# Instrument Manual

Interface to Leica FlexLine







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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 and Testdata

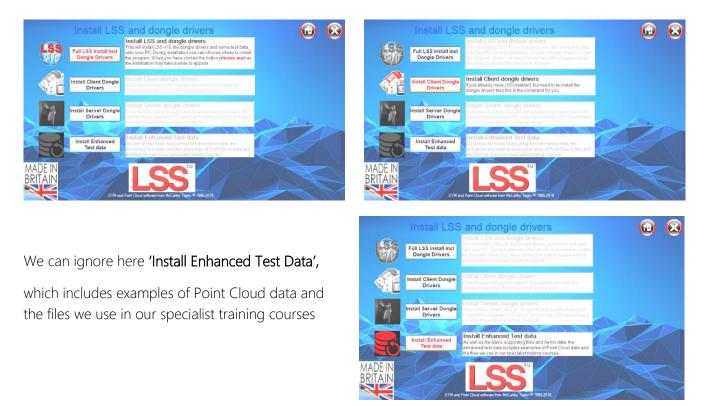
**Note:** Leica Installs may be required (such as the DBX Reader) on the PC in order to fully connect LSS to Leica Flexline.

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'



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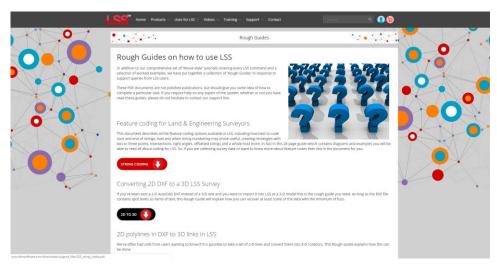
### 1.2 LSS Rough (How to) Guide

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;

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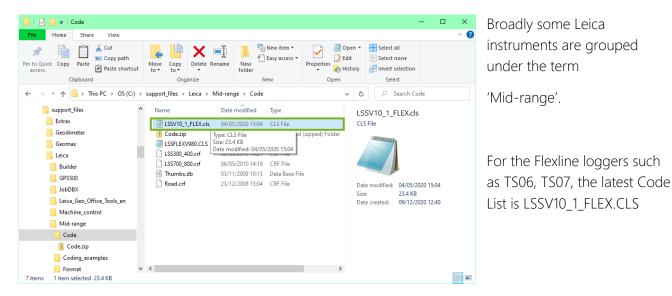
#### 1.3 LSS Prototype and Feature Code Lists

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** ;

					ROTOTYPE [*] - LSS Versi		h h									-	- 🗆 ×
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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).:



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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.

Survey Instrument	Code List
Export Code lists	×
<ul> <li>Instrument type</li> <li>Leica HeXML (Captiva)</li> <li>Leica HeXML (Viva)</li> <li>Leica IDX (1200)</li> <li>Leica XML (Icon)</li> <li>Topcon XML code libr</li> <li>Topcon TDD code libr</li> </ul>	ary (recommended)
<ul> <li>○ Trimble - FXL Library fil</li> <li>○ Trimble - Survey Control</li> </ul>	· · ·
Back OK	Cancel Help

Export Code Listinstruments - Leica We will be copying this Code List across to the logger Point feature(s) for today's exercise. Points : all Select Locate Use trailing digits as dimension attributes When starting a new job on the logger, it can be configured to include this code list. Link feature(s) all 2 Links : Select Locate The LSS Export command is covered in more detail Include attribute for string numbers later on in this workshop manual. Tree features Spread : PD1 Select Trunk : PS1 Select Include height choice list Include species choice list Code list type Other O TPS100 LSS reserved codes + extras TPS300 Include link choice lists O TPS400 O TPS700 Export Code Listinstruments - Leica 2 GPS500 O TPS1100 Create file : LSSV10\_1\_FLEX.CLS Browse Flexline ) TPS1200/Viva Back ок Cancel Help ок Cancel Help Back

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#### 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.

