DWL TCD monitor with QL Software

1 June 2020

https://icmplus.neurosurg.cam.ac.uk

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Table of Contents

Prerequisites	3
Locking and unlocking ICM+	5
Starting a new data collection session	7
Manually configuring data collection	9
Annotating clinical events	. 13
Terminating the data collection session and archiving the data	. 14
Restoring a closed data collection session	. 16
Exporting data to a csv (Excel) format	. 17
Appendix 1: Configuring ICM+ system options	. 19
Appendix 2: ICM+ configuration folders and files	. 24
Appendix 3: Editing ICM+ Projects	. 25
Appendix 4: Registering ICM+	. 28
Appendix 6: Preconfigured users and passwords	. 30
Appendix 7: Selected relevant references	. 31

Prerequisites

- 1. A laptop (or a PC) with the latest ICM+ plus DWL TCD module. The extra laptop may not be necessary if ICM+ is to run on the TCD computer itself.
- 2. DWL TCD Doppler-Box® X via a Laptop, Multi-Dop® T and Multi-Dop® X, with the latest QL software version



- 3. Ideally **ABP waveform** should be collected at the same time to make TCD measurements more meaningful, either from a **patient monitor or non-invasive ABP monitor**, using an appropriate ICM+ module
- 4. Appropriate cables:

Connection of Doppler-Box® X via Laptop, Multi-Dop® T and Multi-Dop® X with ICM+ laptop is via port 1 (above) and a null modem USB-USB cable, like this:



https://www.ftdichip.com/Support/Documents/DataSheets/Cables/DS_USBNMC.pdf

Alternatively a combination of USB-Serial cables, with **one** of them a null-modem (https://www.startech.com/uk/Cards-Adapters/Serial-Cards-Adapters/USB-to-Null-Modem-RS232-DB9-Serial-Adapter-Cable-DCE-FTDI~ICUSB232FTN) will work too.



Additionally, **Multi-Dop**® **T** and **Multi-Dop**® **X** can be connected to the ICM+ laptop by using a RS232 (female)-to-USB cable set-up.





CabeCreation USB to RS232 Adapter with FTDI Chipset



RS-232 male connector

1

Locking and unlocking ICM+

ICM+ includes a simple system of user based permissions, which allows it to be used safely in a clinical environment, also by people with minimal training, ensuring that the vital data collection process is not inadvertently interrupted or disturbed.

If your ICM+ is correctly configured when the program is run it will automatically initialize with the default user 'Nurse'. There are three other users already configured in ICM+, the Administrator, the Manager and the Operator. The users have been configured with progressively decreasing operational rights.

The **Nurse** is the user with the fewest rights in the software, effectively only being able to insert clinical events, browse the charts and starting new sessions, without any possibility to disrupt the data collection procedure. Please refer to the 'How to use the events form' for more details. After 3 minutes of inactivity (configured in the settings, figure below), ICM+ automatically switches to the default user, if configured, which for the data collection should be set to **Nurse**.



The **Administrator** is the user that will have full access to the full features of the application.

The Manager will have the same privileges but will not be able to manage user accounts.

The **Operator** will only be capable of starting new Recording sessions with available profiles, browsing data, inserting clinical information and display configuration.

Login (change users) form is accessible via a button on the main menu bar.



Or the speed tool bar, when the data collection is in progress



When the Login button is pressed, the User login form will appear.

Current user: Default user:	Administrator Nurse			
Default	Lock	1	2	3
Other user		4	5	6
Name Adr	ninistrator 💌	7	8	9
Password ••	••		0	Back

In this form you will find:

- 1. A button to the Default user and a button to lock the application so that nothing but the login button is accessible.
- 2. A key pad to insert the Password for a given use.
- 3. And a Drop-Down menu to select the user to login as.

Starting a new data collection session



To create a new data acquisition session hit New Patient button.

This will bring up a new form, where patient details can be inserted:

,	TCD Monitorin	Ig		×	New Project
Data File:	\\Mac\Home\Documen	ts\ICM+\Data\TCD_2020060516203	6_GAUSSW8.icmp		
Patient's	information				
First Na	ame	Middle Initial	Date Of Birth	05/06/2020 🔲 🗸	00:00
Surnan	ne		Date Of Ictus	05/06/2020 🔲 🗸	00:00
Hospita	al ID		Date Of Admission	05/06/2020 🔲 🔻	00:00
Room/E	Bed No		Sex	Unspecified	~
Anonyn	nised ID				
					6.4
F	etrieve Demogra	aphics From			*
Data Acq	uisition/Analysis Cor	aphics From			*
Data Acq W:\ICM	uisition/Analysis Cor 1+\Configs\Other	aphics From Infguration Profile r Devices\Profile - DWL	TCD + ABP Analog	jue.icmc	< €
Data Acq W:VCM Custon	etrieve Demogr uisition/Analysis Cor I+\Configs\Other iise the profile	aphics From figuration Profile r Devices\Profile - DWL Clear All	TCD + ABP Analog	Jue.icmc	V Personal Clear History

More importantly a data acquisition/analysis profile (configuration) file should be selected, either from the history list box or loaded from the file system. These can then be modified if necessary using Signal Sources editor, or On Line Analysis editor.

