

COMPUMEDICS USA, INC.

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1 Introduction

The primary part number for the Compumedics CURRY product is 9138-0050-01. CURRY 8 is a major upgrade from CURRY 7. It builds upon all the features of CURRY 7 but with new exciting features to make recording, review and analysis of EEG and MEG as well as medical image data easier.

CURRY 8 software suite comprises the following programs:

- CURRY 8
- CURRY 8 Launcher
- Dongle Updater

2 Changes in CURRY 8.0 from CURRY 7

This is an overview of the most significant changes and bug fixes that were made to the current software release compared with the last release, CURRY 7.

2.1 Highlights

- CURRY 8 is a native 64-bit application with unlimited memory access
- Redesigned user interface with new look-and-feel, reduced visual clutter, popup toolbars in data display area, toolbars above parameter panels
- Programmable function keys (F-keys) for quick selection of montages, filters, etc
- New head models: individualized FEM, inside sphere, precomputed BEM head model with option to exclude cerebellum from source analysis
- Source analysis based on Stereo-EEG is now possible
- New current density methods: LAURA, swLORETA, FOCUSS, ssLOFO
- Image Data rotation support for Segmentation Preview, Segmentation Result, MIP, Localize
- New grid view image data display option showing multiple axial slices simultaneously

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- Support for up to five image data sets; database drag-and-drop support with parameter persistence for up to ten image data sets
- Pial surface created together with cortex
- New Statistics methods Maps SnPM, CDR SnPM, temporal multiple comparison correction
- Stand-alone Digitizer module supporting new devices (NDI Krios and Polhemus Patriot)
- Options to stream live data to MATLAB or via TCP/IP (NetStreaming), dedicated to BCI applications
- Exported data files contain a file history, documenting previous filenames and processing steps

2.2 User Interface

- Windows 10 look-and-feel
- Redesigned icons
- High-resolution display support
- Popup toolbars in data display areas; toolbars above parameter panels
- Touchscreen gesture support (swipe, zoom, etc)
- Selectable menu and dialog fonts
- Option to “not show again” information and warning popup windows
- Reworded text in popup dialogs so that all buttons have descriptions matching their actions (as opposed to generic text such as “OK”)
- Redesigned progress bar with smooth progress for nested tasks and display of remaining time; progress indication in Windows taskbar.
- Redesigned file dialogs with Options popup dialog; meaningful suggestions for file names and folders when saving files for more types of files saved; option to open file after saving for more types of files saved
- Redesigned 3D View Properties dialogs, now matching the rest of the software

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2.3 Database

- New database file format, based on Sqlite3. Legacy .mdb files still supported.
- Groups of subjects/patients: “Experiment” renamed to “Group”.
- Option to include multiple macros in a study, one of which can be executed automatically when opening the study; study macros can be run via right-click menu.
- Option to not display results when loading all results contained in a study.

2.4 EEG and MEG Data Import

- New simplified format for functional data parameter files. Legacy .dap / .rs3 format still supported.

2.5 Signal Processing

- The data processing pipeline can be customized regarding processing steps (Rereferencing, Baseline Correction, Filtering, Template Matching, Artifact Reduction, Miscellaneous) and their order.
- Up to five applications of each processing module are possible.
- Processing scopes for ERP, Epilepsy, and Curry 7 legacy.
- Template matching with automated time range selection (-100 ... +400ms) around single timepoint.
- Events and epochs can now be analyzed for the same criteria (Voltage, Noise, SNR) in order to exclude/reject outliers.
- Dipole clusters can be computed by scanning selected events or epochs.
- Possibility to perform a data interpolation for standardized 10/20 electrode positions.
- Continuous wavelet transform for time-frequency analysis, supporting Morlet, Mexican Hat and Paul wavelets.
- Exported data files contain a file history, documenting previous filenames and processing steps.

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- Also export video when exporting a data file.

