

Instrument Manual

Interface to Leica FlexLine

LSSTM

Leica
Geosystems



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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.

Chapter 1

1.1 Install LSS and Testdata

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

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

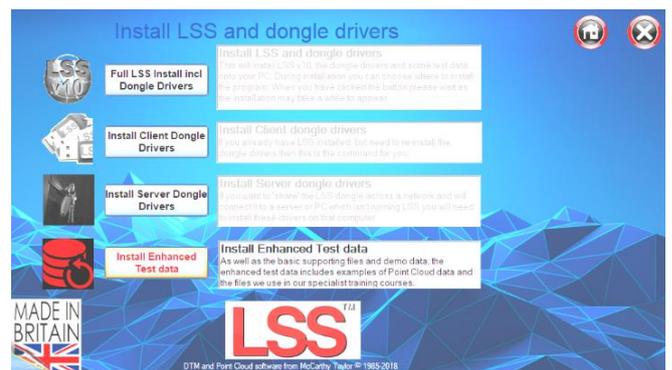
Select 'Install LSS & Test Data';



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



We can ignore here 'Install Enhanced Test Data', which includes examples of Point Cloud data and the files we use in our specialist training courses



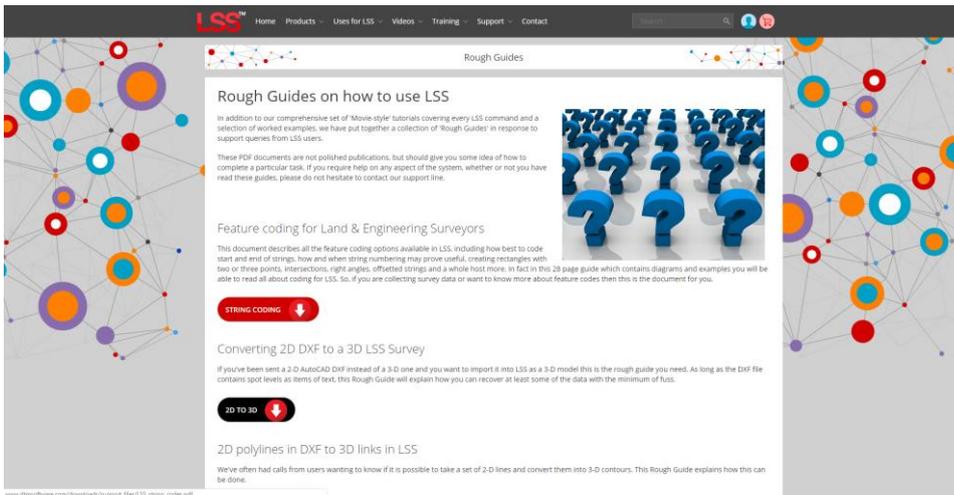
1.2 LSS Rough (How to) Guide

In the main window there are some other useful items that can be installed.

The 'How to Guides' are pdfs documents.



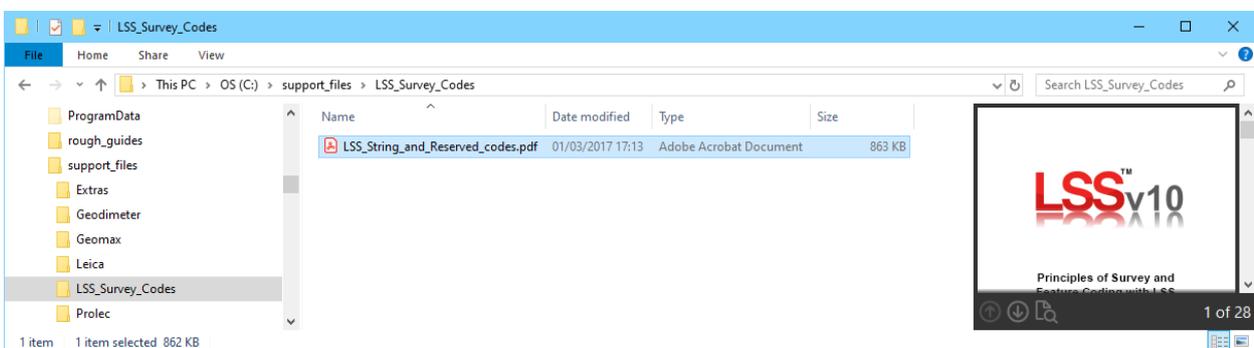
1.2.1 LSS String Coding and Reserved Codes



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

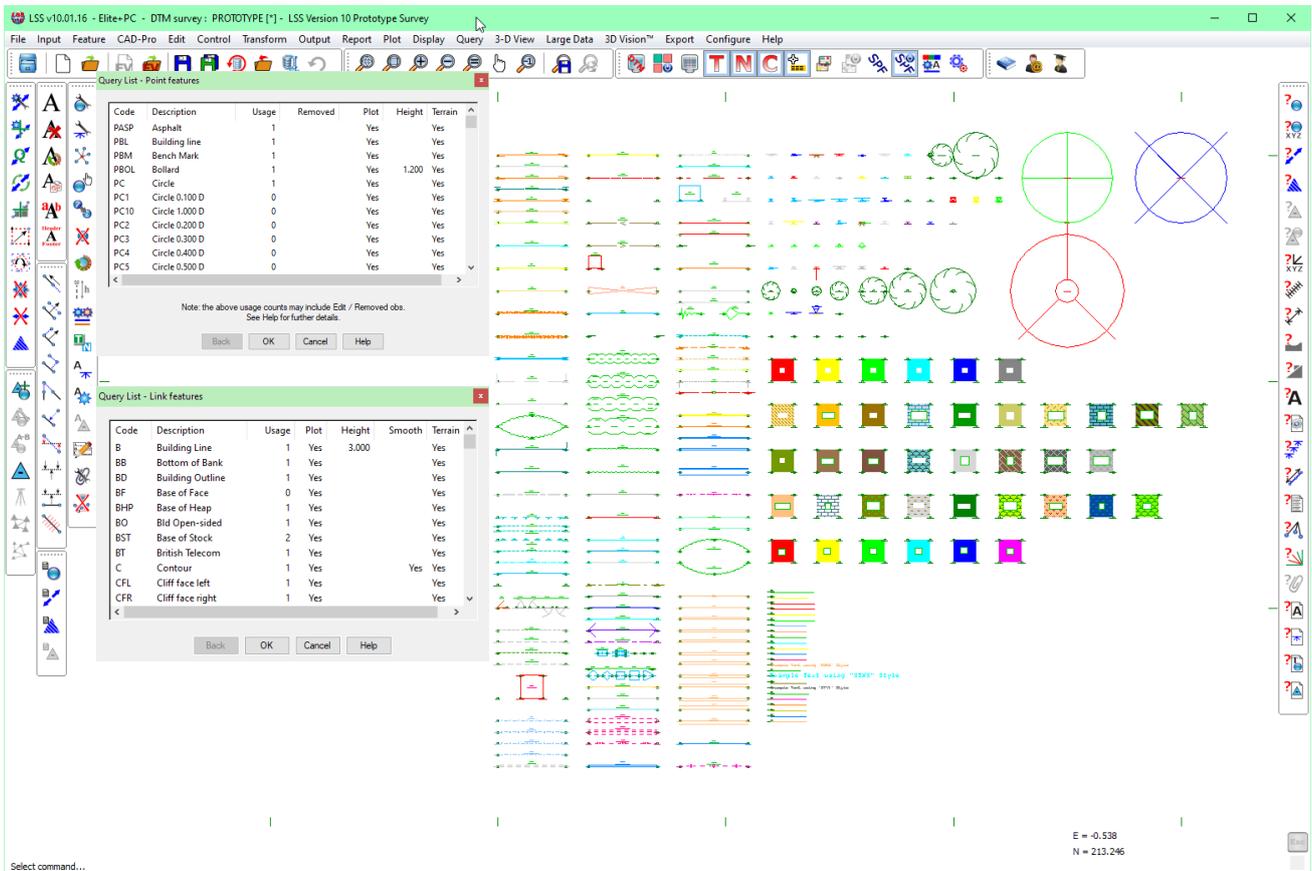
'Support_Files\LSS_Survey_Codes'

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



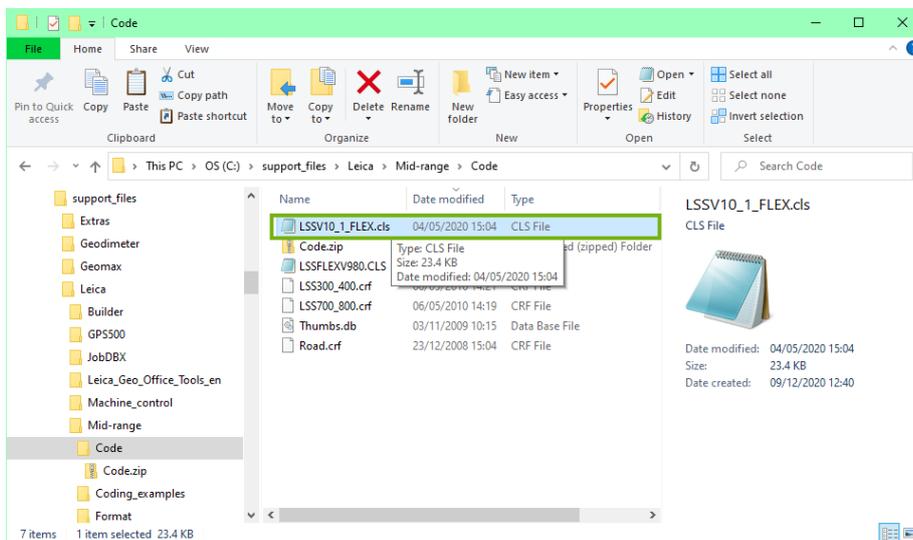
1.3 LSS Prototype and Feature Code Lists

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.

There are **Example Codelists** 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):



Broadly some Leica instruments are grouped under the term 'Mid-range'.

For the Flexline loggers such as TS06, TS07, the latest Code List is LSSV10_1_FLEX.CLS

This has been exported as described on the next page and hence is available on LSS media to be copied to the Leica instrument as described shortly.

The command

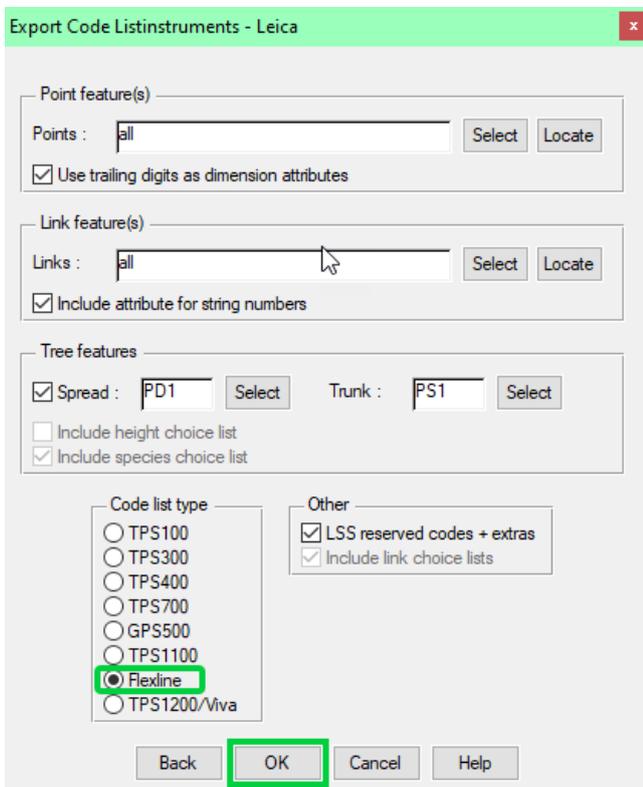
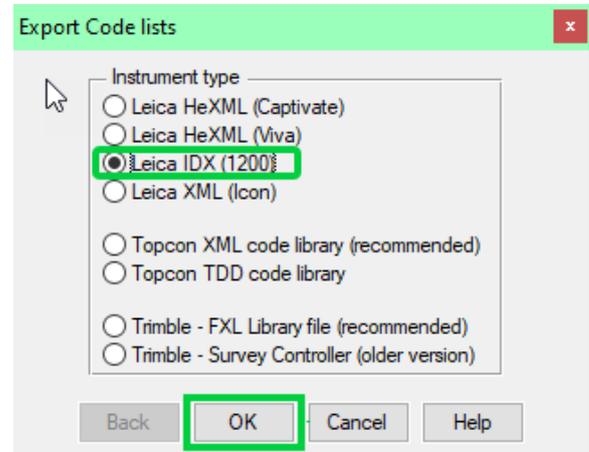
Export Survey Instrument – Code List

Allows

'Leica IDX (1200)'

To be selected from the list.

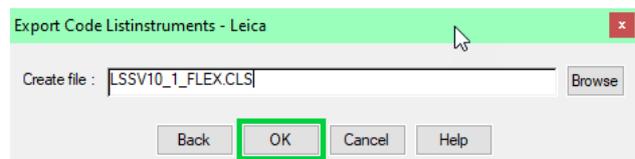
The following export method has been used to create a code list from the latest LSS Prototype – for use on the Leica Flexline series of loggers.



We will be copying this Code List across to the logger for today's exercise.

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

The LSS Export command is covered in more detail later on in this workshop manual.



Technical Notes:

- When the Code list is copied to the Leica Flexline, the Code List name appears.
- The default is to include all 'Points' and 'Links' Features, but they can be (multi) selected.
- LSS will recognise any series of point features with numbers appended to a stub code and automatically export as attributable features.
- When coded the attribute is added and when converted to LSS the attribute value is appended to the stub code. Examples are PC, PD, PS, PT and recent addition, PIC.
- Some attribute values are set in decimetres to allow diameters to be coded correctly.
- Trees are special examples where the (default) PD and PS codes allow trees with spreads (PD in metres) and trunks (PS in decimetres) to create trees with varying spreads and trunk diameters. These also include attributes for height and species.
- The recommended default is to include the LSS Reserved Codes by ticking the box.
- The LSS Reserved codes are accessed via the F7 Free Code Hot key defined later in this guide and will also include attributable values.