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#### 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;

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

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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';

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For the Code List the following sequence;

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File Name	Date	11	File Name	Date	File Name	LSSV10_1_FLEX.CLS
		11			Folder	Leica FlexField\Codes
Application Data	26.10.20		LSSV10_1_FLEX.CLS	05.11.20	Code Name	
🚞 Codes	26.10.20				Code Name	LSSV10_1_FLEX
🚞 DB	26.10.20	1				
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For the Format File, a similar procedure;

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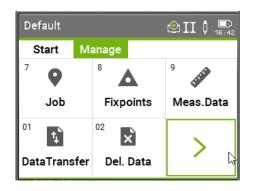
### 1.5 Configuring Leica Flexline – Manage Settings

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

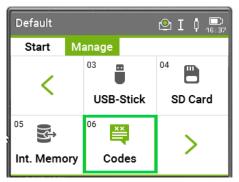
The Memory Devices;

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Jobs and Data;

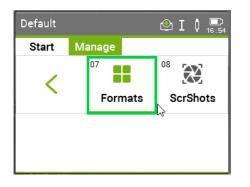


#### Codes;



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PBL		Building line	
~M		Bench Mark ~	
PBOL		Bollard	
PC		Circle	
PCON		Concrete	
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New	Edit	View   Dele	te

#### Format Files;



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Back	DelAl		Delet	te	]					

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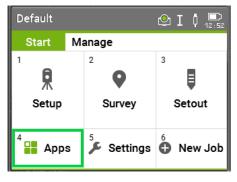
#### Instrument Manual - Interface to Leica Mid-Range

#### 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';

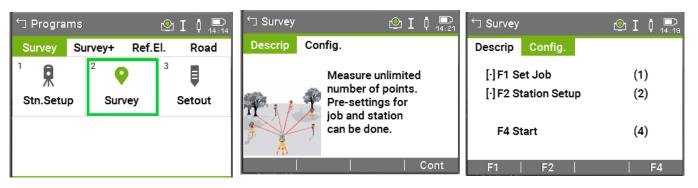


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Survey	S	urvey+	Ref.E	1.	Road
1 Stn.Setu	<sup>2</sup> O Survey		ey	<sup>3</sup> Setout	
2					
-					

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;



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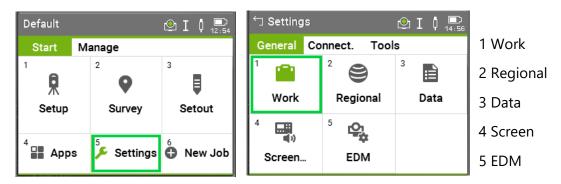
#### Instrument Manual - Interface to Leica Mid-Range

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



#### 5 Settings

Choose Settings for the following instrument settings;



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

つ Work Set	ttings	🗠 I 🕴	□) ← 14:52	] Work S	ettings	🗠 I 🕴	() 14:50	句 Work S	ettings	Q	I 🕴 🛄
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Trigger Key	2	Off	<> L	ine 2		Target Height <>		Show PtID	)		Yes <>
USER Key 1		Level & Plummet	<> L	ine 3		Code <>	17 H.	Show PtC	ode		Yes <>
USER Key 2	2	Offset	<> L	ine 4		Hz angle <>		Only 50 Pt	ts		No <>
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			L	ine 7		Height diff. <>	$\sim$				
Default		Co	nt [	Default		Cor	nt	Default			Cont

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

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Default	Cont	Default	Cont	Default	Cont

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

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General Co	nnect. Tool:	s <sup>3</sup>	つ Data Settings	🕑 I 🏮 ⋿	🗂 Data Settings	🕑 I 🕴 🛄
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Screen	EDM		Code	Permanent <>>		
			Default	Cont	Default	Cont

#### 4 'Screen' Settings

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1 💼 Work	<sup>2</sup> S Regional	<sup>3</sup> Data	Display Illum. Reticle Illum. Screensaver Appl.Descrip.	100% <> Off <> after 10 min <> All <>	Beep Sector Beep Setout Beep	Normal <> Off <> Off <>
4 Screen	5 C		Keyboard Illum. Touch Screen Default	Off <> On <>	Default	Cont

#### 5 'EDM' Settings;

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General Con <sup>1</sup> Work	nnect. Tool <sup>2</sup> S Regional	s <sup>3</sup> Data	EDM Lights Laser-Point Guide Light	Off <> Off <>	EDM Lights EDM Mode Target Meas. Mode	Prism<> Round (GPR)<> Precise+<>
4 Screen	5 🤤 EDM			Cont	Leica Const. Abs. Const. Atmos   Scale	0.0 mm -34.4 mm Cont   ↓

