



Built in Data logger and Digital Ampchart

The iCON advanced motor controller display has a built in amp chart datalogger, capable of storing running current and Voltage levels, a complete history log and data from other connected devices such as the ACE downhole sensor. This data is stored on a removable SD card, so it may be transferred to other devices such as a laptop computer for further analysis. The cards may easily be swapped in the field for data transfer, and PC software (called Chartlogger) is provided that allows graphical display of the data correlated to any events that may have occurred. Typically at least a years worth of charts will fit on a single card. All data is stored in plain ASCII files, so may also be imported into other programs such as Microsoft Excel. In addition the SD data card provides a very convenient way to quickly clone motor controller settings, as configurations may also be read from or written to a motor controller.

To set and configure the controller for data logging is straightforward. First the motor controller must be enabled for data logging (Data Logger → Enabled). The serial number is used as part of the logged files filename, so when files are loaded later to a PC each site can be uniquely identified. The date and time have to be set in the controller, as the correct date and time are required for accurate data logging. Next a suitable SD card is required, it must be 2 GBytes or less in size (SDHC types will not work) and the write protect sliding tab must be set to off (closest to the connection pins). It is best to start with a blank, formatted card to reduce the chance of card full errors, but is not a requirement. iCON will not overwrite other files that may exist on the card, and the card may be inserted at any time. If iCON is powered on when the card is inserted the two SD status LED's will rapidly flash for a few seconds. During this time the card is being inspected to verify the directory structure and free space available. If everything is OK the LED's will extinguish after a few seconds and data logging will automatically start. If the red LED stays lit or flashes there is a card error of some sort, such as the write protect tab is set or the card is full. If the red LED is extinguished data logging starts and will keep running until there is an error (such as card full) or the card is removed. The blue LED will flash each time data is written to the card. Data logging will automatically restart after a powerfail.

During data logging at a predetermined rate (Datalogger → Log Period) a set of readings will be taken. Once a number of samples have been buffered inside the display they will be written all at the same time to the SD card. The samples are not written every time they are taken as this could cause premature burn out and failure of the SD card, but rather written when the internal buffer is full or the operator forces them to be written if the card is to be removed (Datalogger → Flush Card). The user is cautioned not to set the sample rate too small (ie continual fast writes), as it will result in huge data files and could result in 'burnt out' SD cards, however it may be very useful during startups and tests for example. Typical values for sample rates may be every 10 seconds, this may be changed at any time.

Files and file formats.

To allow quick and easy access to the data it is stored in multiple files, a new file being created every day at midnight. The logged data file name is explained by the following example, 32100329.CSV where '3210' is the controller serial number and the next 4 numbers are the date, in this example March 29th. As logging continues new files will appear each day, after the example file they will be named 32100330.CSV, 32100331.CSV, 32100401.CSV etc. At the end of the year the next file will be named 32100101.CSV Note that the year is not stored in the filename, so if the data is

not removed from the card within a year an existing year old file will be overwritten. Each file contains data in ASCII format such as follows:

```
3210,09/10/12,10:40:42,0014.6,0015.0,0014.3,0487.1,0473.8  
3210,09/10/12,10:40:47,0014.7,0015.0,0014.4,0484.8,0469.9  
3210,09/10/12,10:40:52,0014.6,0014.8,0014.5,0482.6,0471.8
```

In order separated by commas they are.....

Serial number of the controller,
Date (USA format),
Time of day (24 format clock),
Phase A current in Amps,
Phase B current in Amps,
Phase C current in Amps,
C-A Voltage,
A-B Voltage,

If an ACE downhole sensor is connected the following readings will also be appended to each line.....