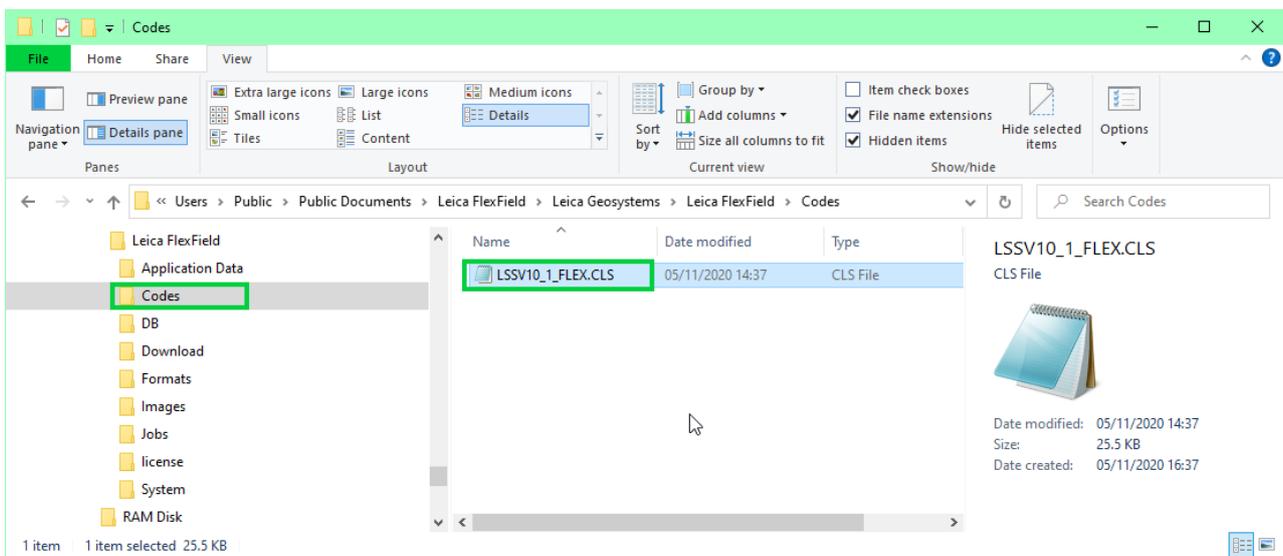
1.4 Configuring Leica Flexline – Importing Files

The two requirements for using Leica Flexline to the best advantage with LSS are

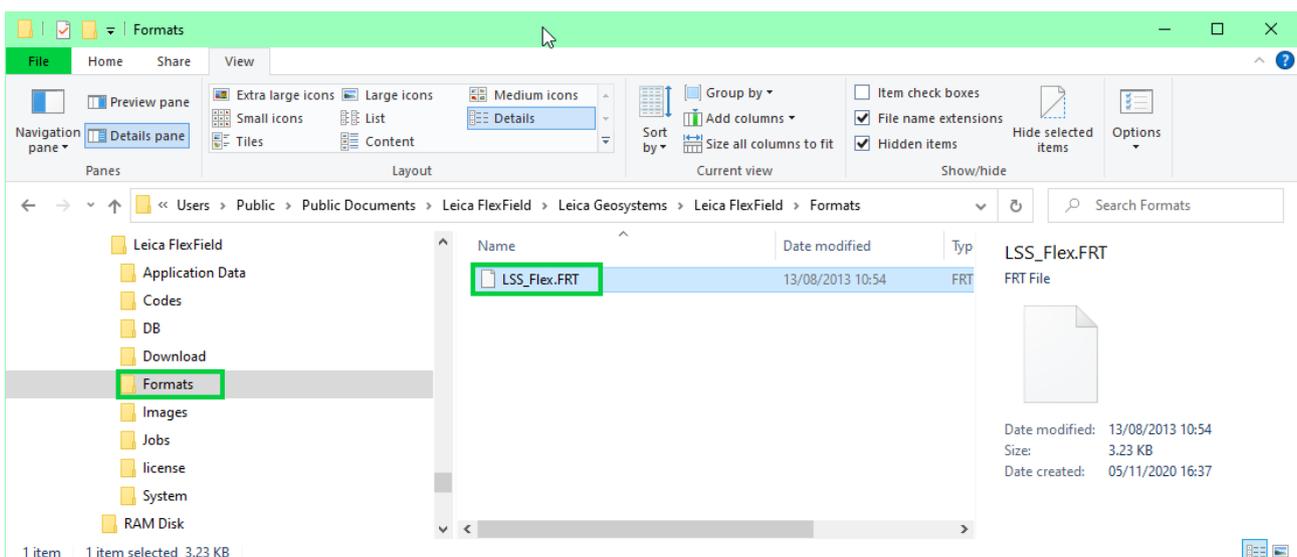
- **'Code List'** - created by LSS as above
The LSS point features translate as 'point codes' and the LSS link features as 'point codes with lines'.
The use of 'line codes' appears unnecessary and has been avoided because of the incompatibility when processing the same code list from a Flexline.
- **'Format File'** – suitable configuration for LSS (identical for both EDM and GPS).

The transfer of files and data between instrument and pc is generally carried out on a USB flash drive and this should be formatted by the Leica prior to use, to create the folder structure.

The **Code List** – created as already described is copied to the **'Codes'** Folder;



The **Format File** is found in the LSS Media under the Support Files folder and is copied to the **'Formats'** Folder;



The following steps explain the method of transferring this code list to the Leica Flexline;

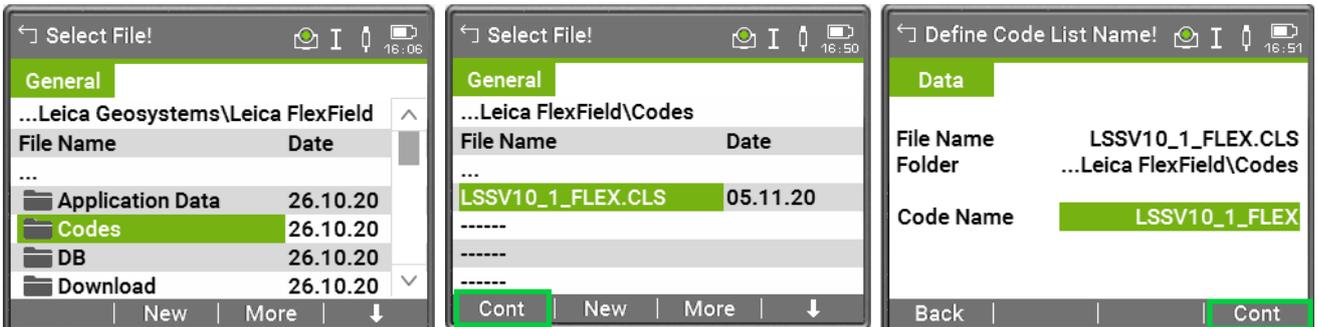
On the instrument, select from the main menu the 'Manage' Tab and 'Data transfer' – 'Import';



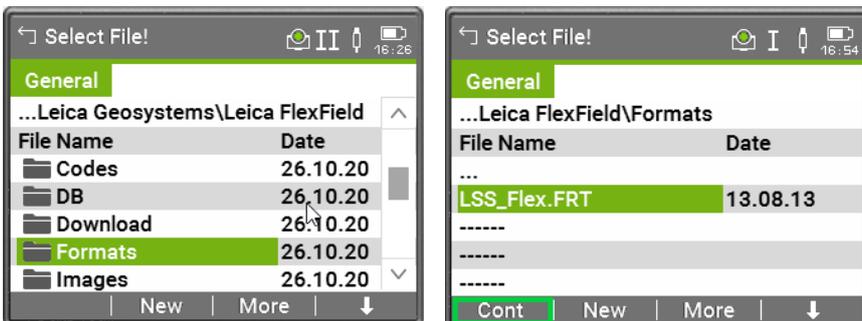
We need to Select:

- From 'USB Stick'
- To 'Instrument'
- File 'Single File'

For the Code List the following sequence;



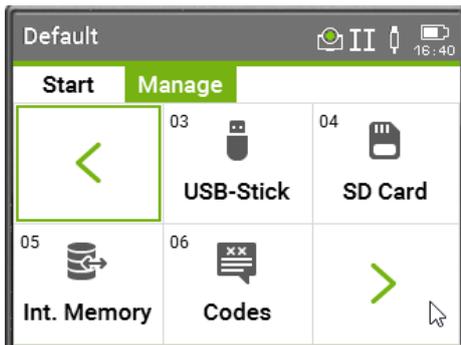
For the Format File, a similar procedure;



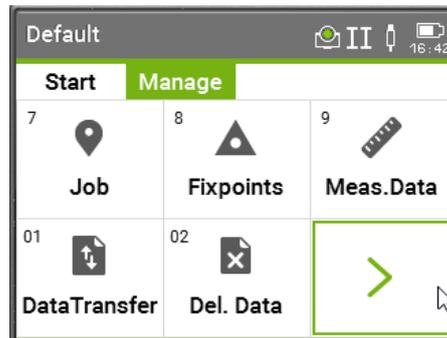
1.5 Configuring Leica Flexline – Manage Settings

The 'Manage' tab allows the following windows to be toggled using the arrows;

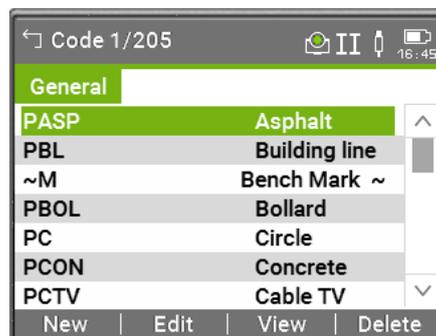
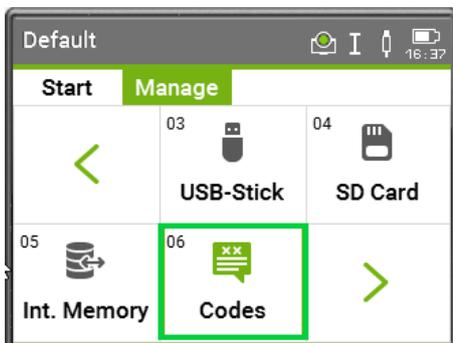
The Memory Devices;



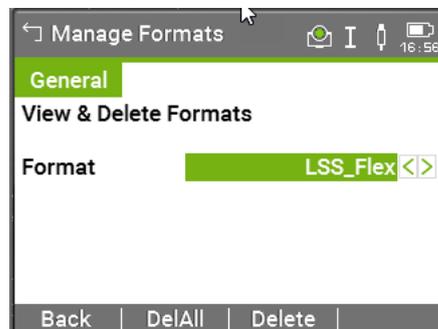
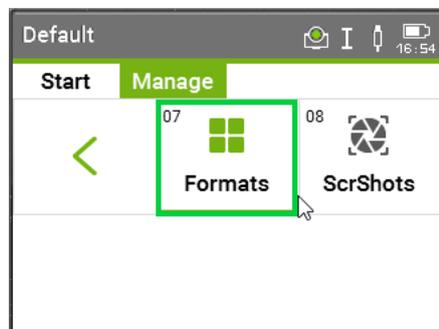
Jobs and Data;



Codes;



Format Files;

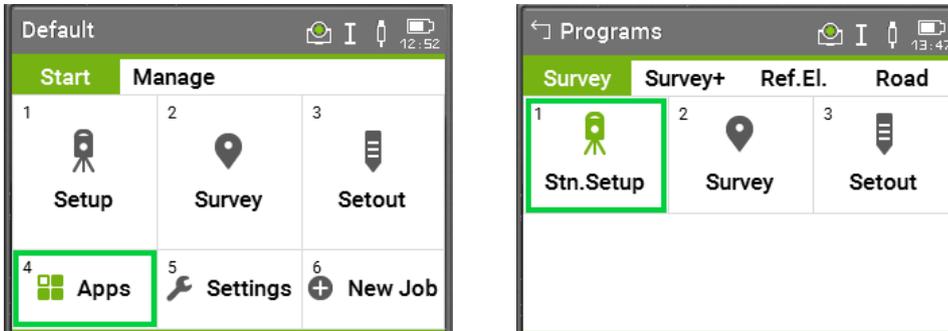


1.6 Configuring Leica Flexline – Start Settings

The 'Start' tab gives access to 'Stn. Setup', 'Survey' and 'Setout' commands and allows the following windows to be configured;

4 Apps

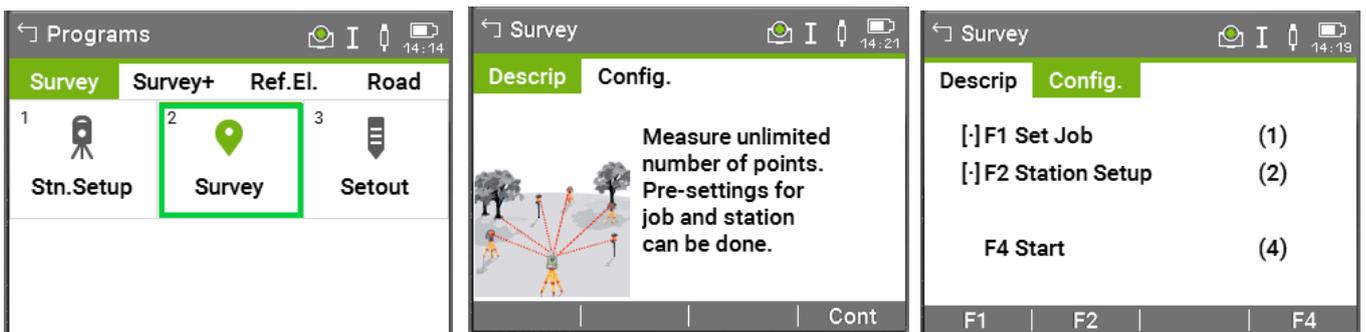
Gives access to 'Stn. Setup';



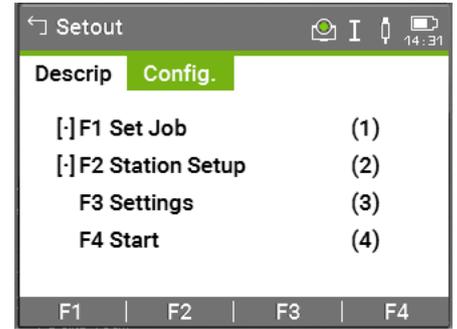
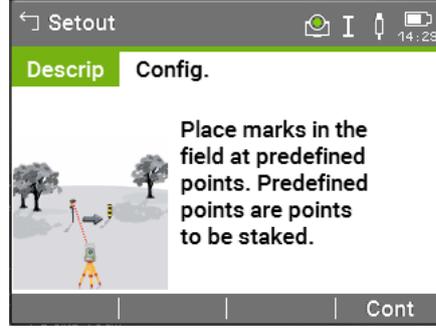
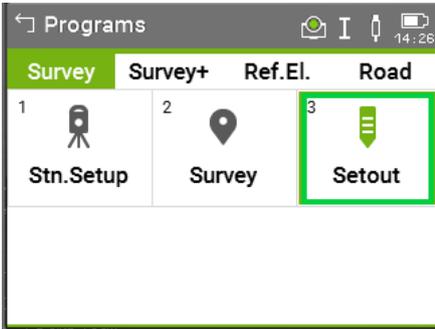
Setup a station and determine its coordinates and orientation, for example to set an initial set up at the start of a survey we can use the 'Config' tab to 'Ori. with Angle';



For Survey, we can configure the Job, Setup and Start details;