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

Default			<ul><li>ゴ Manage Job</li></ul>	🕑 I 🕴 💻
Start	Manage	3	General Enter Job Data	
ľ 🙍	2 Q		Job Operator	 
Setup	Survey	Setout	Remark 1 Remark 2	
<sup>4</sup> App	s 🏂 Settings	6 New Job	Date	16.11.2020 16:19:27
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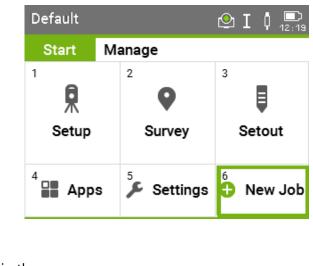
Copyright © McCarthy Taylor Systems Ltd, 2019

## 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



🗂 Manage Job	🗠 I 🅴 💻	
General		Type in the
Enter Job Data Job	FLEX SURVEY	Job Name,
Operator Remark 1	DJM	<b>Operator</b> and other
Remark 2 Date	 19.11.2020	Remarks:
Time	12:22:27	
Insert   Delete	Clear   →345	

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

FLEX SURV	FLEX SURVEY 🕑 I 🕴 🚍		Code 1/205	🕑 I 🕴 💻
Start N	Manage		General	
	03 💼	04	PASP	Asphalt 🔨
1			PBL	Building line
	USB-Stick	SD Card	~M	Bench Mark ~
			PBOL	Bollard
05	06 ××		PC	Circle
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#### Back to top

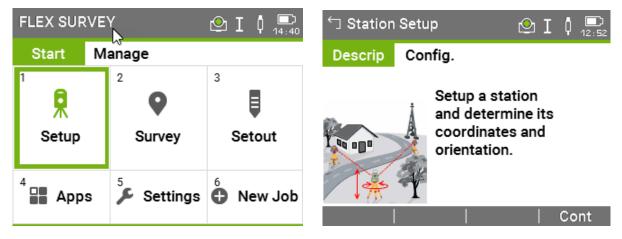
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#### Setup procedure

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;

🗂 Station Setu	IP 🕑 I 🖡 🛄	└ Station Setup	🕑 I 🏮 ⋿
Descrip		Descrip Config.	
•	Ori. with Angle	[·] F1 Set Job	(1)
Tun and	Aim at a target to set the orientation of a known station.	[·]F2 Settings	(2)
XY		F4 Start	(4)
	Cont	F1   F2	F4

Then click '**Cont**'.

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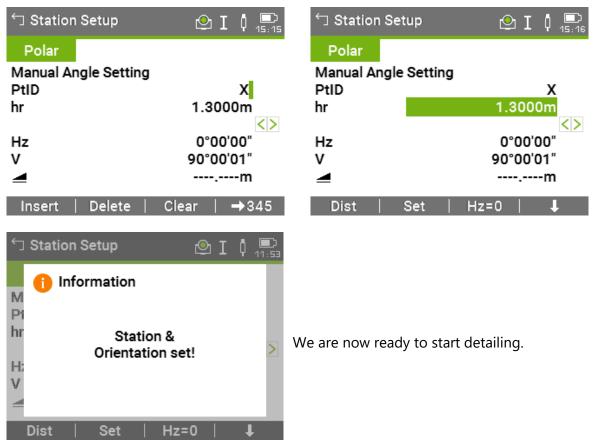
To set the set-on station name and details, click '**Point ID**' and the right arrow to key access the '**New Point - Coordinates**' screen and create a new point and specify a '**Point ID**' (i.e. Station name) and the relevant arbitrary coordinates for new station A;

🕤 Enter Coordir	nates 🕑 I 🕴 📼	🗂 Enter Station [	Data 🕑 I 🕴 🛄
Data Job PtID East North Height	FLEX SURVEY A 1000.0000m 2000.0000m 300.0000m	Data Ori. with Angle Station hi	<mark>A</mark> 1.6000m
Back	Con <u>t</u>	Meas H   List	│ Cont │ 🖡

