Cloud Height Meter CHM 15k

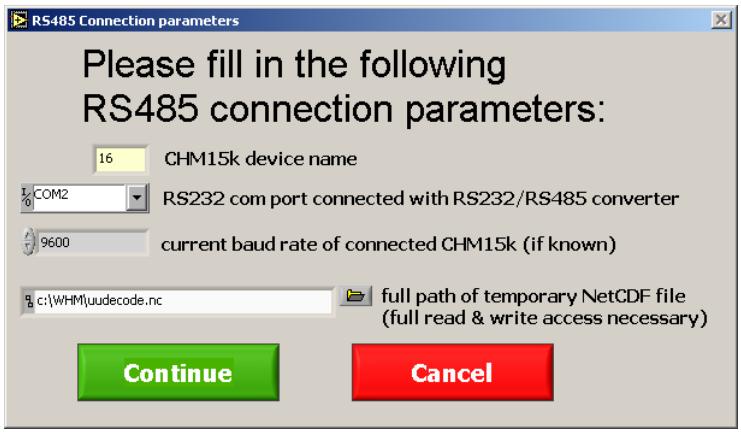
JO-DataClient:
Terminal software for CHM15k

1. Introduction

The main purpose of the Terminal program JO-DataClient is receiving data telegrams from CHM15k via RS485 connection line and displaying these data. Moreover, it can also be used for remote maintenance and diagnosis of connected CHM15k devices. Especially for these tasks there are basic commands for reading CHM15k system parameters, and with some restrictions also writing these parameters. This is based on the CHM15k command structure, described in chapter 8 of the User Manual. Finally, JO-DataClient provides an update procedure for CHM15k software components “JO-Main.exe” and “JO-CloVisCHM.exe” without interruption of normal measurement operation mode.

1.1 Menus and commands

Immediately after start the following dialog appears.

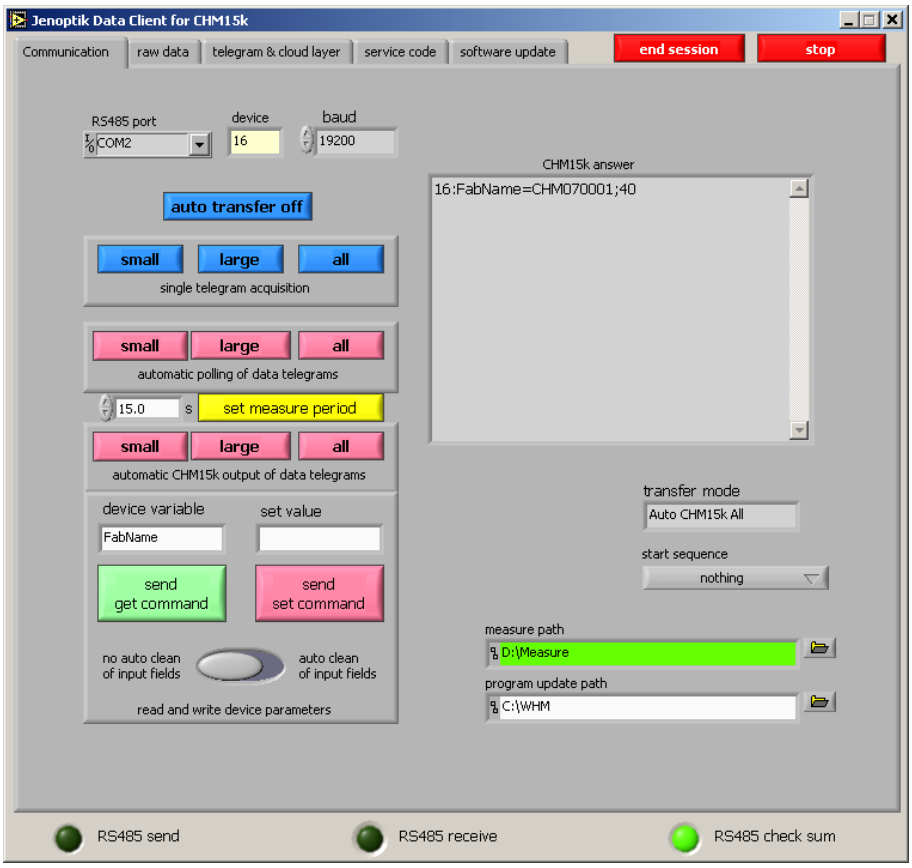


The four input fields on the left side should be filled with appropriate values. If the current baud rate of the connected CHM15k is unknown, then use the value “9600”, in case of false connection speed the CHM15k will automatically set speed 9600 for itself after 30 seconds.

