

# SmartSoft User Manual for SmartScope Interrogators

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Prepared by:	K M Jones
Checked by:	J Grelin
Approved by:	C Coetzee

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# **1** INSTALLATION

Smart Fibres' interrogators are shipped with a CD containing installer files for the SmartSoft interface. The host PC must run a suitable Operating System, this manual covers installation on a PC running Windows XP, Vista or 7. Installers for Linux and other operating systems may be available on request.

To install the software on the host PC navigate to "setup.exe" on the CD and follow the instructions that appear during the install process. The installer will also install National Instruments' LabVIEW<sup>TM</sup> Run Time Engine (RTE). It will then place a short-cut in the Windows Start Menu (under the Smart Fibres program group) and on the Desktop.

The latest release of SmartSoft can also be downloaded from the Smart Fibres website. Contact Smart Fibres technical support for details.

# **2 PREPARING FOR USE**

#### 2.1 HOST PC - IP ADDRESS SETTINGS

After installing SmartSoft, connect the supplied Ethernet cross-over cable between the host PC and the interrogator. The PC's network connection must be configured to a suitable subnet; by default the interrogator's IP address is 10.0.0.150 and its Net mask is 255.255.255.0. The Net mask for the PC must also be set to 255.255.255.0, suitable ranges for the PC's IP address are 10.0.0.1 to 10.0.0.149 or to 10.0.0.151 to 10.0.0.250. (see appendix 5.1 for further details or contact your network administrator for assistance).

# 2.2 HOST PC - FIREWALL SETTINGS

When SmartSoft runs for the first time you may receive a warning from the Windows Firewall or other installed Firewall. You should allow the program through the firewall. If the operating System is Windows 7 you must allow SmartSoft to run on both Private and Public domains otherwise data from the interrogator will not reach SmartSoft. See also Appendix 5.2.

### 2.3 STARTING SMARTSOFT

On the host PC navigate to the Smart Fibres > SmartSoft short-cut on the Windows Start Menu and start the program.

The program requests the IP address of the interrogator. As shipped from the factory this will be 10.0.0.150. An Ethernet connection is attempted and the dialogue box changes to indicate progress.

Interrogator IP address	Connecting
Interrogator IP address	Connecting to IP address 10.0.0.150
OK Cancel Auto start	60 seconds Change IP Cancel

The Auto start check box can be used later so that SmartSoft starts without user input, this combined with copying a shortcut to the Windows Startup menu allows SmartSoft to start up automatically on a remote system in the event of a reboot or power interruption to the host PC.

If a connection can be made successfully the dialogue box will close after a few seconds and the SmartSoft main screen appears. If connection problems are encountered refer to the guides in the Appendices.

M SmartSoft for SmartScope			
	Connected to 136296 @ 10.0.0.150	Instrument Basic Enhan Set Up Acquisition Acquisi	tion Plug-ins Quit
<u>.</u>			

A number of function buttons are shown top right. Inactive functions are greyed out.

**Instrument Set-up** is used to set the interrogator's operational parameters.

Basic Acquisition is not implemented for SmartScope.

**Enhanced Acquisition** is the main panel in the program allowing sensor set up, visualization and logging to be configured. Attempting to use Enhanced Acquisition without first reading this manual is not recommended.

**Plug-ins** allows the user to run custom LabVIEW source code modules. Contact Smart Fibres technical support for details.

**Quit** is used to close the entire application. Always use the Quit button to exit the SmartSoft application; using other methods to close the application may cause unexpected behaviour.

# **3** INSTRUMENT SET-UP

A number of set up tabs are available, they will be described from left to right.

# 3.1 INSTRUMENT SET-UP - ACQUISITION PANEL



Here the user can adjust various parameters which affect the acquisition rate of the instrument and the data processing rate of the SmartSoft software.

The lower half of the screen shows spectra from all operational channels, together with the current wavelengths of any detected FBG peaks. The instrument is set to use the full laser range and per-channel auto-gain.

Starting on the left the user may configure the number of active optical channels, 4 is the current limit.

The user may reduce the amount of data stored in a log file by averaging or decimating the data. This is applied by the SmartSoft application so will not reduce the Ethernet traffic but will reduce the data presented by SmartSoft and optionally saved to file. The extent of data reduction is controlled by the sample size control. Setting this to a number n will result in every nth transmitted data point being presented or stored, either by averaging n points together or by keeping every nth point and discarding the rest. Averaging n data points together will also improve the signal to noise ratio by up to a factor of  $\sqrt{n}$ .

The data processing rate is displayed at the top of the screen when acquisition is in progress.



# **3.2** INSTRUMENT SET-UP – GAIN SLOTS

Gain Slots are used to overcome optical losses on the fibre which may cause downstream FBG peaks to be lower in amplitude than those nearest the interrogator. Each FBG peak or group of peaks can have its own gain level applied.

