Instrument Manual

Interface to Leica Geosystems Captivate

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Introduction

As modern surveying equipment and methods have evolved, LSS has also developed much more functionality in order to make the most of the techniques available. This is especially true when it comes to data acquisition, field coding and transfer from survey instruments. McCarthy Taylor Systems Ltd has strived to ensure that LSS surveyors are able to make the most of the options available.

This manual has been prepared to help with the configuration of both the survey instrument hardware and LSS software.

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Chapter 1

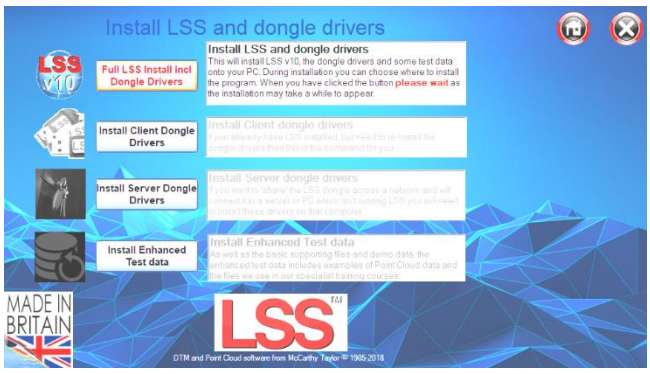
1.1 Install LSS & Testdata

Note: Leica Installs may be required (such as the DBX Reader) on the PC in order to fully connect LSS to Leica Captivate.

It is best to complete all installation steps in one go especially if administrator rights are required.

Select '**Install LSS & Test Data**';

For a new install use '**Full LSS Install Incl Dongle Drivers**'



Also choose '**Install Enhanced Test Data**', which includes examples of Point Cloud data and the files we use in our specialist training courses

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Return to the Install Home Page;

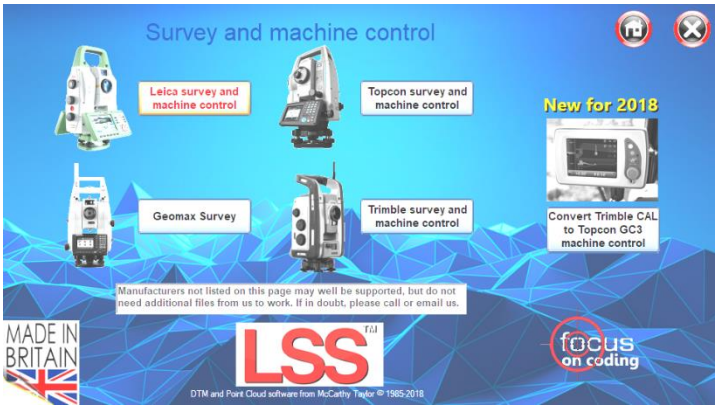
Select

'**Survey & Machine Control**',

and access the files/documents for your instrument type-

For Leica instruments and loggers select

'Leica survey and machine control'



Choose **'1200/Viva/Nova/Captivate'** and the Vimeo;

There follows pages for the Leica PDF Manuals and other Leica related installs and files;

Back to top

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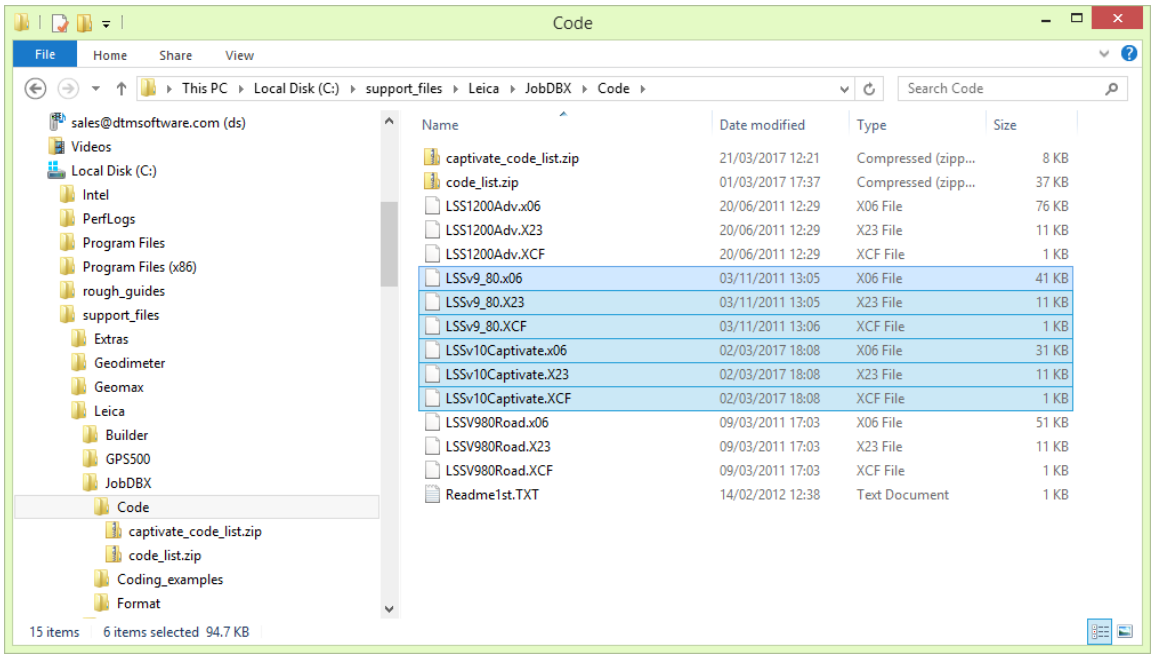
1.3 Example Codelists

Three Example Codelists are supplied on the LSS media. They are pre-formatted for immediate upload to the Leica instrument (how to transfer a code list to the instrument via a data card or USB stick is shown later in this document):

LSSv10Captivate - the standard LSS Prototype for Captivate instruments

LSSV980Road – includes LSS road markings

LSS1200Adv - an advanced version, which uses an alternative method to group features together in the code list. This is only intended as an additional facility and may be used to demonstrate ideas which can be added to the standard codelist in use.



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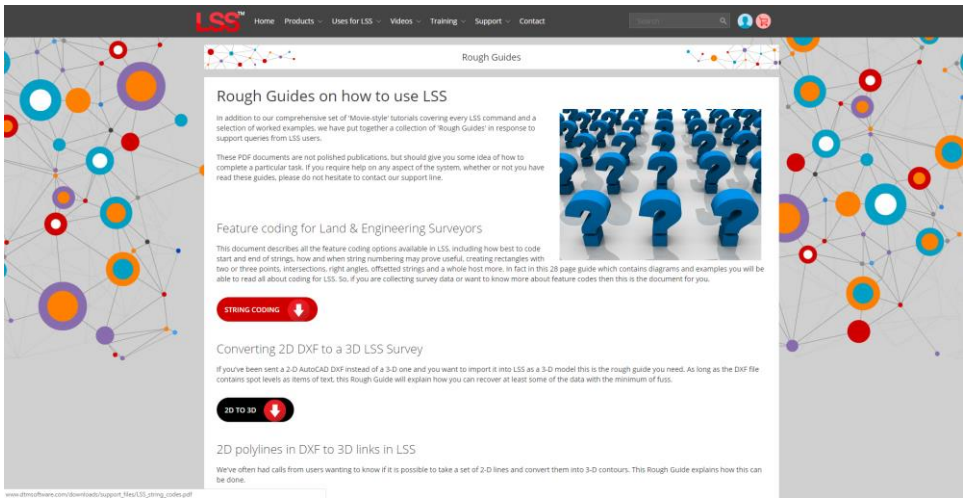
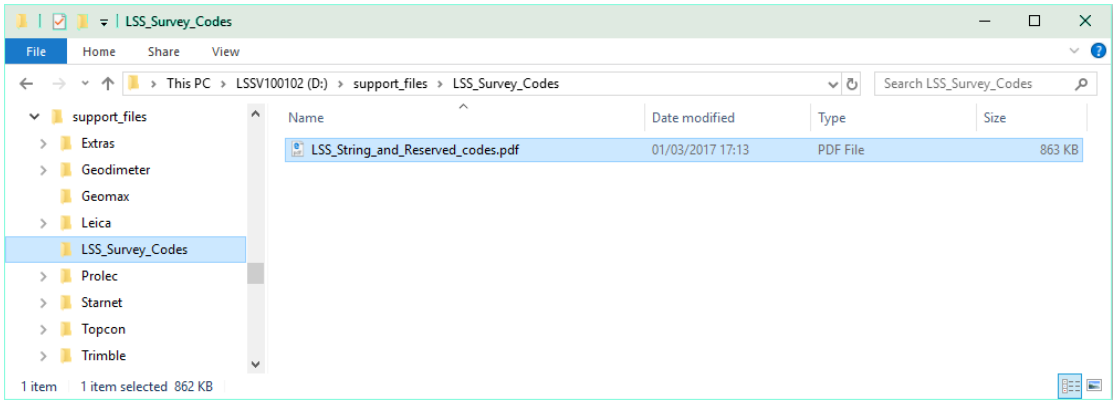
1.4 LSS String Coding and Reserved Codes



The PDF file **'LSS_String_and_Reserved_codes.pdf'** contains very useful information on the principles of Survey and Feature Coding in LSS as well as a complete list of diagrams and descriptions of all the LSS Reserved codes. It is located on the LSS media folder

'Support_Files\LSS_Survey_Codes'

The rough_guides folder can also be accessed via the Windows Explorer window;



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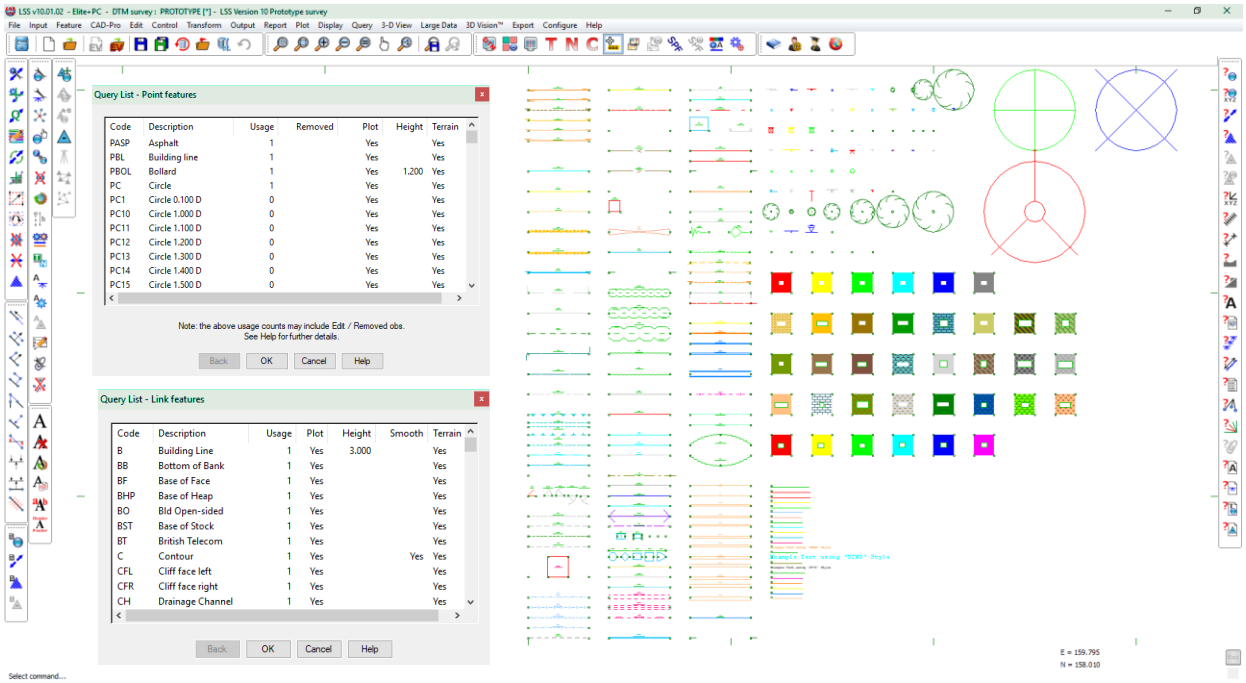
It is recommended that a feature library is copied to the instrument prior to carrying out any surveying tasks and code lists for many loggers have been created based on the standard LSS

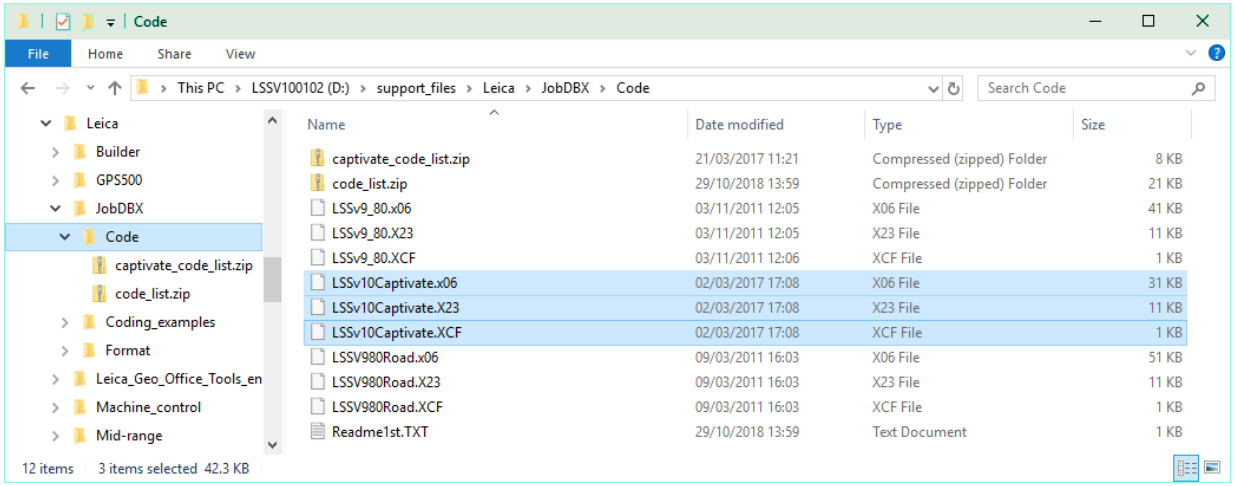


Prototype Survey File - **PROTOTYPE.LSS** ;

Query List as displayed can be used to list the legend entries.

Traditionally the format to use for Leica System X instruments and loggers has been the system X files themselves that make up the code list - .x06, .x23 and .xcf.

Three **Example Codelists** are supplied on the LSS media. They are pre-formatted for immediate upload to the Leica instrument (how to transfer a code list to the instrument via a data card or USB stick is shown later in this document).:



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LSSv9_80 – derived from the standard LSS Prototype for Leica 1200 and Viva.

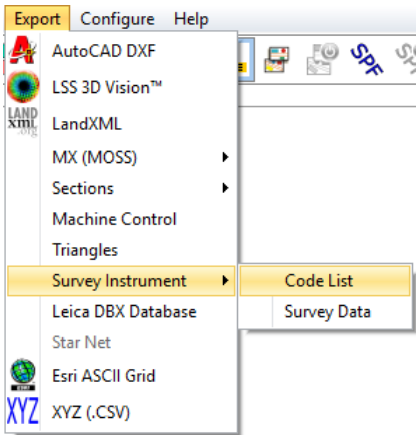
LSSv10Captivate – derived from the standard LSS Prototype for Leica Captivate.

LSSV980Road – derived from the LSS Road markings Prototype for Leica 1200 and Viva.

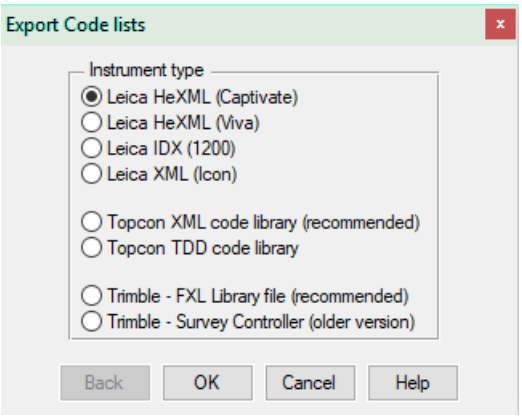
However, with the demise of LGO Tools has gone the option of that program's Code List Manager and hence an alternative is now available from within LSS and the

Prototype.LSS survey.