With “Cancel” the program terminates.

With “Continue” the program will enter normal operation mode with five pages, which are explained in the following sections.

1.2 Communication



This is the main page where all actions (except Software update) are carried out. Remaining four pages serve merely the monitoring of the measuring data as well as service information.

All control elements are placed on the left side of the page. Responses of the CHM15k can be read unfiltered in the display box "CHM15k answer". The raw data part of raw data telegrams is not displayed here, because these data would be too much for this box.

Details of control elements. The top row encloses the interface parameters:

- RS485 port:: Here the RS232 port which is connected to the RS232-485 adaptor is displayed. It can only be changed by the initial dialog (see above).
- device: The name of the connected CHM15k device.
- baud: With this electoral switch the baud rates 1200, 2400, 4800, 9600, 19600 or 38400 bauds can be selected. Note, that the factory default value is 9600 baud.

Below there is a button named “auto transfer off”. Pressing this button means, that all previous automatic transfer modes will be cancelled.

The next block contains three buttons for single telegram acquisitions:

- small: The standard data telegram is requested, see user guide, section 8.2.2.
- large: The advanced data telegram is requested, see user guide, section 8.2.3.
- all: The raw data telegram is requested, see user guide, section 8.2.4.

The next block contains three buttons for automatic polling of data telegrams.

Below there is an input field for the internal measure period (in seconds) of the CHM15k. The associated button must be pressed, if this value should go into effect for the CHM15k device. Nevertheless, this value is also used as the time between automatic polling mode acquisitions described in the previous paragraph, and changes of the value in this sense are applied **without** pressing the button “set measure period”!

The next block contains three buttons for automatic telegram output, initiated by the CHM15k itself, i.e., not by polling.

Remark: All six automatic telegram modes will be cancelled by pressing the button “auto transfer off”, or also by acquisition of one of the three single telegrams.

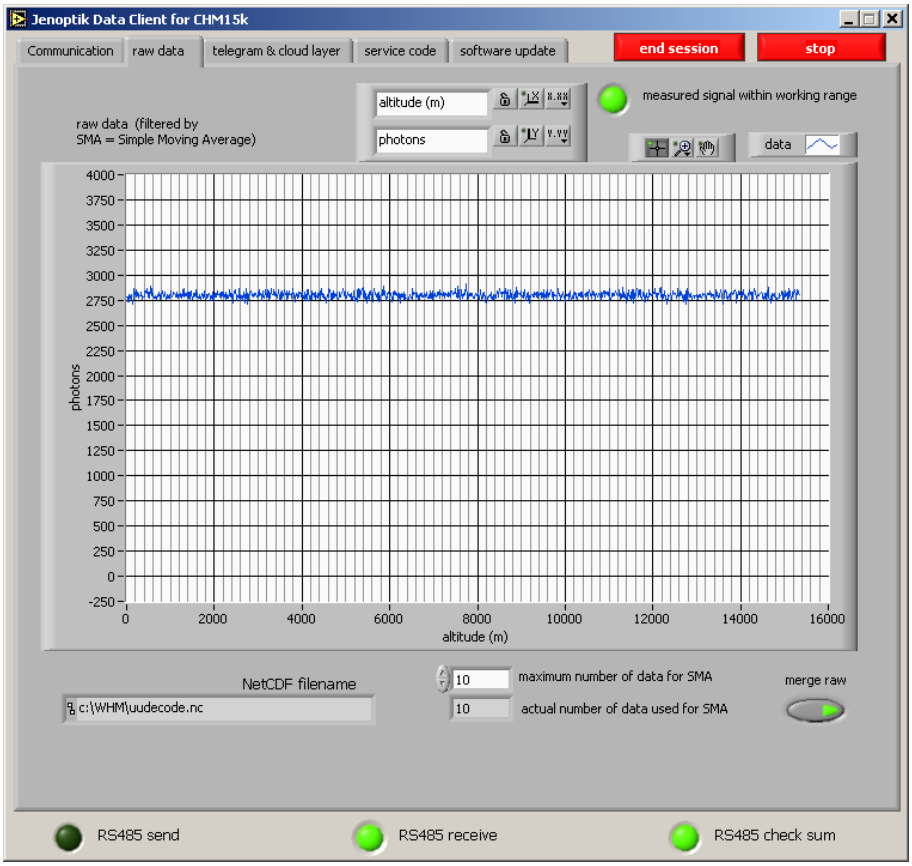
Now a block follows for reading and writing internal CHM15k parameters:

- device variable: Here the name of the concerning CHM15 parameter has to be specified. A summary of these parameters can be find in the user guide, tables 4 and 16.
- set value: Value for the “send set command”.
- send get command: The current value of the parameter is displayed in the box “CHM15k answer” on the right side.
- send set command: Value "set value" is transmitted to the CHM15k. Provided that the suitable parameter is really alterable and is in the permissible range, the successful parameter update will be acknowledged in the box “CHM15k answer”. If one of these restrictions is violated, there is no acknowledgement and the parameter is not changed. For safety reasons some of the parameters are alterable only in the service mode, see user guide, section 8.6.
- switch “auto clean of input fields”: If activated, the two input fields “device variable” and “set value” will be erased after each set or get command

Finally another two paths are adjustable which concern local paths of the computer, where JO-DataClient runs:

- measure path: In this directory the telegram messages of CHM15k will be saved in subdirectory structure, which depends on device name and date, for later evaluations.
- program update path: If a software update has to be carried out (see last page) this path must contain the new program files to be transmitted. This path is to be set here only in the case, if during a running update process JO-DataClient is terminated and is newly started later again. In the latter case the update directory has to be customized immediately after the restart.

1.3 raw data

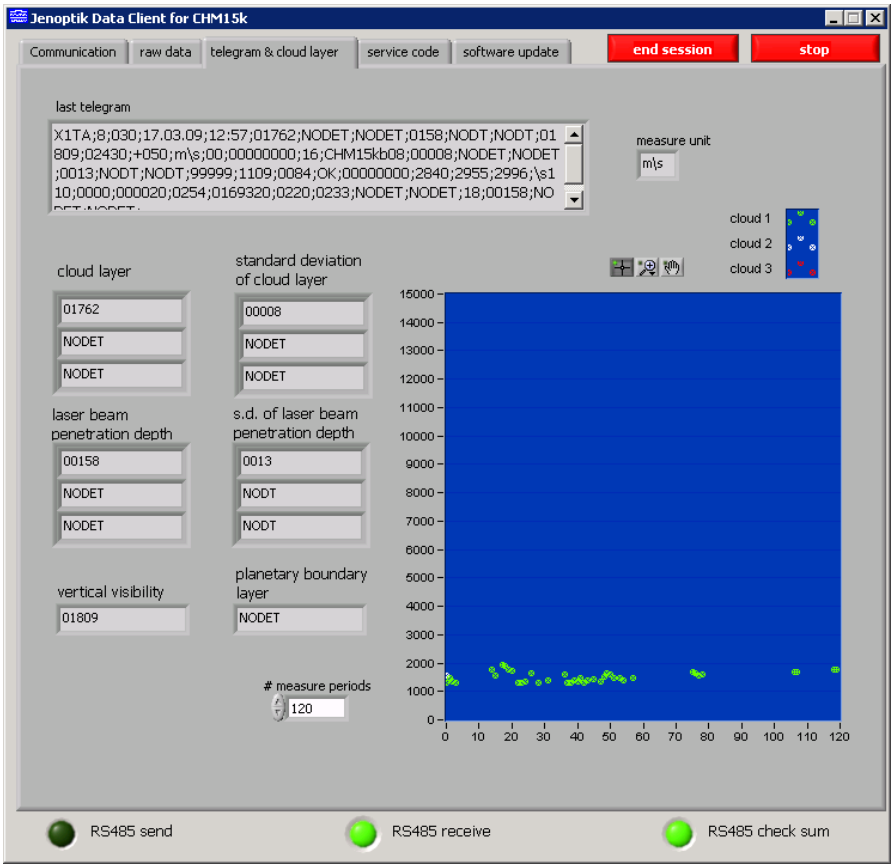


In the graph shown here the raw data of the last transmitted raw data telegrams are grasped. In fact, a simple moving average (SMA) filter is applied on the last 10 raw data telegrams, this number 10 is changeable in the input field “maximum number of data for SMA “. If the value 1 is set in this field, the raw data of the last received raw data telegram are displayed in the graph. The field “actual number of data used for SMA“ contains the number of raw data records used for SMA calculation - without change of parameter “maximum number of data for SMA“ this value should grow with succeeding telegrams up to 10.