The Gain slots are set up on a channel-by-channel basis. The spectrum for the Channel in question is displayed. Click between the spectral peaks to add slot boundaries. The start and end points of the wavelength tuning range are slot boundaries, so be sure not to add slot boundaries before the first FBG or after the last FBG. Care should be taken that during operation the FBG peak will not cross a slot boundary and that FBG peaks remain separated by at least 2 nm from each other and 1 nm from the end of the active laser range.

Slot boundaries can be adjusted by dragging them to their desired position using the mouse. Right click on a boundary to delete it.

Once the slots are established the Gain Mode can be set. There are two modes, in auto mode the gain for each slot adjusts automatically so that the intensity of each FBG peak is maximised but does not saturate. The peak intensity will be maintained between 50 and 100 % and will only reduce below 50% on the highest gain level if the signal is still too small.



In Manual gain mode a fixed gain is applied to each slot. To set the gain, right click on the graph between the slot boundaries and set the gain level between 0 and 8, repeating this process for each slot on all channels. The optimum gain level is above 50% but without saturating; a saturated FBG peak will have a flat top at around 100% intensity. The gain applied to each slot is displayed on the graph. Selecting a manual gain for a slot will automatically change the gain setting from auto to manual.

It is recommended that in manual mode the gain be set as high as possible without risk of the FBG peak saturating. Peaks below 25% relative intensity may suffer reduced measurement performance.

In most cases it is recommended to use Auto Gain.



# 3.3 INSTRUMENT SET-UP - PEAK DETECTION

The peak detection threshold may be adjusted for each channel on this tab. Ensure the threshold level is above the background reflection level but not above any true FBG peaks. In most cases a value of around 15% is optimal. Peak detection is performed by the SmartSoft application using a polynomial fit of the spectral data returned by the instrument.



# 3.4 INSTRUMENT SET-UP – NETWORK

On the Network tab the user can change the IP settings of the interrogator. This is usually only necessary when the interrogator is to be used on a Local Area Network. Be aware that the IP settings of the host PC may need to change in order to maintain connectivity.

If you are connecting the interrogator to a network instead of a direct connection to a host PC, make sure to set the gateway address to match the network router or gateway PC's LAN address and that the interrogator's IP address is unique on the network and not in the pool of addresses assigned to any DHCP servers on the network.

If there is a firewall or NAT router between the interrogator and the host PC you may need to open UDP ports 30001 to 30003, 30070 to 30072 and 30075 to allow SmartSoft to communicate with the interrogator.

See Preparing for Use section and the Appendices for further details and if necessary consult your Network Administrator.



# 3.5 INSTRUMENT SET-UP - LOAD AND SAVE

The user can use this tab to save all the Instrument Set-up parameters to a file. The file can be recalled later using the Load button. This is particularly useful when the instrument is used to interrogate multiple sensor systems, as a configuration for each system can be saved.

### 3.6 INSTRUMENT SET-UP - SAVE AND/OR EXIT

There are three options for exiting Instrument Set Up, pressing "Save changes and exit" will transfer all parameters to the interrogator and the instrument is ready to begin an Acquisition session. Alternatively, pressing "Cancel changes and Exit" will discard any changes and the interrogator will revert to its previous configuration. You can also just select a new panel from the main controls; if any settings have been changed SmartSoft will ask if you want to save them.

# **4** ENHANCED ACQUISITION

Before entering Enhanced Acquisition please go first to the Instrument Set Up section.

SmartScope delivers full spectrum data and FBG peak detection is performed in SmartSoft. This is different to other interrogators in the SmartScan range, where peak detection is performed in the interrogator and the peak wavelengths are delivered.

### 4.1 ENHANCED ACQUISITION - SPECTRUM



The spectrum tab is intended as a tool to aid setting up of sensors and/or interrogator parameters. The sensors on one channel at a time can be viewed with the reflected signal intensity displayed over the wavelength range. Each peak represents the reflected light from one FBG. The appearance of the FBG Peaks will be influenced by the Gain scheme selected during Instrument Set Up.

If desired the instantaneous spectrum can be saved to file, press the save button whilst the channel of interest is being viewed. An image of the spectrum can be exported to the clipboard or a file by right clicking in the graph area.

The graph palette in the top left corner of the graph provides options for navigating around the screen. The cross icon is the selection tool and is used for selecting and moving graph cursors, the magnifying glass icon allows the user to zoom in on the graph to examine particular spectral features in more detail and the hand icon is used to drag a magnified region around the plot.

The plot legend in the top right of the graph can used to change the plot properties, e.g. line style/colour, point style/colour, etc.





The scale legend can be used to gain quick access to the graphs auto-scale options and for changing scale indicator parameters such as numeric format, precision, etc. The cursor legend (shown above) is used for creating cursors on the graph and reading the position of those cursors. Cursors can be created by right clicking inside the cursor legend and can be dragged with the selection tool (see graph palette section). The cursor can be configured by right clicking on its name in the cursor list.