The command



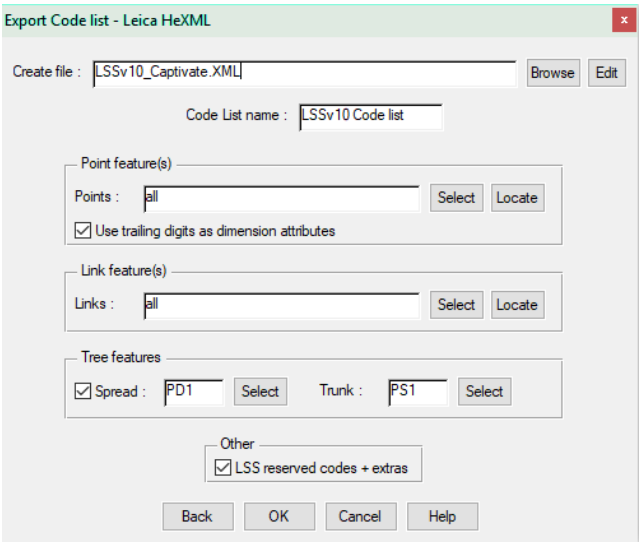
Export Survey Instrument – Code List



Allows

Leica HeXML (Captivate)'

To be selected at the top of the list.



This export method has been used to create a code list for the latest LSS v10 Prototype –

LSSv10_Captivate.XML.

When starting a new job on the logger, it can be configured to include this code list.

The **LSS Export** command is covered later on in this document.

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The two requirements for using LSS coding on Captivate to the best advantage are

'Code List' - created by LSS

'Work Settings' – suitable configuration for LSS coding
(identical for both EDM and GPS).

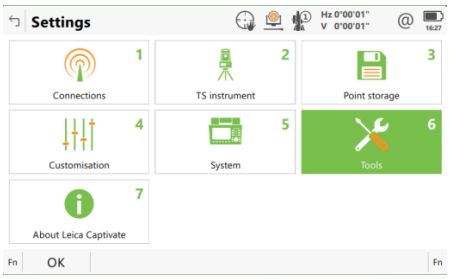
Code List – An example code list has been built from the LSS prototype legend (supplied with Testdata) and is available on the LSS media within the folder
'**Support_files\Leica\JobDBX\Code\LSSv10Captivate.x06, x23, .xcf**, .

The LSS point features translate as 'point codes' and the LSS link features as 'point codes with lines'.

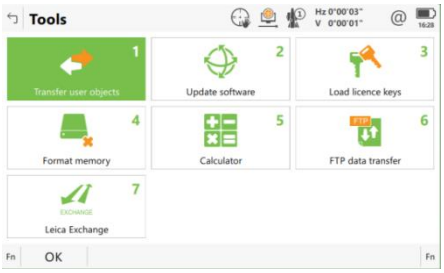
Note: the use of 'line codes' appears unnecessary and has been avoided because of the incompatibility when processing the same code list from a Viva.

The following steps explain the method of transferring this code list to the Viva;
Copy the required Code list files **.XCF**, **.X06** and **.X23**, from the LSS media '**Code**' folder to the '**Code**' folder on the card or USB memory stick.
Transfer the Compact Flash card / USB memory stick from your computer to **Captivate.**
From the **Main Menu**

'Settings'



'Tools'



'Transfer user objects'

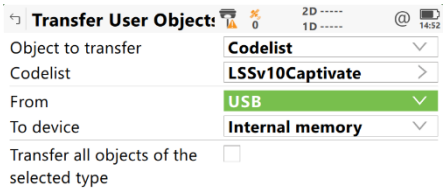
Set **'Object to transfer'** as **'Codelist'**

Set **'Codelist'** to the relevant code list

Set '**From'** as either '**USB**' or '**SD Card**' depending on the data transfer media

Set **'To'** as '**Internal memory**'

OK [**F1**].



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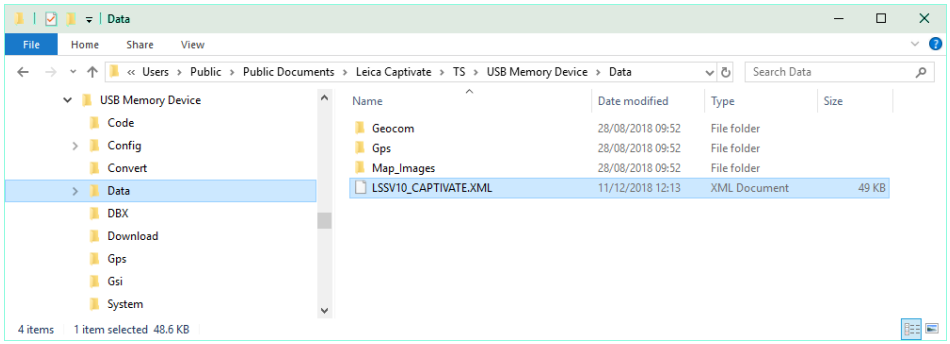
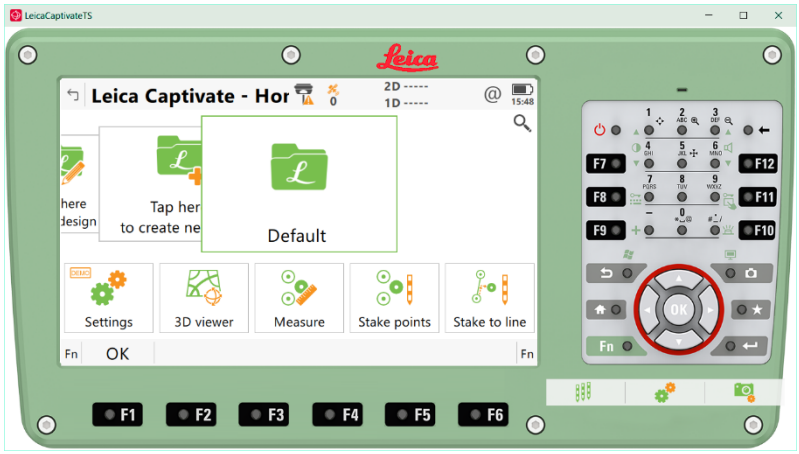
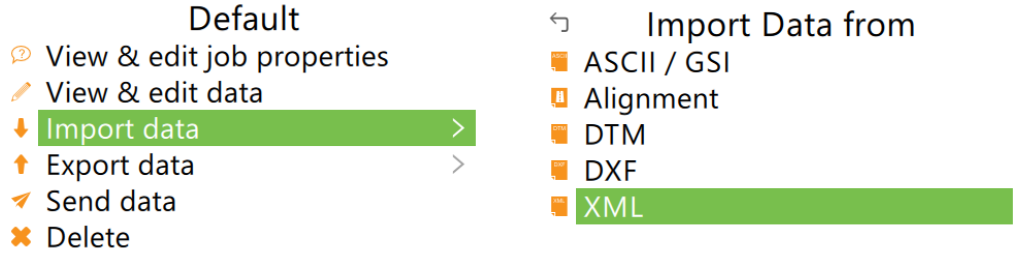
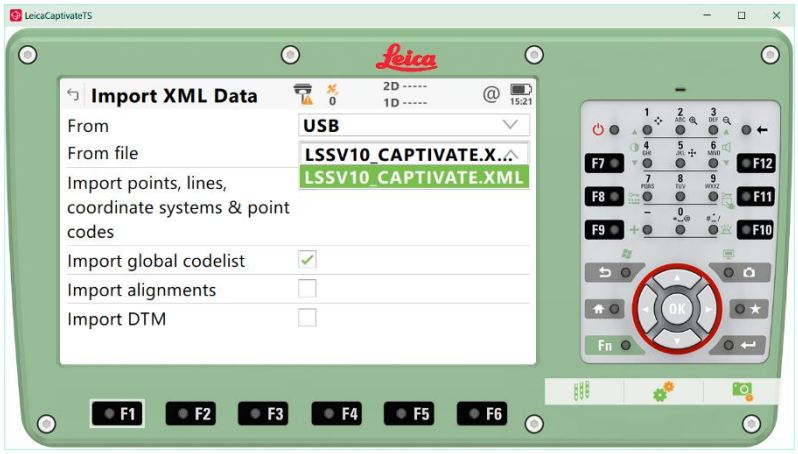
Alternatively and for the latest LSS Captivate Code List we need to ensure the LSSV10_CAPTIVATE.XML is copied to the USB for transferring to the logger, but it will need to be in the Data folder of the USB flash drive.



We need to open a Job, for example 'Default', followed by '**Import data**' and '**XML**';







This time we set From - **USB**

From file – **LSSV10_CAPTIVATE.XML**

We ignore points and lines and so forth, but tick

'Import global codelist'

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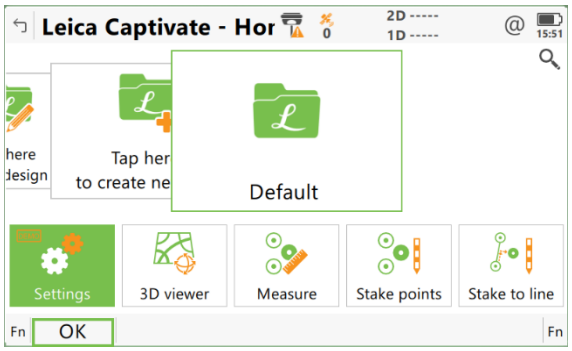
1.6.1 Work Style Settings

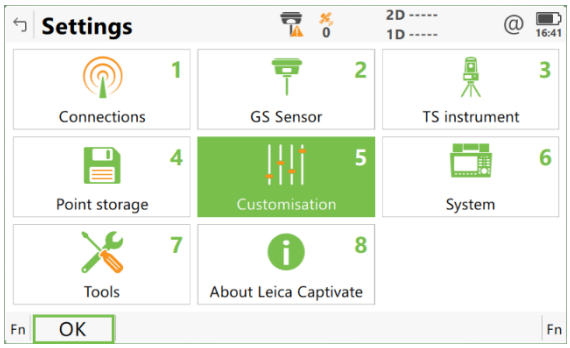
Note: These screen captures refer to TPS and GPS or just TPS, depending on the instrument. These settings are to be set the same for each type of instrument and will need to be duplicated where both are present.

ID templates - To set the ID Templates.

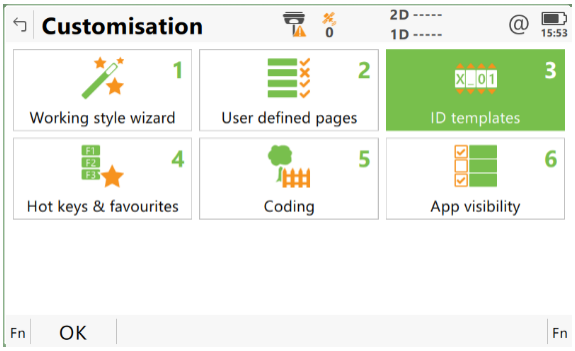
From the **Main menu**



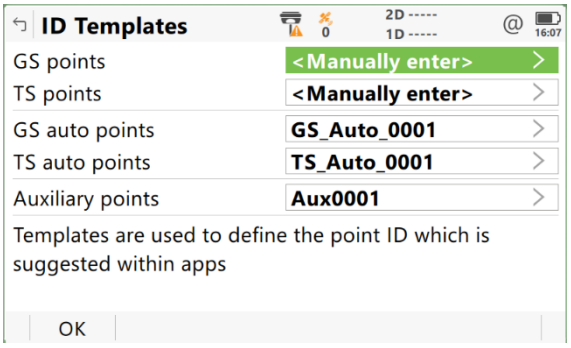
'Settings'



'Customisation'



'ID Templates'



'GS points' as **<Manually enter>**

'TS points' as **<Manually enter>**

'TS auto points' as **'TPS_Auto_0001'**

Note: These screen captures use TPS and GPS as the example.

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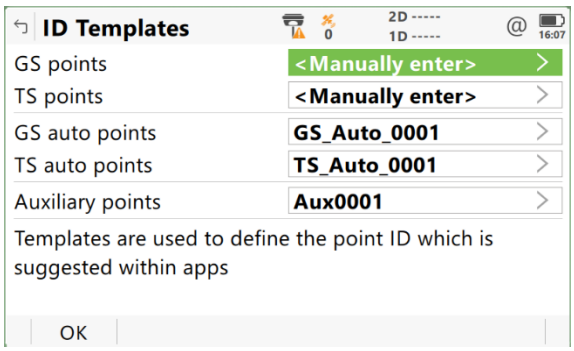
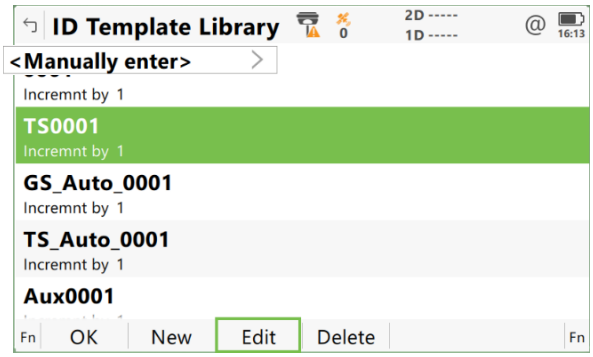
The settings for **'ID Templates'** require the use of the second dialog **'ID Template Library'**

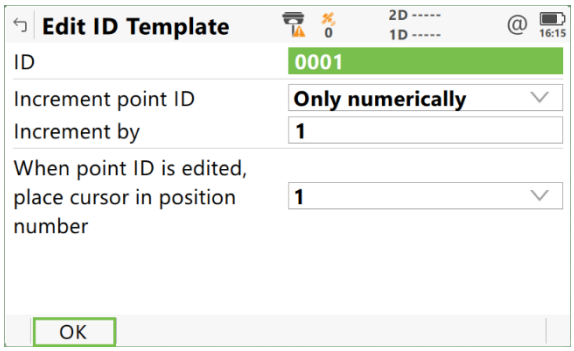


Where relevant click 'Edit' after selecting your choice

For example, highlight the TS0001

And
'Edit'



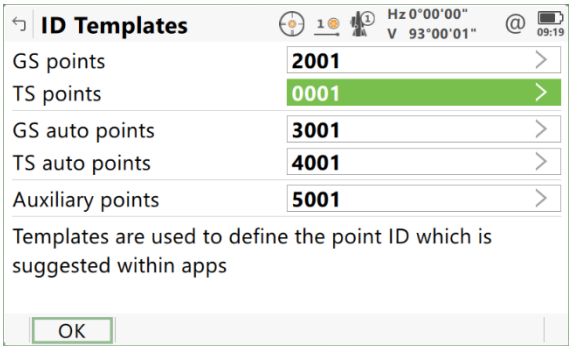


Set the ID to **0001**

Note: in LSS for detail observations, the equivalent Observation Number is numeric only, so it is best if all the set ID points are set numerical, for example, as shown;

This will help ensure that the observations on the logger have unique numerical ID.

It will also result in all the observations being listed in the correct order



Note: The **'New ID Template'** dialog is not always available because some options are **'system ID templates'** and cannot be edited e.g. **<Manually enter>** and **'Use code & string'.**

Note: It may be necessary to go down one to Area001 first, to effect this change.