The signal light “measured signal within working range“ shows whether the data are suitable for cloud height calculation. During the start phase of the CHM15k this light is possibly still red, nevertheless, after a run time of about four minutes it should change to green, which indicates correct operation mode of the detector.

“NetCDF filename” specifies the entire local path of the last transmitted raw data telegram, this file is overwritten every time a raw data telegram is received. A sequential acquisition of these NetCDF raw data is possible by setting on the switch "Merge Raw".

1.4 telegram & cloud layer

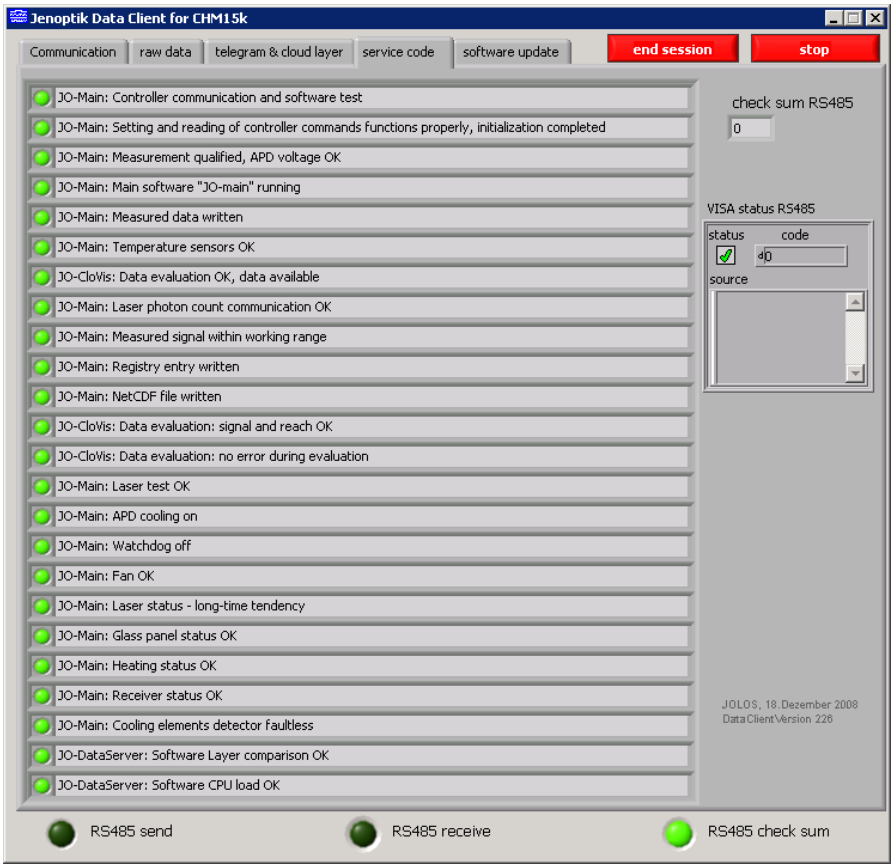


All types of telegrams contain up to three cloud layer an associated laser beam penetration depths; in the advanced and raw data telegrams also the standard deviations of these values. All these values are displayed on the left side of this page, together with the last received telegram message. At the bottom there is also a line displaying the vertical visibility and the planetary boundary layer.

The right side shows the course of cloud heights over the last 120 telegrams.

In the above example we see two recognized cloud layer, hence the field for the third cloud layer is marked with NODET or NODT, short form for "not detected". The first cloud layer is at a height of 765 meters with a penetration depth of 105 meters, the second layer at a height of 4,980 meters and a penetration depth of 285 meters. The vertical visibility is 1,880 meters and the planetary boundary layer is located at 8760 meters.

1.5 service code



Each telegram message contains a service code field: In the standard telegram it consists of 8 bit, in all other telegrams of 32 bit. On this page these service code bits are listed clearly by their meaning. Moreover, a green signal light shows the proper operation of the suitable function. During the start phase of CHM15k some of these signals lights maybe still dark. However, after some minutes the CHM15k should enter normal operation mode with all lights on. Disabled lights can be hints for trouble-shooting.

