

CSV File based EMR Interface Description

The following Plusoptix instruments can interface with an EMR (Electronic Medical Record):

- Mobile Pediatric Autorefractor plusoptiX **A12C**
- Mobile Vision Screener plusoptiX **S12C**
- Pediatric Autorefractor plusoptiX **A16**
- Vision Screener plusoptiX **S16**

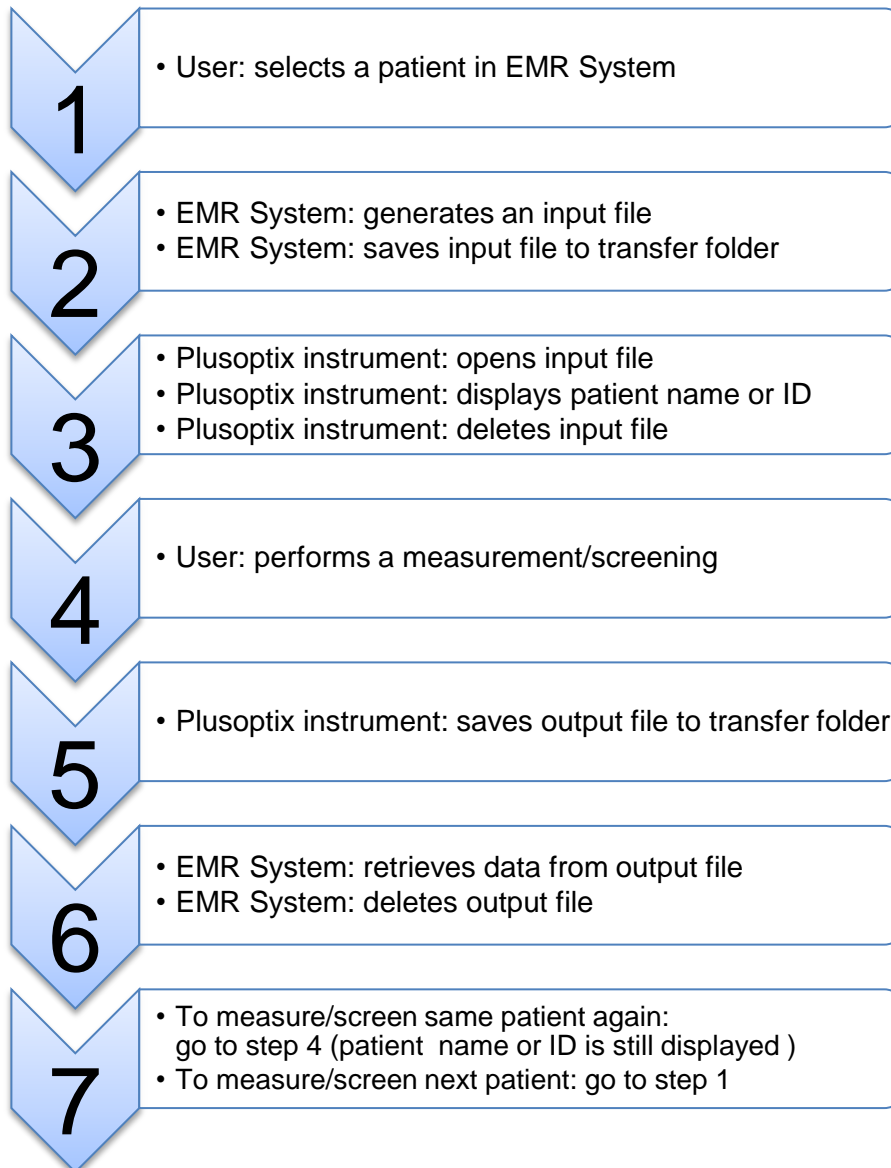


This document amends the user manual of each instrument. It describes how to make the EMR interface work by the use of CSV files. This is a “full” integration, i.e. patient name or ID is sent from the EMR System to a Plusoptix instrument, and measurement/screening results are saved to data fields within the patient’s EMR.

Please note that an EMR Interface is not needed if you just want to attach a PDF File Report to a patient’s EMR (see paragraph Descriptions & Definitions for a description of a PDF File Report). Refer to the user manual of your Plusoptix instrument for instructions to print a PDF File report or to copy and paste it to a patient’s EMR.

CSV File Exchange Workflow

This flow chart illustrates all tasks that need to be performed.



Plusoptix instruments will keep last patient information until a new input file is saved to transfer folder. Therefore an inconclusive measurement/screening can be repeated without providing the patient's input file again.

If an output file is not deleted in step 6, each successive measurement/screening result will be added in a new row to the existing output file.