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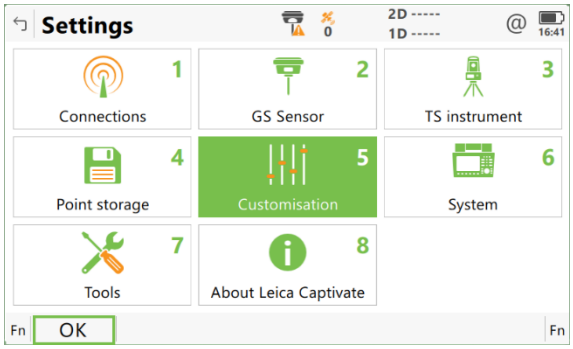
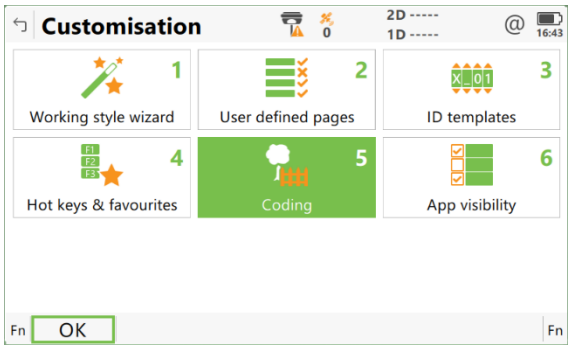
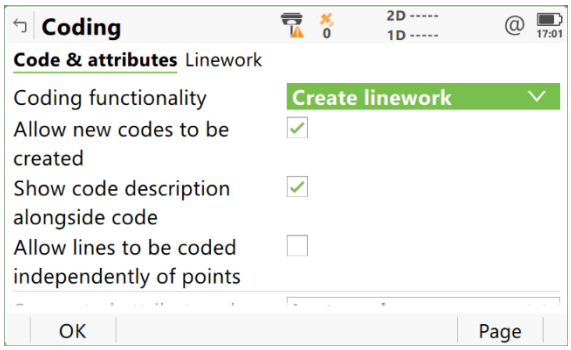
1.6.2 Coding & Linework

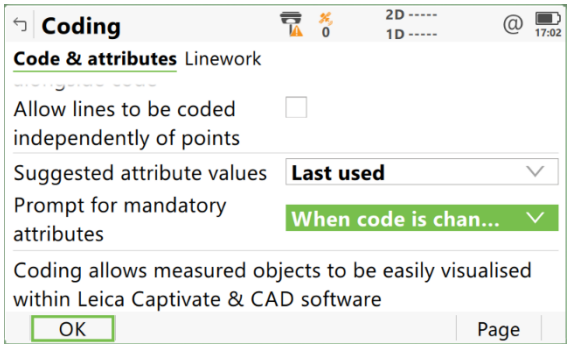
Return to **'Settings'** and '**Customisation**', then select '**Coding';**







Tick



'**Create linework**'

'**Allow new codes to be created**' and

'Show code description alongside code'.

'**Suggested attribute values**' to '**Last Used**'

'**Prompt for Mandatory Attributes**' to '**When code is changed**'

The '**Last Used**' which will recall the last attribute value for each individual feature e.g. for link features the last used string number for the selected feature will be offered.

The '**When code is changed**' where attribute input will not be requested unless the feature code is changed.

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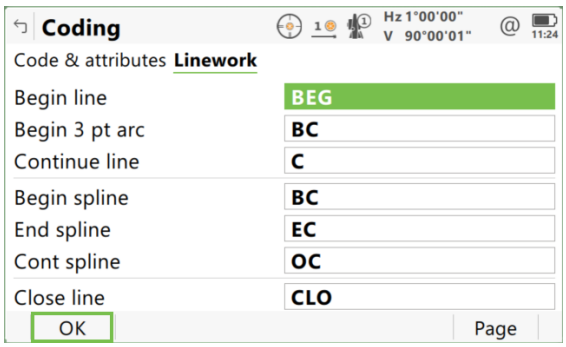
Note: a feature change can be triggered by toggling the feature list using the right and left arrow keys.



Linework: The screenshot shows the suggested settings for Linework on the logger.

Please set the following;

Begin Line = BEG and Close Line = CLO

Quick coding Note: This can be enabled by setting the Coding functionality (shown above) to 'Only code pts - No linework'. Then on the Quick coding tab set to 'On' and the number of Digits to use and how they are stored.

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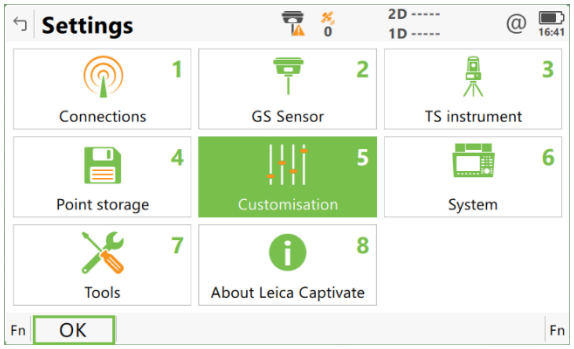
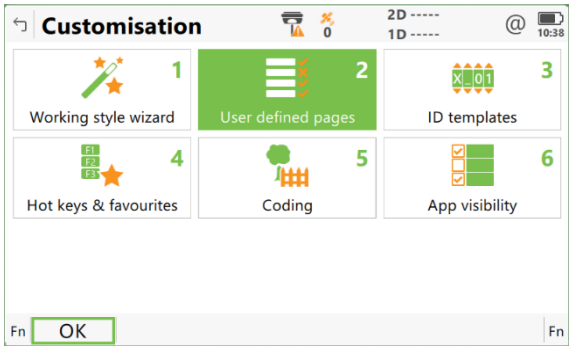
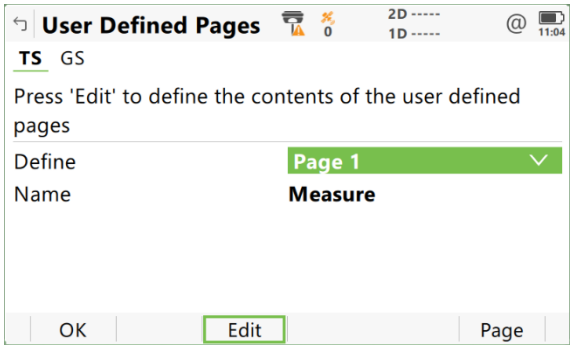
1.6.3 User Defined Pages

These next settings configure the display screens on the Captivate logger seen during detailing. There are three page Tabs available to view on the screen.

Return to **'Customisation'** select **'User defined pages'**



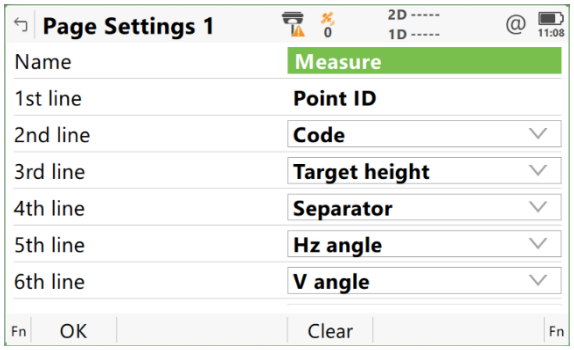




'TS' tab to set the display for Total Station.

Each page is accessed via the down arrow

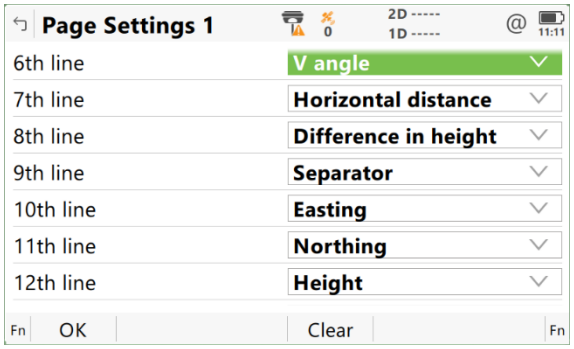
Click 'Edit' to view or make edits.



Page 1 is given the name '**Measure**'

by default, which we can accept.

We will accept these settings but they can be customised as required for the future.



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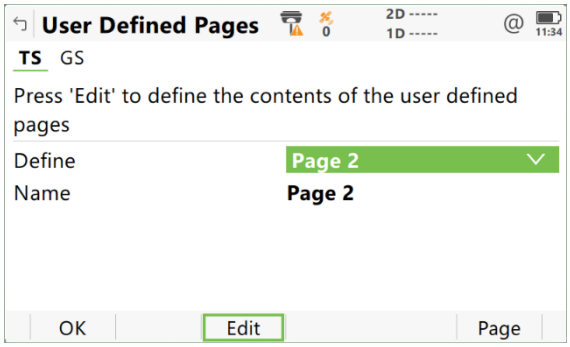
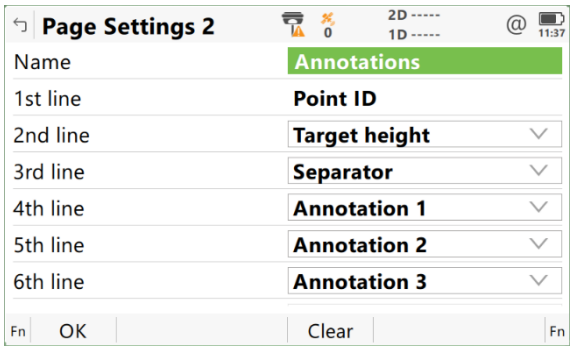
Next in '**User Defined Pages**' use the

down arrow to change to **Page 2**;



'Edit'

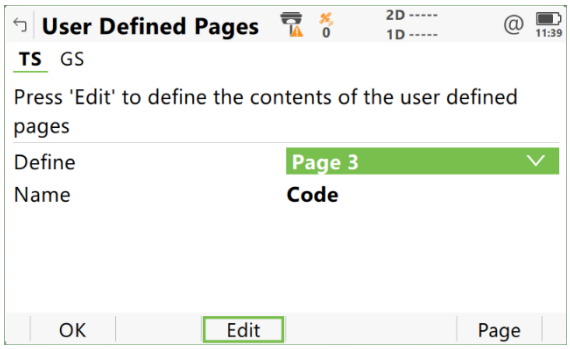


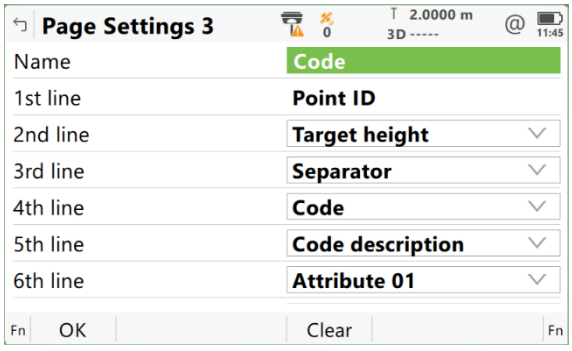
Change the tab name to '**Annotations**'
Leave as displayed

Next use the

down arrow to change to **Page 3**;

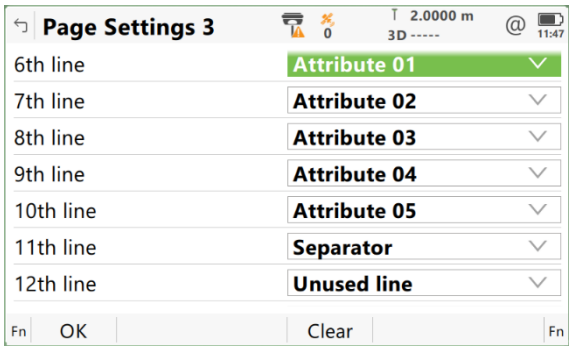
Here we will 'Edit' the **'Code'** tab to help us see how the feature coding works with the attributes in the LSS code list. This will not affect the information displayed on the **'Survey'** screen





If required we can rename this tab.

Scroll down to access the next lines.



The key here is to make use of the attributes through the LSS reserved codes which should be found in the code list.

Set each line for the display as indicated here.

Once complete, click '**OK**' or '**F1**'

Note: This screen example is for TS. The equivalent setting for **'Target height'** on GS is **'Antenna height'**.

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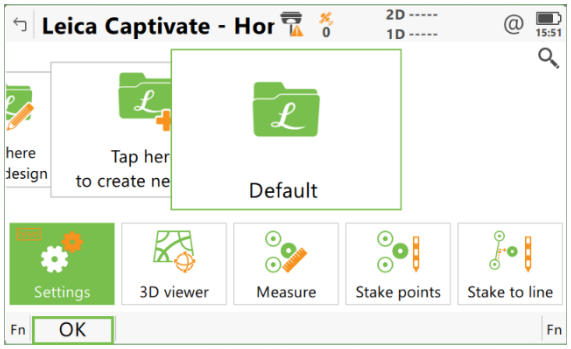
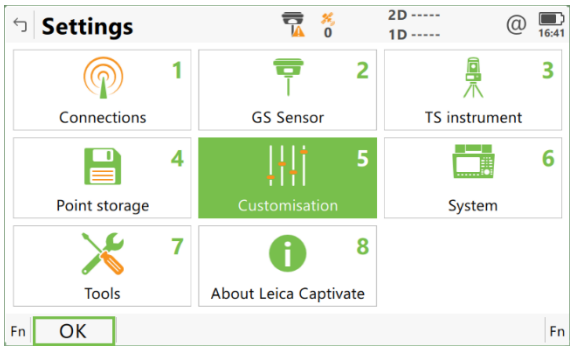
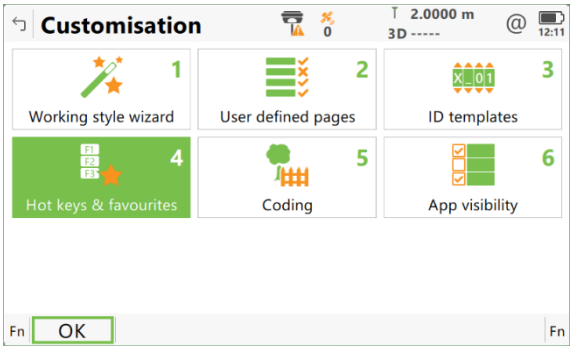
Return to **'Settings'** and '**Customisation**'

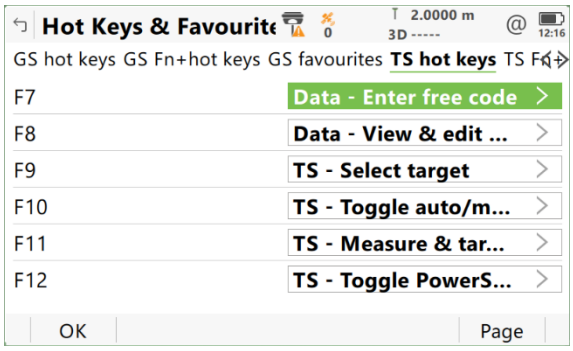




select '**Hot keys & favorites**'



Tab '**TS hot keys**'



The right arrow displays the list of options

Set '**F7**' to '**Enter free code**'

Leave others or change as required by hitting

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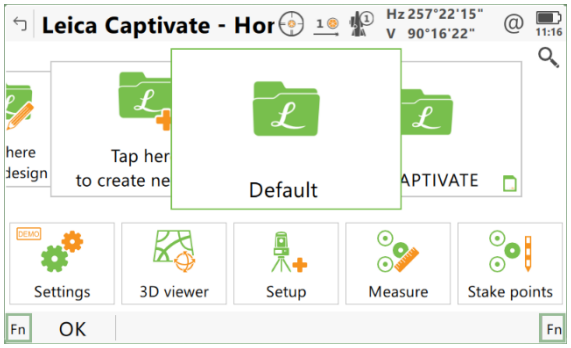


The Function buttons are located in the bottom corners of the main screen;

Once pressed the function opens Tabs for;

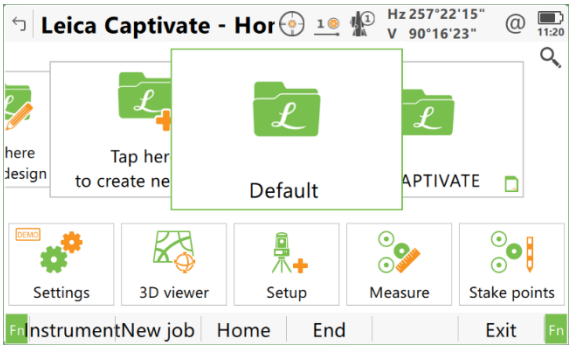
'Instrument'

'New job'

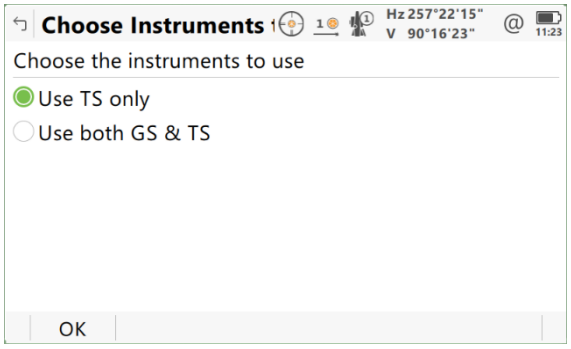
'Home'

'End'

'Exit'



For example, the 'Instrument' tab allows us to choose the instrument type;



In this manual we have set

'Use TS only'

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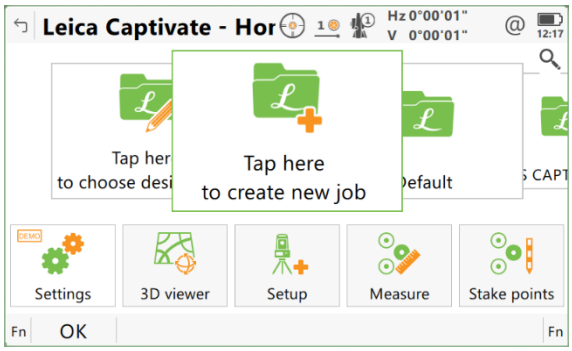
Chapter 2