ACE downhole sensor intake (instrument) temperature in °F,
ACE downhole sensor intake pressure in PSI,
ACE downhole sensor motor winding temperature in °F,
ACE downhole sensor X vibration,
ACE downhole sensor Y vibration,
ACE downhole sensor discharge pressure in PSI,
ACE downhole sensor discharge temperature in °F,
ACE downhole sensor spare channel

In addition to the running analog values that are stored the iCON display also logs a complete history of events, such as stops, starts, power fails etc. on the SD card This data is stored in a separate file where the first four digits is the serial number and the next 4 numbers are the date, in this example March 29th. This is also a text file and may be read using any suitable program. Each event is stored as a new line such as:

```
PwrOff 09/10 09:53:42  
Pwr On 09/10 09:53:45  
MnStrt 09/10 09:54:47  
OLD 09/10 09:54:52  
MnStrt 09/10 09:57:41  
MnStop 09/10 10:27:36  
PwrOff 09/10 10:27:54  
Pwr On 09/10 10:27:57  
AuStrt 09/10 10:29:00  
MnStop 09/10 10:35:01
```

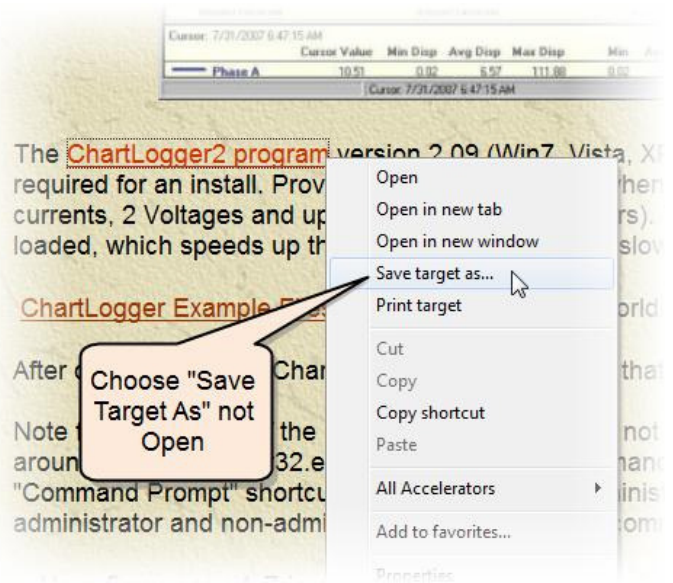
This event data will also be loaded automatically when Chartlogger reads in the datalogger files, and then Chartlogger will also display events. The user may then click on an event to move the graph to the relevant time; see Chartlogger explanation for further details.

iCON Chartlogger Display Program

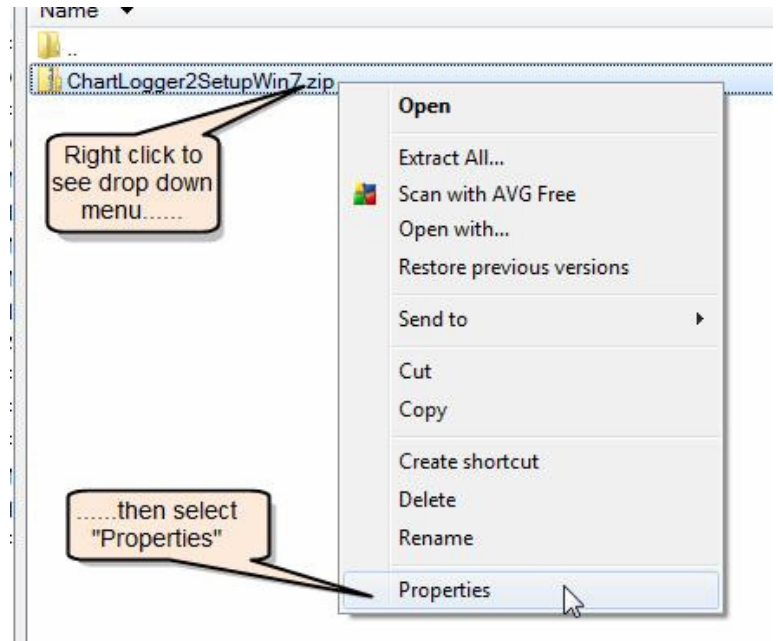
Chartlogger is a PC based software program that allows graphical displays of various types of data, usually changing analog signal levels from a variety of transducers that have been collected over extended time periods. It has been specifically written to handle extended time depth data which is impossible to display effectively with programs such as Excel. Chartlogger makes it easy to zoom in and inspect with great detail events that may have occurred months ago; it also may link to events that may have been recorded by certain devices such as over current shutdowns. Typical data sources would be ampchart type current and Voltage levels on ESP systems, varying tank levels, changing downhole environmental conditions or signals from almost any other source. Data to be displayed by Chartlogger may come from several different devices, each with different capabilities. These include the Amper data loggers (1 data channel), ACE Downhole sensor SRU2 surface readout with datalogging capabilities (up to 8 channels) and the iCON advanced motor controller that records 13 channels plus history events. Chartlogger may be import all of these formats, plus data from other devices if it is formatted correctly.