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ectrum		Sel	ect sen	sors	Charts	1	Graphic		Plug-ins	EXIT DATA
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103Gr05 103Gr07 103Gr08	1547.044 1543.092 1539.278	1547.042 1543.092 1539.277	1547.045 1543.090 1539.270	1547.045 1543.093 1539.280						
M036410	1531.018	1531.017	1531.008	1531.018						
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					Scheduled lo	9	Log every			

# 4.2 ENHANCED ACQUISITION – SELECT SENSORS

The Select Sensors tab has two tables. The left hand table displays all available FBGs that have been detected by SmartSoft from the spectral data received from the instrument. If there are more FBG Peaks on the Spectrum tab than available FBGs in the table then revisit the Instrument Set Up and either adjust the Gains, increase the Sensors per channel setting or adjust the peak detection thresholds.

The FBG table displays all the FBGs on channel 1 in descending wavelength order followed by those on channel 2 and so on. The channels are colour coded for ease of identification. For each FBG there are columns for its current wavelength as well as average, minimum and maximum.

The right hand table displays the selected Sensors; this table will be empty to start with. Sensors are added to the table using the "+" button or by right clicking on a grating in the FBG table. This brings up the add sensor dialogue box.



The user can select one of the FBGs from a drop down list of all available FBGs. The user may now give the sensor a meaningful name and change the Sensor type and measurement units.

For measurements other than Wavelength the user must enter a number of parameters so that SmartSoft can make the conversion. The type and quantity of conversion coefficients requested by the sensor set-up dialogue box are determined by the sensor type selected.

When all the required entries have been made, the Next button will become active allowing the user to move to the next step, at the last step the OK button becomes active completing the configuration for that sensor.

The available Sensor Types may vary. It is possible for Smart Fibres to create custom Sensor Types for specific applications, and these are created from a configuration file included with the SmartSoft Installer.

The default Sensor types are usually as listed below.

#### **Wavelength**

A wavelength sensor requires no parameters, the wavelength of the FBG will be displayed in nm.

#### <u>Strain</u>

A strain sensor requires a reference wavelength, that is the wavelength measured when the sensor is under no strain. The coefficient of thermal expansion (CTE) of the material the sensor is bonded to can also be entered but this is only valid if compensating for temperature and only required if the user wishes to remove the part of the strain induced by thermal expansion. A Strain Sensor can be temperature compensated by any Temperature Sensor that has been added to the Sensor table. (See example below).

#### Temperature (linear fit)

A temperature sensor requires a reference wavelength, the temperature scaling factor in pico-metres per degree, which should be supplied by the manufacturer and the temperature offset (the temperature of the sensor at the reference wavelength) which for Smart Fibres temperature sensors is 0 °C. If the scaling factor is left as zero it will be calculated based on the reference wavelength provided. This will be a close approximation but it is recommended to use the manufacturer supplied value for maximum accuracy. Smart Fibres provides calibration certificates with all their temperature sensors, the coefficients from the certificate should be entered via the Sensor Set up dialogue.

#### Temperature (quadratic fit)

A temperature sensor with a quadratic fit requires the three quadratic coefficients, these will be provided on a calibration certificate for Smart Fibres' temperature sensors

#### **Pressure**

A pressure sensor requires the CTE of the pressure sensor (only required if compensating for temperature) and the micro-strain to pressure conversion factor (ustrain/bar) which should be supplied by the sensor manufacturer.

#### <u>SmartPort</u>

To set up a SmartPort sensor you must first define the SmartPort temperature sensor by adding a sensor, selecting the "SmartPort T" sensor type and entering the coefficients from the data sheet. Then define a SmartPort pressure sensor by adding a sensor, selecting the "SmartPort P" sensor type, entering the coefficients from the data sheet and selecting the corresponding temperature. (See example below).

#### 4.2.1 Example – Strain Sensor

		1	1.000					
Sensor Name	Sensor Type	Units	Upd	Aste selected refere	nce waveleng	ths to Mean 💌		
My Strain Sensor	Strain	• ustrain •	Ge	ating name	Grating	Wavelength (sm)	Reference in	ent -
Sensor Description			121	Strain	changed 1	1964 0213	0.0000	141
K Cancel	fack 🔷 Nest 🛷	CK.	-	X Cancel	e Back	Ant Next	e cic	

Select Strain as the Sensor Type and enter a Sensor name. Then press 'Next'.

The reference wavelength is the wavelength against which the sensor will be compared. SmartSoft needs to measure a change in the wavelength of an FBG in order to convert to engineering units such as strain, temperature and pressure. The reference wavelength may be supplied by the sensor manufacturer and can be typed in the box or it can be entered by pressing the blue arrow next to either the "set current" or "set mean" menu selection.

It may be necessary to first set the type to wavelength and log and analyse some data in order to determine the required reference wavelength. The reference wavelength should be the wavelength measured when the sensor is under its reference strain, this would usually be zero strain.