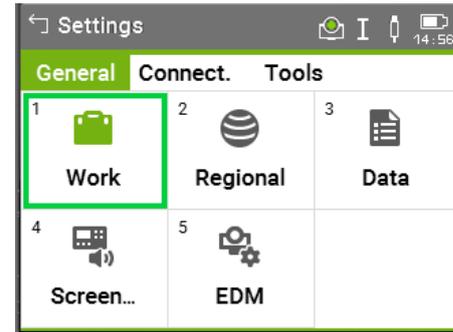
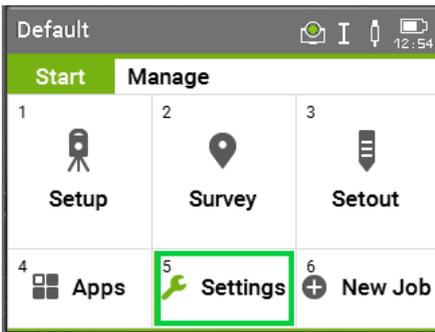


For Setout, we can configure the Job, Setup, Settings and Start details;



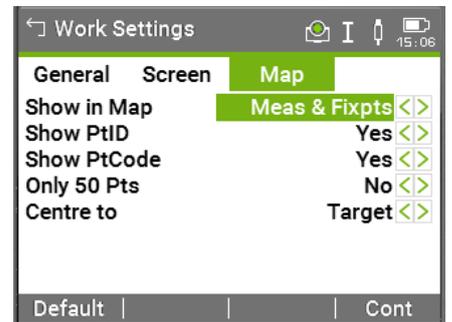
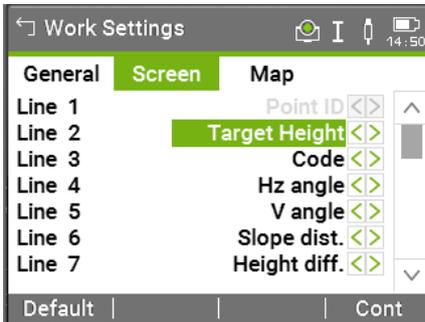
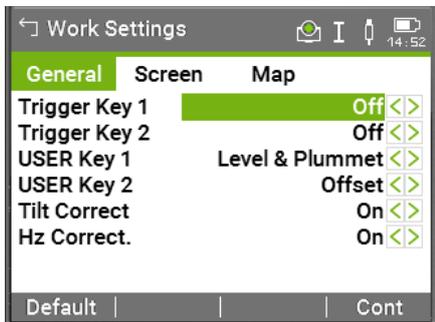
5 Settings

Choose Settings for the following instrument settings;

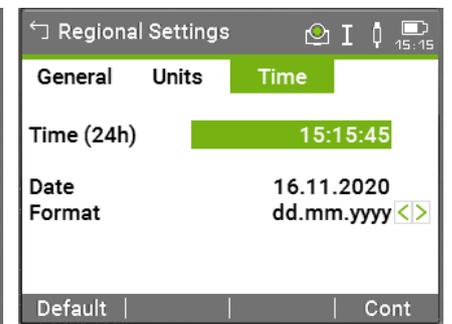
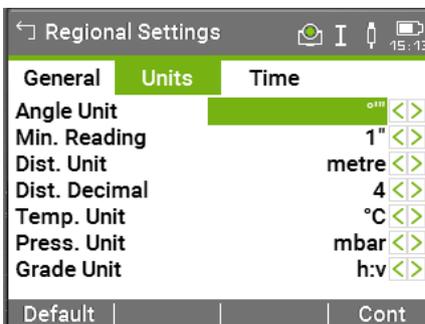
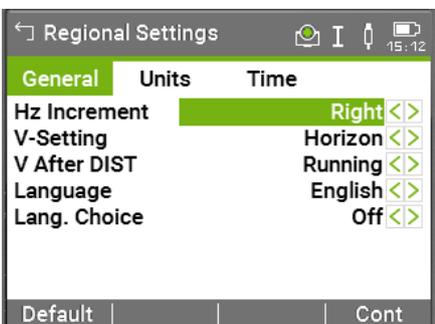


- 1 Work
- 2 Regional
- 3 Data
- 4 Screen
- 5 EDM

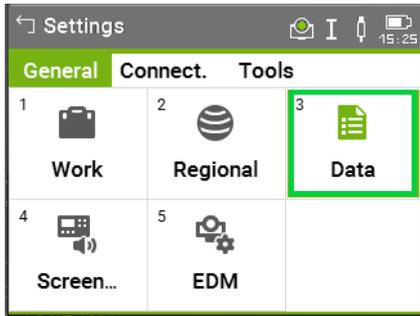
For example, in the 1 'Work' Settings, it is possible to organise the 'Survey screen';



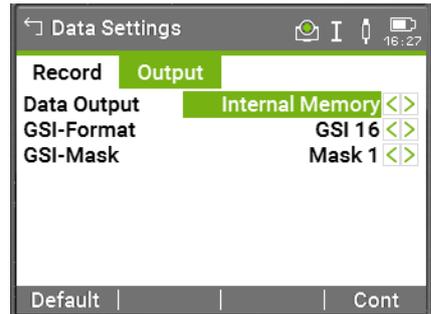
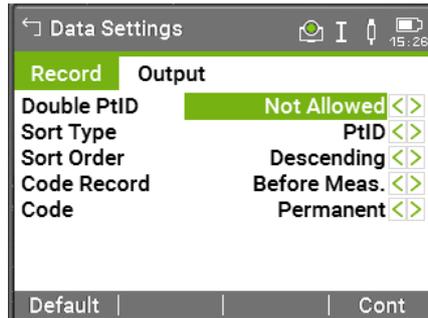
Under the 2 'Regional' Tab can be set 'General', 'Units' and 'Time';



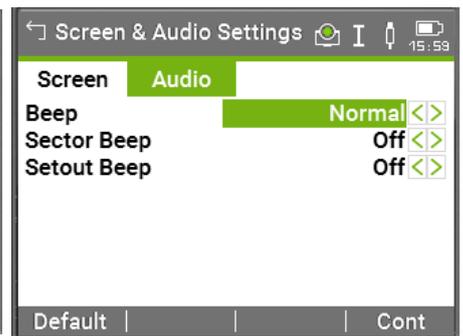
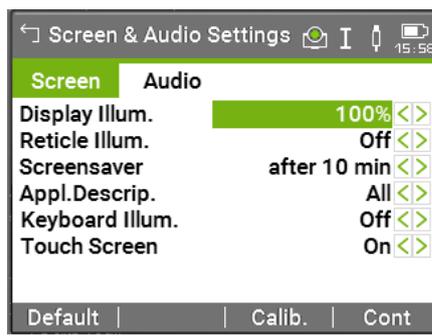
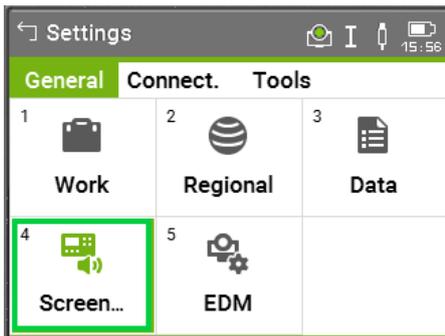
Click on the **3 'Data'** Tab to access



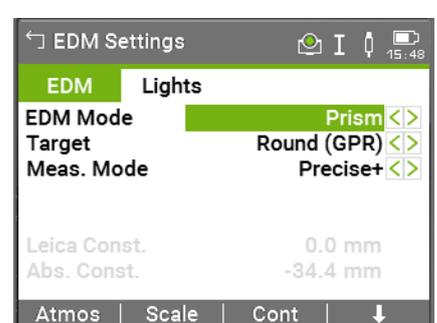
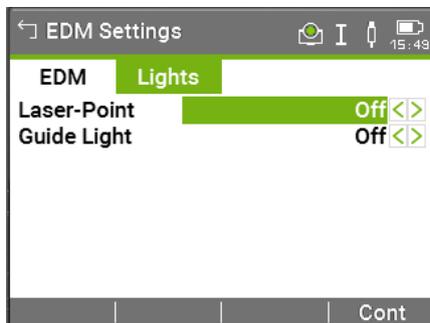
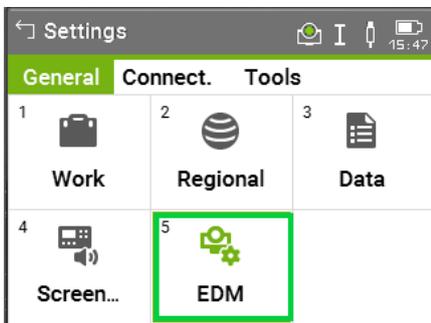
The 'Record' and 'Output' Settings;



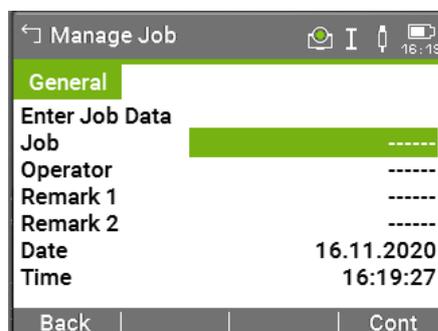
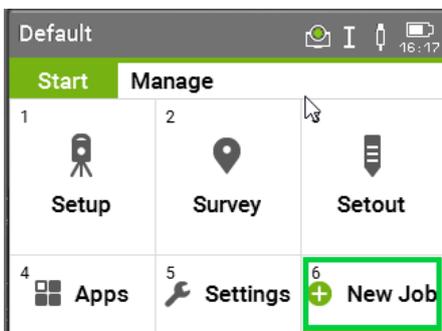
4 'Screen' Settings



5 'EDM' Settings;



6 'New Job' Finally, the New Job settings;



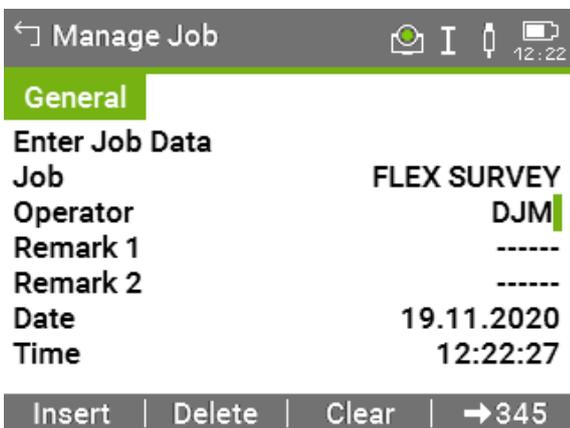
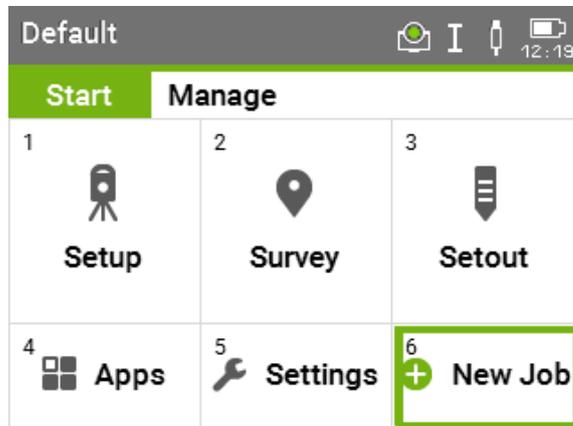
Chapter 2

2.1 Instrument Data Capture on a Leica Flexline

2.1.1 Creating a new Flexline job

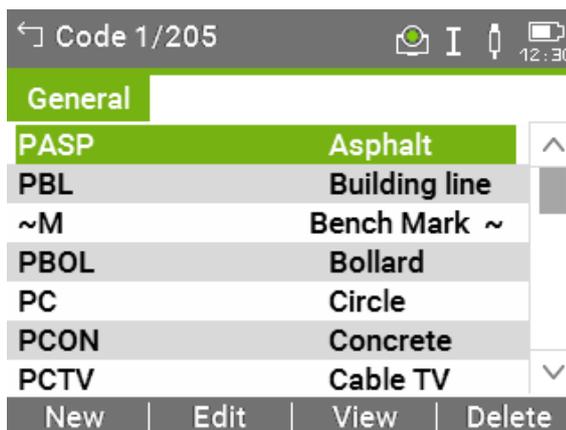
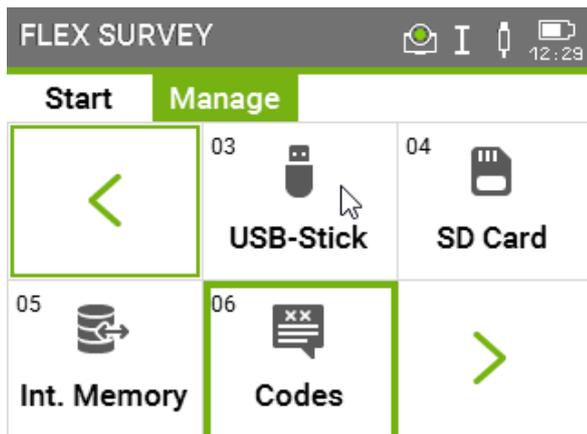
Select option '**6 New job**' from the **Home screen**

Start Tab



Type in the **Job Name**, **Operator** and other **Remarks**:

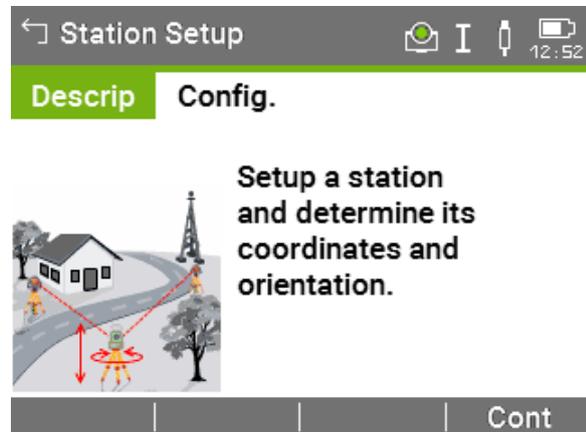
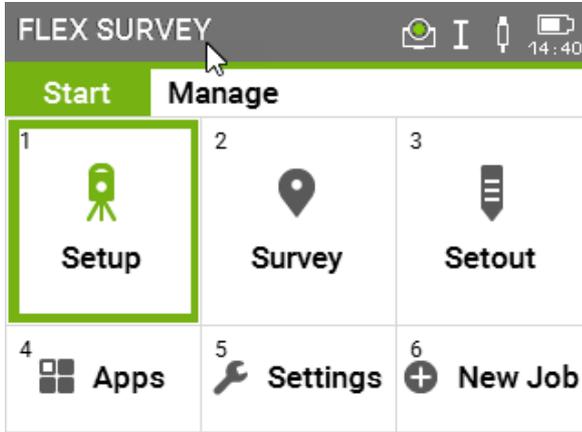
In the Manage Tab, it is possible to click the **06 Codes** tab and access the codes which can be edited;