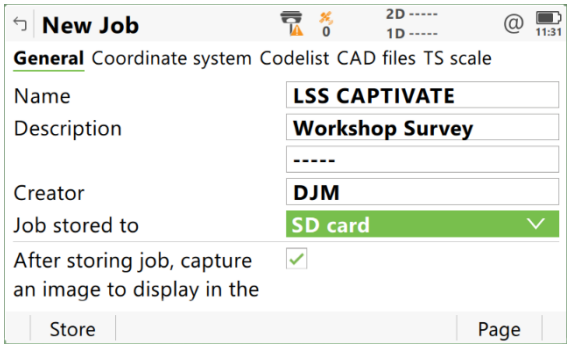
2.1 Instrument Data Capture on a Leica Captivate

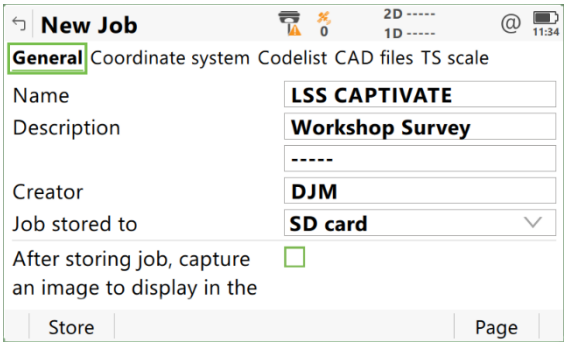
2.1.1 Creating a New Captivate Job

Select option **'Tap here to create new job'** from the **Home screen**

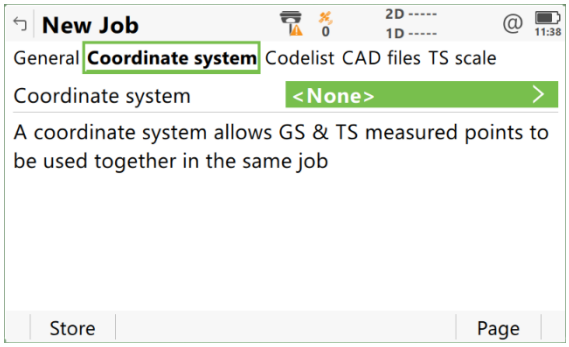


Type in the **Name** and other settings for **General**:





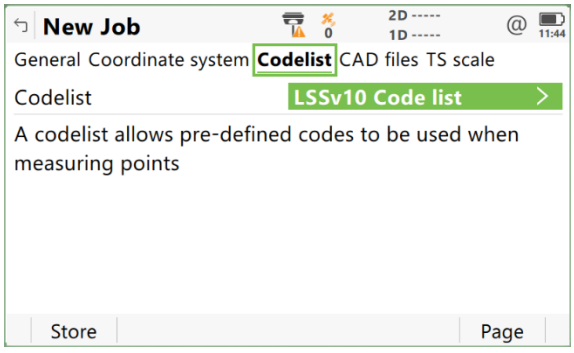
Note: the default is set to 'capture an image to display'.

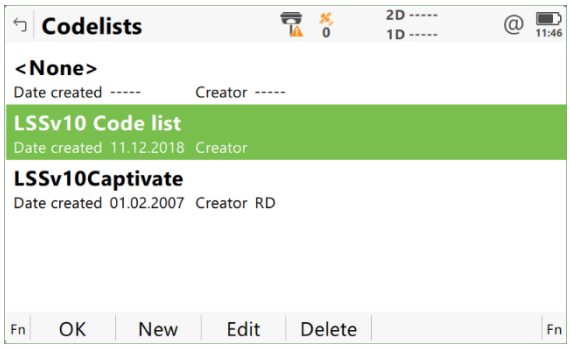


There is a tab to set the 'Coordinate System'

– more for GPS surveying.

Click the **Codelist** tab and use the right arrow to set to the required code list configured earlier:





Note: If only one Codelist is in use on the Instrument then it will be the default. We can ignore the 'CAD files and TS scale tabs for now, and press '**Store'**.

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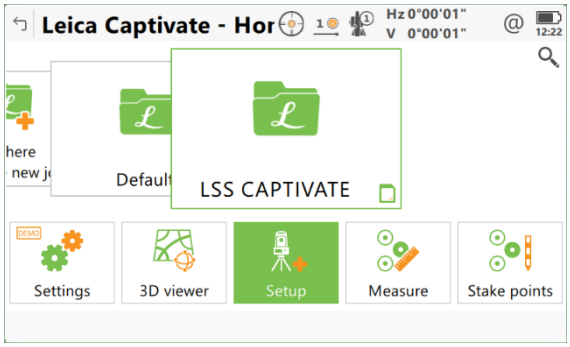
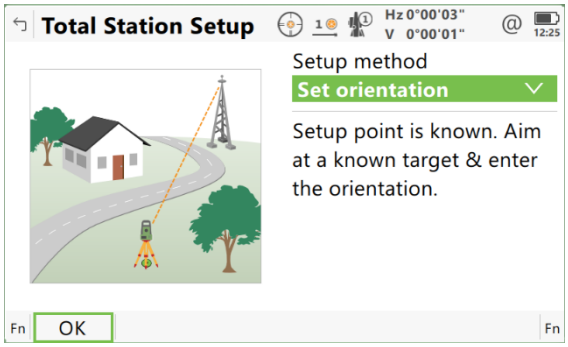
2.1.2 Setup Procedure

The following example assumes an arbitrary co-ordinate system, from a starting point and bearing. If existing control coordinates are needed the stations can be uploaded from LSS to a **Fixpoint Job** (see exporting data to Leica DBX) and then copied to the current job before the first set-up

From the Main screen menu select '**Setup**'

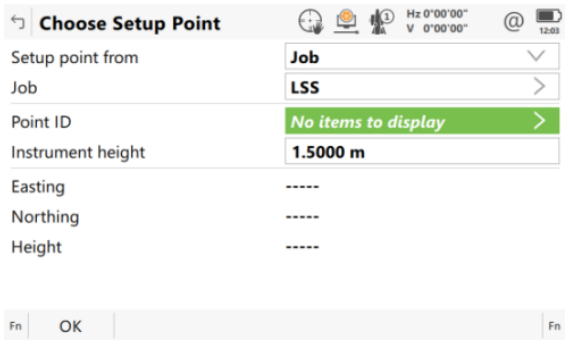


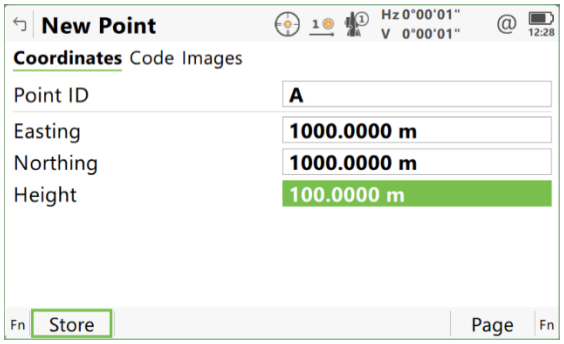


On the '**Total Station Setup**' page select the '**Setup method**' as '**Set orientation**'.

Then click '**OK**'.

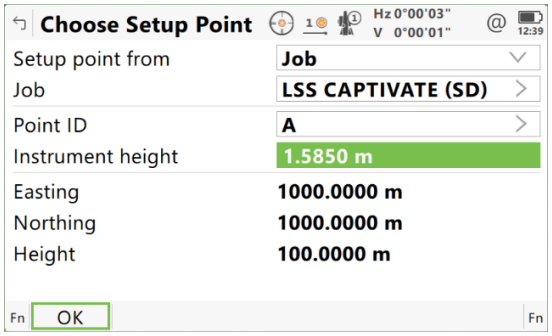
To set the set-on station name and details, click '**Point ID**' and the right arrow to key access the '**New Point - Coordinates**' screen and create a new point and specify a '**Point ID**' (i.e. Station name) and the relevant arbitrary coordinates for new station A;

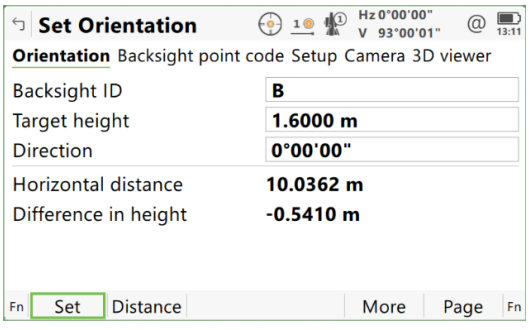




'Store'

Specify a '**Backsight ID'**, '**Target Height**' and '**Direction**', Sight the target, then press '**Distance**' then '**Set**'





You are now ready to start detailing.

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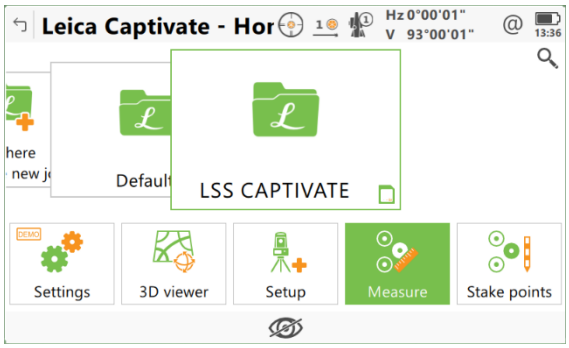
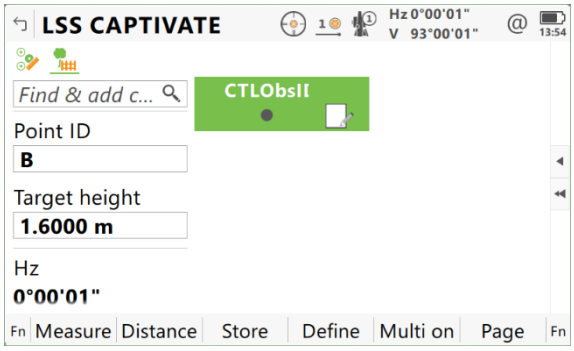
2.1.3 Detail Procedure

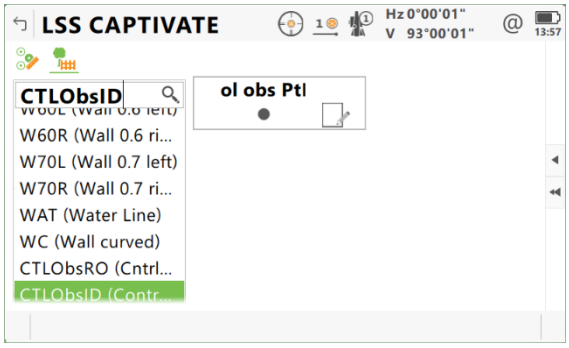
LSS uses Point, Point with Line and Free coding. The Codes are accessed via the display entry 'Code' and the Free Codes via the **[F7]** key. In each case the relevant Codelist is displayed as exported from LSS (see the LSS media 'support_files' folder).

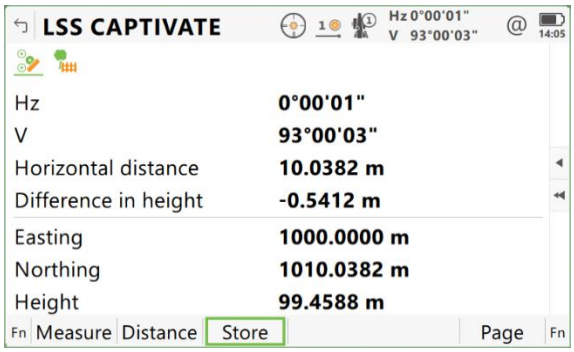


From the '**Home**' menu select '**Measure**'

We will start by taking observations to Stations, *e.g.* B and C, for which the code CTLObsID is selected from the drop-down list - In the '**Code**' option click the list icon;



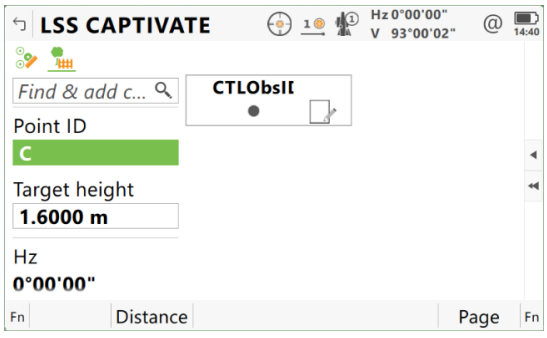


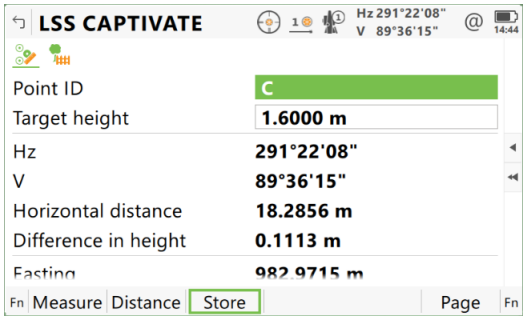


Click on '**Page**' to view the observation.

Either '**Measure**' or '**Distance**' and '**Store**'.

We will use the same code for Station C;





Press '**Store**'

Back to top

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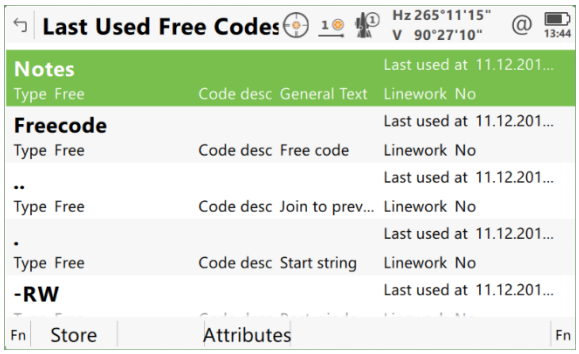
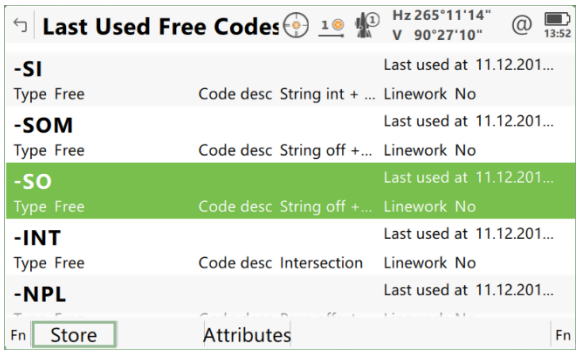
2.1.4 The Free Code and Attributes Options

The **Free Code** commands, accessed with the F7 button, configured earlier, will list the LSS Reserved codes, which in turn have associated attributes.

Use the drop-down list to select the required Reserved Code, **-SO**;





Attributes - The display mask will show the required attributes (either integer, real, text or choice list) for the selected feature code.

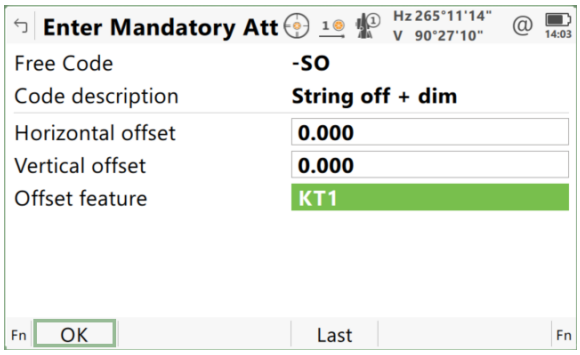
With -SO the choice is to type in

'Horizontal offset'

'Vertical offset'

'Offset feature'

Setting the offsets as here to 0.000 will assume the observation itself is on the offset feature,



KT1 – Kerb Top

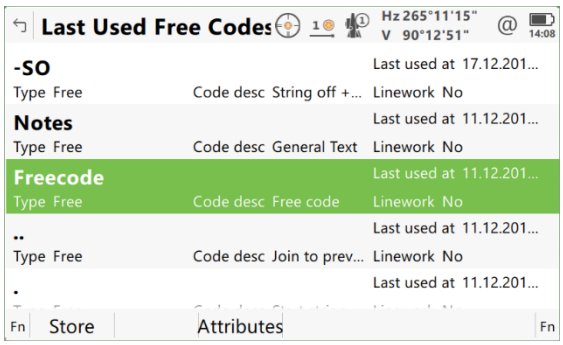
Note: The LSS default for mandatory attributes is 'Only on code change'. The default values as set in the Code list.