Descriptions & Definitions

To avoid misunderstandings and misinterpretations, key words are defined here:

- Network Interface** All Plusoptix instruments mentioned above feature a WLAN interface. plusoptiX A16/S16 feature a LAN interface (RJ-45) additionally. Please note that if an instrument features both (WLAN and LAN), only one interface can be used at a time, and a selection needs to be made in device settings.
- Device Settings** All Plusoptix instruments can be customized in device settings. Please refer to your Plusoptix instrument's user manual for further information.
- DHCP Server** All plusoptiX 12 instruments need to obtain their network address from a DHCP server, i.e. a server that allocates IP addresses automatically. plusoptiX 16 instruments can obtain their network addresses either by automatic allocation by a DHCP server or by allocation of a static IP address.
- Network Password** In WLAN networks, WPA 2 security protocols are being used. Please note that network password may not exceed 63 characters.
- EMR Interface** In order to exchange patient data and measurement / screening results between your EMR System and your Plusoptix instrument, an EMR interface as specified in this document needs to be implemented by your EMR System provider. Please note that neither Plusoptix nor any Plusoptix distributor can perform necessary modifications in your EMR System.
- Transfer Folder** Once a Plusoptix instrument has received a network address from a server, a so called "transfer folder" will be accessible. This transfer folder is physically located within your Plusoptix instrument, and it is being used in order to exchange input as well as output files between your EMR System and your Plusoptix instrument. The network paths of transfer folders are:

\\px12-xxxx\transfer\ (for A12C/S12C)

and

\\px16-xxxx\transfer\ (for A16 /S16)

In order to be able to address multiple Plusoptix instruments within the same network individually, the last 4 digits of a Plusoptix instrument's Serial Number (S/N) are used in its network path. "xxx" is a place holder for these last four digits of the S/N. You will find the S/N on a sticker next to the battery compartment (A12C/S12C) or on the bottom of the camera cradle (A16/S16). Plusoptix Instruments are checking the transfer folder approximately every 2 seconds for a new input file automatically. Please note that this folder alone can be used to exchange input and output files.

Input File A file generated by your EMR System in order to provide patient information prior to a measurement / screening to a Plusoptix instrument. This file has to be named "input.csv", and it has to be saved to the transfer folder.

Output File A file generated by a Plusoptix instrument after a measurement / screening that has been performed or has been aborted, i.e. an inconclusive measurement / screening. This file is named "output.csv", and it can be retrieved in the transfer folder.



An input file triggers an output file. If your EMR System does not provide an input file in the transfer folder to begin with, your Plusoptix device will not write output files, and the transfer folder will remain empty. Once an input file is provided, the manual entry of patient data in the Plusoptix instrument's user interface is disabled until the Plusoptix instrument is rebooted.

PDF File Report In addition to an output file a measurement report (A12C/A16) or a screening report (S12C/S16) can be saved to the transfer folder. Reports are PDF documents that are meant to be shared with the patient. They provide measurement / screening results and a screenshot of the last video picture. They can be customized with an information column (S12C/S16) or an information header and footer (A16). Please refer to your Plusoptix instrument's user manual for a sample PDF File Report. In order to save a PDF File report to the transfer folder this option needs to be selected in device settings.



If the automatic export of the PDF file has been activated in the settings, a PDF file is saved in the transfer folder in addition to the original file for each successful measurement.

If one or more measurements are aborted without result, a PDF file is only stored in the transfer folder for the first aborted measurement.

Input File Specifications

An input file needs to meet the following specifications:

- Present patient information in a CSV File, side by side in one single line, and without a space after the separator.
- Adhere to this sequence: last name, first name, date of birth, patient ID, location, contact
sample: Smith,John,31.12.2016,1234567890,Downtown clinic,mom&dad@e-mail.com
- Use same date format as selected in device settings.
sample: Smith,John,12/31/2016,Downtown clinic,mom&dad@e-mail.com
- Contain five separators, a sixth separator after "contact" is optional.
sample: Smith,Mary,10/21/2014,1234567891,Downtown clinic,parent phone: 555-555-5555,

- Separate data fields using a comma or a semicolon as selected in device settings.
sample: Smith;Mary;10/21/2014;1234567891;Downtown clinic;parent phone: 555-555-5555;
- Include at least:
 - S12C and S16: last name, first name and date of birth. Last and first name can be substituted by a patient ID. Location and contact information are always optional.
sample with minimal information: Smith;John;12/31/2016;;;
sample with patient ID as a substitute for last and first name: ;;12/31/2016;1234567890;;
 - A12C and A16: last name and first name. Last and first name can be substituted by a patient ID. Date of birth, location and contact information are always optional.
sample with minimal information: Smith;John;;;;;
sample with patient ID as a substitute for last and first name: ;;;1234567890;;