After the OK button is clicked, the Devices check is performed using Device Check dialog.

Please check the o	connections before continuing:		
Device	Connection	Test	Enabled
ADC	Simulation	1	Yes
DWLQLTCD	COM2	_	Yes

This dialogue is used to test the communication between the ICM+ and the monitor (the 'Test connections' button). If the test is successful the OK button can be pressed.

This menu can also be used to select the right connection, whether it is a serial connection (like the one presented in the picture) or an IP address. In the case of a serial port connection, the button auto allocate ports can be pressed and the application will search for the right port.

After this dialogue, ICM+ main display is presented and the session begins recording automatically, if configured in the used project. Otherwise use Start button (see next page).

Message	
1	The recording session has been automatically started
	• ок

If ICM+ **shuts down during a recording session** the next time it is run, the previous session is automatically restored, but here the user must first verify that all the signals are being received correctly in the Monitor button. After this the Start button must be pressed and the session resumes recording.



Manually configuring data collection

If there is no prepared profile available that includes desired data collection from the monitor or if there is a need to modify or add parameters downloaded from the monitor Signal Sources option needs to be used. This can be done in the New Data Acquisition Form:

Customise the profile	Clear All	Signals Sources	Con Line Analysis
✓ ОК	X Cancel	😵 On Screen Keys	

Or using Signals button in the main Menu (Data Section), with the data acquisition in pause mode. Please note that the recording must be stopped before the Signals button becomes enabled



This brings up the Sampler Configuration form:

Digital output devices	Analogue output d	evices RS232 ASCI	streaming devices			
Name	Туре	Port	Baud	Sampl Frq	Enabled	
Modify	+ <u>A</u> dd	Delete	Clear			

9	Digital Outp	ut Device Conf	figuration Dialog	×
Device Name: D	VLQLTCD	Device Type:	DWLQLTCD DWLQLTCD EV1000 Evita HemedexBPM	~
			ICON iControlWave InfinityGateway InfinityRS232	v
Interface type	COM Port: Baud Rate: Address:	COM1 ~ 115200 ~	Sampl. Freq. 100.00 💌 Enabled: 🗸 Communication Test	~
🗸 ок	X Cancel	le Keyboard		

Clicking on Add button in the upper part (Digital Output devices tab) opens a Device Configuration dialog. Here, one can select the monitor module from the list of available (installed) interfaces, as well as specify the COM port to which the TCD connection cable is attached.

evice Name:	DWLQLTCD	Device Type:	DWLQLTCD	
connection esta /ave values rec vailable waves connection clos	ablished ceived /numerics list: Ch1Pr red	os,Ch1Neg,Ch2F	Pos,Ch2Neg	

When the correct interface module (DWLQLTCD) and the correct COM port and Baud Rate (matching the one configured in the QL software) is selected, clicking on 'Communication Test' will try to establish communication with the monitor and the log of that communication is printed in the memo box, listing also all the parameters that are available to download from the monitor.

After the connectivity is confirmed the dialog can now be closed, which causes the device to be added to the data collection configuration. What remains to complete the configuration is adding all the desired parameters to be collected. This can be achieved by using the Add button in the lower part of the Sampler Configuration dialog.

>		Sampler Config	guration Dialog	
ligital output devices	Analogue output devices	RS232 ASCII streami	ing devices	
Configured devices v	with proprietary digital outp	ut protocols		
Name	Туре	Port	Baud Sampl Frq	Enabled
DWLQLTCD	DWLQLTCD	COM2	115200 100	Υ
Modify	+ Add - D	elete 😫 Clea	a <u>r</u>	
Name	Units Device	Waveform M	lin V Max Enabled	
Modify	+ Add	elete 🔄 Clea	ΔĽ	
🗸 ок 🗙	Cancel 🖹 😫	ave 🖄 Load	Advanced	Explored Sector

This opens a signal selection dialog:

Digital Output Device Signals Selection Dialog	×
Device : DWLQLTCD V Signal Name : Signal Units : Waveform :	
Physiological Values Range Min Value : 0 Max Value : 300 Start Stop	
V OK Cancel 🛞 Keyboard	

Digital O	utput Device Signals Station Dialog
	Signal selection di
Device : DWLQLTCD	List of available signals
Signal Name :	Ch1Pos
Signal Units :	Chiveg Ch2Pos Ch2Neg
Waveform :	
Enabled 🗸	
Physiological Values Range	
Min Value : 0	
Max Value : 300	Stop
	C Refresh the list
VOK X Cancel	V OK Cancel

Using the little '...' button one can select available signal, one at a time.

Once the waveform is selected one can test the data acquisition by clicking on Start button. If all is well OK button will close the dialog and add the new parameter to the data acquisition configuration.