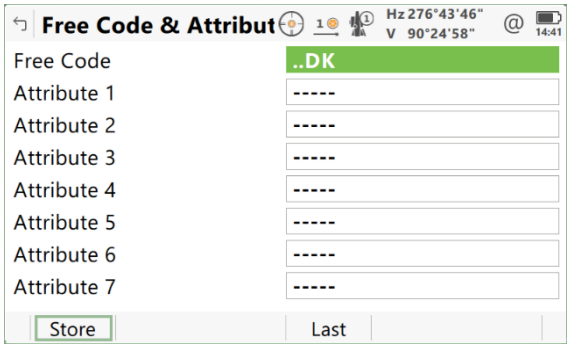
Note: The current feature remains active on repeated measurements.

Note: It is necessary to use the **Attributes** button on the code list to change an attribute that is not set to Mandatory as per reserved codes -REC and –RIN.

Note: The **Last** button will show the last used codes in order.

The F7 Hot key also is used to access the '**Notes**' and '**Freecode**' (to allow extra codes to be added) as well as the "." and ".."





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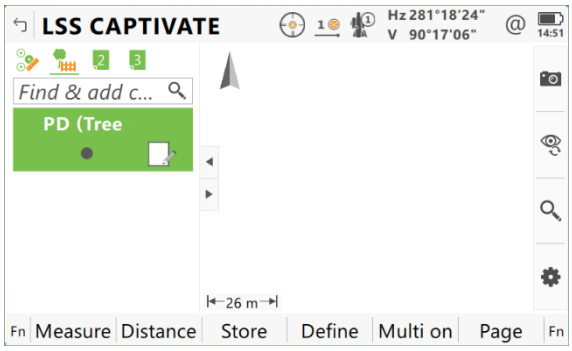
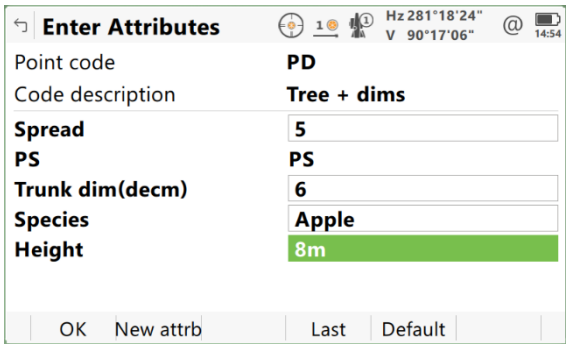
It is the LSS reserved codes for which attributes are generally used but some specific Point features also make use of the attributes on a logger;



There is a prompt for the attributes;



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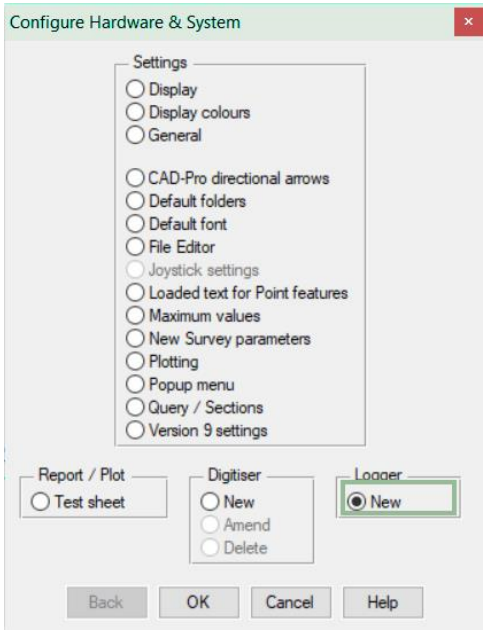
Chapter 3

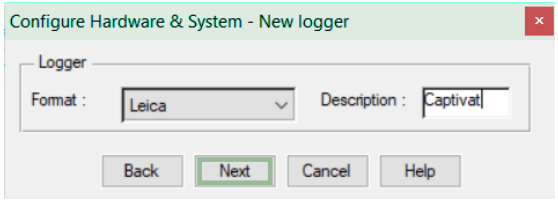
3.1 Configuring the Leica Job (DBX) Reader in LSS

This is a once-only operation, for each type of instrument to be used, on every computer into which survey data are to be downloaded.



To configure our logger of choice in LSS we select Configure Hardware & System, followed by 'Logger - New' (if there is already another logger configured then the option will be 'Logger / Change'). Now we need to choose the format of the data.

We will configure LSS as a Leica logger using the Job (DBX) Reader.



Select the logger format as 'Leica' and give the description as 'DBX'.

Next we choose 'Job (DBX) reader';

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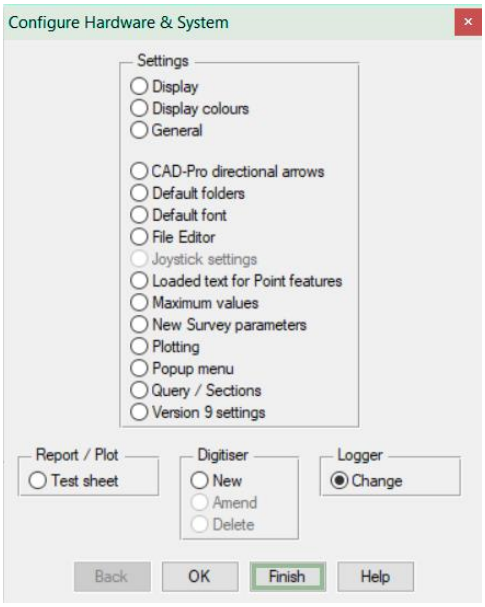
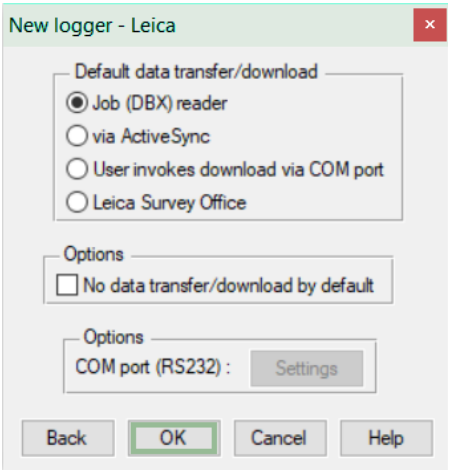
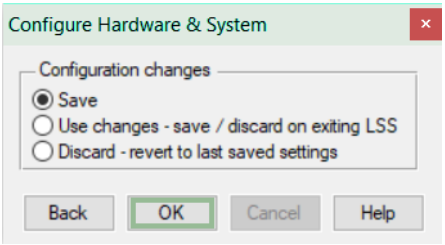


Clicking '**OK**' will allow us to 'Finish' and 'Save' our logger settings to the registry.





Note: This must be repeated for all PCs that are to use the Job reader.
Once installed and configured, the Job reader will read the card and the list of jobs will appear in the next window. On selection of the Job to process LSS will directly create a Load file.

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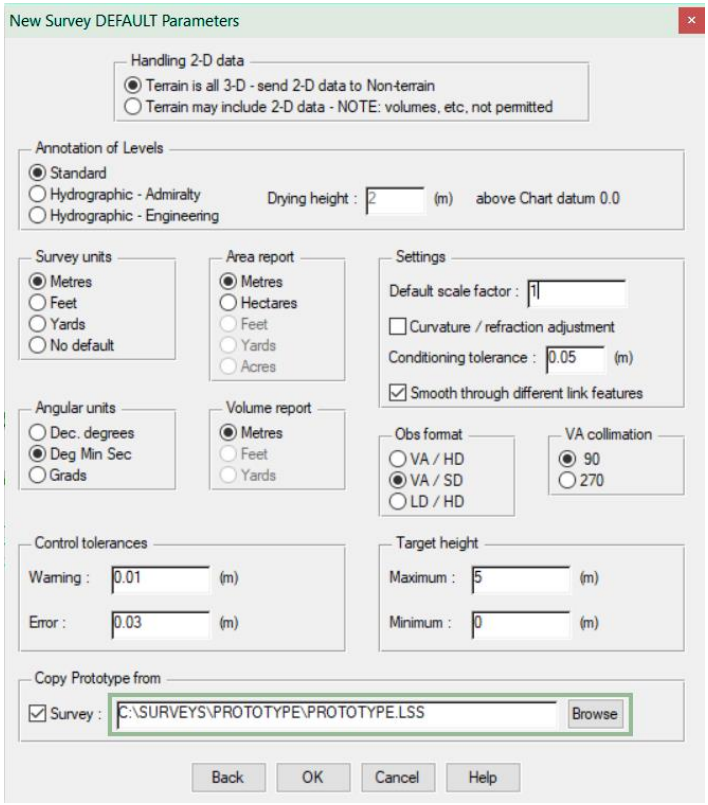
3.2 Configuring the New Survey Parameters in LSS

For each survey the following parameters are set during what is termed the "survey initialisation" process, which is the starting point for all surveys.

The command **Configure Hardware & System - New Survey Parameters** allows many of these options to be set for the PC in the following window:



Set the Handling of 2-D data,

Alter standard Annotation of Levels for hydrographic surveys.

The Drying height is the height above Chart Datum to be considered as 'tidal'.

Set Survey units for length, area and volume in the survey,

And other survey parameters:

Angular units, Obs format, Vertical angle collimation.

Control tolerances set the Load values for Warnings and Errors, and also maximum and minimum Target heights,

'Copy Prototype from' - an LSS template survey from which the feature legend and display settings are copied.

'Default Scale factor' - this value is used to provide a default scale factor to newly loaded or edited stations to relate radial survey observations to their grid coordinates.

The value is normally be set to '1.0', but, **Note:** GPS data (including stations) based on the **OSGB36 TN15 transformation** should have the *local scale factor* applied here.

'Curvature / refraction adjustment' - will apply a fixed correction to radial survey data. The difference in level between adjusted and non-adjusted observations amounts to 7mm in the first **1km**, rising to 7m at 10km, so is rarely of concern for most surveys.

'Conditioning tolerance' - applies to arcs and circular steps - either surveyed or Co-Go generated - or when 'Output smoothed links' is used.

'Angles format' – all survey data is displayed in this format and can be changed.

'Obs format' – cannot be changed once radial survey data have been processed. It is possible to have different formats contained in loadfile(s), but after being processed all survey data is displayed / reported in this format.

'VA Collimation' - sets the default Vertical Angle at horizontal- either 90° or 270°. LSS is able to process combined Face Right and Face Left station observations.

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'Control tolerances' – refer to the survey data processing of control observations. When a control (station) observation exceeds the warning or error values it is reported. However, when an error is issued the survey processing will be terminated as well.

It is the responsibility of the surveyor to be aware of these settings.

Note: It is possible to use negative target heights for when the detail pole is inverted, but exceeding the set values will also issue a warning.

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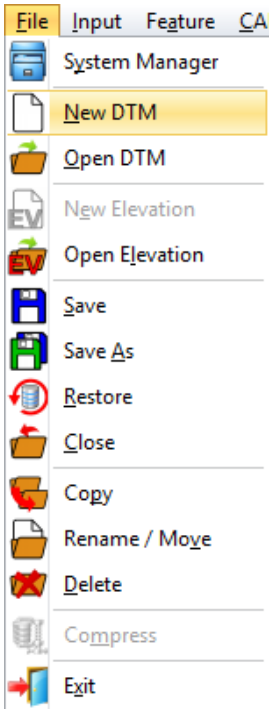
3.3 Creating a New Survey in LSS

A survey must be open to process the data in LSS and we will do this exercise in a new survey.



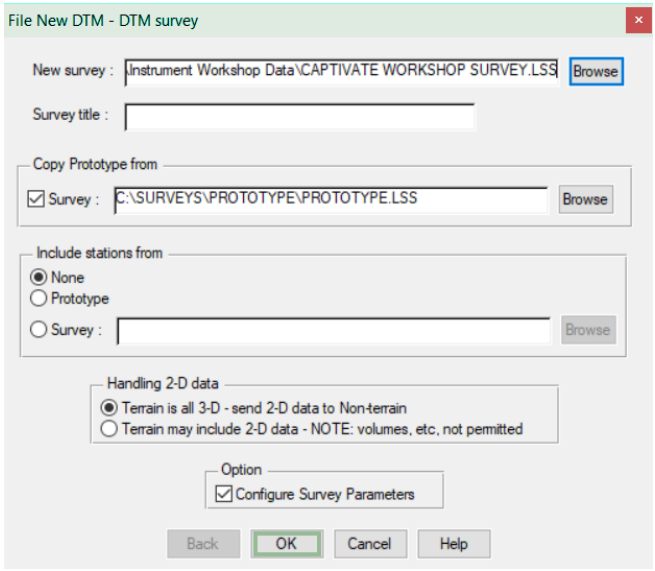
Select **File New DTM** from the main menu.

Click Browse against 'New survey' in the dialogue below.

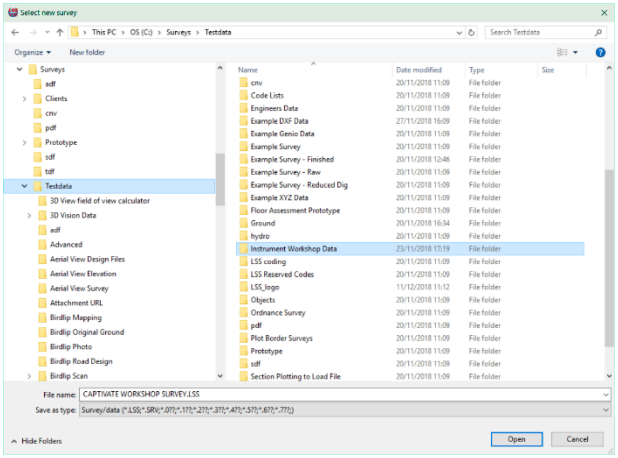
We can create a new folder for the new survey to go in and call it *e.g.* C:\ Surveys\Leica System X Workshop\

Enter the survey name, *e.g.*
LEICA SYSTEM X WORKSHOP SURVEY;

Select it in the 'Save in' box



Click 'Save'.



This will return to the 'File New DTM' dialog with the path and name of the intended LSS survey.

If required we enter Survey title, or if left blank, LSS will use the survey name as the title.

Note: the LSS Prototype is found in Testdata and also in Prototype directory, and either can be used here. It is assumed that the surveyor will look to create their own prototype for their features in say C:\Surveys\Prototype and so will not be accessing the original LSS prototype in Testdata.

The 'Prototype' will be as per 'New Survey Parameters' (described earlier).

If we had stations already at the site we could bring them in here,

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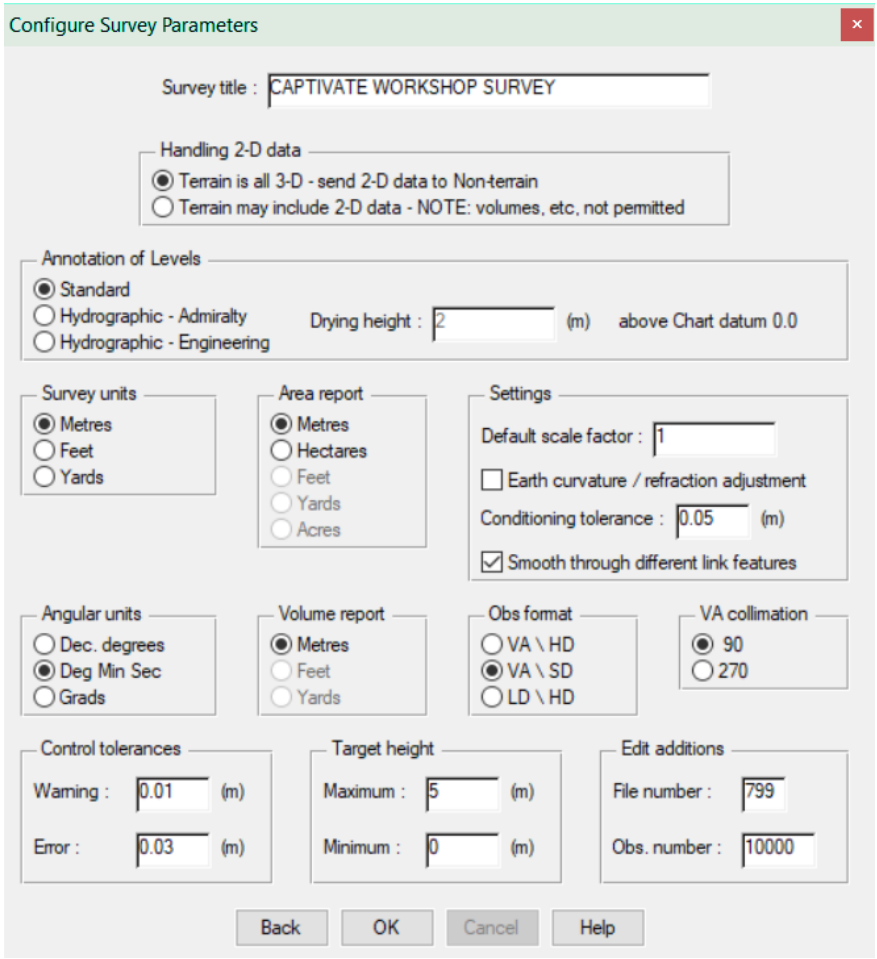
(We will set the survey so any 2-D data will go to the survey's Non-terrain).