'Cont'

#### **Recording a Backsight**

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



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

🗂 Station Setup 🕑 I 🌵 📮 Polar Manual Angle Setting PtID В hr 1.3000m CTLObsID <> 359°59'59" Hz v 90°00'02" ---.--m Insert Delete Clear →345

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;

🕤 Survey		🕑 I 🏮 🛄
Survey	Map	
PtID		2 ^
hr		1.3000m
Code		CTLObsRO <>
Hz		0°00'00"
v		90°00'02"
		m
		m 🗸
Meas	Dist	Store   🖡

└─ Coding	🕑 I 🕴 💻
Code	
Enter Attributes	$\land$
Code	CTLObsRO
Q-Code	
Desc.	Cntrlobs RO attr
	B
	~
Insert   Delete	e   Clear   →345

#### **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;

🕤 Survey	Q	⊇ I 0	句 Code 1	/205	🕑 I 🏮 🛄
Survey	Мар		General		
PtID		0001 ^	PASP	Asphalt	^
hr	1.	3000m	PBL	Building	
Code			PBM	Bench Ma	
Hz		°23'59"	PBOL	Bollard	
V		°31'47"	PC	Circle	
		m	PCON	Concrete	
		m 🗸	PCTV	Cable TV	$\sim$
Insert	Delete   Clear	→ABC	New	Attrib.	Cont

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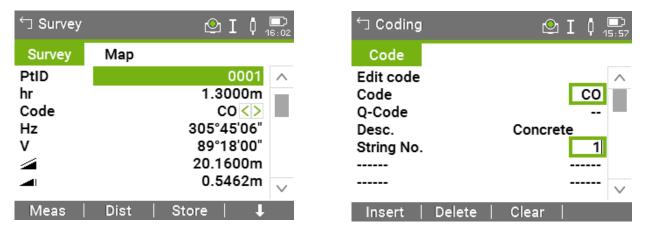
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The code list can also default to the closest entry to the typed characters, or the arrow keys can further be used to manually select the required code.

'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.

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#### 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;

└─ Code 20	4/205	🕑 I	¢	() 14:25
General				
OffsetUD	Offset U			$\sim$
Setup Fr	Setup (F			
Setup Pt	Setup (P			
CTLObsRO	Cntrlobs			
Freecode	Free cod			
Notes	General			
CTLObsID	Control			$\sim$
New	Attrib.		Co	nt

Code 1	96/205	٩	Ι	¢	<b>)</b> 14 : 28
General					
	End stri				$\sim$
	Close st				
	Start st				
	Join to				
OffsetLR	OffRad R				
OffsetFB	OffRad F				
OffsetUD	Offset U				$\sim$
New	Attrib.		1	Co	nt

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;

Survey	🗠 I 🖡 /	■〕 16 : 11	🗂 Coding	🕑 I 🕴 🖞	<b></b> ) S:09
Survey	Мар		Code		
PtID	0003	~	Enter Attributes		$\wedge$
hr	1.3000m		Code	PIC	
Code	PIC <>		Q-Code		-
Hz	283°10'12"		Desc.	Inspection Cover	
v	89°30'35"		Dim (INT)	6	
	22.4160m				
	0.5581m	$\vee$			$\sim$
Meas	Dist   Store   🖡			Cont	t

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;

Code 1/1		❷ I 0 ■ 14:42	Coding	🕑 I 🖡 💭
General			Code	
PD T	ree + d		Edit code	^
			Desc.	Tree + dims
			Spread	5
			PS	PS
			Trunk	4
			Height	6
			Species	
New A	Attrib.	Cont		Cont Cont

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#### **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;

つ Code 1	63/205	🕑 I 🏮 💻	🗂 Code 3	/1	🕑 I 🏮 💻
General			General		
-REC	2/3 pt r	^	-REC	2/3 pt r	
-RIN	Rect. in				
-HA	HA offse				
-VA	VA offse	_			
-NLP	Perp off				
-NPL	Perp off				
-INT	Intersec	$\sim$			
New	Attrib.	Cont	New	Attrib.	Cont