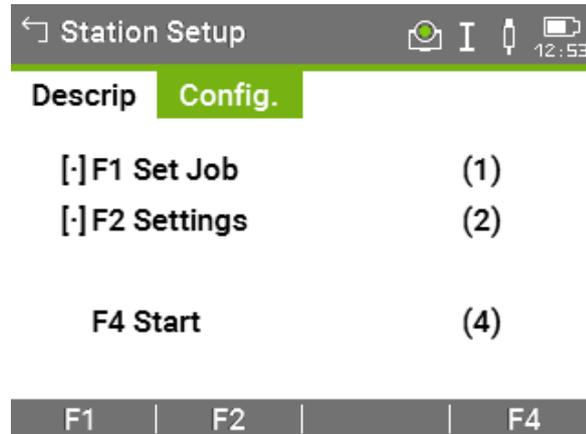
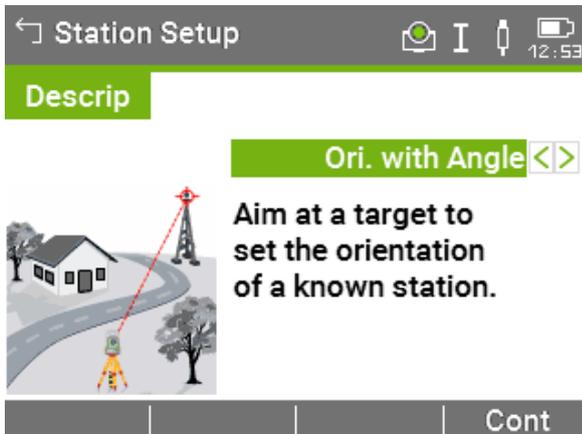
Setup procedure

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 GSI) and then copied to the current job before the first set-up

From the Main screen menu select '**1 Setup**';

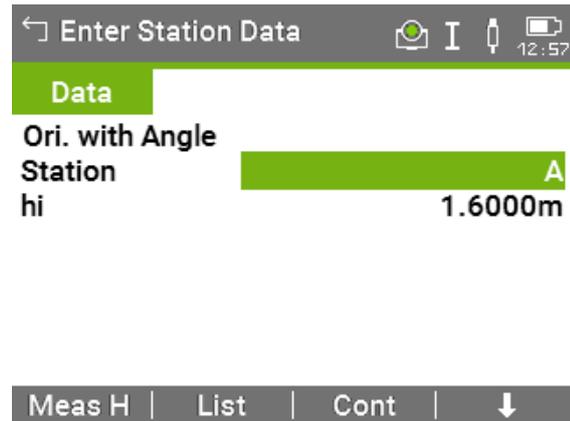
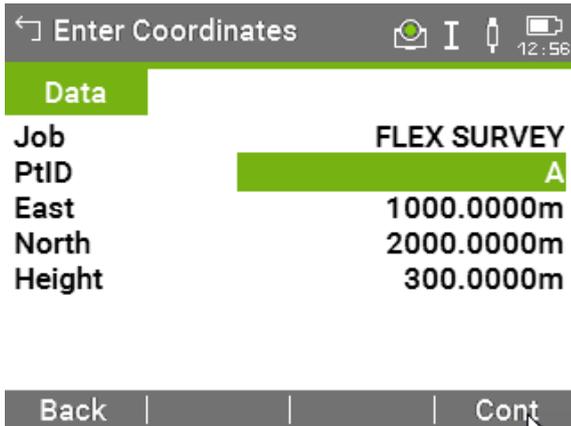


On the '**Station Setup**' page select the '**Setup method**' as '**Ori. with Angle**'. The **Config** accesses F1 Set Job, F2 Settings and F4 Start;



Then click '**Cont**'.

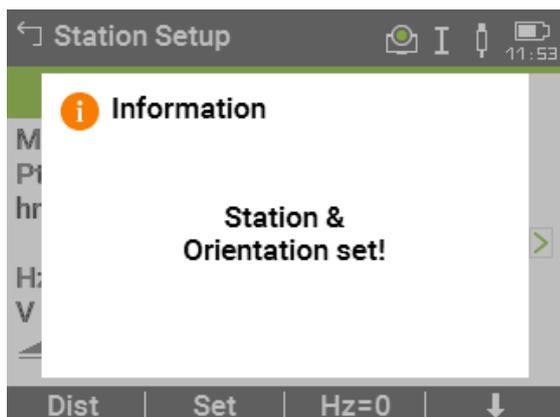
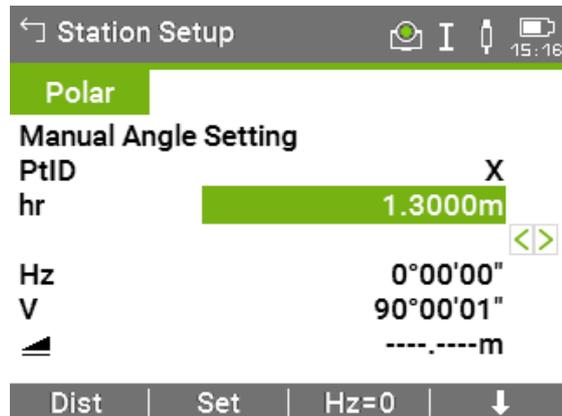
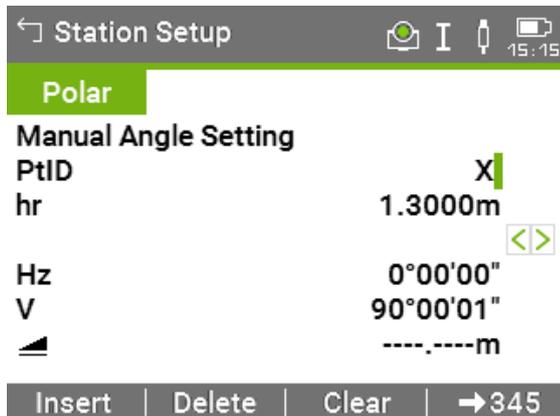
To set the set-on station name and details, click **'Point ID'** and the right arrow to key access the **'New Point - Coordinates'** screen and create a new point and specify a **'Point ID'** (i.e. Station name) and the relevant arbitrary coordinates for new station A;



'Cont'

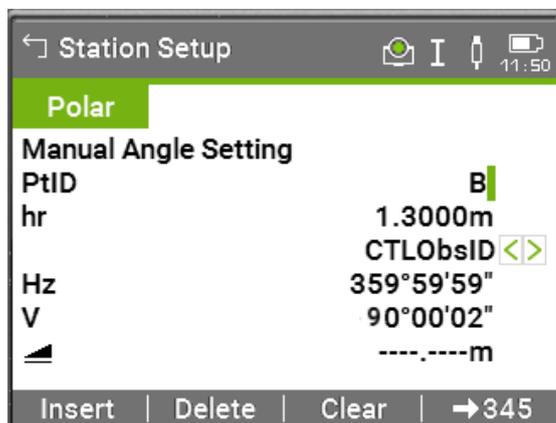
Recording a Backsight

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

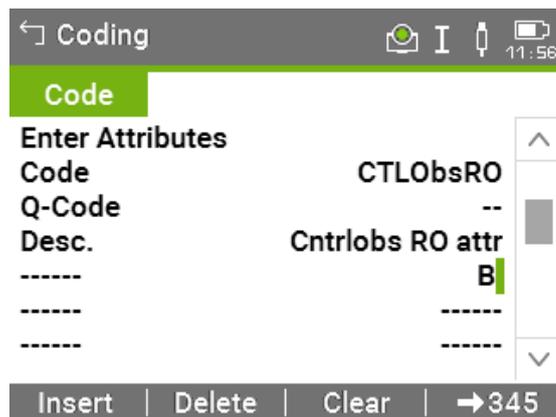
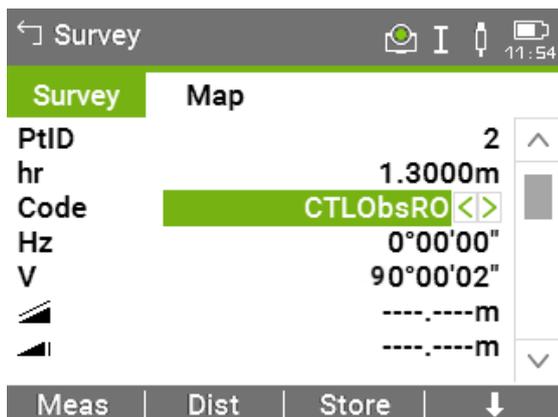


We are now ready to start detailing.

For subsequent Control Observations, either select the Code **CTLObsID**, in which case the Point ID will be assigned to the Station Name;



Alternatively, and if we are now using numbers as part of the detail surveying, **CTLObsRO**, which allows the station name to be set as an attribute;



Detail Procedure

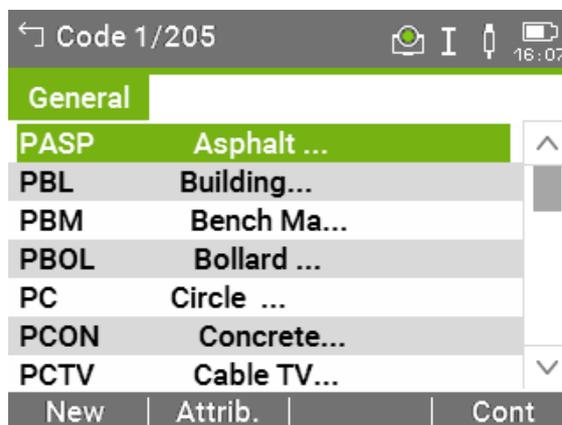
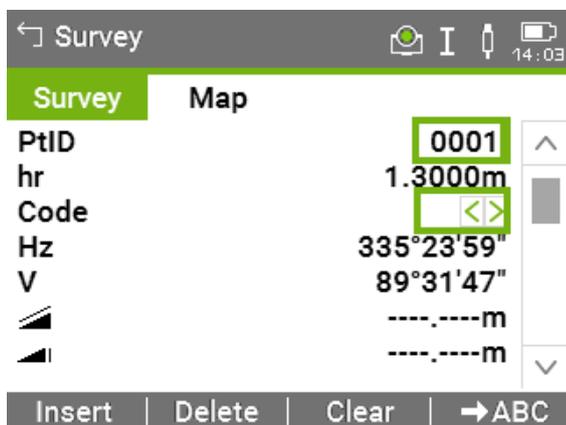
LSS uses Point, Point with Line and Free coding. The Codes are accessed via the display entry 'Code' and the Free Codes via the **[F7]** key. In each case the relevant Codelist is displayed as exported from LSS (see the LSS media 'support_files' folder).

For normal detail, we should (have) set the Point ID to **0001**. The Flexline should have been configured to increment the point ID by 1 as the job progresses.

The Codes are accessed by clicking the Code Tab in the display;

The following examples are all included in the LSS Workshop Survey.

For simple coding Point features can be selected from the list;

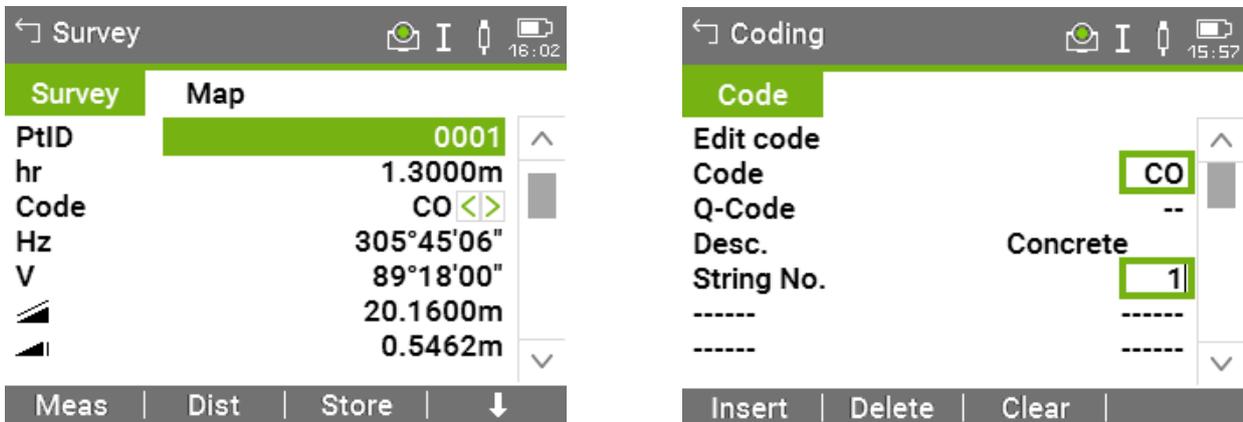


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The code list can also default to the closest entry to the typed characters, or the arrow keys can further be used to manually select the required code.

'Cont' will return to the display mask with the highlighted feature code

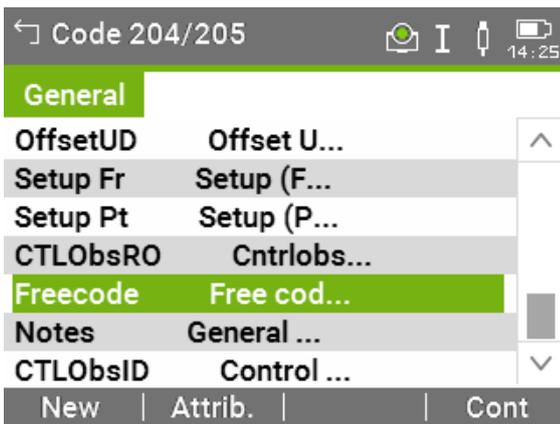
For Link features, it is best to make use of the string numbers to control any stringing of linear features;



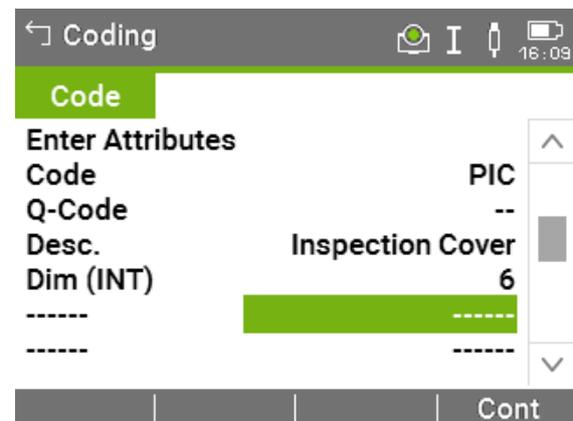
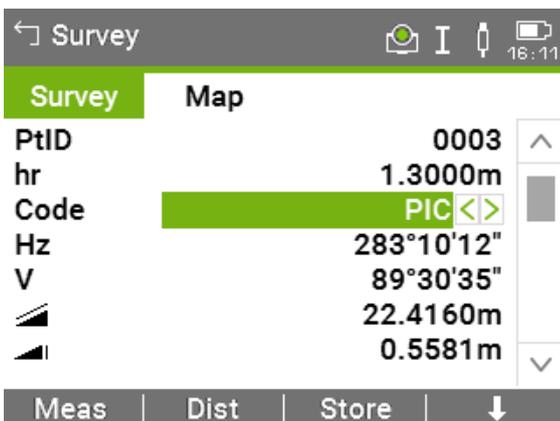
Once the code has been set choose either '**Distance**' followed by '**Store**', or '**Measure**' to measure and store the point in one operation.