The sensor can be compensated for temperature effects by selecting a temperature sensor. Temperature sensors must be added to the Sensor table before they are available to select for compensation.

Sensor name	Semor	*
femperature change	None Vane Temperature My/Temperature Sensor	
		*

Coefficient name	Value	
Coefficient of thermal expansion (ustrain/*C)	0.000000	-

The CTE of the material to which the strain sensor is bonded to can be entered if it is important to remove the strain induced by thermal expansion leaving just the strain induced by mechanical loading. If this is not required leave CTE set to 0.

#### 4.2.2 Example – SmartPort PT Sensor

A SmartPort sensor measures both Temperature and Pressure, the Temperature needs to be measured in order to deduce the Pressure. SmartSoft treats a SmartPort as two separate sensors. To set up a SmartPort sensor you must first define the SmartPort temperature sensor by adding a sensor, selecting the "SmartPort T" sensor type and entering the coefficients from the calibration certificate. Then define a SmartPort pressure sensor by adding a sensor, selecting the "SmartPort pressure sensor by adding a sensor, selecting the coefficients from the calibration certificate and selecting the coefficients from the calibration certificate and selecting the coefficients from the calibration the calibration certificate and selecting the coefficients from the calibration certificate and selecting the coefficients from the calibration certificate and selecting the corresponding SmartPort T temperature sensor.

Have the SmartPort Calibration certificate to hand and also the coefficents csv file for the Sensor, the file will be named with the Serial Number of the Sensor, e.g. 134567 coeff.csv

sensor marrie	Sensor Type	Units
MySmartPort T	SmartPort T	- C -
Sensor Description		

Grating name	Grating	Wavelength (mm)	Reference	(nm)
Temperature	CH01G-01	1548.0247	0.0000	*

Select SmartPort T as the sensor type and give the Sensor a meaningful name, then press 'Next'. Check the correct Grating has been selected. The Calibration certificate will indicate the approximate wavelength of the grating, so it should be possible to identify it in the FBG table.

Leave the Reference Wavelength set to 0.

pefficient name	Value -	Coefficient name	Value
	0.000000 😑	A.	-0.824567
	9.000000 😌	B	2611.238286 (0)
	9.000000 0	c	-2066800.68900 -#-
		-	
	+		

Now press the Load button and select the SNxxxx coeff.csv file, which will populate the coefficient values. Now press OK.

Next add another Sensor, give it a name and select SmartPort P as the Sensor Type.

Sensor Name	Sensor Type	Units	 Update s	elected ref	erence wavele	ngth	sto Mean	-	
My SmartPort P	SmartPort P	+ bar	Gratine	uname	Grating		Wavelength (nm)	Reference in	ab
Sensor Description			 U. Priest	iure.	(3425-01		1548.4131	0.0000	31
SmartPort pressure server. Select the grating and enter the	coefficients from the calibrati	on certificate	(E) Tem	perature	CH016401		1548.0104	1548.0104	
			19 Edu						

Ensure the Gratings selected for the Pressure and Temperature are correct, do not worry about setting the Reference wavelengths for now this will be done later.

Confillment manual	Mahan	Colle	an mana Crofine	Sector Sec	Wasseleneth (pas)	Pateran a lumi	
open moent name	value	UI Por	ing name: Coursely		1548.4151	a data a	1
	-0.824567	(r) ***	Ch0264	4 .	1540,4151	0.0000 -2	
	2611.238286	10.10	mperature CH0164	1 .	1940.0104	1548.0104	
	-2066800.68900 🐲						
1	0.995889						
4	136.576698						
	-3234.289080 🗢						
	8240.862932 🗧						
	-44.134228 (5)						
	1163.350763 🗧 🗧						
Load		1715el	ect all				

Press the Load button and again select the SNxxxx coeff.csv file to populate the coefficient values. Now press the 'Back' button. Using Windows explorer or MS Excel open the SNxxxx coeff.csv

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-	-2066801				Get Free Template	90 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (		sensor setup					-
-	0.991889				Download Clp Art								
	156.5767				to Get More			Update selected ref	erence wavele	ength	ste Mean		
	-5234.29				Get Horself Pere	erfund in Manash	1.1	8	Continue		the state of the	N D. Contractor	for A
	8240.863				Cufinit	Sector for the cost of		Grating name	Grating		wavelength inm	o neterence	inm;
	-44.1342							Pressure	Ch02G-01		1548.4146	1558.3670	. 0
-	1161.351							Temperature	CHILGER		1548.0099	1550.23	La.
	-4902.13							and the second second	Stimulater	10.74	122201122	moord	182
	4.895917												
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/= =	0.003241												
-	0.003241 0.076421						-	111 12 12 12 12 12 12 12 12 12 12 12 12					-

Enter the value ITO as the Temperature reference wavelength and IPOTO as the Pressure reference value. Press 'Next' and then the OK button will be active. Press OK to complete the configuration.