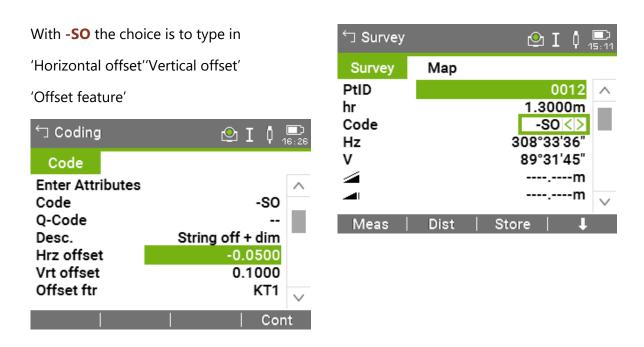
For **-OU**, we use a negative attribute for depth in metres;

🗂 Code 19	9/205	🕑 I	0 🛄 16:20	<ul><li>☐ Coding</li></ul>	🕑 I 🏮 💻
General				Code	
OffsetUD	Offset U		^	Enter Attributes	^
Setup Fr	Setup (F			Code	OffsetUD
Setup Pt	Setup (P			Q-Code	
CTLObsRO	Cntrlobs			Desc.	Offset U(+)/D(-)
Freecode	Free cod				-0.6
Notes	General				
CTLObsID	Control		$\sim$		$\sim$
New	Attrib.	(	Cont		Cont

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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.

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#### **Adding Annotations**

Code 205	5/205	ΘΙΦ	<b>)</b> 15:34	<ul> <li>☐ Survey</li> </ul>	1	🗠 I 🕴	<b>)</b> 15:41
General				Survey	Мар		
OffsetUD	Offset U		$\sim$	PtID		0013	$\sim$
Setup Fr	Setup (F			hr		1.3000m	
Setup Pt	Setup (P			Code		Notes <>	
CTLObsRO	Cntrlobs			Hz		308°33'36"	
Freecode	Free cod			v		89°31'45"	
						m	
Notes	General					m	
CTLObsID	Control		$\sim$				$\sim$
New	Attrib.	Co	ont	Meas	Dist	Store   👃	

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;



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Dec 2019

## 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.

		configure r laruware oc system	
To configure our logger of choice in LSS w <b>Configure Hardware &amp; System</b>	e select	<ul> <li>Settings</li> <li>Display</li> <li>Display colours</li> <li>General</li> </ul>	
Choose 'Logger - New'		CAD-Pro directional arrow Default folders Default font File Editor	S
(if there is already another logger configur option will be 'Logger / Change').	ed then the	<ul> <li>Joystick settings</li> <li>Loaded text for Point featule</li> <li>Maximum values</li> <li>New Survey parameters</li> <li>Plotting</li> <li>Popup menu</li> <li>Query / Sections</li> </ul>	ures
Next we need to choose the format of the	data.	Report / Plot     Digitiser       O Test sheet     O New       Amend     Delete       Back     OK     Cancel	Logger
Configure Hardware & System - New logger Logger Format : Leica V Description : Fle	exline	We will configure LSS as a L using the Job (DBX) Reader	
Back Next Cancel Help		Select the logger format as 'Le description as 'Flexline'. Next'	eica' and give the
New logger - Leica 🛛 🗙			
<ul> <li>Default data transfer/download</li> <li>Job (DBX) reader</li> <li>via ActiveSync</li> <li>User invokes download via COM port</li> <li>Leica Survey Office</li> </ul>	But we need	es download via COM port d to tick nsfer / download by default	
Options Options Options COM port (RS232) : Settings	ʻOK'		
Back OK Cancel Help			
Back to top			<b>Page</b> 23 <b>of</b> 29
		e to Leica Mid-Range	
Version LSSv10.01.10 Copyright ©	McCarthy Ta	ylor Systems Ltd, 2019	Dec 2019

#### We can accept these standard

Clicking 'OK'