2.6 Maps

- Statistics p-Values are now displayed in logarithmic scale; improved display of insignificant segments in hatched style
- Option to use equal scale even if not in butterfly plot mode
- Gray backdrop if SNR in PCA/ICA plots is below 1

2.7 Source Reconstruction

- New head models:
 - individualized FEM (for Scalp-EEG and Stereo-EEG) based on tetrahedra or cubes, with support for anisotropic skull
 - inside sphere (for depth electrode support)
 - precomputed BEM head model allowing to exclude cerebellum from source analysis
- Option to perform source analysis for Stereo-EEG
- Option to create a BEM or FEM head model directly from the head model dropdown
- Option to exclude a certain volume-of-interest defined by image data markers or overlays from the allowed source space
- New default brain-to-skull conductivity ratio of 25 (instead of 80); display of brain-to-skull conductivity ratio in Head Model panel
- Option to adjust scaling of standard surfaces and precomputed head models based on electrode locations
- Option to start dipole clustering directly from Fit parameters
- Logging of achieved and expected deviations (goodness-of-fit)
- New current density methods:
 - LAURA

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- swLORETA
- FOCUSS
- ssLOFO
- New CDR dipole (“virtual electrode”, “probe”) options
 - regional CDR dipole
 - mirrored CDR dipole
 - CDR dipole representing a volume-of-interest defined by image data segmentation result or markers
- New button to initialize coherence clipping based on display clipping used for current density results

2.8 Image Data Import

- Support for additional image data file formats
 - Freesurfer .mgh
 - Freesurfer compressed .mgz
 - Nifti compressed .nii.gz
 - JPEG 2000-encoded DICOM
- Improved built-in image datasets
 - higher-resolution standard dataset based on ICBM-152
 - new pediatric dataset for age range 0-5.
- New field strength UI on File Format page
- Autodetection of real-world data range from image data files
- Threshold page including threshold estimation is only offered if modality is MRI
- Histogram correction (based on ITK N4 algorithm) for improving intensity homogeneity; automatically suggested if field strength is larger than 2.5T
- Option to import landmarks from first image data set

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2.9 Image Processing

- Pial surface is now created along with cortex and can be activated for display in 3D View cortex properties.
- Rotation, reslice support and Localize location display for
 - Segmentation Preview
 - Segmentation Result
 - Maximum Intensity Projection (MIP)
- New grid view display option showing multiple axial slices simultaneously
- Option to display up to five image data sets simultaneously
- Parameter persistence for up to ten image data sets when reordering them in database
- Improved display of DTI fractional anisotropy data with fiber orientation lines overlaid onto orthogonal views
- Option to activate “magnetic” cursor where highest intensity in vicinity is selected after clicking in image data.
- New automatic marker shape mode that fills existing segmentation result with markers and draws a sphere when clicking outside of segmentation result
- New option for saving image data
 - RGB DICOM file format
 - DICOM name, age, birthday, gender, study, series, accession number support
 - DICOM anonymization option
 - Save image data sets in the same coordinate space
- Option to use high-contrast symbols for dipole display, which can be selected in 3D View dipole properties (“2D Symbol”)
- Option to superimpose more than one thresholded image data set
- Option to subtract left vs. right portions of image data.

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- Option to restrict display of source results to nearby slices, which can be selected in 3D View dipole properties (“2D Distance”)
- Option to disregard Stop markers in MIP view
- Option to keep histogram colorscale centered by pressing <Alt> when dragging outer handles
- Option to center zoom at cursor location
- Option to display atlas structures below cursor
- Option to display an image data scale; possibility to restrict scale display to functional data such as PET, SPECT, fMRI and to axial slices only
- Adjustable cursor size and line width including “auto” mode
- Color scale support for head model display and dipole clusters (color by epoch type)
- User interface for histogram color scale limits
- New “PAN tilted” reslice option which offers the same angulation as used in 3D View.
- BEM/FEM geometry panel now allows to create FEM head models for use with Scalp-EEG and Stereo-EEG; skull anisotropy support; display of brain-to-skull conductivity ratio
- New menu entries to create Voxel Mesh in raw image data resolution
- New menu entries to create brain mask, where different algorithms are used for MRI and CT data
- Display of real-world intensities in image data tooltips and on scale
- Persistence of image data save and display options across multiple simultaneous image data sets