Digital Outpu	It Device Signals Selection Dialog
Device : DWLQLTCD V	Preview
Signal Name : FVI	60 A A A A
Signal Units :	50
Waveform: Ch1Pos	
Enabled 🗸	35 - M
Physiological Values Range	30
Min Value : 0 Max Value : 300	Start Stop
VOK X Cancel	> Keyboard

This process can be repeated as many times as it is needed putting together the complete list of parameters to be collected, which complete the data acquisition configuration procedure. Name the velocity channels appropriately – eg FVI or FVr

		Sampler Co	onfiguratio	n Dialo	g		-		×
Digital output devices	Analogue output dev	rices RS232 ASCI	streaming dev	ices					
Configured devices	with proprietary digital	output protocols							
Name	Туре	Port	Baud	Sampl	Frq	Enabled			
DWLQLTCD	DWLQLTCD	COM2	115200	100		Y			
12			A						
Modify	+ <u>A</u> dd	- <u>D</u> elete	Clea <u>r</u>						
Name	Units Device	Waveforr	m Min V	Max	Enabled				
FV_I	cm/s DWLQL1	CD Ch1Pos	0	300	Y				
FV_r	cm/s DWLQLT	CD Ch2Pos	0	300	Υ				
Modify	+ Add	<u>D</u> elete	Clear Load		Advanced	🛞 Keyt	oard]	

Please note, that adding parameters/signals to the data collection will make ICM+ show and record the data through the Signal Monitor window but the trends charts will not automatically get configured to show them. This is because the trend charts only show results of calculations, not the raw data. So to display even just a mean trend of a newly added variable collected from the monitor ICM+ this needs to be configured first in the analysis section, as in picture below, and then the new trend added to the charts.

	Primary Analysis Secondary	Analysis 1	Secondary Analysis 2	Secondary Analysis 3	Secondary Analysis 4	Final Analysis
Name	Formula	Sampling Frq	Min	Max	Digital Filter	Enabled
ABP	abp	100	0	300	None	Y
fvl	fv_I	100	0	0	None	Y
fvr	fv_r	100	0	0	None	Y
CaBVI	integrate(fv_l- movin	100	0	0	None	Y
CaBVr	integrate(fv_r- movir	100	0	0	None	Y
Modify	y <u>+ A</u> dd _	Delete	Clear A	uto <u>F</u> ill Defaul	t Fs [Hz]: 100.0	

Annotating clinical events

As soon as the acquisition of data starts the main menu tool bar will get minimised and in its place a small, 'data acquisition essentials', tool bar will open, as below.



There, from left to right the following functions are accessible:

- 1. Log-in/Log-off form to change the user (ie privileges)
- 2. Patient discharge/stop data collection session
- 3. Event annotation form (which will be disabled if no events are configured)
- 4. Free textual annotations form
- 5. An on-screen keyboard
- 6. The last button closes this tool bar and unfolds the main menu toolbars

Terminating the data collection session and archiving the data

When the data acquisition process is finished the recording session can be closed using the Close button present in the ICM+ button. This will initialize a cascade of forms that will eventually lead to the sealing of the file and subsequent archiving the data to the file server, if required.

Closing a session is different from closing the program. To close the ICM+ application you need to press the red cross present on the upside corner of the right side of the screen. If ICM+ is closed (Exited) using this button or if the computer shuts down, the next time it is run, the recording session will be resumed with the same configurations it had at the moment of shutdown.



When this button is pressed a dialogue is presented prompting the user to confirm the closure of the recording session:



After confirming the end of the recording session another dialogue is presented prompting the user to archive the data:



After confirming this dialogue the Data Archiving Form is presented, where the user can specify/confirm the location of the server and its share to use:

Data archiving configuration	form	_ 0 <mark>X</mark>
Use settings from the project:	TCD Monitoring	
Data storage details		
Data Archive Folder		
//srv1/archive		E
Create New Subfolder	✓ Use original file name for the subfolder	
TCD_20170512193532_HE	х	
☑ Create info text file		
Operation		
🔘 Сору	Move	
Cancel	Remember Selection	

If a session was for some reason closed and a recording needs to be restored again the button open can be pressed.



The dialog that opens can be used to reopen the file in order to upload the data to our servers or to restore the recording session.