Configure Hardwar

Report / Plot Test sheet

Back

ОК

Leica coding s format file (LS GSI file on the

g settings, as they will relate to the LSS_Flex.FRT) used in the Export to he Flexline.	Leica data type :LSS defaultSet upCodeIndexDetailCodeIndexStation name : $3$ $42$ $42$ $73$ $73$ Instrument ht. : $3$ $43$ $44$ $73$ $73$ $73$ Control obs (RO) : $3$ $44$ $44$ $74$ $73$ Ro target ht. : $3$ $45$ $44$ $43$ $43$ General TextCommentsCommentsMeasured Offsets1: $6$ $42$ $12$ $42$ $12$ 2: $6$ $43$ $32$ $14$ $15$ 3: $6$ $44$ $44$ $15$ $44$
vare & System 🗙	Back OK Cancel Help
O Default font	l allow us to 'Finish' and 'Save' our logger settings to e registry.
	Configure Hardware & System 🛛 🗙
O Query / Sections       Digitiser       O New       Amend       Delete	Configuration changes Save Use changes - save / discard on exiting LSS Discard - revert to last saved settings

OK

Cancel

Help

Configure Hardware & System - Leica coding

Note: This must be repeated for all PCs that are to use the Job reader.

Help

Finish

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

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

Terrai	g 2-D data n is all 3-D - send 2-D data n may include 2-D data - N	to Non-terrain OTE: volumes, etc, not permitted
Annotation of Levels — Standard Hydrographic - Admir Hydrographic - Engin	- Dijing noigin	: 2 (m) above Chart datum 0.0
Survey units Metres Feet Yards No default Angular units Dec. degrees Deg Min Sec Grads	Area report Metres Hectares Feet Yards Acres Volume report Metres Feet Yards Yards	Settings         Default scale factor :         □ Curvature / refraction adjustment         Conditioning tolerance :       0.05 (m)         ☑ Smooth through different link features         Obs format       VA collimation         ○ VA / HD       ③ 90         ③ VA / SD       270
Control tolerances		Target height
Warning : 0.01 Error : 0.03	(m) (m)	Maximum : 5 (m) Minimum : 0 (m)
Copy Prototype from — Survey : C:\SURVI	EYS\PROTOTYPE\PROT	DTYPE.LSS Browse

et the Handling of 2-D data,

Iter standard Annotation of Levels for ydrographic surveys.

he Drying height is the height above Chart atum to be considered as 'tidal'.

et Survey units for length, area and volume n the survey,

nd other survey parameters:

ngular units, Obs format, Vertical angle ollimation.

ontrol tolerances set the Load values for Varnings and Errors, and also maximum and ninimum Target heights,

Copy Prototype from' - an LSS template urvey 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.

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'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.

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#### 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.

Configure Hardware & System 🛛 🗙					
Settings Display Display colours General CAD-Pro directional arrows Default folders Default font File Editor Joystick settings Loaded text for Point features Maximum values New Survey parameters Plotting Popup menu Query / Sections					
Report / Plot     Digitiser     Logger       O Test sheet     O New     O Change       Amend     Delete					
Back OK Cancel Help					

**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.

Co	onfigure Hardware & System - File Editor		x
	- Editor	Browse	
	Back OK Cancel Help		]

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;

Configure Hardware & System	This will offer the user
Configuration changes         Save         Use changes - save / discard on exiting LSS         Discard - revert to last saved settings         Back       OK         Cancel       Help	'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 fr	ck 'Browse' against         ew survey' in the         alogue below.         e can create a new         der for the new         rvey to go in and         II it         File name:         FLEXLINE_SURVEY	CAD					
	🔀 Select new survey						×
Click 'Browse' against	$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\blacksquare$ $\rightarrow$ This PC $\rightarrow$ OS (C:) $\rightarrow$	Surveys > Leica Flexline	Survey	5 V		.eica Flexline Su	rvey
'New survey' in the	Organize 🔻 New folder						?
dialogue below.		^	Name	Date modified	Туре	Size	
			REXLINE_SURVEY.ASC	19/11/2020 16:50	ASC File	36 KE	3
We can create a new folder for the new	Prototype	- 1	Size: 35	2 KB	16:50		
survey to go in and call it		~					
	File name: FLEXLINE_SURVEY						~
Select it in the 'Save in' box	Save as type: All (*.*)				Save	Cance	~ el