2.10 3D View

- Updated 3D engine (Direct X11) for better and faster hardware support
- New layout options with four, six, and nine views
- Option to create movie file where the cut plane changes position

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- Option to control behavior of “Rotate Eternal” via a popup dialog: normal, slow, advance display time as rotation progresses
- Support for RGB image data in cutplanes
- Improved standard surfaces: skin, skull, brain, cortex
- Option to display 3D Talairach grid
- Option to display waveform information for selected sensors and dipoles

2.11 Localize

- New layout options with large rotatable MIP
- Multi-selection support in location list and change locations panel
- Option to adjust Localize symbol shape
- Option to remove all locations outside of active head model
- Support for individual colors for Localize locations
- Support for defining individual EEG channel groups for Localize locations
- Support for additional file formats
 - column-based free-format ASCII file support
 - Elekta .dip file support
 - normals and strengths from plain text files
- New “Action Potential” waveform for simulation
- Option to create Stereo-EEG depth/needle electrodes in Grid geometry panel
- Option to change location labels based on current EEG channel labels
- Option to load only labels from an exiting file
- Option to create normals based on locations of nearest neighbors
- Improved “Change Sensor Locations” functionality with less requirements regarding existing landmarks and affecting active channel groups only

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2.12 Results

- New Statistics methods
 - Maps SnPM (calculates significances per sensor)
 - CDR SnPM (calculates significances per source location)
 - Difference test for single epoch/condition type
- New Statistics options
 - suggestion to activate “Use all selected epochs” if applicable
 - temporal multiple comparison correction
 - collapse (average) samples
 - auto-adjust number of randomizations
 - calculate statistics for shifted latencies per condition
 - exclude an epoch type or condition in statistics (applies if more than two are available)
 - auto-create group and condition labels based on grid data
 - resample source locations to new geometry
 - include number of epochs in output
 - statistics text output is now stored with Statistics results and saved to result files
- Improved result tree display
 - Multi-selection support
 - New Load/Delete/Save/Delete File options when right-clicking category in Results tree
- Improved Kept Results
 - New automatic replace and append modes, accessible from Source Reconstruction toolbar
 - Menu option to change dipole size to Uni when keeping or appending to results

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- Option to export CDR and Scan results in DICOM format
- Option to export triangle meshes (including source results) in STL format for 3D printing
- Option to export source results and lead field as EEG/MEG data file
- New Freesurfer RAS coordinate system; option to import Freesurfer triangle meshes (.asc and binary formats)
- Option to not transform coordinate system when loading results (assuming locations in result file are valid for currently selected coordinate system)

2.13 Workflow

- Scope support. Scopes are sets of factory defaults for certain application areas. Epilepsy, ERP, and Curry 7 scopes are provided; custom scopes can be created.

2.14 Automation

- Support for macros in sub-folders
- New macro language features (* example macros are available)
 - conditional branches*
 - calling sub-macros*
 - loops*
 - labeled jumps*
 - show a banner and read banner text
 - exit (end macro execution)*
 - Option to auto-proceed if popup dialogs aren't acknowledged
 - shortcut *LL expands to current Localize label
 - shortcut support for popup, Report, and Output window texts
- Option to resume macro after opening derived study from within macro
- Option to start macro opened from arbitrary location as well as study macros in single-step mode

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2.15 Report

- Macro support for Report interactions
- Option to paste description to Report for all results