Tick '**Configure Survey Parameters**', then Click 'OK'

Ticking the '**Configure Survey Parameters**' allows us to revisit the parameters set during the initialisation process and is worth checking through:



We can alter the Survey Title,

Change the handling of 2-D data,

Adjust other survey parameters.

For GPS data and the Ordnance Survey National Grid TN15 transformation, the 'Default scale factor' can be set here

'Control tolerances' can be adjusted if necessary

This window can also be invoked by the command **Configure Survey Parameters.**

If we continually have to reset a particular parameter, then it might be worth reconfiguring the

New Survey template values in **Configure Hardware & System - New Survey Parameters**.

Note: It is worth saving the survey immediately after initialisation, provided all the parameters are correct of course. This will also set a "Restore point" prior to loading the survey data, and this will help with addressing **Input Load** issues when processing the survey.

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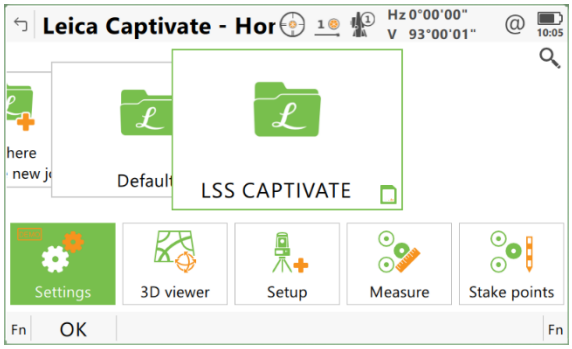
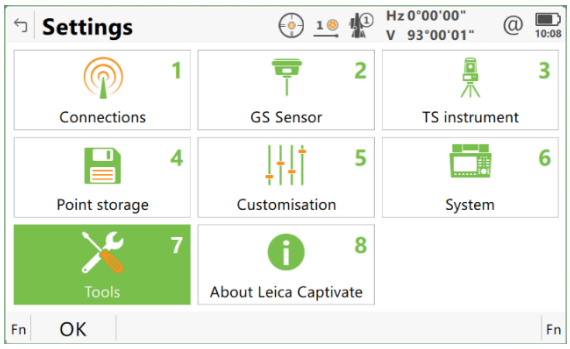
3.4 Data Processing – Input Download / Convert

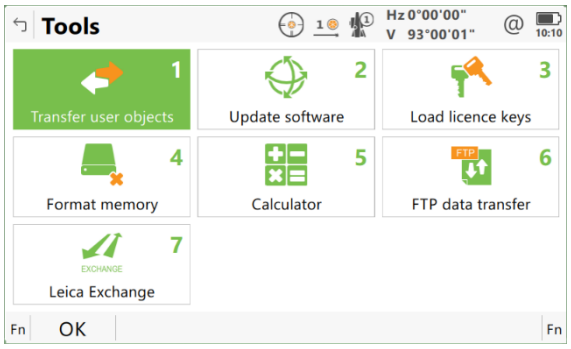
The first task is to transfer the survey Job DBX files from the logger to PC and on the earlier models this is carried out by removing the CF card from the instrument and inserting in the card reader in the PC.

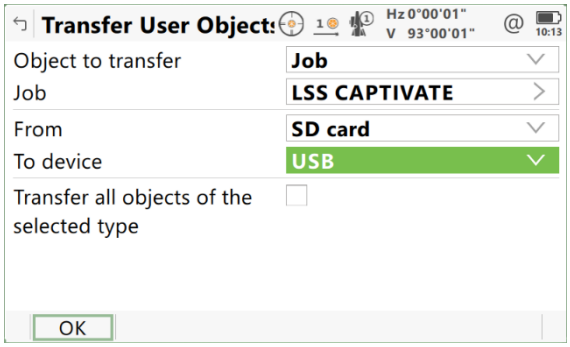
On the Leica Captivate loggers, the recommendation is to use the USB flash drive that has been formatted for the Leica instrument.

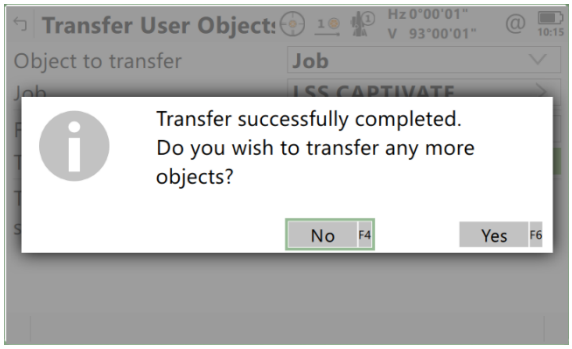
Select Settings - Tools – Transfer user objects option and this time selecting to transfer Job from SD card to USB. This avoids the need to remove the card.











Once we have transferred the Job we require, a message requests whether we wish to transfer any other jobs across.

Once the transfer is, complete we can switch off the unit and we now remove the USB from the logger port to connect to the PC, bearing in mind the warning below;

Important Warning:
Never insert or remove the Compact Flash [CF] card unless the Leica Captivate sensor is switched off. If there is data access to the CF card when removing or inserting it, your files may become damaged.

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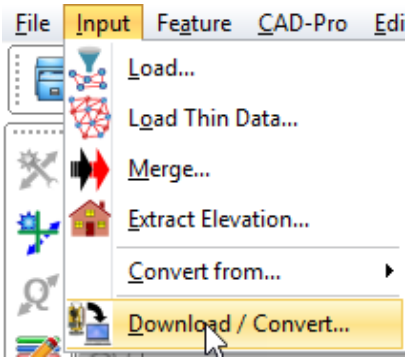
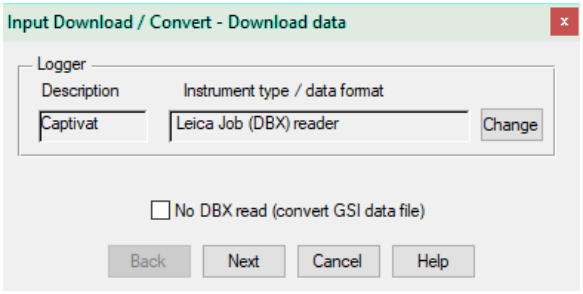


In LSS we select Input Download / Convert to invoke the Download data window.

The Captivate should already have been configured on this PC.

'Change' allows us to make amendments to the logger.



If 'Leica Job (DBX) reader' is not shown nor is it present on the logger list when

'Change' is selected then we have not already configured a logger.

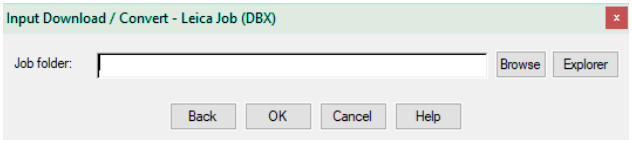
To rectify click 'New' and follow the dialog boxes or refer to the 'Configure Logger' section above.

Note: If a Leica GSI file e.g. '.SVY', from reading a Job via Legacy mode, already exists on the C: drive, we can tick 'No DBX read (convert GSI data file)'.

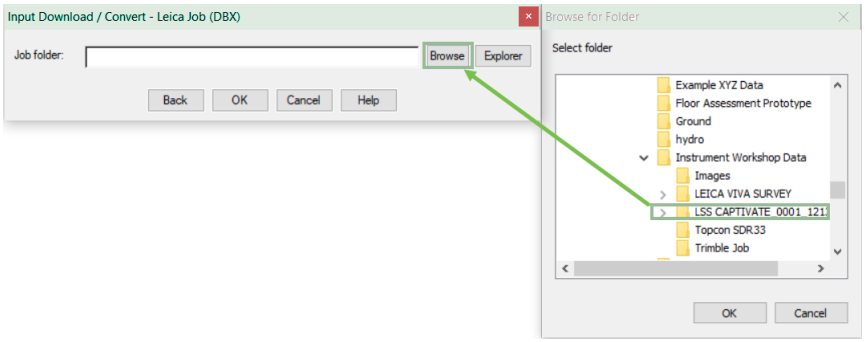
This will skip straight to the conversion dialog where the file is selected as the 'Downloaded file'.

Click 'Next'

We need to define the Leica DBX Job;



Select the DBX folder by either;



Clicking Browse (particularly useful when the DBX folder is on a CF card)

and Click 'OK', or

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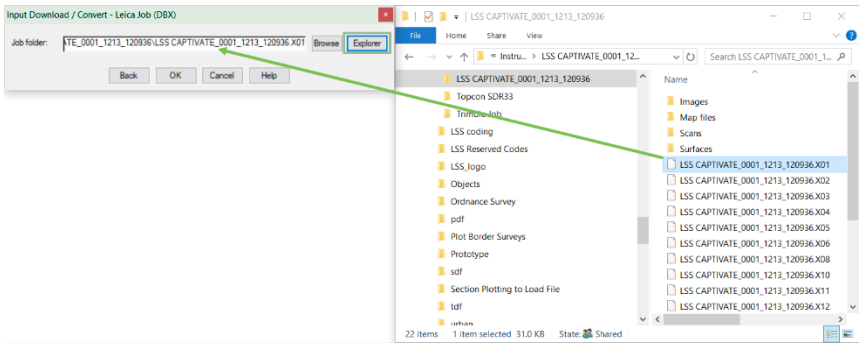
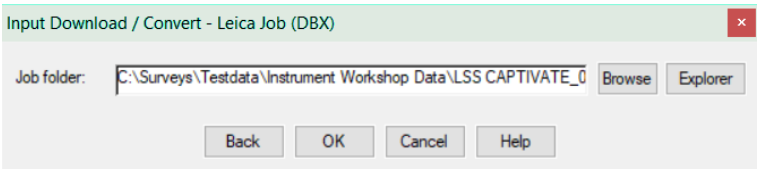


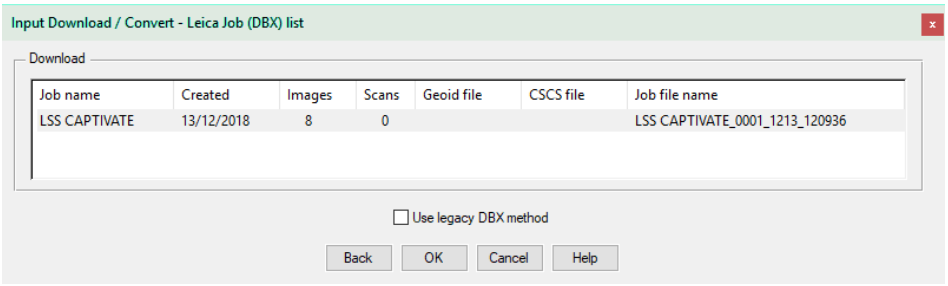
a) Click 'Explorer' (particularly useful if the DBX folder is already on the PC).

This uses a Windows Explorer dialog from which the DBX files (or the folder itself) can be selected using 'drag and drop'.

The Job name should appear in the window.



Clicking 'OK' to the selected Job folder will provide a list of the Jobs in that folder.



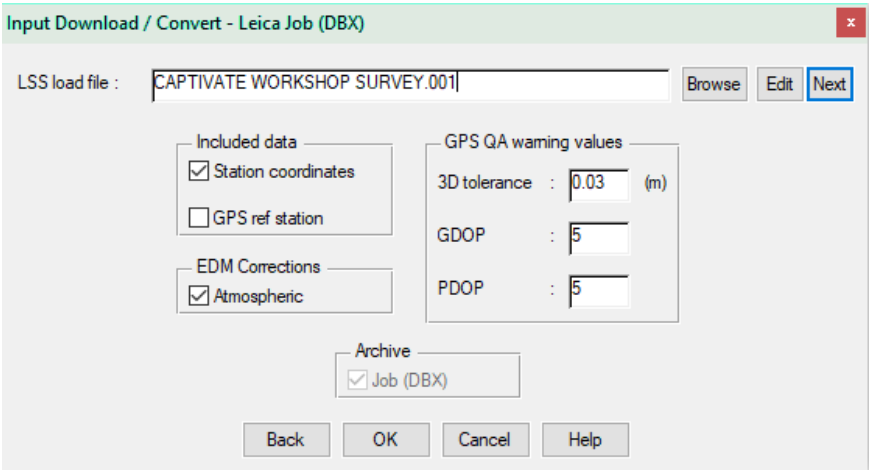
Select the required Job and click 'OK'.

Note: For Viva (or later) instruments each Job is located in its own folder

Note: The 'Use Legacy DBX method' is present to allow a user to process a Job as per LSSv9.91. Please see the documentation from this version if this option is required.

Click 'OK'

If the LSS load file input box is empty and 'Next' is clicked then LSS will automatically provide the next available load file number for the current survey.



The settings for Included data and GPS QA warning values are remembered.

The Included data options relate to the requirement for Control stations in the Load file. The GPS ref station might be selected e.g. if the Job references an on-site base station.

'Archive DBX job database' will copy the database files to a sub-folder of the current survey.

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Note: The job database files (DBX) are not 'archived' if browsed from within the current survey sub-folder tree (the option will be greyed).

Click 'OK' to process the Job, create the Load file, and automatically invoke Input Load.

Note: If the survey does not exist then File New will occur prior to Input Load.

Note: A report is written at the bottom of the Load file showing the QA information, as well as the number of converted stations, set-ups, observations, text etc.

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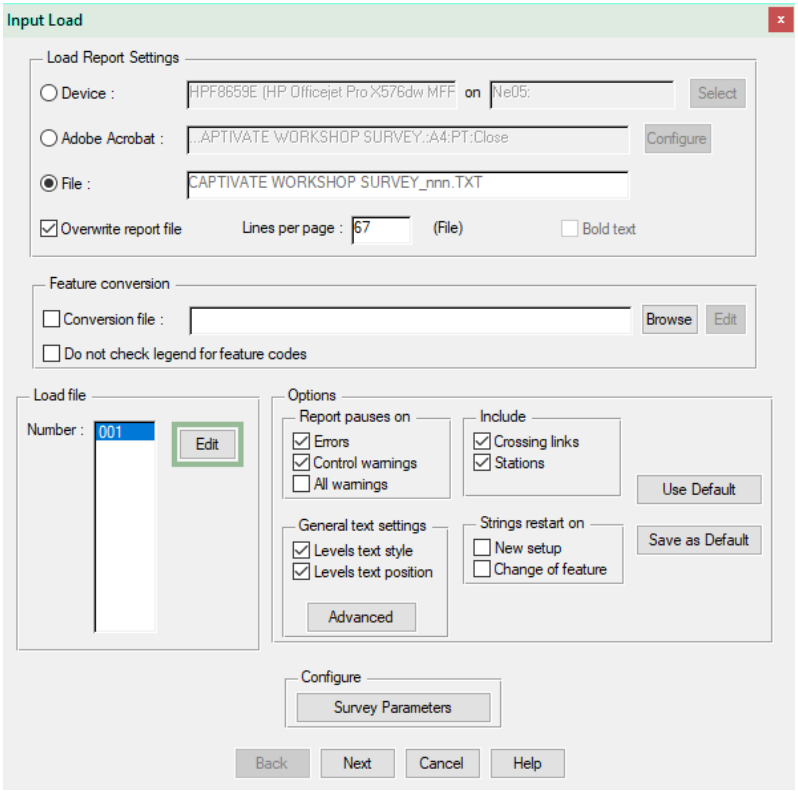
3.5 Data Processing – Input Load

3.5.1 Introduction

The 'LSS Load Input file' is the format by which all external data is processed in LSS.