Output File Specifications

An output file presents information in a CSV File. Comma or semicolon separators are used as selected in device settings. There are no headers in the first line. Information of each measurement/screening is presented side by side in a single line in this sequence:

- 1st column: Date and time stamp, formatted as selected in device settings
- 2nd column: Internal check-sum
- 3rd column: Same last name as provided in input file
- 4th column: Same first name as provided in input file
- 5th column: Same date of birth as provided in input file
- 6th column: Same patient ID as provided in input file
- 7th column: Same location as provided in input file
- 8th column: Same contact as provided in input file
- 9th column: Spherical measurement value of the right eye in diopters [dpt]
- 10th column: Cylindrical measurement value of the right eye in diopters [dpt]
- 11th column: Axis measurement value of the right eye in degrees [deg]
- 12th column: Pupil diameter measurement value of the right eye in millimeters [mm]
- 13th column: Spherical measurement value of the left eye in diopters [dpt]
- 14th column: Cylindrical measurement value of the left eye in diopters [dpt]
- 15th column: Axis measurement value of the left eye in degrees [deg]
- 16th column: Pupil diameter measurement value of the left eye in millimeters [mm]
- 17th column: Measurement value of gaze asymmetry in degrees [deg]

- 18th column: Distance between left and right pupil in millimeters [mm]
- 19th column: Indicator for measured/screened eye(s):
Value = "1" if right eye was measured (A12C/A16)
Value = "2" if left eye was measured (A12C/A16)
Value = "3" if both eyes were measured/screened binocularly (all Plusoptix instruments)
- 20th column: Indicator for measurement/screening result:
Value = "0" if screening result = "pass" (S12C/S16)
Value = "1" if screening result = "refer" (S12C/S16)
Value = "2" if screening was inconclusive (S12C/S16)
Value = "4" if measurement started and provided measurement results (A12C/A16)
Value = "5" if measurement started but no measurement results were obtained, i.e. measurement was aborted (A12C/A16)
- 21st column: Optional PDF file name:
A "PDF file name" is provided only if device settings are set to save a PDF file report to transfer folder. Otherwise this column remains empty. PDF file naming convention is:
<last name>-<first name>-<measurement date>-<measurement time>.pdf
With <last name> as provided in column 3, and <first name> as provided in column 4. If a Patient ID number is provided in column 6, <last name> and <first name> are substituted by <Patient ID>. Format of measurement date is [yyyymmdd] and format of measurement time is [hhmmss]. Samples of PDF file names provided by A12C/A16 are: Smith-Mary-20161028-094440.pdf and 1234567891-20161028-094440.pdf
Please note that S12C/S16 will add screening result to PDF file name. Screening result corresponds to screening result indicator in column 20, and can be [pass], [refer] or [inconclusive]. Samples of PDF file names provided by S12C/S16 are: Smith-Mary-20161028-094440-pass.pdf and 1234567891-20161028-094440-refer.pdf
- 22nd column: Indicator for referral criteria being used:
Value = "-1" if instrument doesn't use referral criteria (A12C/A16)
Value = "1" if referral criteria set ROC 1, was chosen in device settings (S12C/S16)
Value = "2" if referral criteria set ROC 2, was chosen in device settings (S12C/S16)
Value = "3" if referral criteria set ROC 3, was chosen in device settings (S12C/S16)
Value = "4" if referral criteria set ROC 4, was chosen in device settings (S12C/S16)
Value = "5" if referral criteria set ROC 5, was chosen in device settings (S12C/S16)
- 23rd column: Indicator for reason of referral:
A12C/A16 will always provide a value = "16777216" in this column.
S12C/S16 will provide a coded number that indicates the reason of a referral, with
Value = "0" if screening result is "pass"
Value = "1" if reason of referral is "Hyperopia right eye"
Value = "2" if reason of referral is "Hyperopia left eye"
Value = "4" if reason of referral is "Myopia right eye"
Value = "8" if reason of referral is "Myopia left eye"
Value = "16" if reason of referral is "Astigmatism right eye"
Value = "32" if reason of referral is "Astigmatism left eye"
Value = "64" if reason of referral is "Anisocoria"
Value = "256" if reason of referral is "Anisometropia"
Value = "1024" if reason of referral is "Gaze asymmetry"
Value = "33554432" if reason of referral is an inconclusive screening result



Multiple reasons of a referral will be added and provided in one sum, e.g.:
Myopia right and left eye with astigmatism in right eye will show value = "28" (=4+8+16)