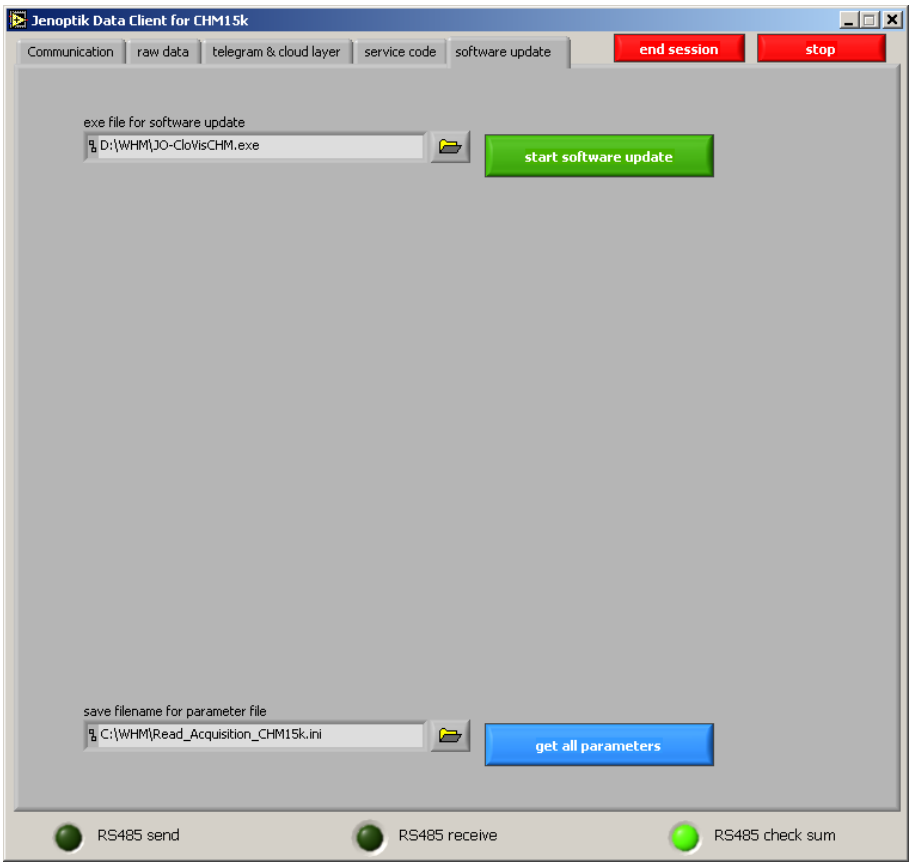
Every received message from CHM15k (telegrams & set/get command answers) contains a gibberish total in terms of two's complement. Transmission is checked by this gibberish total, proper transmission is indicated by value zero in the field "check sum RS485". Non-zero values indicates transmission problems, cables and transformers must be checked carefully (proper grounding, termination and pull up/pull down resistors etc.) and/or the transmission speed should be lowered (see field "baud" in section 2.1).

1.6 Software update

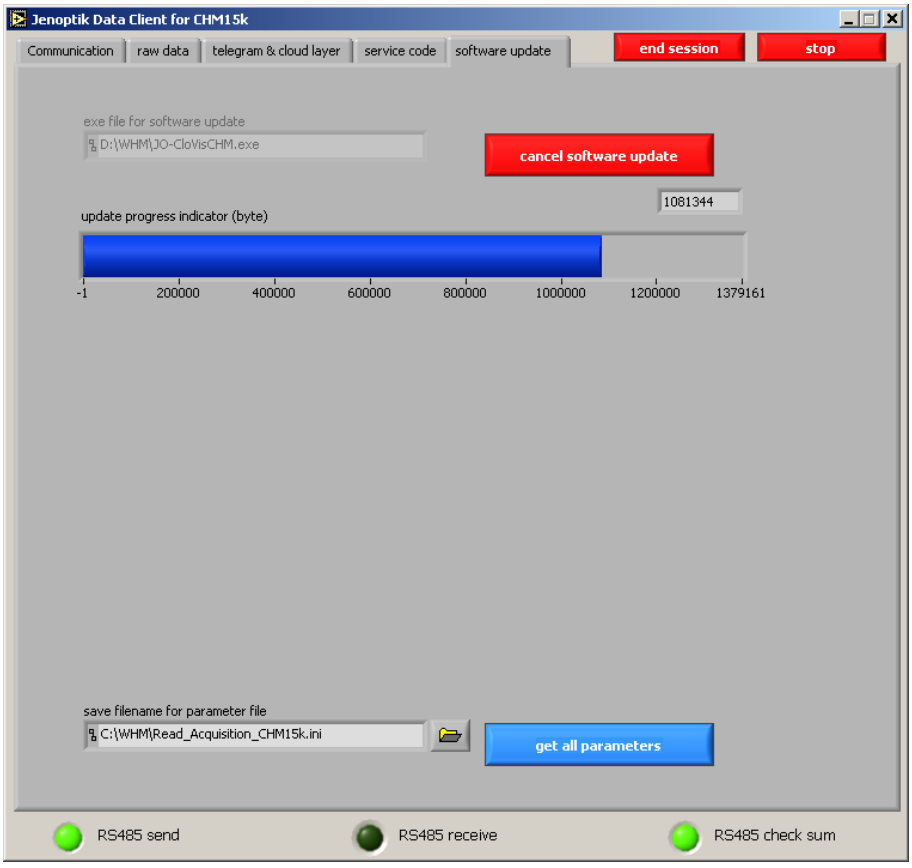
JO-DataClient contains an update function for two main components of the internal CHM15k software:

- JO-Main.exe: software for controlling the hardware & saving raw data
- JO-CloVisCHM.exe: calculation of cloud layer, laser beam penetration depths, vertical visibility and planetary boundary layer

Update transmissions to the CHM15k take place interlocked with automatic telegram transmissions. More precisely, an update transmission consists of a data block which is sent to CHM15k immediately after receiving a telegram from CHM15k. Of course, this procedure seems more useful in the automatic telegram modes than in polling mode.



First, a file must be chosen in the field "exe file for software update". After pressing the (green) button “start software update“ the update transmission to the CHM15k starts.



This image shows a snapshot of the update process for JO-CloVisCHM.exe. 1,081,344 of a total of 1,379,161 bytes were already transmitted.
During the whole time of the update process (which may last for hours) the regular operation of the CHM15k is not impaired. Moreover, a temporary shutdown of the CHM15k as well as of JO-DataClient does not interrupt a running update – when both components run again, a discontinued update process will be resumed. Finally, a running update can be cancelled only by pressing the (red) button “cancel software update“.

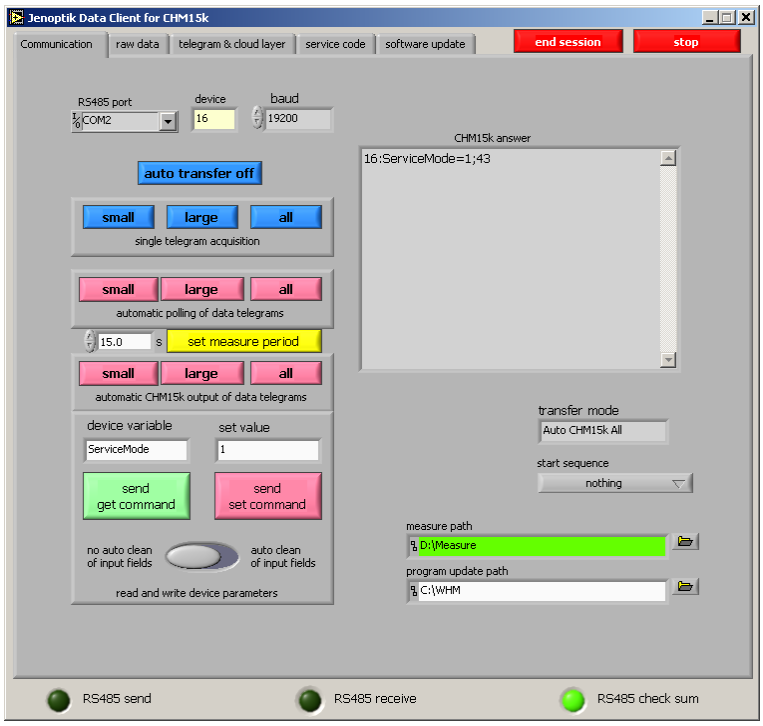
Only if all data blocks of the update were transmitted successfully, the old program file “JO-CloVisCHM.exe” is replaced by the new one. Normally this replacement should take no longer as one minute, so that only for this time interval no current data telegram are calculated. The successful end of the update process can be noticed within JO-DataClient by disappearing of the red cancel button and reappearing of the green start button.