The Free Code and Attributes Options

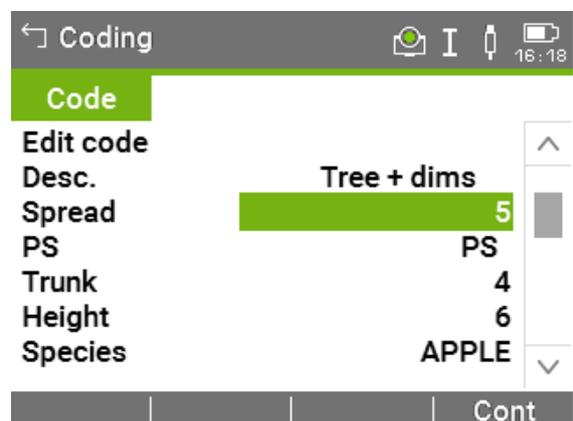
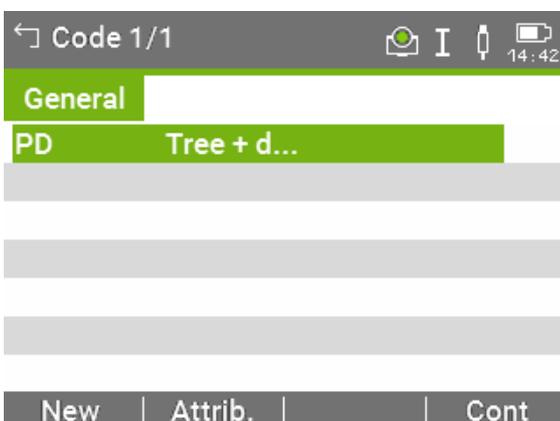
The **Free Code** commands, and special LSS Codes (". ." And ". ." to start, end, Join to and Close can be accessed from the Code List;



Some Point features have their dimensions set as attributes on the logger the attribute being added to the 'Stub' code. Recently was added to the LSS Prototype and therefore the Code List attributes to the PIC – Inspection Cover, the diameter being measured in decimetres;



Similarly PT for Trees, with the spread as metres and PD, where the Spread in metres, trunk diameter in decimetres, Height (Text) and Species (Text) are all attributes as shown;

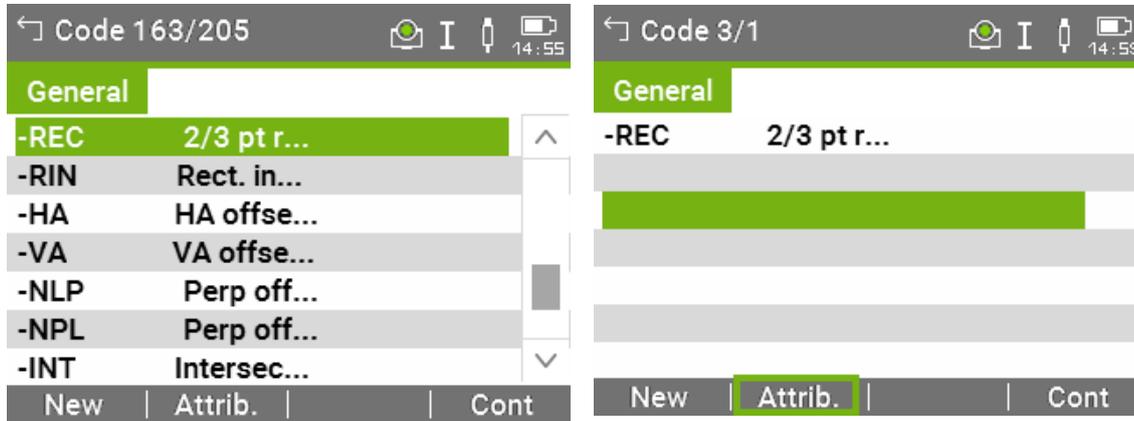


The LSS Reserved Codes Options

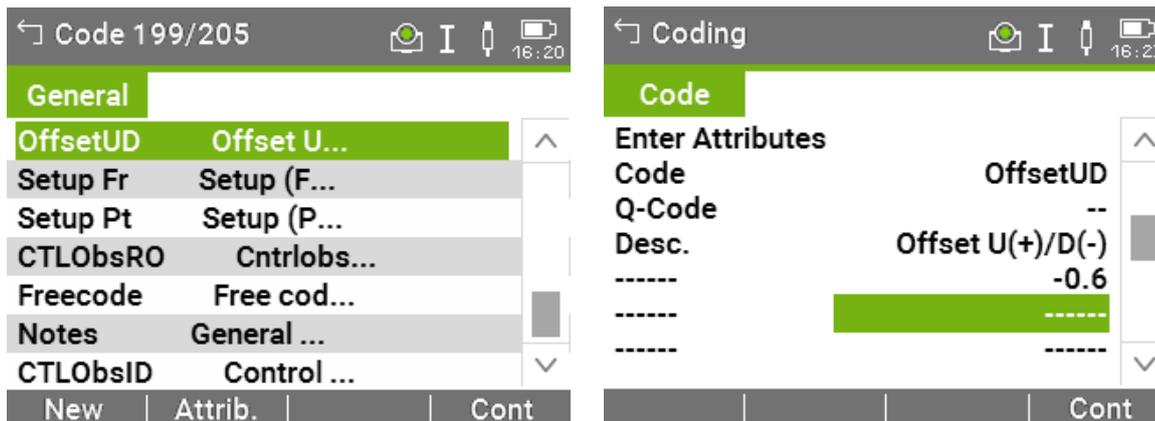
LSS Reserved codes are included within the exported Code List as standard and many have associated attributes, although many are not mandatory for LSS – use values of 0.0 for example on measured versions of the Reserved Codes;

Some examples are included in the LSS Workshop Survey. The display mask will show the required attributes (either integer, real, text or choice list) for the selected feature code

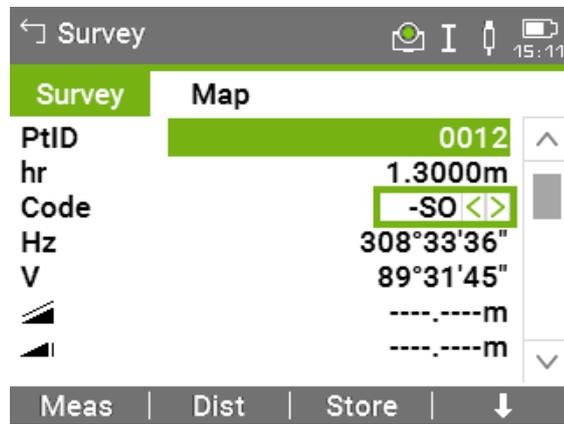
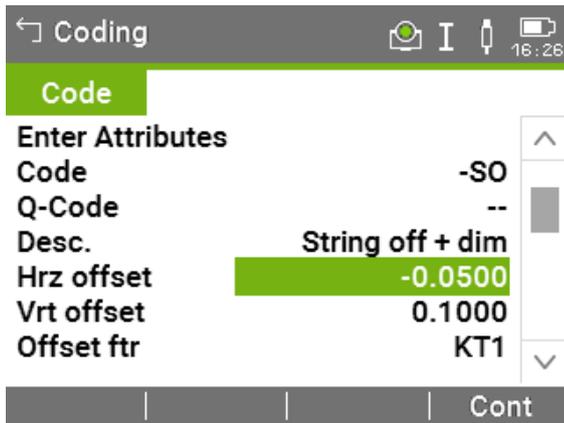
Use the drop-down list to select the required Reserved Code, **-REC**;



For **-OU**, we use a negative attribute for depth in metres;



With **-SO** the choice is to type in
 'Horizontal offset' 'Vertical offset'
 'Offset feature'



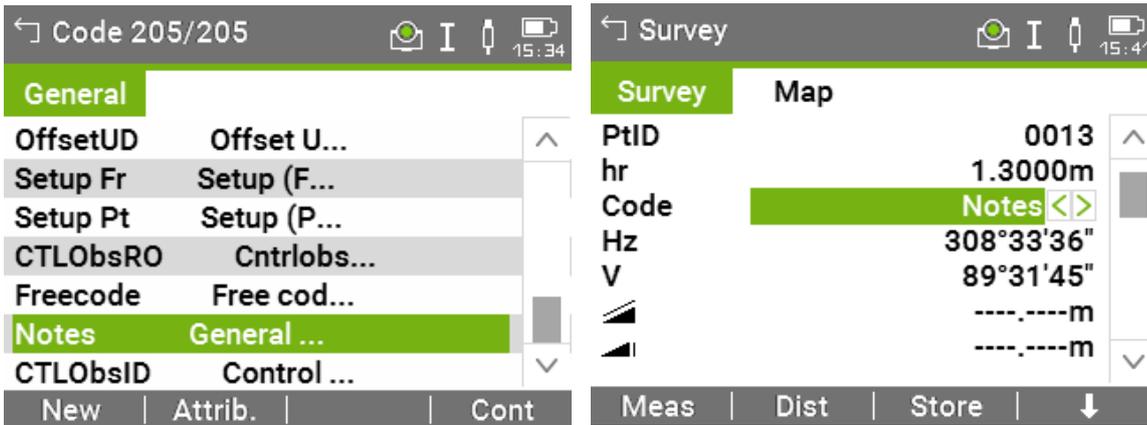
Setting the offsets to 0.000 will assume the observation itself is on the offset feature, e.g.

KT1 – Kerb Top

Note: The current feature remains active on repeated measurements.

Adding Annotations

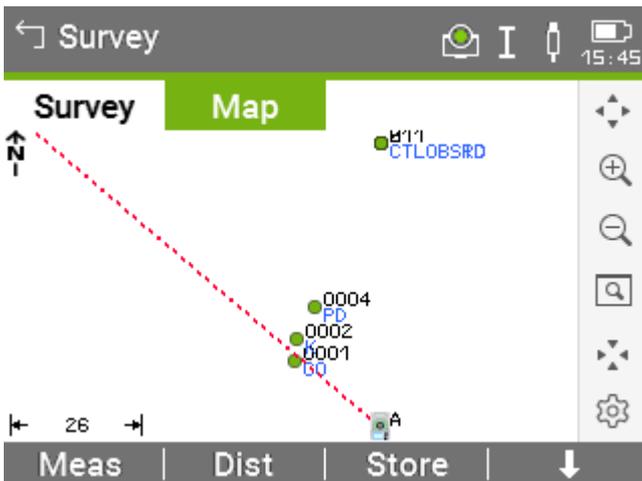
It should be possible to access the Annotation options through the **Notes** code as shown below;



Note: in the annotation on an observation should be made before either 'Measure' or 'Store' for that observation has been selected.

Viewing on the Screen

The Map function will display the survey points and lines;



Chapter 3

3.1 Configuring LSS for the Leica Flexline

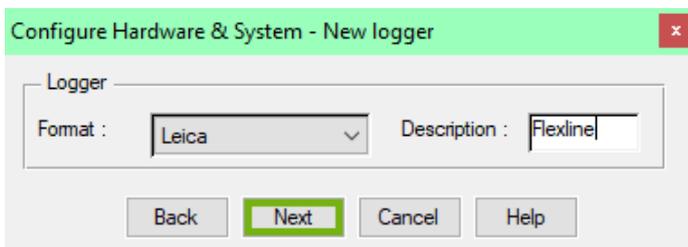
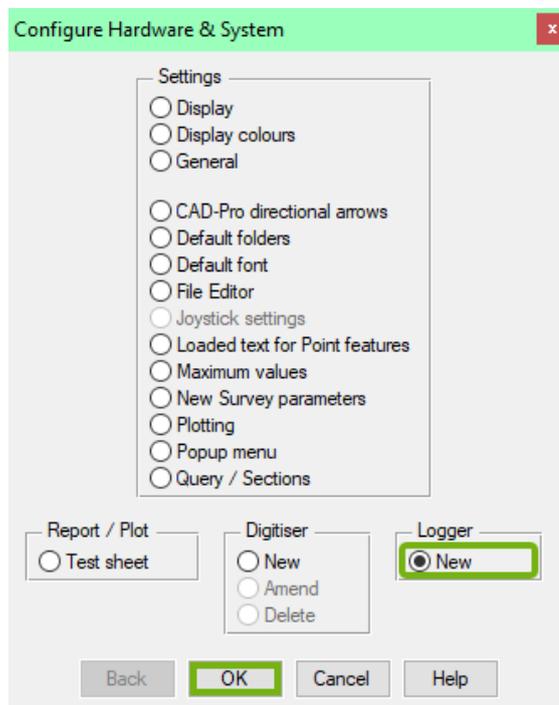
This is a once-only operation, for each type of instrument to be used, on every computer into which survey data are to be downloaded.

To configure our logger of choice in LSS we select **Configure Hardware & System**

Choose 'Logger - New'

(if there is already another logger configured then the option will be 'Logger / Change').

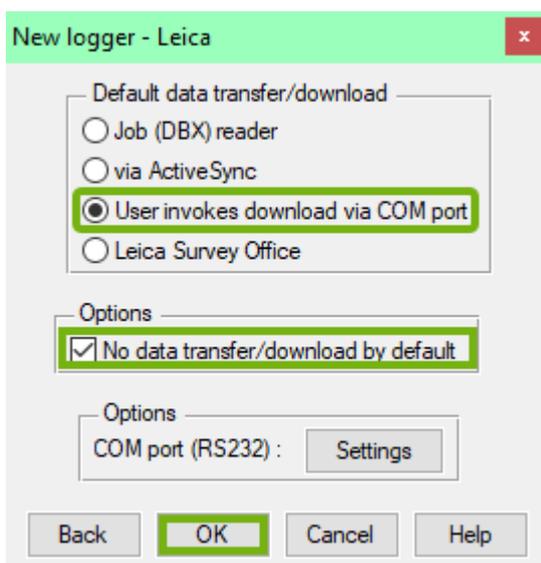
Next we need to choose the format of the data.