#### 4.2.3 Editing the Sensor Table

There are a number of buttons down the left side of the Sensor table.

The Edit button is used to change the parameters of the selected sensor. The Sensor Dialogue box is opened again to give the option to update any of the parameters entered when adding the sensor the first time. If the user wishes to change the sensor type then the existing sensor must be deleted, using the "-" button and a new sensor created.

The Save button is used to save the entire Sensor List so that is may be recalled at a later time, all the sensor settings are saved to file. Note, the current sensor settings are always saved automatically whenever the user exits Enhanced Acquisition. In the case where the interrogator may be used with a variety of different sensor configurations, each can be saved to a different Sensor List file and these can be loaded as required for future use. It is good practice to Save the Sensor settings after completing or editing their set up parameters.

The Load button is used to recall Sensor settings that were previously saved. The last used settings are automatically loaded each time Enhanced Acquisition is started.

Note, if the FBG that provides the wavelength source for a sensor is removed from the system, i.e. is not present in the FBG table, then Sensors using that FBG will automatically be removed from the Sensor Table.

# 4.3 LOGGING SENSOR DATA

Rel. time	
Log time	
0 Seconds	
Log every	
0 Minutes	
	Rel. time   Log time   0   Image: Seconds   Log every   0   Image: Minutes

The logging feature on the Select Sensors tab can be used to save all the sensors present in the Sensor table. The file duration can be set in seconds or the user may use the Log button to Start and Stop logging. Sensors will be logged at the Data Processing Rate displayed at the top of the screen.

To log sensors first select a File path in the Log File box, the file path can either be typed in or selected using the folder browse button to the right of the box. Assign a name to the file e.g. "My Log File". If the file does not exist it will be created automatically.

When a path and filename have been entered the Log button should become active, when ready press the Log button to start recording data. Optionally the user may set the "Log Time" in seconds, after this has elapsed logging will stop automatically. Setting a Log Time of 0 means logging is only stopped when the user deactivates the Log Button.

Data is saved in tab separated format suitable for opening with common spreadsheet applications such as Microsoft Excel and OpenOffice Calc. The Start Time is given in UTC format, which is number of seconds since 00:00 on 1<sup>st</sup> January 1970. Each sample or line in the file then has a time relative to the start time or its own absolute UTC timestamp, depending upon whether the Switch is set to "Rel. Time" or "Abs. Time".

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9.1	0.012	164.98	1961.223	1667 173	1553, 172	1555.08	1547,114	1543, 126	55.39.364	15第.1課	1531.054	1
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11	0.02	1584.947	3541 223	1567.173	1853 173	1550.079	1547.115	1543.128	1539.364	1535.138	1531.055	
2	0.024	164.97	1661.223	1667-173	1653,173	1550.00	1547 114	1543.125	1539,364	1636.13#	1531.053	
3	0.028	1564.968	1561.221	1557.174	1553.173	1550-079	1547.113	1543.125	1539.365	1535.138	1531.055	
4	0.032	1564 M7	1501.222	1557.173	1553.173	1550.08	7547.114	1543 125	1539.365	1535 130	1031.054	
级.	0.036	354,977	1591,222	1657,173	捕机规	1559.08	1647.112	1543 125	1639.364	168.00	1531.055	
€.	0.04	1564.367	1561.223	1557.173	1553.173	1550.079	1547 114	1543.124	1539.364	1535.138	1531.055	
T	0.044	1564.967	1591.222	1567 173	1663 173	1553.079	1547 113	1543 127	1539.364	1535.138	3531.054	
9.	0.048	1564.966	1561.222	1667,173	1553.173	1550 079	1547 114	1543,125	1539.363	1636,129	1571.055	
9	0.052	1564 968	1561.222	1557 173	1553 173	1550.08	1547.114	1543.126	1539.364	1535.138	1531.055	_
80	0.056	1564.968	1551.221	1587.173	1563 173	1550.079	1547 113	1543.126	1538 363	1536 138	1531.055	
25	0.06	1564.967	1961 222	1557 174	1863.172	1550.079	1647 114	1543 125	1539,364	1636,178	1531,055	
1.4	P.P.S.	seconds_1	D_FHG_TH	RTP /			proving the	<ul> <li>CORNEL</li> </ul>				• 1
(inter	dy											

#### 4.3.1 Scheduled Logging

A further option is to set up scheduled logging, in this mode a short burst of data is recorded at regular intervals. As before first set up the file path and filename then use the Log Time to set the length of the burst. Next set the Schedule period in minutes in the "Log Every..." box. When ready, press the Scheduled Log button instead of the Log button. The Scheduled log button should become active after the "Log Every..." has been populated.

#### 4.3.2 Logging to Sequential Files

For longer logging sessions it is convenient to break the file up into a series of smaller files.

Clicking on the Gears icon we opens a Log Settings dialogue box.