Type Image: Columents and the main data file Image: Columents and the file Image: Columents Advanced Search Image: Columents and the file Image: Columents and the file Image: Columents Advanced Search Image: Columents and the file Image: Columents and the file Image: Columents Advanced Search Image: Columents and the file Image: Columents and the file Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image: Columents Advanced Search Image	۹	File Open Dialog)			×
Browse forFile Advanced Search Image: Constraints Deckmonts Image: Constraints Deckmots <t< td=""><td>Type 😹 📓 🍸 ICM+ main data file 🗸 🗸</td><td>C:\Users\Manuel\Documents\ICM+\Data</td><td></td><td></td><td></td><td>~ 35</td></t<>	Type 😹 📓 🍸 ICM+ main data file 🗸 🗸	C:\Users\Manuel\Documents\ICM+\Data				~ 35
Name Size Image Size Image > ASUS CTBL2015010615222_MANUELPC.icmp 40 K8 CHI-adat file O7012015 02.04.77 > ASUS CTBL2015010615222_MANUELPC.icmp 30 K8 CHI-adat file O7012015 02.04.77 > ASUS CTBL20150106115222_MANUELPC.icmp 30 K8 CHI-adat file O7012015 02.04.77 > ASUS CTBL2015010614221_MANUELPC.icmp 30 K8 CHI-adat file O7012015 12.23.08 CHIL CHIL-adat file CTDL2015102014120_UANUELPC.icmp 73 K8 CHI-adat file O7012014 120.022 > CHIL-adat file CHIL-adat file O7012014 120.022 O7012014 120.022 O7012014 120.022 > CHIL-adat file CHIL-adat file O7012014 120.041.713 O7012014 120.041.713 O7012014 120.041.713 > CHIL-adat file CHIL-adat file O7012014 120.041.713 O7012014 120.041.713 O7012014 120.041.713 > Freecol Freecol Freecol Freecol O7012014 120.041.713 O7012014 120.041.713 > CHIL-adat file 101112014 02.54.22 O7012014 120.041.713 O7012014 120.041.713 O7012014 120.041.713 > Freecol Freecol Freecol O7012014 120.040.713 O7012014 120.041.713<	Browse for File					
b Brage b Brage b Brage c:Users/Hanuel/Documents/UCM+/Data/CTBL_20150106153922_MMMJELPC.kmp c:Users/Hanuel/Documents/UCM+/Data/CTBL_20150106153922_MMMJELPC.kmp c:Users/Hanuel/Documents/UCM+/Data/CTBL_20150106153922_MMMJELPC.kmp c:Users/Hanuel/Documents/UCM+/Data/CTBL_20150106153922_MMMJELPC.kmp c:Users/Hanuel/Documents/UCM+/Data/CTBL_20150106153922_MMMJELPC.kmp - Events, Size: 4706 - NoteCalls, Size: 2 - PatientDescr PatientDescr Name= VialInitial= Surname=	Coursents Carriers Carr	Name CTEI_20150106153922_MANUELPC.icmp CTEI_20150106142213_MANUELPC.icmp ARPE/CP_Lycox-lengterm TBilemp CTEI_2017174510_MANUELPC.icmp CTEI_20141202171342_MANUELPC.icmp GTEI_20141202171342_MANUELPC.icmp ARPE/CP_Locox-lengterm TBilemp ARPICPL_Cocking term TBilemp ARPICPL_COCKING term TBILEmp CTBI_20141202171342_MANUELPC.icmp Generac_20141202161420_MANUELPC.icmp ARPICPL_COCKING term TBILEmp ARPICPL_COCKING term TBILEmp	Size 40 KB 30 KB 1,314 KB 25 KB 73 KB 47 KB 838 KB 179 KB	Item type ICM+ data file ICM+ data file	Date modified 07/01/2015 00/26-47 06/01/22015 14-24-02 27/12/2014 1925:08 27/12/2014 18:00 022 19/12/2014 12:23:01 02/12/2014 12:23:01 02/12/2014 12:23:01 10/11/2014 02:45:22 10/11/2014 09:47:30	1
Generatin, Sox 366 Generatin, Sox 36	C:Users/Hanuel/Documents/UCH+/Data/CTBI_20150	106 153922_MANUELPC.comp				^
Name= MidInital= Surname= HospitalNo=	- Generalino, Size: 366 - ClinicaData, Size: 2 - PatientDescr, Size: 780 - RawData PatientDescr					~
AnonymizedID=123 DateOfBitth=06/01/2015 Sex=Male	Name MidInitial= Sunname HospitalNo= AnonymizedID=123 DateOfBirth=06/01/2015 Sax=Male		ſ			

To reopen a file for inspection or to upload it is only necessary to double-click the desired file.

To restore the recording session, the highlighted button must be pressed and the recording resumes using the same profile as when it was closed.

There are two ways the data can be exported from ICM+. One way is to select Export option in the main menu (the Brain icon).



This will export all the trend data from the memory, all the variables, in commas separated columns of values, with the first column containing the time stamps, in the internal Windows DateTime format. The DateTime format is essentially a number of days (and their fraction, which translate into time) since 31/12/1899. Imported into Excel it will initially showed up as those numbers, but if date or time (or combined) cell formatting is requested for that column the data and or time will be shown.