Installation.

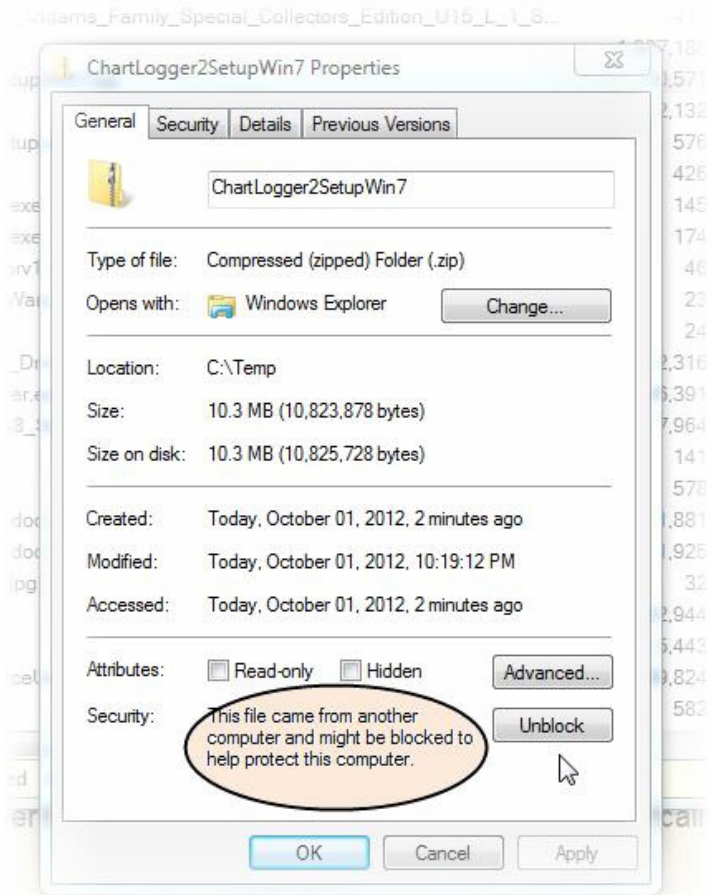
The latest version of Chartlogger may always be downloaded from www.acedownhole.com It will be downloaded as a compressed 'zip' type file, and it is important to save it to the PC *before* opening the file otherwise it will not work. As shown in the example, right click on the download link, then select "Save Target As". You will then be prompted for a suitable directory on the PC to save it to.



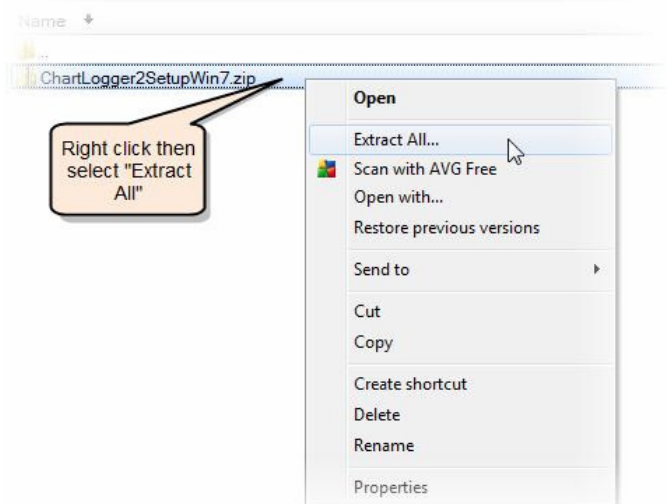
Once it has been downloaded to a suitable location it must be checked and possibly 'unblocked' before it is 'unzipped'. Many versions of Windows will block the functions of downloaded programs, so even though they may appear to install correctly they will not run correctly, and there is no indication that Windows has blocked correct program operation. To check the downloaded zipped file locate it and 'right click' on the properties.