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

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

'Next'



'User invokes download via COM port

But we need to tick

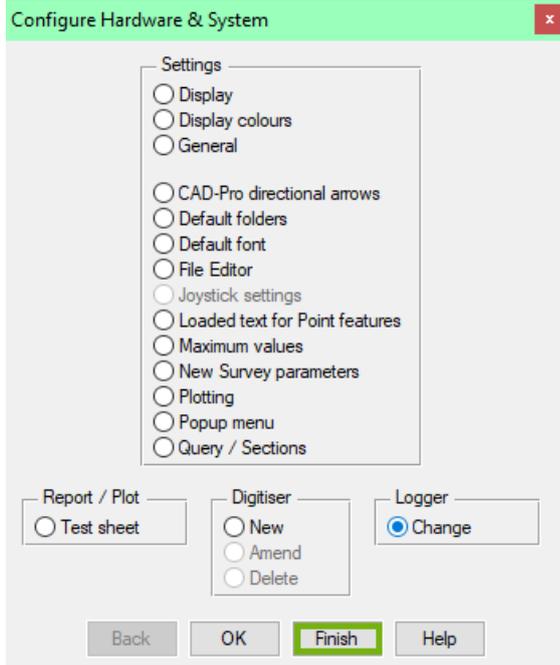
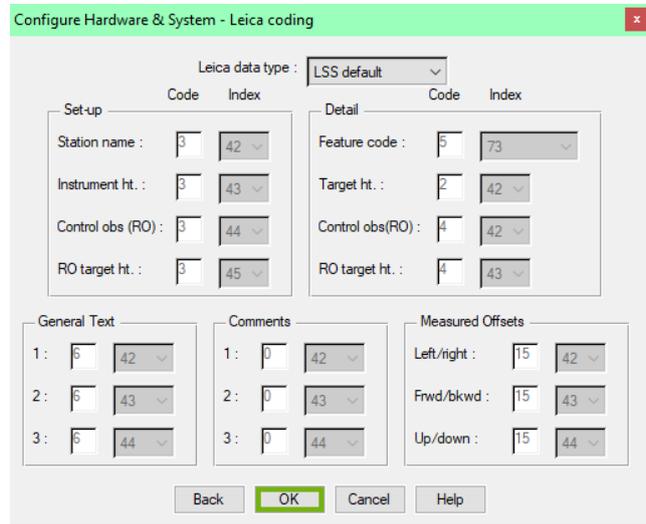
'No data transfer / download by default

'OK'

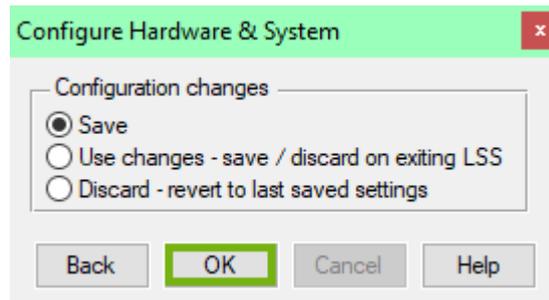
We can accept these standard

Leica coding settings, as they will relate to the format file (LSS_Flex.FRT) used in the Export to GSI file on the Flexline.

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.

3.2 Configuring the New Survey Parameters in LSS

For each survey parameters are set during the **File New** "survey initialisation" process.

Configure Hardware & System - New Survey Parameters allows these options to be set:

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 Load file(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.

'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.

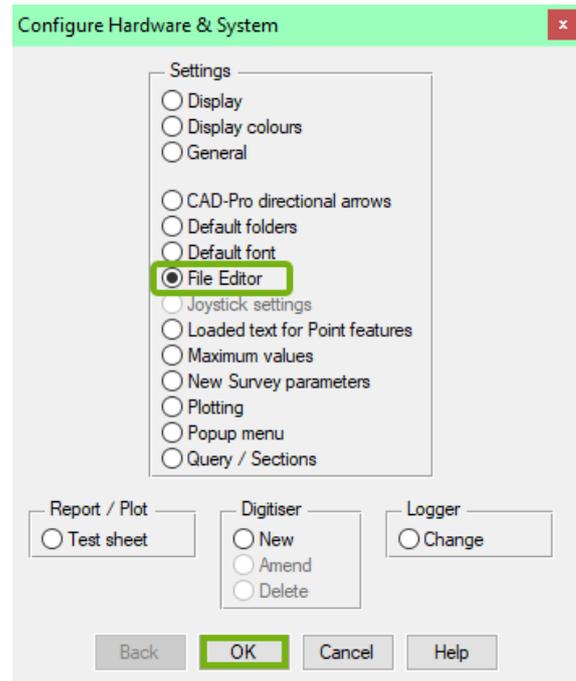
3.3 Configuring the File Editor in LSS

The **Configure Hardware & System** menu control the default LSS settings held within the LSS registry of the current computer;

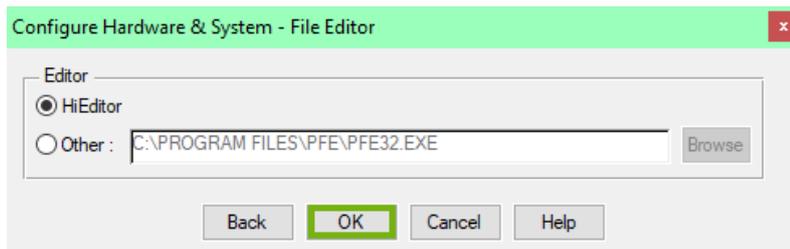
There Are many options worth investigating.

It includes the **Configure Hardware & System - New Survey Parameters** just described and many other options that allow the user to fine tune many of the settings of LSS.

In LSS the default file editor sets the application that opens a browsed file when the 'Edit' button is clicked.



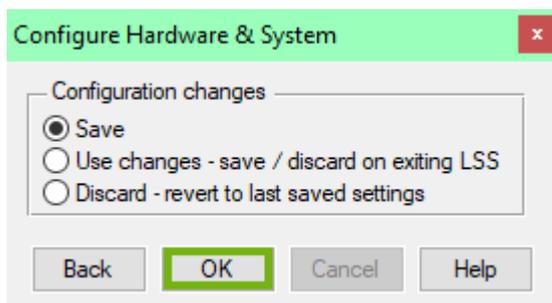
Note: HiEditor is the recommended editor to use in LSS and is installed with the version 10 and automatically set as the default, unless a previous version of LSS was already installed.



Either way, in this case HiEditor should be selected in this window;

But it would be possible to set a preferred editor here if required.

Saving the configuration changes is then prompted and carried out if we click 'Finish' in the correct button;



This will offer the user

'Save' and 'OK' to permanently save any configuration changes.

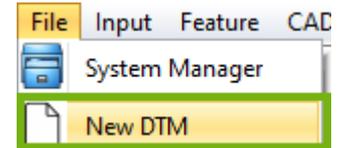
'Use changes – save / discard on exiting LSS' will allow us to choose at the end of the session.

'Discard – revert to last saved settings' will ignore the latest changes to the settings.

3.4 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.

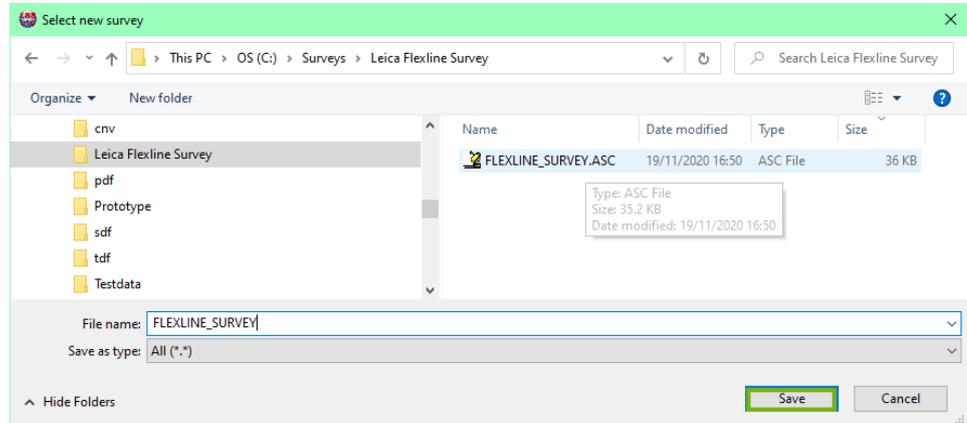
Select **File New DTM** from the main menu.



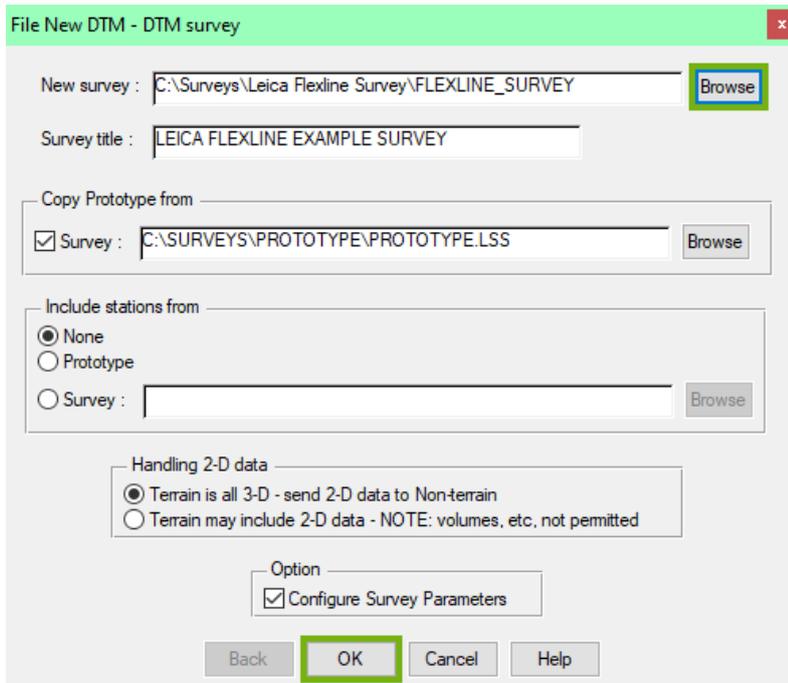
Click 'Browse' against 'New survey' in the dialogue below.

We can create a new folder for the new survey to go in and call it

Select it in the 'Save in' box



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



C:\ Surveys\Leica Flexline\and the survey name, e.g. FLEXLINE SURVEY;

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

Set the Prototype, and,

'Include stations from' as required

Technical Notes:

- 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,
- We will accept the default survey so any 2-D data will go to the survey's Non-terrain).
- Tick '**Configure Survey Parameters**', before Clicking 'OK'

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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 as required

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

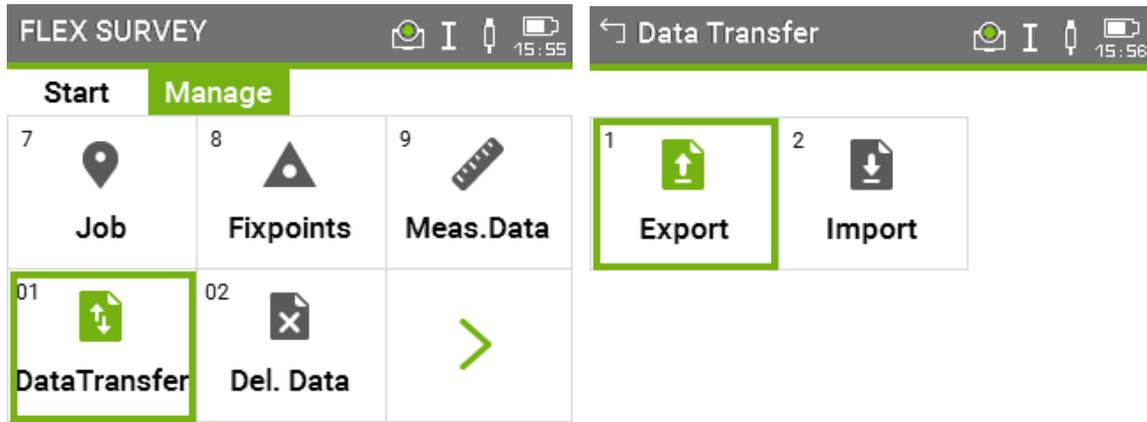
Technical Notes:

- 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**.
- 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.

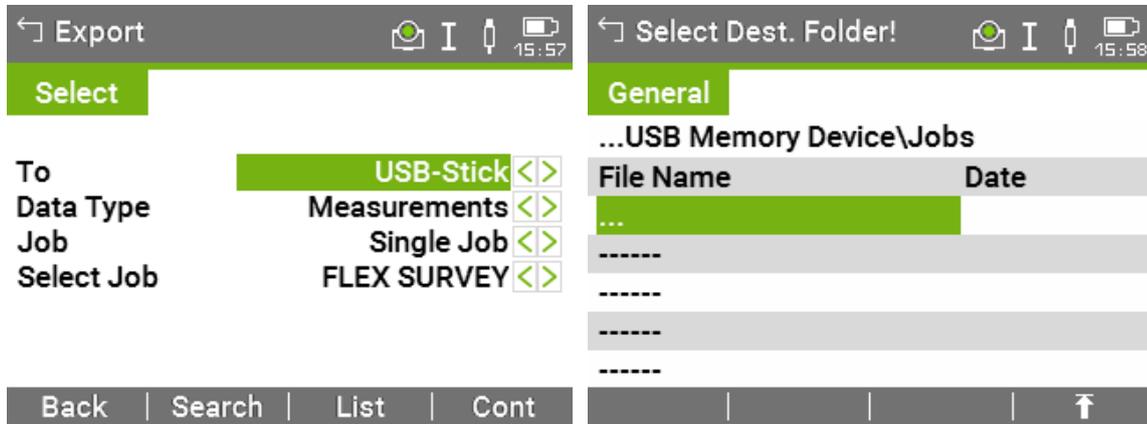
3.5 Data processing – Input Download / Convert

The first task is to transfer the survey Job from the logger to pc and the recommendation is to use the USB flash drive that has been formatted for the Leica instrument.

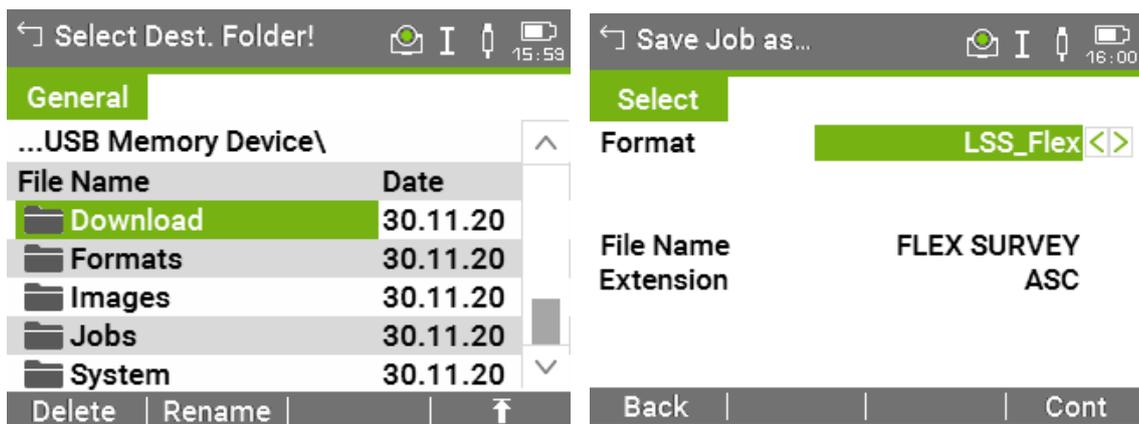
In the **Manage Tab** Select **Data Transfer – Export**



We will set the 'To' option to transfer Job to **USB-Stick** for the Measurements from 'Single Job'



We will be requested the Folder on the USB Stick – suggestion is 'Download' – and to choose the Format file, which should be scrolled through to the LSS_Flex format, which we transferred earlier;



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

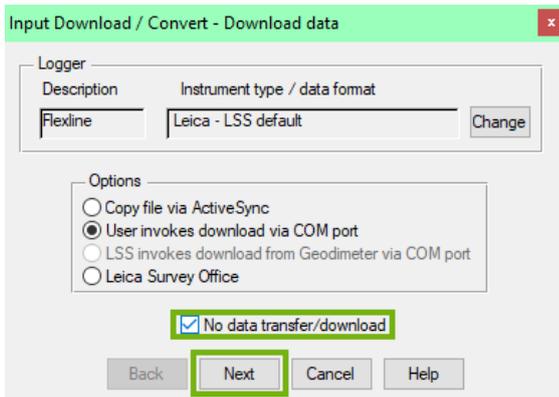
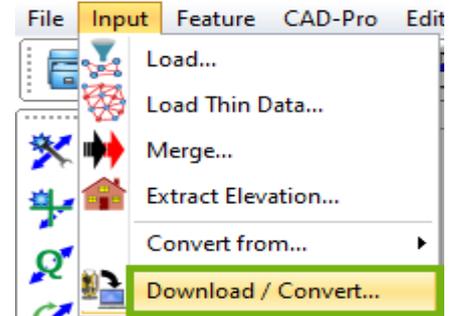
Once the transfer is complete we can switch off the unit and we now remove the USB from the logger port to connect to the pc, bearing in mind the warning below;

Important Warning:

Never insert or remove the USB Stick unless the Leica Flexline sensor is switched off. If there is data access to USB when removing or inserting it, your files may become damaged.