2 4 4 4	et the maximum number of data lines in a log file. When he limit is reached a new file is created, Use the prefix and oostfix controls below to ensure each file has a unique ame.
	Lines per log file
	(j) 18000
-2	strivent, re-now order, as those, school, ser-
	minute), %5 (second), %< digits u (fractional seconds with digits precision), %6 (am/jonn.flag), %9 (year within antury), %Y (year including century), %m (month number), %b (alternisted month name), %d (day of month), and %a abbreviated weekidan name). Log name prefix
	minute), %5 (second), %< digits u (fractional seconds with digits precision), %6 (am/our.flag), %9 (versi within antury), %Y (year including century), %m (month number), %b (alternisted month name), %d (day of month), and %a abbreviate weekiday name). Log same prefix %V %m%d-%H%M%%S
	minute), %5 (second), %< digits u (fractional seconds with digits precision), %6 (am./p.m.ftag), %6 (vers within sentury), %7 (year including century), %m (month number), %b (alternisted month name), %d (day of month), and %a abbreviated weekay name). Log same prefix %V %m%d-%H%M%S_ Log same posifix

The user may set the number of Lines per file, so that each file then becomes a fixed size, when the current file is full a new file is automatically created and logging continues without interruption. The time period of each file will be set by the lines per file control and the Data processing rate, so at 5 Hz 18000 lines per file will create a new file every 3600 seconds, so every hour.

The user may customise the prefix of the file name or define a postfix. In the default case shown above each new file will be prefixed with a data and time stamp, of the form YYYYmmdd-HHMMSS, e.g. 20160108-123306. The filename specified in the Log file box defines the remainder of the file name.

Once the Log settings have been completed ensure the Log Time is set to 0 for indefinite logging and press the Log button. Files will be created sequentially as shown in the example below.

Organize 🔻 🛛 Inclu	de in l	library 🔻 Share with 👻	Burn New folder			EE •	<b>E</b>	(
🔆 Favorites	-	Name	Date mo	odified	Туре	Size		T
📃 Desktop		20160108-123306_My Log F	ile 08/01/2	016 17:40	Text Document		517 KB	
Downloads		20160108-173306_My Log F	ile 08/01/2	016 17:57	Text Document		43 KB	



# 4.4 ENHANCED ACQUISITION - CHARTS

By default two charts are shown, each with dual y-axes. All the sensors present in the Sensor table are available for adding to the charts, this is achieved by selecting the tick box next to each sensor. The dropdown menu controls at the top of each list are used to select the sensor type (and units) for each y-axis, all the sensors in the Sensor table of that type then appear in the list below the Sensor Type menu control. It is not possible to add mixed sensor types to the same y-axis so make use of both graphs and left and right y-axes if multiple sensor types are to be displayed simultaneously. If more than one sensor is selected on a graph then each trace takes a different colour.

The chart can be expanded by hiding one of the y-axes using the hide axis button next to the Sensor Type selector. The entire lower chart can also be hidden by pressing the down arrow button between the upper and lower charts, whereby the upper chart expands to fill the whole tab.

The y-axes of the charts auto-scaled by default but by right clicking on the charts the user may disable auto-scaling and may then edit the maximum and minimum y-axis limits to display the desired amplitude range.

The x-axis represents time. The chart will display the latest 512 samples, so the time span of the graph data depends upon the Data processing rate, at 5 Hz the graph displays just over 100 seconds of data.

An image of the chart can be exported to the clipboard or saved to a file by right clicking on the graph and selecting "Export simplified image...".



# 4.5 ENHANCED ACQUISITION – GRAPHIC

On the graphic tab the user may load a photograph or diagram of the structure being monitored. The file must be in JPG format and 800 x 600 pixels in size. Some example pictures are installed with the application and are located in the common application data directory e.g. "C:\ProgramData\Smart Fibres\SmartSoftv4.2I\Graphics". The location of the common application data folder is dependent on your version of Windows, the file path above is for Windows 7.

By right clicking on the graphic the user may add sensors from the sensor table and display their current values in numeric or mini-graph form. By right clicking on an existing sensor it may be deleted or the type can be changed between Numeric and Graph.

SmartSoft (v4.2.4.4)		-	Sector Name	And States	Carl and Carl
ASMART I	FIBRES .	Connected to 138368 @ 192.168.1.102 Data processing rate: 1.00 Hz.	Instrument Set Up	Basic Enhanced Acquisition	Plug-ins Quit
Spectrum	Select sensors	Charts	Graphic	Plug-ins	EXIT DATA AGAINITON
Refresh list Plugins Upload manager v4.2 plu Drywell Plug-in Autotune corr2 plug-in Instru Ca <u>lib v6.32 plug-in</u> LUT scan <u>List of plug-ins</u>	g-in x				
1					

# 4.6 ENHANCED ACQUISITION – PLUG-INS

The plug-ins tab is used for running additional functions from LabVIEW source code, these can be written by the end user to increase and customise the functionality of the SmartSoft user interface. Details on how to write plug-ins can be obtained on request from Smart Fibres.