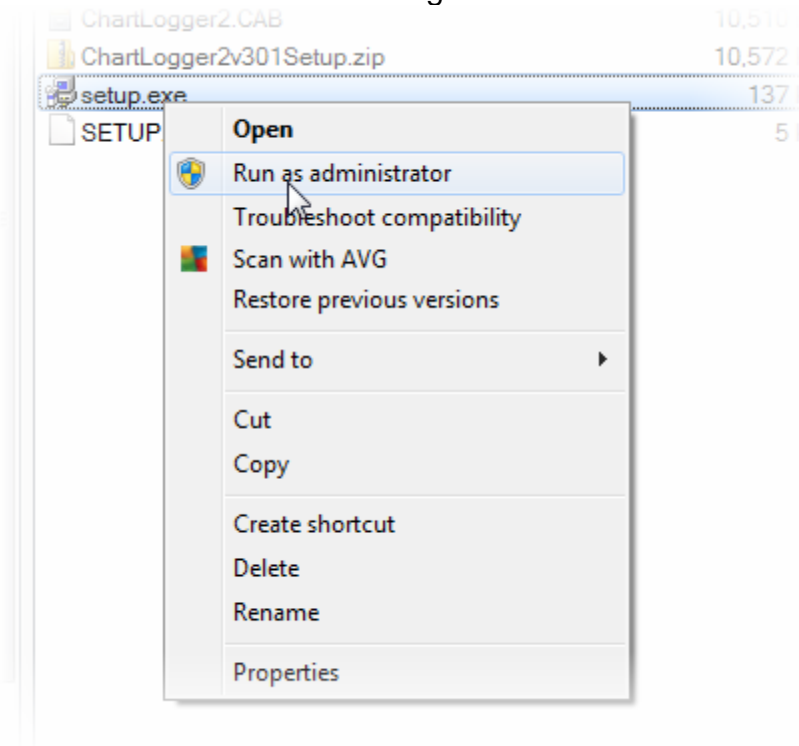
A properties window will be displayed similar to that shown (it may vary slightly depending on the version of Windows). If the file has been blocked by Windows as shown in the example check the 'unblock' box and click apply, then close the property window.



Again 'right click' on the file and select 'Extract All' which will 'unzip' the downloaded files; the destination may be set by the user.