	Format Cells	? ×						
Image: State of the state o	Number Alignment Font Border Fill Protection Category: General Sample Date Date Date Ime Currency Accounting Date ddammunus Praction Category: Date ddammunus	File Home Pate Calibri Clipboard Is	Insert Page Laye $\mathbf{U} = \mathbf{I} \mathbf{I} \mathbf{I} \mathbf{I}$ $\mathbf{U} = \mathbf{A}^{T} \mathbf{A}^{T} \mathbf{A}^{T}$ Font \mathbf{I}	test_cl.cov + formulas = = 章 章 C 章 章 章 章 章 章 Abgement = DateTime	Microsoft Excel Data Review Custom • Market A Styles Number G	View "** Insert * #* Delete * Format * Cells	C · C · C · C · C · C · C · C · C · C ·	- ∰ 83 & & t*
A1 F DateTime A B C D JateTime CP(mmH) AMP(mmH HE[]/m1] A3485.4146 -2.411 0.072 3 42486.4145 -2.673 0.0274 82.6 4 42486.4145 -2.673 0.017 0.07 5 42486.4145 -2.575 0.017 0.07	Scientific mmm-yy Text h:rmm AMPM Special h:rmmss AMPM h:h:rmms dd/pm/yyy h:h:rmm mm:ss:0 @	A1 1 DateTime 2 26/04/2016 0 3 26/04/2016 0 4 26/04/2016 0 5 26/04/2016 0 6 26/04/2016 0	B ICP[mmH/ 9:56:23 -2.411 9:56:33 -2.778 9:56:53 -2.995 9:57:03 -3.152	C D AMP[mmi]HR[1/min 0.0072 172.1 0.0274 82.1 0.01 70.0 0.0143 54.2 0.0072 52.9	E F n RR[1/min]RAP[] 6 3.742 6 4.556 7 4.716 0.4 8 0.2 8 4.073 0.4	G RA[mmHg 0.0252 0.07 811 0.1393 496 408 0.0557	H I ICPmax[m ICPmin -2.383 -2.4 -2.232 -2.4 -2.492 -2.8 -2.876 -3.0 -3.103 -3.1	1[m Slq 453 425 843 086 209
0	Type the number format code, using one of the existing codes as a starting	7 26/04/2016 0 8 26/04/2016 0 9 26/04/2016 0 9 26/04/2016 0 10 26/04/2016 0 11 26/04/2016 0 12 26/04/2016 0 13 26/04/2016 0	9:57:13 -3.248 9:57:23 -3.287 9:57:33 -3.302 9:57:43 -3.316 9:57:53 -3.319 9:58:03 -3.331 9:58:13 -3.341	0.0073 106. 0.0052 169. 0.0063 89.3 0.0074 71.6 0.0087 77.5 0.0078 81.5 0.0098 97.9	3 23.12 0.5 9 21.32 0.5 6 17.66 0.6 2 25.06 0.6 6 6.27 0.6 4 15.79 0.6 8 16.77 0.	201 0.0091 927 0.0049 227 0.0051 319 0.0044 254 0.0103 287 0.0072 612 0.0052	-3.223 -3.2 -3.261 -3.3 -3.294 -3.3 -3.306 -3.3 -3.305 -3.3 -3.319 -3.1 -3.328 -3.1	276 301 318 324 331 348 356
Ready Average 42487,78801 Count 23417 Su		Ready Ready	Aver	age: 27/04/2016 18:54./] 4 4 Count: 23417	100%	0	•

The second way of exporting data is to use the data export chart tool, located at the bottom of each charting vertical panel:



This will export data only from the variables plotted in the panel corresponding to the button toolbar, in this case it will be ICPsys, ICPdia, ICP and ICPpulse only, and only from selected time periods, if the selection tool is used, or the whole recording time, if not.

	🛃 🔊 • (H •	-	DLPatient000	1036_r1.csv - Micros	oft Excel	-	- 0	×
	ile Home	Insert Page La	yout Formula	as Data Rev	iew View		ے 😮 ۵	æ X
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	A	В	С	D	E	F	G	-F_
1	DateTime	ICPsys[mmHg]	ICPdia[mmHg	ICP[mmHg]	ICPpulse[mmHg]			
2	42668.57096	216.4	-3.937	0.744	220.4			
3	42668.57108	-2.629	-2.899	-2.743	0.2701			
4	42668.57119	-2.481	-2.647	-2.554	0.1663			
5	42668.57131	-2.406	-2.594	-2.511	0.1877			
6	42668.57142	-2.396	-2.594	-2.498	0.1984			
7	42668.57154	-2.396	-2.567	-2.484	0.1709			
8	42668.57166	-2.396	-2.539	-2.481	0.1434			
9	42668.57177	-2.396	-2.539	-2.476	0.1434			
10	42668.57189	-2.387	-2.539	-2.471	0.1526			_
11	42668.572	-2.387	-2.521	-2.468	0.1343			
12	42668.57212	-2.341	-2.521	-2.462	0.1801			
13	42668.57223	-2.368	-2.53	-2.464	0.1617			
14	42668.57235	-2.359	-2.503	-2.459	0.1434			
15	42668.57247	-2.341	-2.521	-2.453	0.1801			
16	42668.57258	-2.313	-2.503	-2.431	0.1892			
17	42668.5727	-2.332	-2.512	-2.43	0.1801			
18	42668.57281	-2.313	-2.503	-2.426	0.1892			
19	42668.57293	-2.313	-2.503	-2.431	0.1892			
20	42668.57304	-2.332	-2.503	-2.433	0.1709			
21	42668.57316	-2.322	-2.503	-2.425	0.1801			-
H	DLPatie	nt000036_r1 🥂]/					
Re	ady				1	00% ——		-(+) _;;

Appendix 1: Configuring ICM+ system options

Most of the programmable behaviours of the software can adjusted via the Settings menu. This menu can be found by clicking the Home tab and the Settings button.