Loading data into a survey model

The **Input Load** command will invoke the following window, highlighting the correct load file i.e. '.001' if 'Save and Load' has been chosen at the end of the conversion process. .



A Load Report file will be generated – we will accept the default _nnn.TXT file type for this exercise.

A conversion file can be invoked if, for example, the field codes on the logger require changing to the LSS feature codes in the survey's legend

Leave the options as per default, but please note the layout changes in version 10

And the options to set up annotations for features, particularly for utilities surveys

'Next'.

Clicking the 'Edit' button next to the Load file 001 will open the Load file in the editor configured / reviewed earlier

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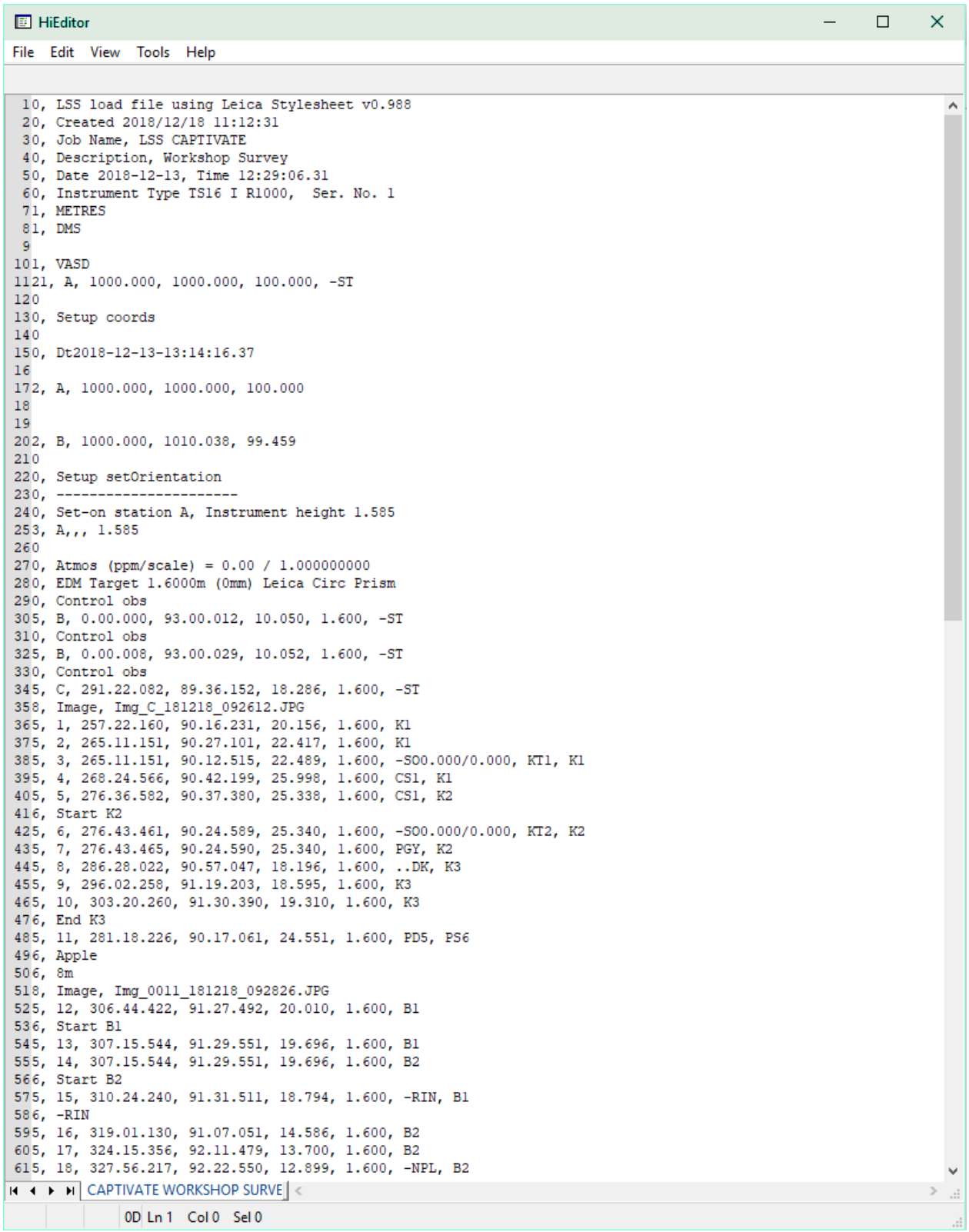
The Load file can be viewed and edited to address any issues raised during Input Load.

'Next' will start the Input Load survey process but usually we will want to open the load file first to check through all the set ups, target heights and feature coding.



A load file can contain either radial observations, coordinate observations or both, which can be opened in HiEditor;

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3.5.2 An Explanation of the LSS Load File Format

Radial and coordinate record types

0 = Comment line containing information that will not be processed by LSS, such as the surveyors name, date and time of the survey.

1 = Parameters record containing e.g. survey units and angular settings.

2 = Station coordinate record.

20 = Station coordinate control observation used as a check and commonly encountered with GPS survey equipment to verify a survey station position.

6 = An item of general annotation (normally text entered on an instrument as a comment or note). Such annotation will be shown in the LSS survey centred on the previously surveyed point.

9 = End of file marker. It is not necessary to have one of these at the end of the file.

Radial only record types

3 = An instrument setup record with set-on station, followed by backsight station, backsight angle, instrument height, vertical angle collimation and station scale factor. Some of the fields may be blank as in this load file as LSS will be getting information from lines which follow.

4 = A control observation where the final field is the station name. If there is a 4 record following a setup record, this will provide any missing information in the setup record. This is identical to a '5,' record with a '-ST' code.

5 = A 'detail' record which contains an observation to a surveyed point with the feature code appearing in the last field. Multiple features may be specified and separated by either a comma or a forward slash.

This record type may also be a control observation, where '-ST' is the code, with the station name either following this or being taken from the observation number field.

We may also use the special or Reserved codes.

Coordinate only record types (not shown in this example)

21 = A coordinate record. Instead of collecting radial data it is possible to collect and convert coordinates, e.g. for GPS survey data. These survey data can also use Reserved codes.

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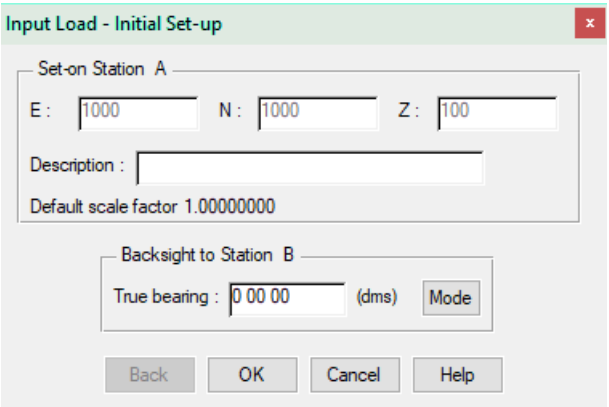
If the survey is empty and no station coordinates are provided prior to the first instrument set-up in the Load file, then an Initial Set-up dialog will be presented to verify the station coordinates and orientation.



Click 'OK'.

Otherwise the station coordinates from the Leica instrument are loaded along with the detail.

As the load file is processed so a report is produced showing all relevant information e.g. comments, setups and control observations. Any warnings or errors found in the data set will cause the processing to pause. An error will not allow Input Load to complete.

The end of the Input Load Report should appear, with a note

*** Warning(s) issued *** recognising that some warnings had been issued.

Any misclosures that exceed the 'warning' parameter are labelled Large differences, and Load will pause. Likewise for any that exceed the 'error' parameter except that here Load will not complete.

If we scroll back up the following report file, we might find 'Warning : Feature does not exist.' and 'Warning : Large Difference.' Warnings have been generated during the Input Load process. Otherwise, click 'Continue' to update DTM and 'OK' to close window.

If a loaded feature is not found in the Legend, then the 'Warning : Feature does not exist.' is created. We will also be prompted to save new feature selections to a CNV file.

For each control observation, the combined 3D measured 'slope distance' is compared with any stored values and tested against the 'Control Tolerance' warning and error values set in 'Survey Parameters'.

Those control observations with 'Warning : Large Difference.' next to them, are where the warning tolerance (0.01m) was exceeded (but not the error tolerance).

Note: The load file header includes the following information as comments;

Coordinate system used (including the geoid and CSCS files used).
Transformation name and type
Projection Scale factor

Note: The processing will also include comments on;
Which detail observations have zero values and have been removed
Whether a station observation is being used as 1d, 2d or 3d.

1d stations observations are commented out and not used, unless it is the only one in the set-up, in which case the load file set-up record uses its values as the backsight name and horizontal angle.

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2d station observations have their target heights removed so that height differences are not attempted to be reported

Whether a station coordinate is 1d, 2d or 3d.

If a station's xyz coordinates are all zero then it is ignored.
If it is 1d it is reported but not used
If it is 2d it is reported and used.

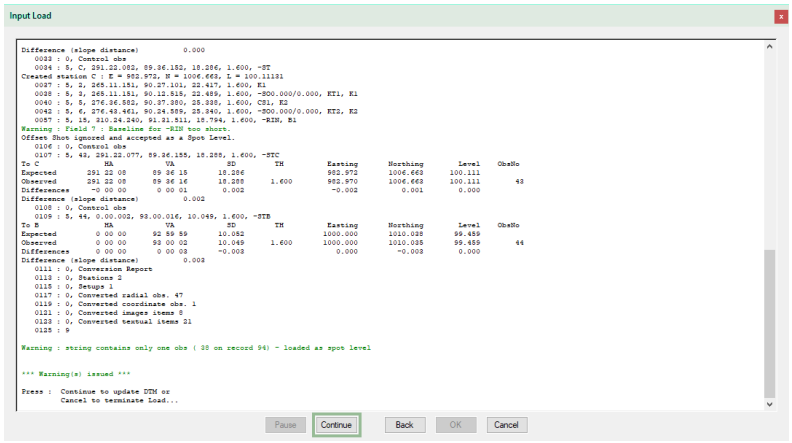
Note: The set-ups in the load file are annotated with the Set-up type

Note: if an observed station does not exist in the survey, then the **first** observation is used to compute its coordinates – they are not meaned here. Subsequent station 'shots' become 'check' observations'.

Note: if any errors are encountered the load will not be permitted. It will be necessary to review these errors and maybe respecify the error tolerance to allow the load.

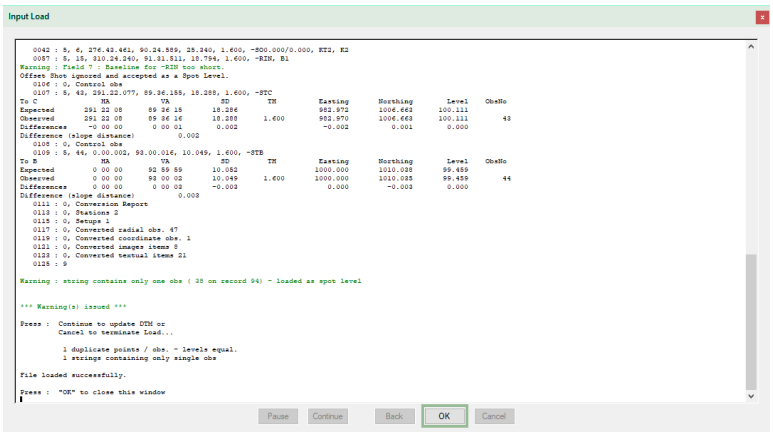
Often errors occur simply because the stations have been incorrectly labelled during the set-ups, or there is one poor observation.

To correct these click 'Back' and then 'Edit' to open up the load file. Some editor programs allow 'CTRL+G' to go to the line directly.



If available, Click 'Continue' at each pause / prompt

'OK' to complete the load.



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3.6 GPS Survey Instrument Issues

GPS data can be read directly from the DBX Job when CSC and/or GEM projection files are in use as long as the GPS coordinate system is OSTN02 or OSTN15, or similarly for Northern Ireland and the Republic of Ireland.

Note: During the **Input Download / Convert** process LSS will report if a job is using CSCS or GEM files on the job list.

Or as a local grid via a coordinate transformation or a fixed base station and the levels relate to Ortho-heights.

Combined GPS (coordinates) data and TPS (radials) data will be processed simultaneously during the same DBX read.

Scale factor

If the Job coordinate system contains a scale factor then LSS can also apply this and therefore correctly maintain the radial (TPS) data with the GPS data in the same LSS model as long as the Geometric scale factor is automatically set on the instrument

For the 1200:

Select the **'Station Setup'** dialog

Click **'Scale'**

Set **"TPS corrections / GeomPPM / Calc Scale"** to **Automatically**.

For the Viva:

Select **'Jobs and Data'**

Select **'New job'** or **'Job properties'** (if it is an existing job)

Set **'Compute scale using'** to **'Stn & coord system'**

This enables LSS to set the relevant scale factor for each individual station and apply this to each shot in the set-up and also to seamlessly process Smartpole data.

The grid scale factor in an LSS model can be changed to a local grid using File\Transform\Scale. This requires the use of File Transform to first Transform Obs as XYZ (which converts all radial observations to XYZ).

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Chapter 4

4.1 Exporting Data to Leica Instruments

The Export of data to survey instruments and loggers falls broadly into four categories:

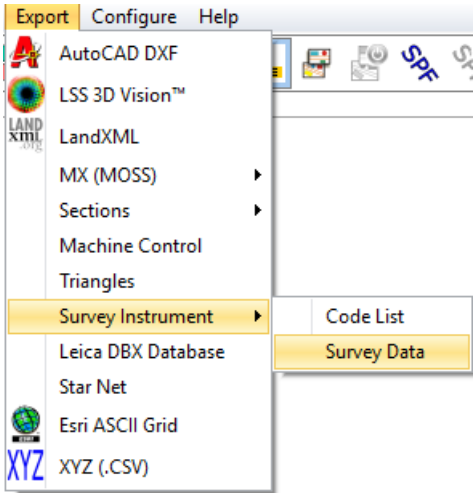
Points
Lines
Triangles
Alignments

LSS exports data to most types of survey instruments using the same logger configuration as **Input / Download / Convert**.

From the main menu the export commands are listed under **Export**;

For survey instruments the key exports are:

'LandXML'
'MX (MOSS)'
'Sections'
'Machine Control'
'Triangles'
'Survey Instrument' – Code List or Survey Data
'Leica DBX Database'
'Star Net'
'Esri ASCII Grid'
'XYZ (.CSV)'



Choose which is the most appropriate for your particular logger.

For Leica System X (DBX) loggers the most likely format would be Leica DBX Database.

The generated files are copied to the CF card or USB ready for transferring to the instrument.

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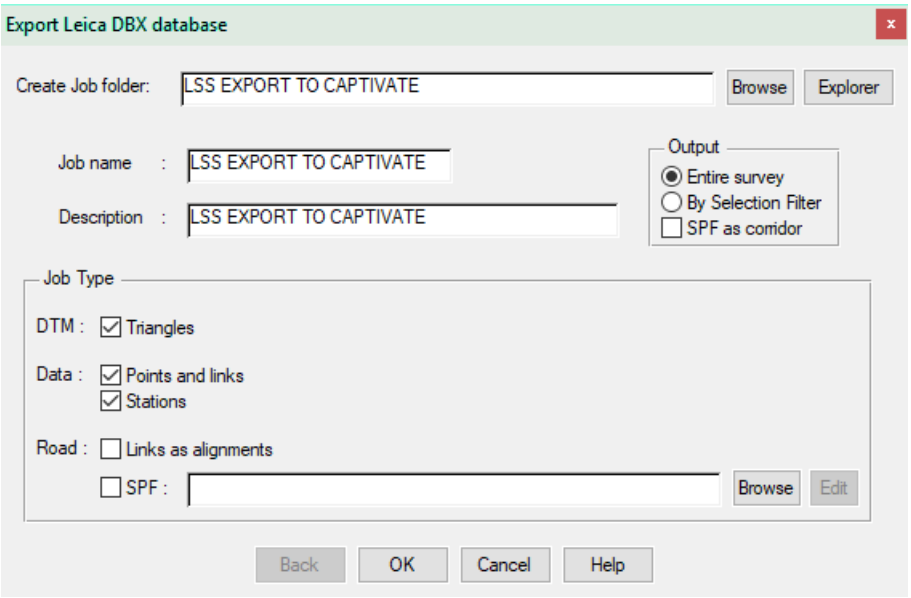
4.1.1 Export Leica DBX Database

The option **Export Leica DBX database** exports the LSS model as the three types of DBX job file direct to DBX based instruments.