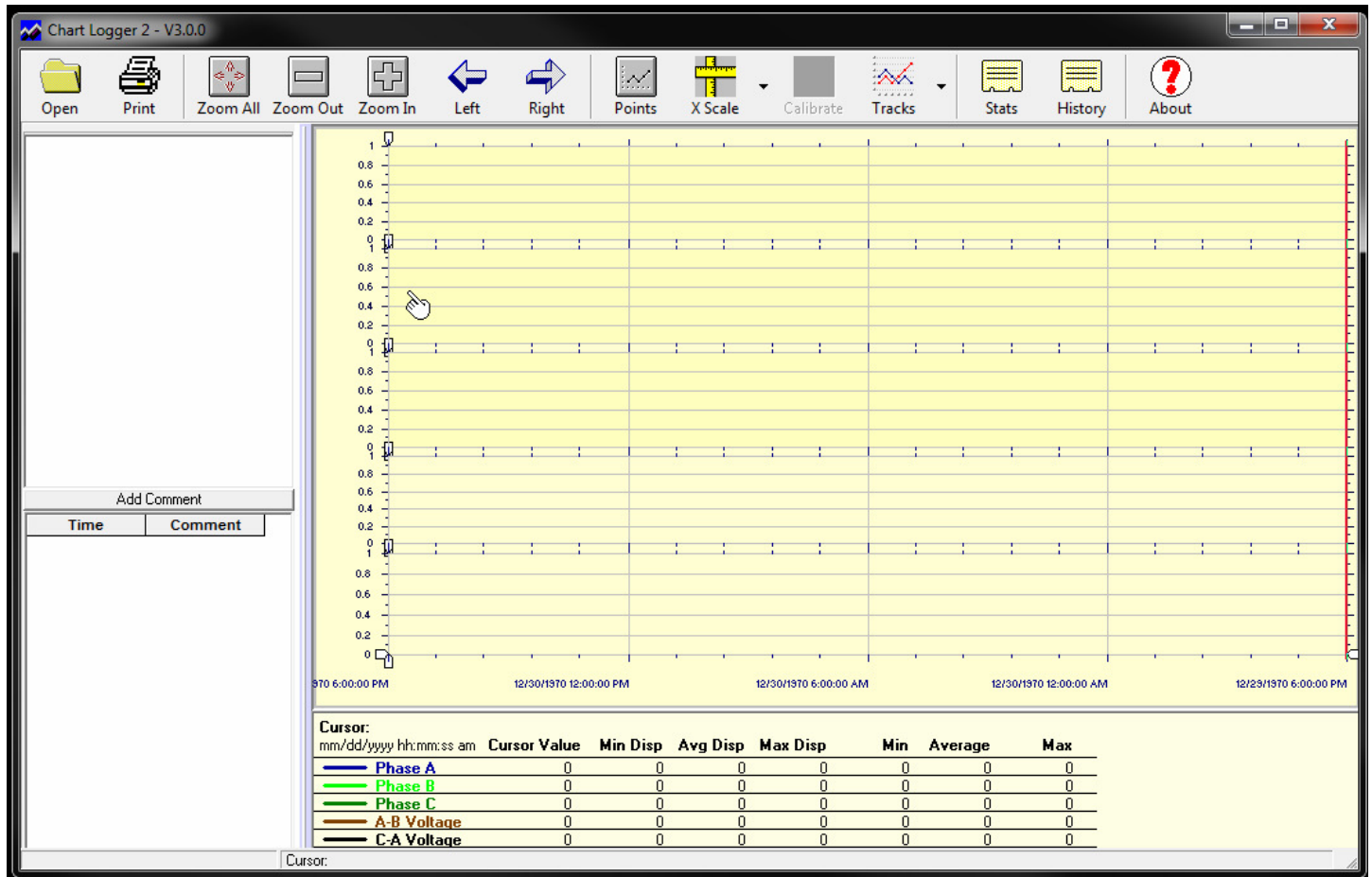
Once this has been done locate the file 'setup.exe' in the directory with the downloaded files. Do not double click on it but instead right click and select 'Run as Administrator'.



If this option is not shown contact your network administrator for assistance, since the program may not operate correctly if it cannot be installed with elevated installation rights. The program installation should now proceed and after a few seconds success should be reported.

For convenience a shortcut may be created and placed on the desktop or any other suitable location. Finally we are able to run the Chartlogger program.