In the Settings menu you will need to configure several things:

• On the General tab:

	8		Settings		
Seneral	Archiving	Display	Analysis	Raw Data Rec	System
Resear	ch Group/Ce	entre ident	ificator		
CAMB	RIDGE				
System	Configuratio	n Folder			
C:\Use	s\Public\Doc	uments\0	M+\syscor	nfig\	E
User Pl	igins Folder				
C:\Use	s\Public\Doo	uments\K	M+\Plugins	1	E
Default	Configuratio	n Profiles	Folder		
C:\Use	sManuelDo	cuments\	ICM+\Config)s/	E
Default	Data Folder				
C:\Use	rs\ManuelDo	cuments\	ICM+\Data\		E
Data Fi	e Name Form	nat			11.15
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Remov	e records w	ith NAN vi	alues while	exporting to text	fie [

- The Research Group/Centre identification will be a unique name in the project that will identify the centre. This name should be fully inserted in capitals (ex. CAMBRIDGE).
- The Data File Name Format will be used to configure the structure to be used on the construction of the name of each data file. As each file generated in the study must have a unique identifier we agreed in using a structure that uses the format highlighted in the picture. A description on how to build this File Name format is presented further down in this appendix.

• On the Archiving tab:

			Settings			×
General	Archiving	Display	Analysis	Raw Data Re	c Syste	m
Local ar	chiving					
Automat	ic Data Arch	iving at th	e recording	session end:	Ask	¥
Create t	ext info files	for archiv	ved data			п
Delete o	riginal data a	fter archi	vina			1
Archive	Root Folder	Location				tool .
						Es
Archive	Folder Name	Format				
<proje< td=""><td>CT>_<cent< td=""><td>RE>_<an< td=""><td>ONYMD>_</td><td><date><time></time></date></td><td></td><td></td></an<></td></cent<></td></proje<>	CT>_ <cent< td=""><td>RE>_<an< td=""><td>ONYMD>_</td><td><date><time></time></date></td><td></td><td></td></an<></td></cent<>	RE>_ <an< td=""><td>ONYMD>_</td><td><date><time></time></date></td><td></td><td></td></an<>	ONYMD>_	<date><time></time></date>		
						4
Upload t	to a remote d	estination				
Defeuit	Destination	CEN	TED TRI			
Deidus	Destination.	CEN	TER IDI			

- The Archive Folder Name Format will follow the same structure as the Data File Name Format. This setting is used for organising local archival storage of the data files.
- The remote server Upload (accessible via the upload function) default Destination can be selected here but it is the matching setting in the Project configuration that will ultimately take precedence.

• On the Raw Data Rec tab:



 The Use 'Start' button to control Raw Signals Recording must be checked if you are using ICM+ to record any data directly from bed side monitors • On the System tab:

Settings	×							
General Archiving Display Analysis Raw	Data Rec System							
Auto restore session in progress on startup	Enable 🗸							
Auto restart recording at program startup Enable V								
Inactivity time to software auto logout [min]	0							
Auto unlock program as user :	Nurse 🗸							
Operating System Policy								
Use this program instead of Windows shell	Disable 🗸 🗸							
Disable logoff/shutdown	Disable 🗸 🤟							
Disable Task Manager	Disable v							
Disable locking the computer	Disable v							
Disable Windows password change	Disable 🗸							
Windows Auto Login								
State Disable v Password								
User Confirm								
Patient description encryption Passphrase								
V OK X Cancel 🛞 Keybo	bard							

 Set the Auto unlock program as user to Nurse. Setting the inactivity time to a value greater than 0, eg 10 min, will cause the software to auto login as that default user following a selected period of time without interaction with the software (this will only happen of course if the program was unlocked as another user) To build the **Data File Name Format** you will need to click the highlighted button and the following form will appear:

<centre></centre>	СТВІ		
<project> <date></date></project>	<centre></centre>		
<time></time>	<anonymid></anonymid>	Fi	ree Tex
<lastname></lastname>	<date></date>	PI	ease pro
<computer> <bedid></bedid></computer>	<time></time>	C	TBI_
<patientid> <anonymid></anonymid></patientid>			
<guid></guid>			
Name Sample			

Input form	×
Free Text Element	
Please provide value for this text element	
СТВІ_	
OK	

In this form it is possible to add/remove any name element present in the Available Elements menu.

The '_' and any additional static text can be inserted by using the element '<text>' and inserting the text to be added manually.