Acceleration of the update:

Default setting for the update block size is 2,048 byte, this amount of update data will be transmitted following every received telegram. With 30 seconds of measure period and approx. 2 MByte program file a whole update process consist of approx. 1000 blocks and therefore lasts more than 8 hours! However, the update block size can be raised with the variable **UpdateBlockSize** up to and including a value of 32,768 byte, this parameter can be changed by the set command from section 2.1. However, it must be clearly warned that a single block transmission of 32,768 byte lasts about 12 seconds at transmission speed 38400 baud. So one has to think (and calculate) carefully about possible combinations of measure period, raw telegram mode and update block size before changing this parameter – at current time there is no lock in JO-DataClient to prevent users from choosing dangerous parameter combinations!

Important Remark:

Update operation is only permitted in ServiceMode. Therefore this service mode must be initiated before starting the update:



There is an additional button “get all parameters” on this page (not related to software update) for this purpose:

All parameters of the CHM15k will be saved into the local text “file save filename for parameter file”.

1.7 General available controls or indicators

At the bottom line of the window there are three light indicators:

- RS485 send: Normally this light should only blink for a short moment, while sending commands. An exception is a running software update, where large blocks of data will be sent to the CHM15k, in this case this light shines for some seconds.
- RS485 receive: This light shines while receiving data from CHM15k. During this period send actions (like set/get variables) must not be done because there is only a half-duplex RS485 connection to the CHM15, so simultaneous sending and receiving is not possible.
- RS485 check sum: Each answer of CHM15k (telegram or set/get command confirmation) is closed by two checksum bytes (complement of two). The result of check is indicated by this light: green - ok / red - failure.

There are two buttons in the upper right corner of the program window:

“end session”: The current session is finished, and the very first start dialog (with RS 485 connection parameters) appears again. Now possibly changed connection values should be filled in and another session can start.

“stop”: The program terminates.

2. Command line parameters

JO-DataClient can be invoked with one ore more of the following command line parameters:

- **–baud <index>**:
  Possible values of <index> can be 0 (1200 baud), 1 (2400 baud), 2 (4800 baud) , 3 (9600 baud, default) , 4 (19200 baud) , 5 (38400 baud) , 6 (57600 baud) or 7 (115200 baud).
- **–com <port>**:
  Usually <port> is one of the serial ports ASRL1::INSTR (default), ASRL2::INSTR, and so on. Depending on the Labview environment on the host PC, the alternative names COM1, COM2 may be available too.
- **–device <number>**:
  The default <number> is 16, suitable for the factory default device number of a CHM15k.
- **–measurepath <path>**:
  <path> specifies the main directory of locally saved raw data telegrams (NetCDF). Default <path> is D:\Measure
- **–ncpath <filename>**:
  <filename> specifies the full qualified filename (i.e. including path) of a required temporary NetCDF file for the decoding of raw data telegrams. Therefore the user must have read and write access to this path. Default <filename> is C:\WHM\uudecode.nc
- **–utcupdaterate <hours>**:
  Any positive value means that the internal CHM PC clock is synchronized with the client PC clock (converted to UTC) every <hour> hours. Default value for <hour> is 0, i.e., no synchronization is done.
- **–startseq <index>**:
  Possible values of <index> are 0 (start sequence off), 1 (“Transfermode” tested), 2 (“dt(s)” tested), 3 (“Transfermode” & “dt(s)” tested). Default index is 3.

Changing these parameters via command line affects the input fields of the start dialog (see Chapter 2). Moreover, by setting appropriate values for these parameters the start dialog can be skipped by the additional command line parameter **-nostartdialog**.

Example for a Autostart_DataClient.cmd batch file:

```
set CHMDIR=%systemdrive%\Jenoptik\Programs
set MPATH=d:\Measure

start /B %CHMDIR%\JO-DataClient –device 16 –com ASRL2::INSTR –baud 5
–ncpath %TEMP%\uudecode.nc -measurepath %MPATH% –utcupdaterate 6 –startseq
3 –nostartdialog
```

(without linebreak!)

It is important that the current internal baud rate of the CHM15k (set in previous sessions) must coincide with the baud rate in this command line, in this example value 5 means 38400 baud. Otherwise connection failures can occur, see Chapter 2 (start dialog). In this example the CHM PC clock is synchronized every 6 hours.