The list of available Plug-ins is shown in the left hand column, select the desired Plug-in and its front panel will open in the panel space to the right of the Plug-in list.

### 4.7 ENHANCED ACQUISITION – EXIT DATA ACQUISITION

Press "Exit Data Acquisition" to leave this area of the application.

# **5 APPENDICES**

# 5.1 SETTING IP ADDRESS OF HOST PC

#### 5.1.1 Windows 7

Click on the Start Bar and select Control Panel, select "Network and Sharing Centre".

Control Panel Home	View your basic network information and	d set up connect	tions	(
Manage wireless networks <u>Change adapter settings</u> Change advanced sharing settings	COMPAQ615B smartfibres.kc (This computer) View your active networks		Internet Connec	See full map
	smartfibres.local Domain network	Access type: Connections:	Internet Wireless Network (SMARTWIRELESS	Connection )
See also	Change your networking settings Set up a new connection or network Set up a wireless, broadband, dial-up, ad ho	oc, or VPN connectio	n; or set up a router o	or access point.
HomeGroup HP Wireless Assistant Internet Ontions	Connect to a network Connect or reconnect to a wireless, wired, o	lial-up, or VPN netw	ork connection.	
Windows Firewall	Choose homegroup and sharing options Access files and printers located on other n	etwork computers, o	r change sharing sett	ings.

Select "Change adapter settings", Right Click on the Local Area Connection and select "Properties"

Connect using			You can get IP settings assign	ed automatically if	your n	ebvork	supports
🔮 Broadcom NetLi	nk (TM) Gigabit Bhem	et	for the appropriate IP settings	i need to ask your L	netwo	'k admir	istrator
-		Configure .	🕐 Obtain an IP address aut	onatcally			
This connection uses t	ne tollowing tens:		Use the following IP address	ess			
Client for Mon	osoft Networks Scheduler		IP eddress:	1.0	- 30	-10	
🗹 😹 File and Prints	er Sharing for Microsoft	Networks	Subnet mask:	1	- 41	.40	
✓ → Internet Proto ✓ → Internet Proto	col Version 6 (TCP/IPv col Version 4 (TCP/IPv	6) (1)	Default gateway:	0			1
Ink-Laver To	pology Discovery Map	per I/O Driver	(7) Obtain 1995 sarver addres	a a dreatester			
- Link-Laver To	cology Liscovery Hesc			and the second			
🗹 🔺 Link-Layer To	pology Liscovery Hesp	0.000	Lise the following DNS ser	rver addresses:			
🗹 🕂 Link-Layer To	Unimitial	Propeties	Preferred DNS server:	rver addresses:	- 20	5	j
instal	Unimitial	Propeties	Lise the following DNS server:     Preferred DNS server:     Alternate DNS server:	rver addresses:	20	т w	1

Select "Internet Protocol Version 4" and click the "Properties" button. Select "Use the following IP address" and enter the desired IP address and Subnet Mask to suit the interrogator. Click OK to save settings.

After using SmartSoft, to reconnect to a Local Area Network select "Obtain an IP address automatically".

#### 5.1.2 Windows Vista

Click on the Start Bar and select Control Panel, select "Network and Sharing Centre".

$\bigcirc$	Network and Sharing Center	▼	
Tasks View computers and devices	Network and Sharing C	enter	View full man
Connect to a network Manage wireless networks		💵 (	
Set up a connection or network Manage network connections	HP6730B (This computer	smartfibres.local In	ternet
Diagnose and repair			
	💐 smartfibres.local (Domai	n network)	Customīze
See also			
See also Bluetooth Devices	Access	Local and Internet	
See also Bluetooth Devices HP Wireless Assistant	Access Connection	Local and Internet Wireless Network Connection (SMARTWIRELESS)	View status

Select "Manage Network connections", Right Click on the Local Area Connection and select "Properties"

Vetworking Sharing	General				
Connect using	You can get IP settings assigned a this capability. Otherwise, you nee	utomatically if yo	our ne twork	bvork admir	supports istrator
Fisadcon NetLink (TM) Gigabit Ethemet	for the appropriate IP settings.				10000
Configure .	Obtain an IP address autome	doally			
This connection uses the following tens:	Use the following IP address				
Clerit for Microsoft Networks	IP address:	60	ж¢	30	
Read Parties Sharing for Microsoft Networks	Subnet mask:	63	¥1	æ	1 T
A internet Protocol Version 6 (TCP/IPV6)     A internet Protocol Version 6 (TCP/IPV6)	Default gateway:	÷.	÷.,	÷.	Ĩ
	(1) Obtain DHG server address a	utomatically			
	Use the following DNS server	addresses:			
InstalUninstal Propeties	Preferred DNS server:	100	22	22	1
Description	Alternate DNS server:	1.1	20	ar.	
transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication					
across sydrad a work of a focular the works.				Adv	anced

Select "Internet Protocol Version 4" and click the "Properties" button. Select "Use the following IP address" and enter the desired IP address and Subnet Mask to suit the interrogator. Click OK to save settings.