Specify a folder name for the exported files using Browse or Explorer. If the folder name does not exist LSS will create it

Specify a Job name and Description which will become the Job name on the instrument.

These will default to the survey name and its Title

Select the type of data required

The user can choose from;

Standard survey DBX – all the observations are exported as Control points with the same point number as LSS and the linework has the same colours as the LSS legend
Stations (Standard survey DBX) – the stations are exported as Control points
DTM DBX
Road alignment DBX - can be exported as an SPF of a design geometry file or an SPF with single or multiple reference strings.

Note: If multiple reference strings are selected via a combination of 'Links as alignments' and 'SPF' then it will be the longest string that is accepted by Leica as the Centre line.

Note: If DTM or Road are chosen then the name is extended to '*Job name* – DTM' or '*Job name* – Road' automatically (as long as the Job name is still the same as the LSS model name). In this way all the required DBX sets can be put into the same folder without the user needing to set different names.

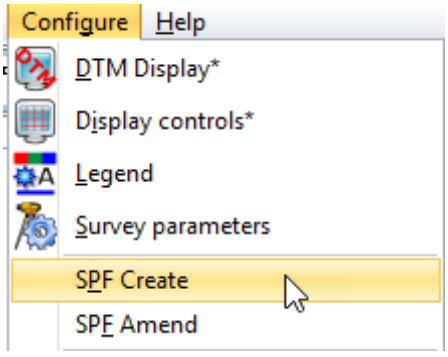
If 'Road (alignment SPF)' is selected an SPF will be needed.

We use **Configure SPF Create**;

Note: An SPF can contain either;

A road design geometry imported via MX Genio or LandXML
or

A normal SPF that can contain multiple reference lines.



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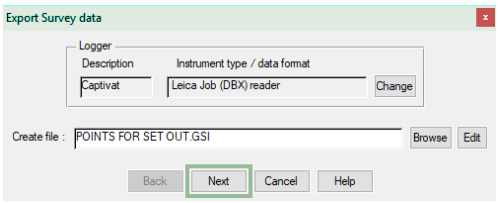
Export Survey Instrument – Survey Data

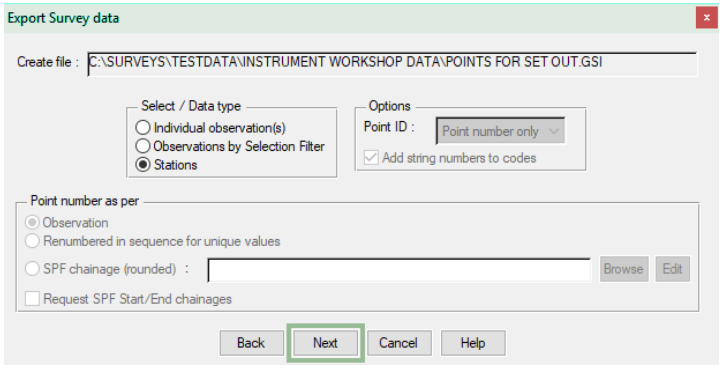


Note: The logger parameters can be altered by clicking 'Change' or by using **Configure Hardware & System / Logger**, or by clicking 'Change' in dialogue box;

Specify a name for the exported file and

click 'Next'.

This dialog allows the selection of observation and station data;



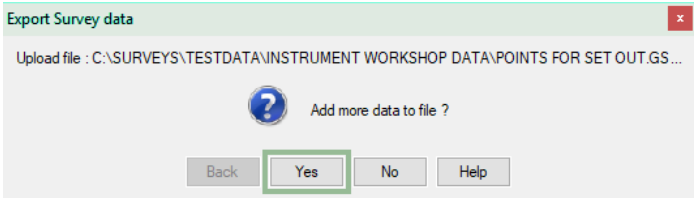
The defaults assume that the 'Observations' will be exported using the Selection filter.

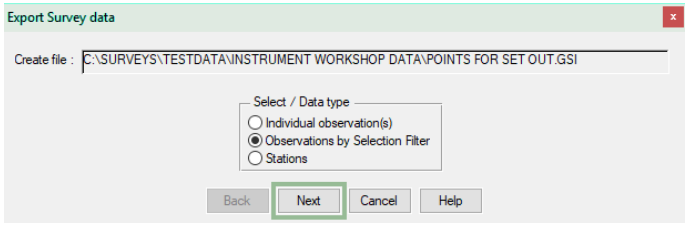
Note: The observations can have the code added to the point number, which can be related to the SPF chainage.

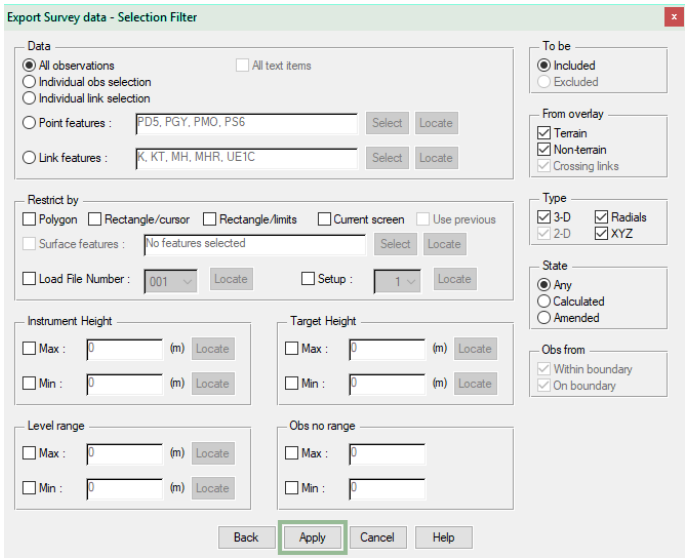
'Stations' first

Click 'Next'.

If chosen the Selection filter dialog will offer the opportunity of multiple observation selection criteria.







Hit 'Apply' to make selections on the screen – there can be many.

As soon as there are observations selected then the

'Cancel' button is replaced by 'Finish'.

Click 'Finish' once all required data is highlighted.

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Note: The data selected by the Selection filter is grouped in the export set first as complete strings and then as individual points related to their loaded order. To export the observations in the order they were located use 'Individual observations' from the previous dialog.

Select -Upload when prompted.

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4.1.3 Exporting an LSS Code List to Leica Captivate

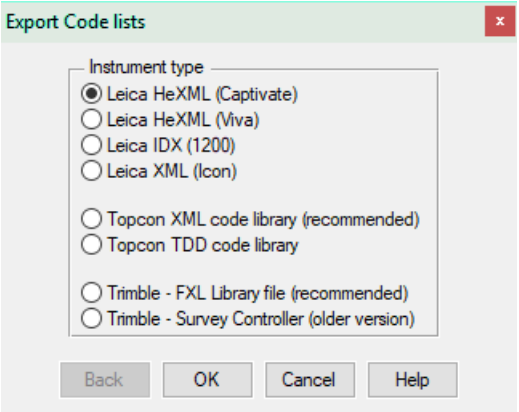
The LSS Export to Code List, now found in 'Export Survey Instrument – Code List' will produce a Leica code list.

However, we suggest that for new users the LSS prototype legend (supplied with Testdata on the LSS media) is used as a standard starting point for which there is a pre-built code list available in the 'Support_Files\Leica\JobDBX\Code_list' folder of the LSS media.

Please refer to the 'Transferring a code list…' in Session 1 above that explains how to copy these files onto the device.

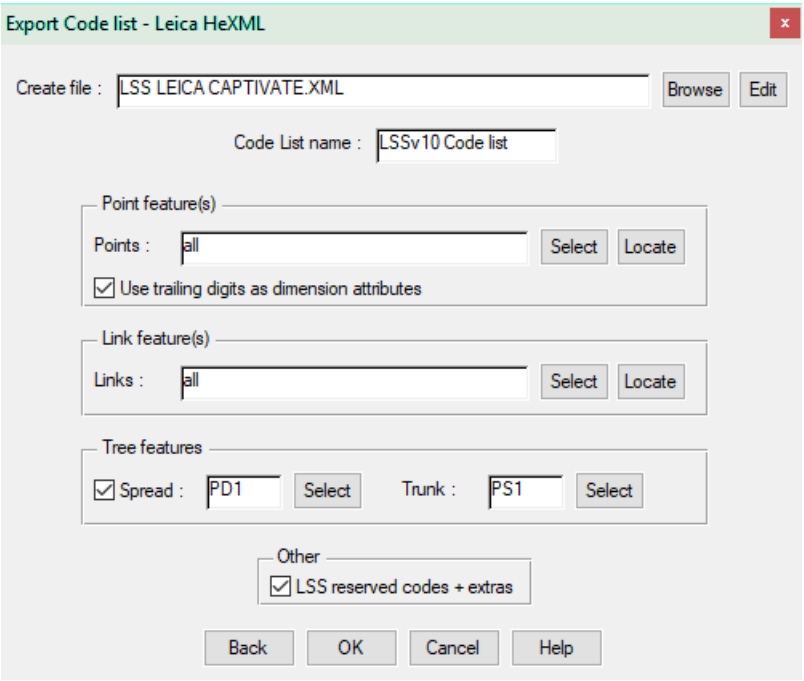
As a consequence it is suggested that the Export code list option is best used for sending *new additional features* to the Leica code list as they are added to the LSS Prototype Survey.

Within a survey containing the prototype legend use Export Survey Instrument – Code List



For Leica Captivate we use

'Leica HeXML (Captivate)



Provide the filename for the code list and Use LSS to generate the IDX code list

'Select' the required point features.

Tick the 'Use trailing digits as dimension attributes' under Points if there are dimension items e.g. PT1, PT2, …,PT20 etc. This will allow LSS to export these as a single feature with a Mandatory integer attribute for a more efficient code list.

Note: It is important in this instance to have an extra feature without the numeric suffix e.g. PT, within the legend so that LSS can convert the items cleanly during the survey processing.

'Select' the required link features.

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Tick the 'Include attributes for string numbers (links only)' under Links if required. This will add a Normal integer attribute, with a default of 0, so that each link feature can have a string number.

Leave the 'LSS reserved codes' box ticked to create all the Reserved codes as Free codes.

Note: This option will also export the 'String codes' and 'Code words' code groups that contain a mixture of free and point codes for extra functionality. OffsetLR, OffsetFB and OffsetUD are identical to the relevant reserved code offsets and SetupFr, SetupPt and CTLObsRO are for use when not using the instrument set-up and coordinate menus.

The primary String codes and Code words are;

CTLObsID' – for point coding a control observation for the instrument and LSS simultaneously.

'Notes' – for adding general text at an observation

'Freecode' – for adding multiple codes to one shot only

Start a new string from the previous point

The reserved codes as a group

The 'Tree feature' requires two Point features with digit suffixes for dimensions, the first feature represents the spread and the second the trunk e.g. PD1 and PS1. This also requires the features PD and PS to exist without the integer value as per Point features.

Note: The Tree feature has several attributes combined to make it a tree function including adding height and species information as well as the spread and trunk.

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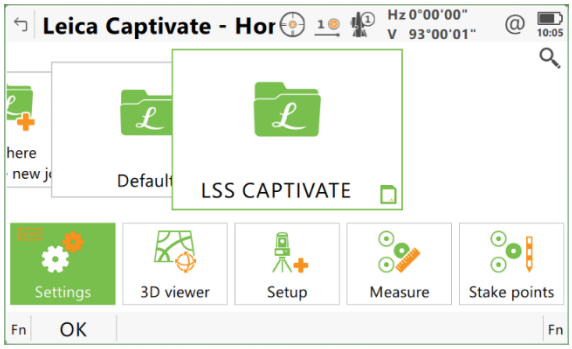
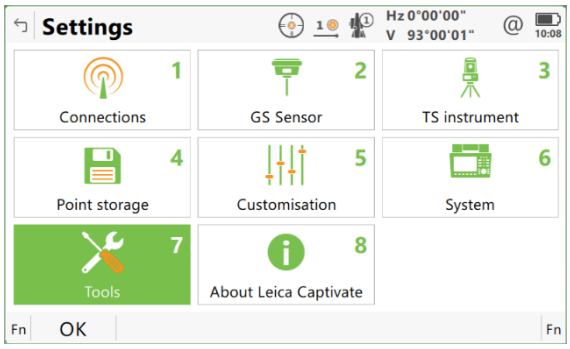
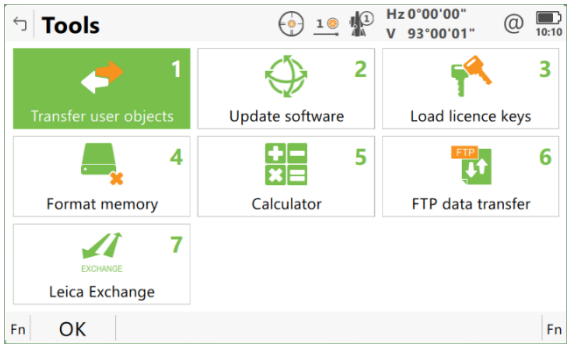
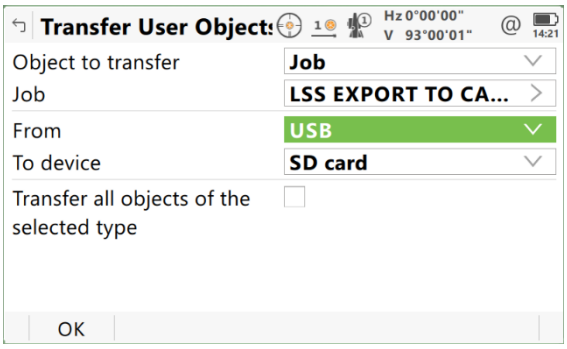
4.2 Opening a DBX Job on Captivate

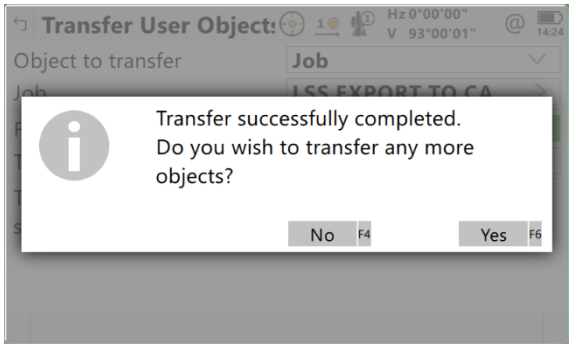
Once exported the DBX Job files are transferred to the Leica Captivate SD Card or USB stick as required.





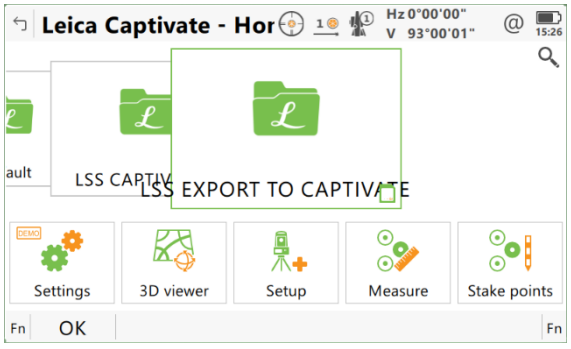


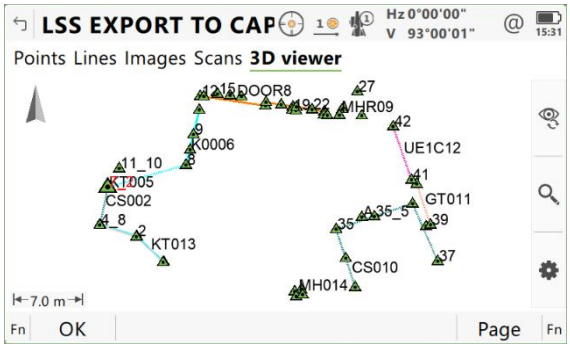




Once we have transferred the Job we require, a message requests whether we wish to transfer any other jobs across.

Select the job on the Main screen;





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Conclusion

Using this manual, we hope that you will be in a position to start making the most of the survey instrument.

We strive to cover and support as much of the capabilities as possible but there are always new methods and developments, so do keep in contact by visiting the LSS Help and other on-line resources or call our support line.

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