Appendix 2: ICM+ configuration folders and files

ICM+ uses two locations (configurable via the Settings form) to store all its configuration files:

Location 1: C:\Users\<username>\Documents\ICM+.

There are two subfolders here:

'Data' folder, where all the data recorded during the acquisition process is stored, and

'Configs' folder, used to store the data collection and analysis configuration 'profile' files, as in the figure below.

Location 2: C:\Users\Public\Documents\ICM+

Here all the environment configurations/settings are stored. This location contains a folder called **Plugins**, where 3_{rd} party function libraries reside, a folder called **TxtFilters**, containing parsing definitions for different text format data files, and a folder called **sysconfig** containing all the settings of the software, except the data collection and analysis profiles which are store in the Location 1 (as above). Although these files could be edited directly using a text editor ICM+ has specific user interface forms to edit all aspects of the program functionality.

Organize Include in library Organize Include in library Share with Burn Name Favorites Desktop Google Drive Downloads icloud Drive Dropbox (Cambridge University) Recent Places Dropbox (Personal) Ibraries Documents Music Pictures			
Organize ▼ Include in library ▼ Share with ▼ Burn New folder Image: State with ▼ Image: State with ℕ Image: State with ℕ <th>C:\Users\Public\Document</th> <th>s\ICM+\sysconfig</th> <th><u>م</u></th>	C:\Users\Public\Document	s\ICM+\sysconfig	<u>م</u>
★ Favorites ^ ■ Desktop ▲ Google Drive ▲ Downloads ④ iCloud Drive ♥ Dropbox (Cambridge University) ■ Recent Places ♥ Dropbox (Personal) ■ Libraries ● Documents ● Music ● Pictures	Organize Include in library	Share with ▼ Burn New folder 🖁 🖽	- 🗌 🔞
Homegroup	 ★ Favorites ■ Desktop Boogle Drive Bownloads iCloud Drive Dropbox (Cambridge University) Recent Places Dropbox (Personal) ⇒ Libraries ⇒ Documents ⇒ Music ■ Pictures ■ Videos * Homegroup 	Name CustomForms SFTP updates updates events.xml projects.ctbi.xml projects.ICP.xml projects.INF.xml projects.TBI.xml projects.tbi.xml projects.tbi.xml go: projects.tbi.xml go: projects.tbi.xml go: projects.tbi.xml go: projects.tbi.xml go: projects.tbi.xml go: projects.tci.xml go: projects.tci.xml go: projects.tci.xml go: projects.tci.xml go: projects.tci.xml go: projects.tci.xml go: projects.tci.xml	

Appendix 3: Editing ICM+ Projects

Projects contain various configurations specific to a particular research project. These can be edited using **Projects** button in the main menu tool bar.



Clicking this button will open the Project Management dialogue, where you create, copy, edit, delete, export/import selected projects to/from a file.

Project Managem	ent			x
	Name	Abbreviation	Description	
	CENTER-TBI	СТВІ		
<u>С</u> ору	ICP monitoring	ICP		
Edit	CSF Infusion Study	INF		
- Delete	Overnight Monitoring of ICP	OVRNT		
Import	Traumatic Brain Injury	тві		
Export	TCD Monitoring	TCD		
🗸 ок				

Double clicking on a selected project or clicking on Edit will open a Project Editor where all the custom project settings can be modified.

				Project Configuration		
General	Data Fields	Events	Data Archiving			
Proje	ct Definition					
Nar	ne:	6	TCD Monitoring		Abbreviation:	TCD
Des	scription:	ſ				
		ļ				
Cus	tom Module:	ļ				r 1
Dat	a Folder:		\Mac\Home\Documer	ts\ICM+\Data\		1
Con	fig Folder:		W:\ICM+\Configs\			1
Dat	a File Name Fo	ormat:	<project>_<date><tim< td=""><td>e>_<computer></computer></td><td></td><td></td></tim<></date></project>	e>_ <computer></computer>		
Def	ault config pro	files:	Profile DWL with ABI	via Intellivue.icmc		1
		E	nforce default confin	uration profiles		
			more detadit coming	aration promes		
				t		
~ 0	к 🗶	Cancel	S Keyboard			

1 . The project **abbreviation** will be part of the file name

2. **'Data Folder'** is a local folder where the data collected as part of this project will be stored

3. '**Config Folder'** is a folder (could be a network share) where the data configuration profiles are kept

4. **Data File Name Format** lists elements that will be used to create automatic file names for each new data acquisition sessions.

5. **Default config profiles** lists profiles that will be available to select in the new data acquisition forms.

neral Data Fie	elds Events Data	Archiving		
Data Fields Def	initions			
	Name	Caption	Туре	Description
🕂 Add	GCS	GCS	Category	Glasgow Coma Score at admission
🗂 Edit	СТ	CT Marshall score	Category	CT Marshall score at admission
X Remove	ТуреТВІ	Type of TBI	Category	General type of brain trauma
Move Up	Politrauma	Politrauma	Category	Other significant injury
👆 Move Dn				
	Y Canaal @	Keyhaard		

The data fields define placeholders for general clinical descriptors that characterise the patient at the time of admission to the critical care unit, that are useful to be kept together with the monitoring data.