The USB Flash Drive is now inserted into one of the COM ports on the PC. The survey job should be seen as a .ASC file as exported in the specified folder on the drive. It can now be copied across to the project folder on the pc.

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



The Leica Flexline should already have been configured on this pc, as above.

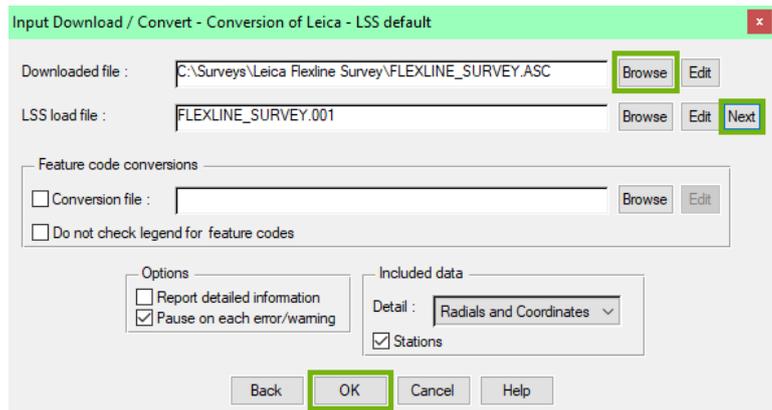
If not, then 'Change' allows us to make amendments to the logger and click 'New' and follow the dialog boxes or refer to the '**Configure Logger**' section above.

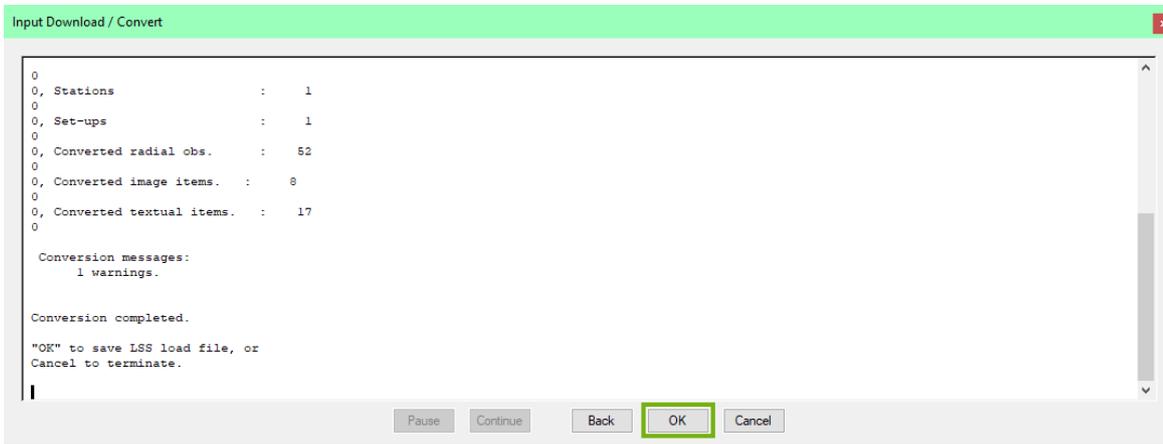
Click 'Next'

The dialogue that follows allows the conversion of the .ASC file to LSS Load file;

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

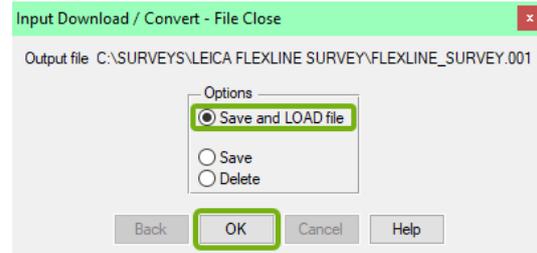
We can accept the default settings for now.





If there are now errors the conversion proceed through the above window, although it is not unusual to see some **Warnings** in green.

A report is written at the end of the load file.



At the end of the conversion process, we are prompted to accept 'Save and LOAD file';

3.6 Data processing – Input Load

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

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

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.

There are options;

'Use Default'

'Save as Default'

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

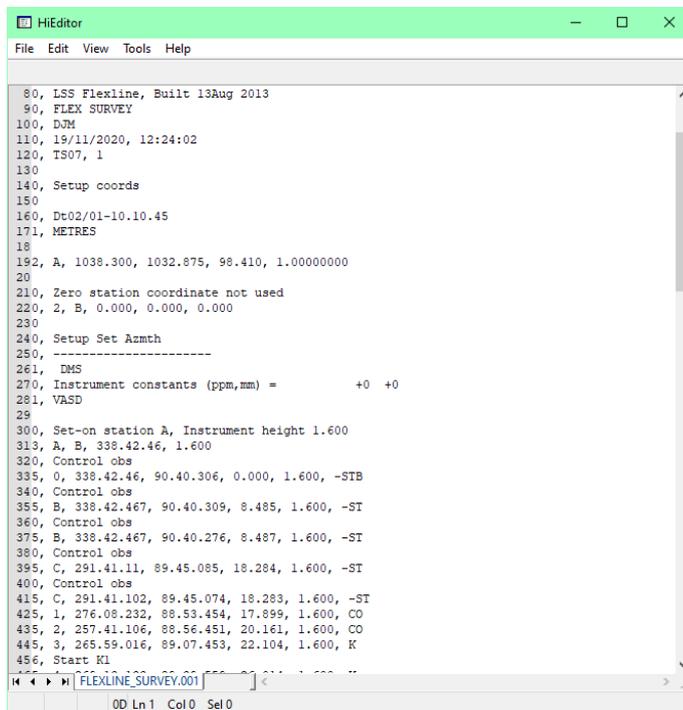
'Next'.

Technical Notes:

- 'Report pauses on' options will prompt us to click 'Continue' during the load when LSS encounters '**Errors**' and 'Control tolerance **warnings**', or 'All **warnings**'.
- 'Include Crossing links' will place the longer of two crossing links into the Crossing link overlay.
- By unticking LSS will not include crossing links and this can provide a tidying process during the load.
- 'Stations' are in the load file by default, but unticking the box will allow the load to compute during the processing or assume that Stations are already in the LSS Survey.
- 'General text settings uses' options are new to Version 10 and allow LSS surveyors, particularly those carrying out utility surveys, to set a feature's text style and position, based on the Level text setting within the survey legend.
- 'Strings restart on 'New setup' or 'Change of feature', normally left unticked, will false a break in strings, notwithstanding the use of string numbers.
- This is for simple coding, where there are no string numbers or start or end 'dots'.
- Clicking the 'Advanced' button gives access to 'Advanced settings' for redefining the 'Conditioning tolerance' for inputting arcs and circles.
- There are settings for loading 'Point feature descriptions as general text.

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

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



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, data 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.

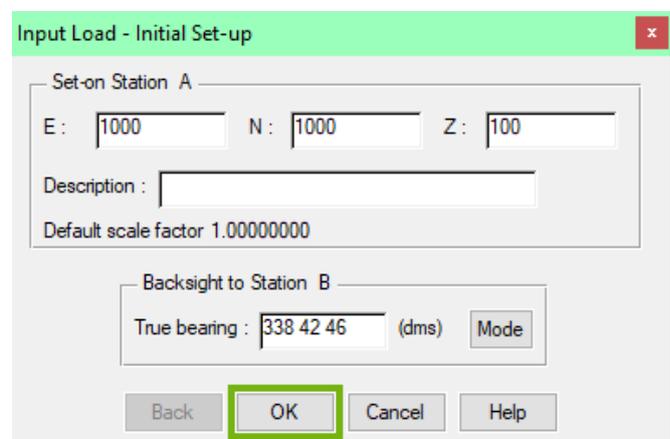
This record type may also be a control observation, where '-ST' is the code, with the station name either following this or being taken from the observation number field.

We may also use the special or Reserved codes, described in detail in the next session.

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.

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.

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

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. For any that exceed the 'error' parameter the 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 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 processing will also include comments on;

- a) which detail observations have zero values and have been removed
- b) whether a station observation is being used as 1d, 2d or 3d.
 - i. 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.
 - ii. 2d station observations have their target heights removed so that height differences are not attempted to be reported
- a) whether a station coordinate is 1d, 2d or 3d.
 - i. If a station's xyz coordinates are all zero then it is ignored.
 - ii. If it is 1d it is reported but not used
 - iii. If it is 2d it is reported and used.

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

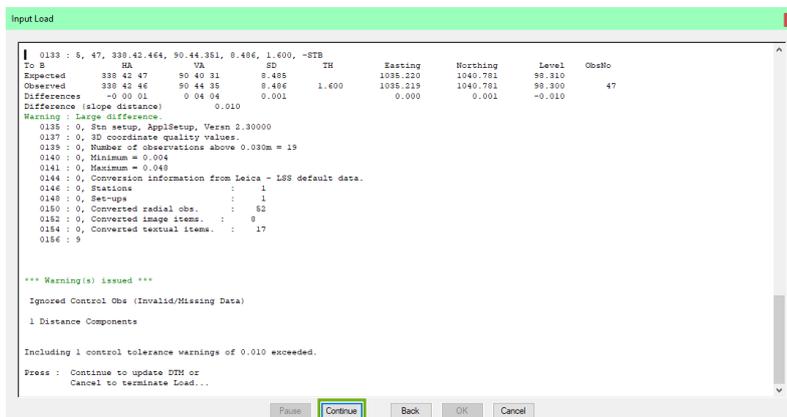
Note: if an observed station does not exist in the survey, then the **first** observation is used to compute its coordinates – they are not meant here. Subsequent station 'shots' become 'check observations'.

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.

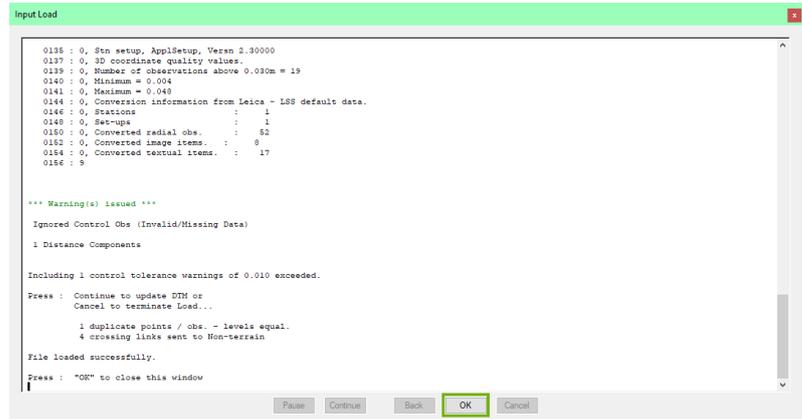
Often errors occur simply because the stations have been incorrectly labelled during the set-ups, or there is one poor observation.

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.

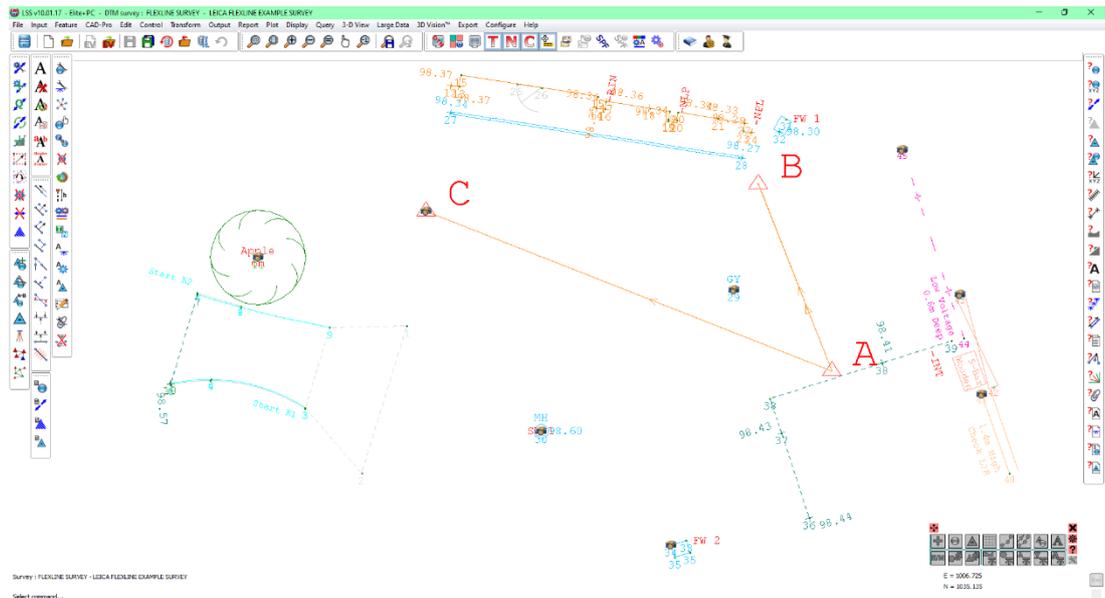


If available, Click 'Continue' at each pause / prompt



'OK' to complete the load.

LSS will display the data.



This includes updating the triangulation to create the DTM.

On the screen, the loaded survey should look like the screenshot:

Note: Attachments in the form of images have come through from the survey data.