After using SmartSoft, to reconnect to a Local Area Network select "Obtain an IP address automatically".

#### 5.1.3 Windows XP

On a Windows XP machine, click and the Start Bar and select "Control Panel." Click on the icon entitled "Network Connections" to open. When open, highlight the "Local Area Network" selection, right click, and choose "Properties".

Local Area Connection Properties		Internet Protocol (TCP/IP) Pro	perties				l (
eneral Authentication Advanced		General					
Connect using: 30 3Coin 3C920 Integrated Fast Ethernet Controller (3C905C-	1	You can get IP settings assigned autonatically if your network supports this capability. Otherwise, you need to ask your network, administrator to the appropriate IP settings.					
Configure	Ī	C @btain an IP address auto C Use the following P addre	naically				
Clerk for Microsoft Networks	11	P addess	10	0	0	49	
Borne and Fines Sharing for Microsoft Networks     Boo Packet Scheduler		Sybnet mark:	255	255	255	0	
8 '8" Internet Protocol (TCP/IP)		Detault gateway	10	0	0	1	
Ipstal. Uninstal Properties	j	C Obtan DNE anner addres	a actomaticada				
Description		🖓 Usy the following DNS set	iver addresses				
Allows your computer to access resources on a Microsoft network.		Evelored DNS server	207	69	188	185	
		@hemate DNS cerver	207	69	158	195	
Shog icon in notification area when connected					1	Adyano	ed.
OK Cancel			Ĩ	0	К		iec

Highlight the "Internet Protocol (TCP/IP)" entry and click "Properties". You will then have access to change the IP address and Subnet mask to suit the interrogator. Click "OK" to save settings.

After using SmartSoft, to reconnect to a Local Area Network select "Obtain an IP address automatically".

### 5.2 SETTING WINDOWS 7 FIREWALL

When SmartSoft is run for the first time the Windows Firewall requests the user's permission to allow the program to through the firewall. On the pop up Window there are three domains to choose, each with a check box. By default only one of these is checked but you must allow SmartSoft to run on both Private and Public domains otherwise data from the interrogator will not reach SmartSoft.

If the firewall has not been set correctly SmartSoft may not receive any Spectra data, so graphs where spectral traces should appear will be blank.

If you missed the opportunity to configure the Firewall when SmartSoft was ran for the first time then you will need to open the Windows Firewall to change the settings.

- Navigate to the Firewall's list of allowed programs as shown below.
- Click the "Change settings" button (you will need local administrator rights to do this).
- Find the entry for SmartSoft, if you have installed multiple versions of SmartSoft there will be one entry per version.
- For the version of SmartSoft that you wish to use check the boxes for Home/Work (Private) and Public. Then press OK and close the Firewall.

Allow programs to communicate through	ugh Wine	dows Firewall				
To add, change, or remove allowed programs and What are the risks of allowing a program to comm	To add, change, or remove allowed programs and ports, click Change settings. What are the risks of allowing a program to communicate?					
For your security, some settings are managed	by your sy	stem administrator.				
Allowed programs and features:						
Name	Domain	Home/Work (Pri	Public Grou	Polic		
SmartScan FBG interrogator user interface.				No		
smartsoft sscope calib v3.071.exe				No		
2 SmartSoftSSc	<b>E</b>		× I	No		
R SmartSoftSSc	2	R		No		
SmartSoftSSc				No		
E invertiget 25c	B	킔	R I	No		
Smartsoftssc.exe	2	2		No	E	
SmartSoftSSI v4.1.1	M			No		
SmartSoftSSI v4.1.3	Ø			No		
SmartSoftSSI v4.1.3	R			No		
SmartSoftSSI v4.1.3				No	*	
4						
		100	DetaijsR	emove		
		Ċ.	Allow another p	ogram		

For reference SmartSoft uses UDP ports 30001 to 30003, 30070 to 30072 and 30075.

## 5.3 USING SMARTSOFT ON A .LOCAL DOMAIN

SmartSoft is written in the LabVIEW programming language developed by National Instruments.

Installing SmartSoft requires a National Instruments utility program call the Run-time Engine to be installed. We are aware of an issue which can affect the performance of the host PC after installation of the Run-time Engine if it is connected to a Windows domain with a .local suffix.

The issue causes the host PC to take much longer to start Windows after login credentials have been entered.

National Instruments have written a patch to resolve the issue, which can be found here: <u>http://digital.ni.com/public.nsf/allkb/814FEF952915137686257B6B006C5F4F?OpenDocument</u> along with more details of the issue.

If you think you may be affected by the issue please download the patch, this creates a file called disable\_nsp.bat, to run the file right click and select "Run as Administrator".

Note, you may need to run the file again if you update any National Instruments software installed on the host PC.