Project Config	guration	1			
General Dat Use Custor	ta Fields Events m Events Form: Event Gro nplications I gnostics gnostics NPH d infusion control control ervention Other ervention Surgical assurements dication Barbiturate diction Bolus dication Infusion	Data Archiving Custom Fo Oups s	T CENTER-TBI Al selected (checked) events Al sooprUP (Vasopress/Inotropes UP) CTBI VasoprDown (Vasopress/Inotropes DOWN) CTBI Fluid (Huid Bolus) CTBI SedDo(Sedation UP) CTBI SedDo(Sedation DOWN) CTBI SedDo(Sedation Bolus) CTBI		
	= +] 🗙 🕅	☑ □		
V OK Keyboard					

This is where events that are already defined elsewhere (in the Events form), listed in the left panel (1), can be assigned to the particular project (listed in the right panel 2.).

Please note that there is also an option of using a customised event form (designed for CENTER-TBI project), selected using the 'Custom Forms' list box (3). It is possible however to add more events to the project but those will only be accessible from within the 'Event List' panel, toggled from the main menu tool bar panel, Charts section.

Project Configuration
General Data Fields Events Data Archiving
Show data packaging prompt at the recording session end
Data Archive Folder
\\fileserver\archive
Create New Subfolder Use original file name for the subfolder
₩ Create info text file
Reset to defaults
Remote upload server
Default Destination:
Data Snapshots
Show data snapshots reminders
Snapshot length [minutes] 60
List of timepoints for data snapshots [hours]
VK Cancel

Here one can define the location and type of data archive procedure:

- This should be ticked in order for you to be prompted to convert the file to archiving HDF5 format at the end of the recording session
- 2. Location of a local file server for data archiving,
- the destination of a remote SFTP upload data server , configured in the Settings, and facilitating multicentre data collection projects

Appendix 4: Registering ICM+

When ICM+ is successfully installed for the first time in a computer it needs to be registered. This will probably already be done for you when you get the laptops, but if any major update needs to be done you will have to register it again.

To register ICM+ you need to press the Registration button on the Home tab.



This will bring up the Detailed ICM+ License Info window where you will need to press the Register New Key button.

Detailed ICM+ License Info			x
ICM+ Registration Status	4	3rd Party Plugins	
Unregistered			
Simulator			
Pressio Pressio2			
Qose			

This will bring forth the ICM+ Registration Form.

InstallCode:	Please quote this code for any further assistance 905F4BC6C299
Username:	peter
Institution:	University of Cambridge
Computer:	HEX Copy Details Email Details
Register No Please enter the	J₩ registration key, then press the [Register] button

Using Copy Details button one can then copy the registration details to paste into an email and send to <u>ps10011@cam.ac.uk</u> with a request to generate a key. The Email Details is a shortcut for this when the computer is networked.

Once the key is received it needs to be pasted into the highlighted space and Register now button clicked upon which the registration successful dialogue should appear.



And the Detailed ICM+ License Info window should now look like this:

CM+ Registration Status		3rd Party Plugins	
Registered To: peter		Summary Statistics Functions	
Institution:		MCEntrony D. 11	
Registration Valid Until: 23/05/2021		Registered (99999 days left)	
Registered Features	_	Multiscale Entropy function	
Data Acquisition And Real-time Analysis	4	Python Functions Registered (10000 days left)	
Customisable Analysis Configuration	4	Allows using custom Python functions for data p	
Raw Signals Recording	1	CA functions plugin Degistered (9999 days left)	
Off-line Analysis of Raw Signals	1	The plugins implements various function forcal	
CSF Dynamics Tools	1	Custom Data Charte	
Cerebrovascular Reactivity Tools	1		
P Register New Key		MSEnChart Registered (99999 days left) Multiscale Entropy Chart	
Installed Monitor Modules		Poincare Chart Pl Registered (20 days left) This is an example of a chart plugin in a dll f	
ortalite			
eneVision			
ucid			
ereLink			
ControlWave			
WLQLTCD			
emedexBPM			

Appendix 6: Preconfigured users and passwords

Administrator – 2718 Manager – 1618 Operator – 3142 Nurse – 1414

The users, their passwords, and their rights are fully configurable in the software, using Users form. The default users have been chosen to fulfil the following roles:

User	Role
Administrator	Complete access to all the software configuration options, the users and passwords
Manager	Access to all the configuration options, except the users and password. This will normally be the user to do the entire configuration needed for data collection.
Operator	Control of the data collection process using preconfigured profiles, and changes to the charts layout and properties.
Nurse	Access to clinical annotations tools only. This should be normally set up as the default user kept logged-in during the data collection process, in order to prevent any inadvertent disruption to data recording but at the same time allowing and encouraging quick access to the clinical annotations.
Guest	This 'user' has no rights, making it impossible to interact with the software in any way.

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