2.16 Acquisition

- Digitizer module is now a separate module (see 2.17)
- Options to stream live data to MATLAB or via TCP/IP (NetStreaming), dedicated to BCI applications (including demo applications in C++ and MATLAB)
- Option to define multiple EEG groups in an amplifier configuration (useful when using multiple grid-, strip- or depth-electrodes)
- Option to use downsampled data for online data processing, while recorded file maintains original sampling rate
- Option to convert recordings into other formats (such as edf or cnt) without the need of the signal processing module
- Option to perform definable actions (start/stop recording, run quick impedance check) on definable event-codes
- Option to automatically generate definable events at a definable interval
- Option to overlay processed and unprocessed data
- Option to change the Sensor Placement in the Position Plot view (with background picture, if available)
- Option to define a timer to stop a recording
- Option to filter Event Log by event type
- Option to record data in compressed file format
- Option to send single epochs to MATLAB or Functional Data
- Video Pan/Tilt/Zoom controls for Vivotek cameras

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2.17 Digitizer

- Stand-alone Digitizer module (can be combined with Acquisition-, Functional Data- or Localize Module)
- Added Polhemus Patriot support
- Support for point-cloud files created with NDI Krios digitizer
- Option to estimate electrode positions to speed up the digitization process

2.18 Miscellaneous

- Curry 8 is a native 64-bit application with unlimited memory access. On 32-bit versions of Windows, a 32-bit version of Curry is installed
- Option to import existing CURRY 7 settings after installation
- Restructured Edit > Options windows
 - Option to delete to recycle bin
 - Option to adjust fonts and to limit font size
 - Option to specify hardcopy height while preserving aspect ratio
 - Option to specify network dongle release time after period of inactivity
 - New visual styles with on-the-fly switching between styles
 - New pages: Settings, User Interface, Function Keys, Acquisition
- If necessary for changes to become effective, restarting Curry is offered
- Option to restore last open study after recovering from a crash
- Option to not send installation/upgrade/downgrade notification email
- Option to disable auto-scrolling in Output window
- New bright colors and color scales; automatic colors names support for user-defined colors
- Compressed file format (lossless, data files are ca. 30% smaller)
- Programmable function keys (F-keys) for quick selection of montages, filters, etc

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- Montage editor always shows an empty trace at the end of the traces list, for easier editing
- Option to display multiple video windows
- Improved visibility of the waveform scale, including the option to change its position
- Option to display smooth waveforms and contour maps
- CURRY 8 Launcher application with advanced launch options

3 Known Issues

These are the known issues with the current release:

- none

4 Recommendation for Users in the Midst of a Study

If you are in the midst of a study and consider upgrading from CURRY 7 to CURRY 8, you are advised not to do so.

5 Installation / Upgrade

CURRY 8 is not an update to CURRY 7, but a major release. It does not require the existence of any CURRY 7 software. If you already have CURRY 7 installed, it is possible to install CURRY 8 alongside it as long as they are installed in different directories.

6 Operating System

CURRY 8 is designed for use on Microsoft Windows 7 or later, 32 or 64-bit and has been extensively tested on Windows 7 32-bit, Windows 7 64-bit, and Windows 10 64-bit. Microsoft Windows Vista or earlier as well as Windows Server operating systems are not supported.

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7 Contact and Support Information

A procedure for obtaining support, reporting problems, or requesting features for this software release:

7.1 Obtaining Support

Send an e-mail to curry8help@neuroscan.com. This can be done via

- Help > Send E-mail to Helpdesk

7.2 Reporting Problems

7.2.1 Curry Produces a Warning

If you are suspicious about a certain warning (error message):

1. Edit > Options > Troubleshooting > Enable Debug Mode
2. Reproduce the error message as straightforward as possible
3. In Output, right-click and select Open in Editor
4. Save the log file and mail its contents to curry8help@neuroscan.com

7.2.2 Curry Crashes

1. Edit > Options > Troubleshooting > Enable Debug Mode
2. In Output, right-click and select Open File Location
3. An Explorer window opens
4. Reproduce the crash as straightforward as possible
5. In the Explorer window just opened, locate the most recent log file and e-mail it to curry8help@neuroscan.com

7.3 Requesting Features

Send an e-mail to curry8help@neuroscan.com. This can be done via

- Help > Send E-mail to Helpdesk

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