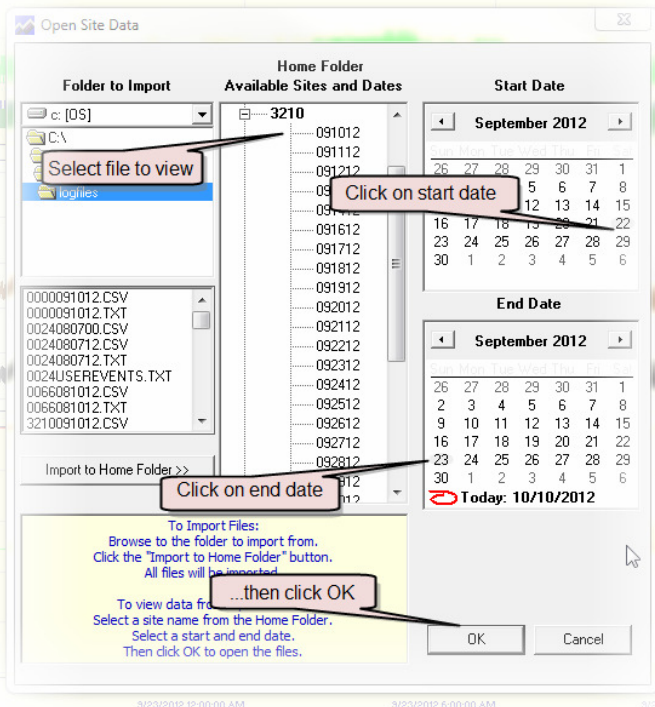
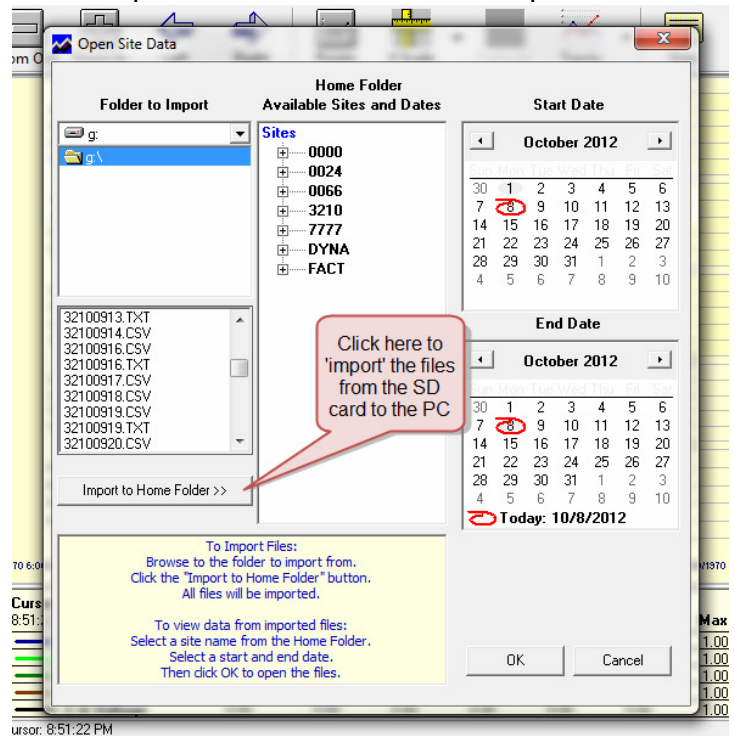
When Chartlogger is first started a screen similar to below is shown. There are several blank graphs plus several blank data areas. This will all change once Chartlogger loads data. We will start by importing data from an SD card that has been installed in an iCON motor controller.



When Chartlogger reads data from a card or other location it will import the data and keep a copy of it on the PC (in a folder called Home), so the card will no longer be required to view the data. Chartlogger will leave the data on the card, or if the user wishes may delete it after it has been imported to the PC. The data files on SD cards do not have the year embedded in the filename, however as Chartlogger imports them it will determine the year from the data inside the file, add it to the filename then store them on the PC. Chartlogger may also import calibration data from certain types of data files.

Insert the SD card in the PC and select Open from the top menu bar. A window will open, select the folder that contains the data files (in this example the SD card is drive G), below that a list of the files that have been found. Click on the "Import To Home Folder" button and the files will be copied to the 'Home' folder. Once they have been imported any available sites will appear in the center 'home' folder.

The data logger files may be huge, and there may be many of them (365 files per site per year), all with very high resolution data. To speed operation and to let the user quickly locate areas of interest Chartlogger will let the user load selected date ranges. This allows the user to easily see data with seconds resolution from months or years ago.



Select a file of interest (3210 in the example), choose start and end dates as shown. After clicking OK the files will be loaded and Chartlogger will display traces. There are many controls that allow optimal viewing of the data, see below for some examples of the capabilities.