Exporting Data as a Leica GSI File

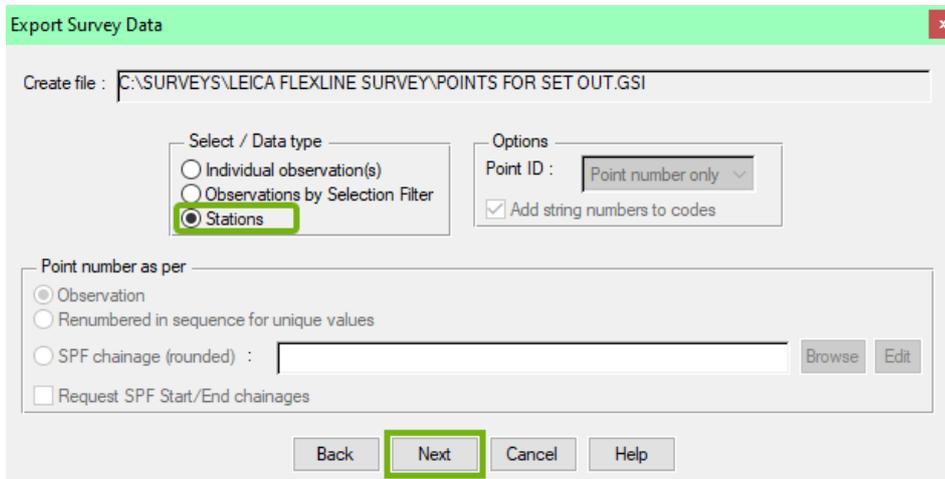
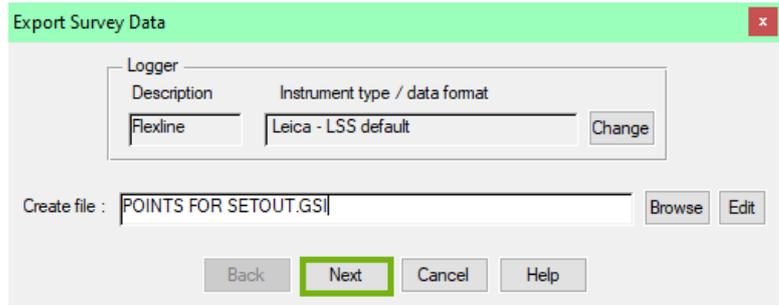
Export Survey Instrument – Survey Data

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

Specify a name for the exported file and

click 'Next'.

This dialog allows the selection of observation and station data;

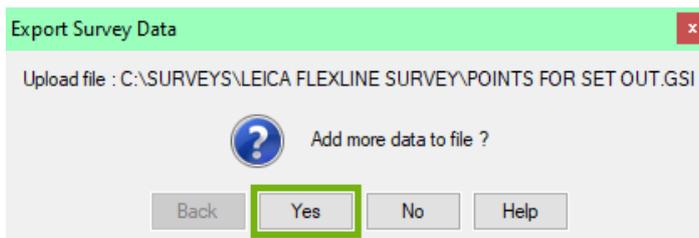


The defaults assume that the 'Observations' will be exported using the Selection filter.

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

'Stations' first

Click 'Next'.

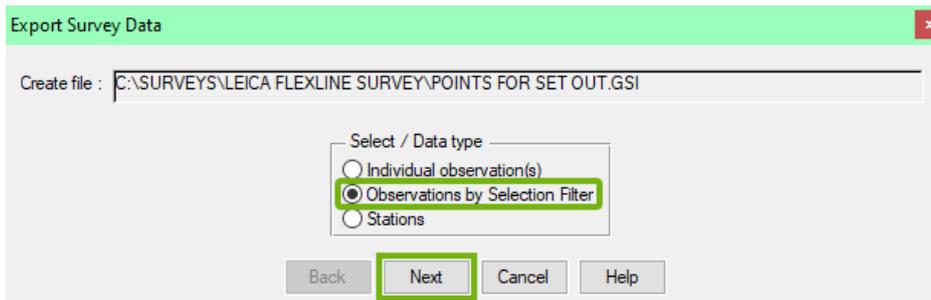


We will be offered

'Add more data to file'

'Yes'

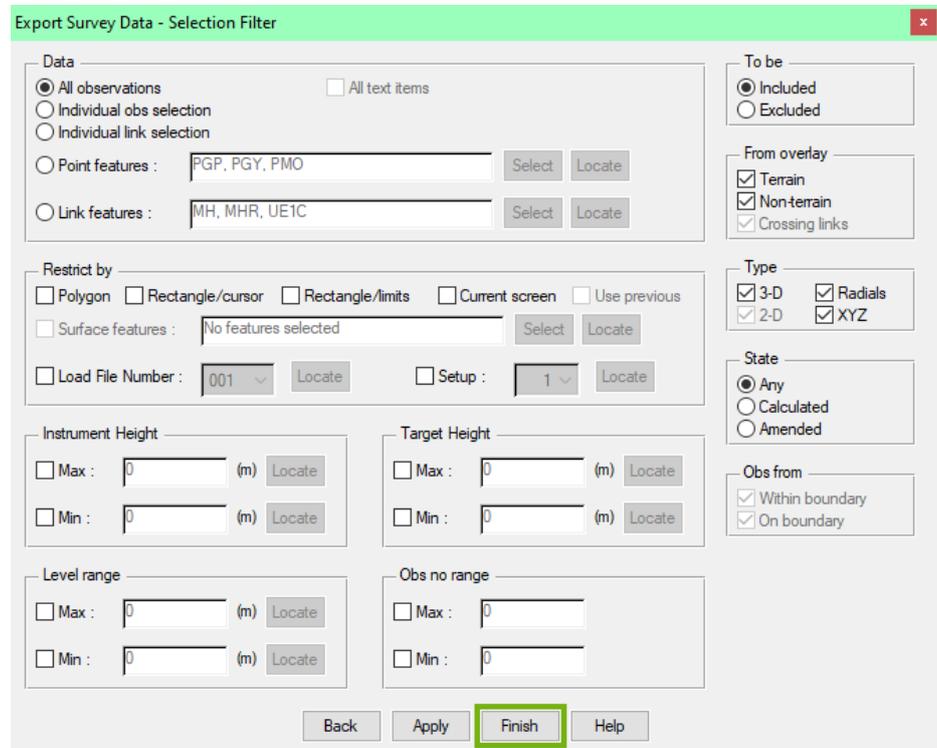
The Selection filter dialog will offer the opportunity of multiple observation selection criteria.



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We make our selection through the various Selection Filter options;



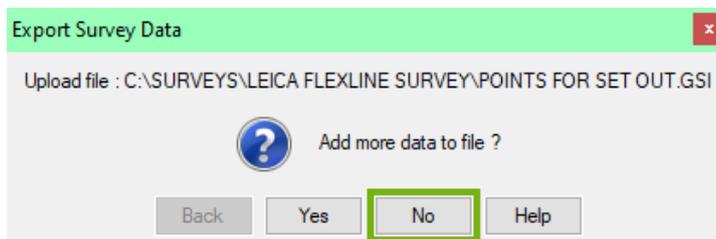
Hit 'Apply' to make selections on the screen – there can be many.

As soon as there are observations selected then the 'Cancel' button is replaced by 'Finish'.

Click 'Finish' once all required data is highlighted.

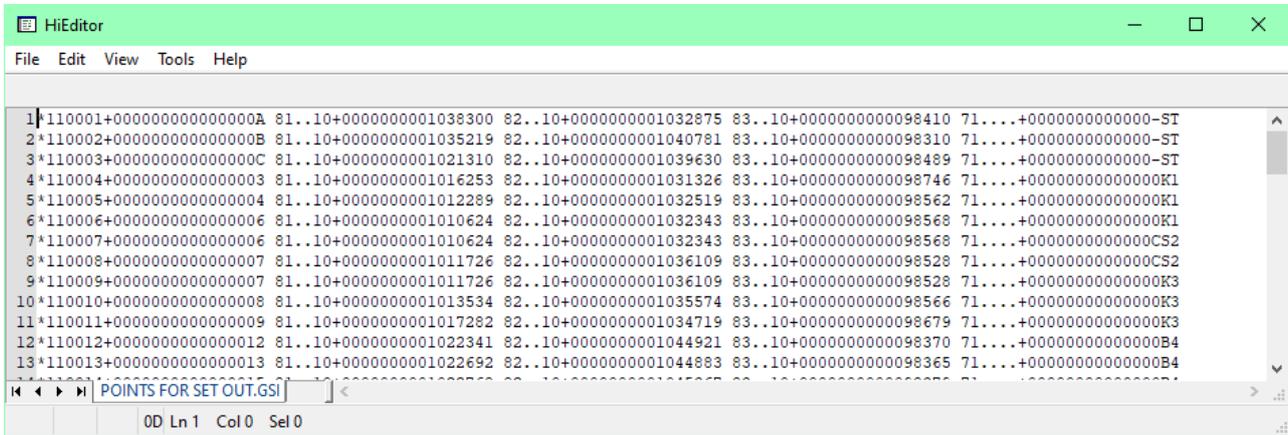
Note: The data selected by the Selection filter is grouped in the export set first as complete strings and then as individual points related to their loaded order. To export the observations in the order they were located use 'Individual observations' from the previous dialog.

Select -Upload when prompted.



'No' once selection has been made

Once complete, the data are held in an ascii file and can be viewed in the default editor, HiEditor,



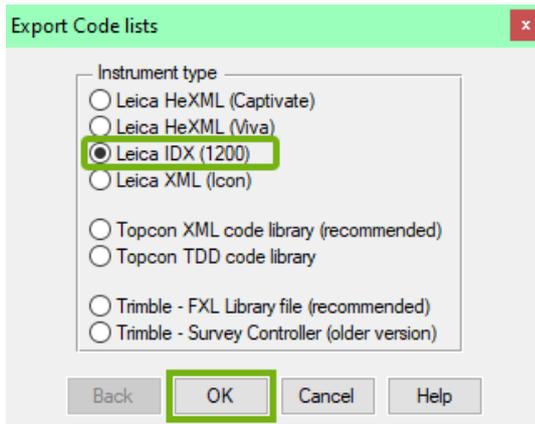
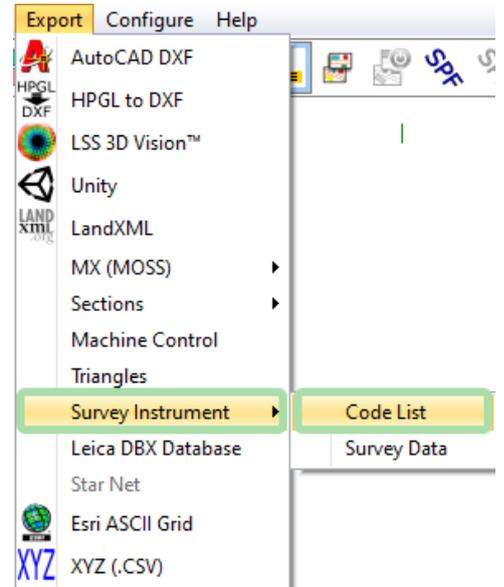
before being copied to the USB Flash drive ready for copying to the Leica Flexline.

4.2 Exporting LSS Code List to Leica Flexline

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

Note: for new users we suggest that the LSS Prototype Legend (supplied with the LSS media) is used as a starting point for which there is a pre-built code list available in the 'Support_Files\Leica\Mid-Range\Code' 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.



To update to a new Code List for Leica Flexline we

Use LSS to generate the IDX code list

'Leica IDX (1200)

'OK'

The various settings are displayed in the next export window for us to provide;

'Select' the required Point features.

Tick the

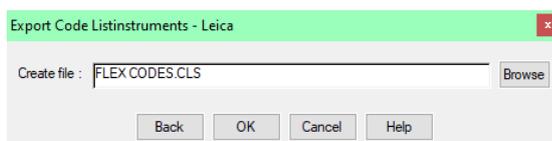
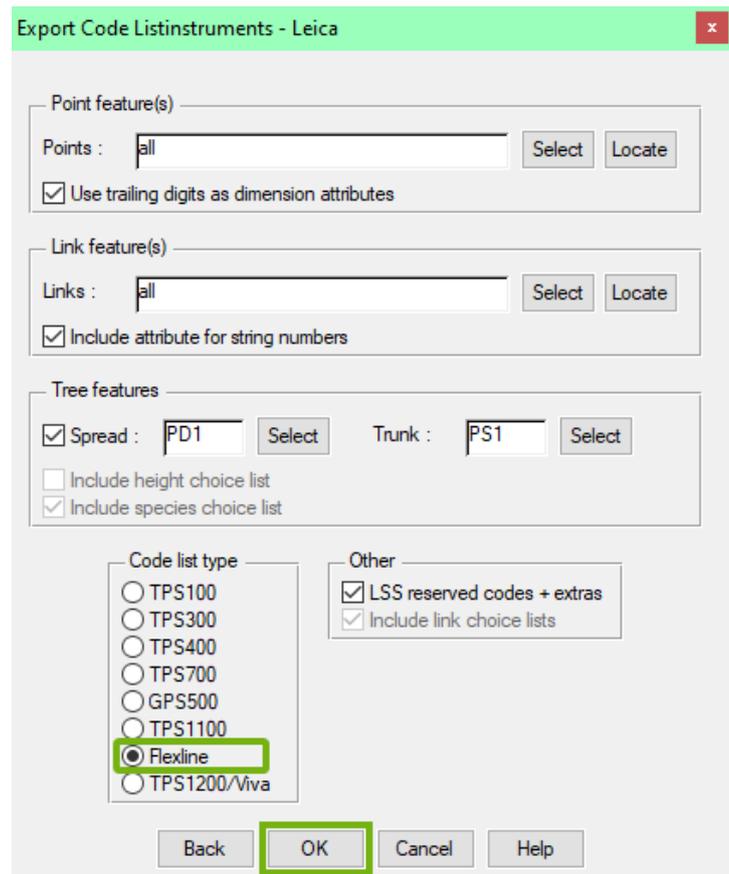
'Use trailing digits as dimension attributes'

'Select' the required Link features.

Set the specific Point feature codes for Tree features

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

Create the Filename for the code list and click 'OK';



Technical Notes:

- When the Code list is copied to the Leica Flexline, the Code List name appears.
- The default is to include all 'Points' and 'Links' Features, but they can be (multi) selected.
- LSS will recognise any series of point features with numbers appended to a stub code and automatically export as attributable features.
- When coded the attribute is added and when converted to LSS the attribute value is appended to the stub code. Examples are PC, PD, PS, PT and recent addition, PIC.
- Some attribute values are set in decimetres to allow diameters to be coded correctly.
- Trees are special examples where the (default) PD and PS codes allow trees with spreads (PD in metres) and trunks (PS in decimetres) to create trees with varying spreads and trunk diameters. These also include attributes for height and species.
- The recommended default is to include the LSS Reserved Codes by ticking the box.
- The LSS Reserved codes are accessed via the F7 Free Code Hot key and will also include attributable values.
- 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 '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.
- 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.

Conclusion

In this workshop we hope that you will be in a position to start making the most of the survey instrument, feature coding in the field, transferring survey data and design data from and to the survey instrument.

We have looked at the LSS Reserved codes and using LSS to coordinate and check the survey control stations.

We should have covered a good deal of the options, but there are always new possible methods and developments so do keep in contact by visiting the LSS Help and other on-line resources, and calls to our support line.

We hope you become comfortable using LSS with the Leica Fexline and feel able to apply what you have learnt today to undertake a wide range of survey and engineering tasks in the future.

If you wish to attend any further training courses please contact us...

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