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

File New DTM - DTM survey	C:\ Surveys\Leica Flexline\and the
New survey : C:\Surveys\Leica Flexline Survey\FLEXLINE_SURVEY Browse	survey name, <i>e.g.</i> FLEXLINE SURVEY;
Survey title : LEICA FLEXLINE EXAMPLE SURVEY Copy Prototype from	If required enter Survey title, or if left blank, LSS will use the survey name as the title.
Survey : C:\SURVEYS\PROTOTYPE\PROTOTYPE.LSS Browse Include stations from None	Set the Prototype, and,
O Prototype O Survey : Browse	'Include stations from' as required
<ul> <li>Handling 2-D data</li> <li>● Terrain is all 3-D - send 2-D data to Non-terrain</li> <li>○ Terrain may include 2-D data - NOTE: volumes, etc, not permitted</li> </ul>	
Option Configure Survey Parameters	
Back OK Cancel Help	

#### **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:

Configure Survey Parameters ×	
Survey title : LEICA FLEXLINE EXAMPLE SURVEY	We can alter the Survey Title,
<ul> <li>Handling 2-D data</li> <li>Terrain is all 3-D - send 2-D data to Non-terrain</li> <li>Terrain may include 2-D data - NOTE: volumes, etc, not permitted</li> </ul>	Change the handling of 2- D data,
Annotation of Levels     Standard     Hydrographic - Admiralty     Drying height : 2     (m) above Chart datum 0.0     Hydrographic - Engineering	Adjust other survey parameters as required
Survey units       Area report       Settings         Image: Settings       Default scale factor : 1         Image: Settings       Image: Settings         Image: Se	For GPS data and the Ordnance Survey National Grid TN15 transformation, the 'Default scale factor' can be set here
Angular units       Volume report       Obs format       VA collimation         O Dec. degrees       Image: Collimation       Image: Collimation       Image: Collimation         Image: O Deg Min Sec       Image: Collimation       Image: Collimation       Image: Collimation         Image: O Deg Min Sec       Image: Collimation       Image: Collimation       Image: Collimation       Image: Collimation         Image: O Deg Min Sec       Image: Collimation       Image: Collimation       Image: Collimation       Image: Collimation       Image: Collimation         Image: O Deg Min Sec       Image: Collimation       Image: Collimation	
Control tolerances       Target height       Edit additions         Warning :       0.01       (m)       Maximum :       5       (m)         Error :       0.03       (m)       Minimum :       0       (m)       Obs. number :       10000	'Control tolerances' can be adjusted if necessary
Back OK Cancel Help	

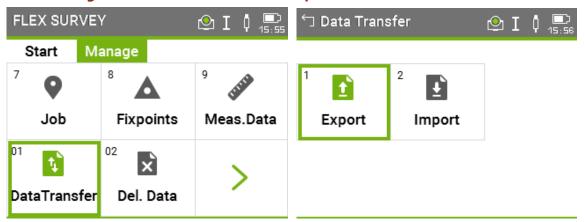
#### **Technical Notes:**

- This window can also be invoked by the command **Configure Survey Parameters.**
- <u>If</u> 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'

☆ Export	🗠 I 🕴 🚍	🕤 Select Dest. Folder	! 🕑 I 🕴 📼
Select		General	
		USB Memory Device	e\Jobs
То	USB-Stick <>	File Name	Date
Data Type	Measurements <>		
Job Select Job	Single Job <> FLEX SURVEY <>		
Select Job			
Back Sear	ch   List   Cont		1

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;

🕤 Select Dest. Folder!	🕑 I 🕴 1	<b>)</b> 15:59	└── Save Job as	🕑 I 🕴 🚍
General			Select	
USB Memory Device		$\sim$	Format	LSS_Flex <>
File Name	Date			
🚞 Download	30.11.20			
Formats	30.11.20		File Name	FLEX SURVEY
images 📰	30.11.20		Extension	ASC
🔚 Jobs	30.11.20			
System	30.11.20	$\sim$		
Delete   Rename	T T		Back	Cont

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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 <u>select</u> **Input Download / Convert** to invoke the Download data window.

Input Download /	Convert - Download data					
Logger       Description     Instrument type / data format       Flextine     Leica - LSS default						
User in User i	Options Copy file via ActiveSync User invokes download via COM port LSS invokes download from Geodimeter via COM port Leica Survey Office					
No data transfer/download						
Ba	ack Next Cancel Help					

File	Inpu	ut	Feature	CAD-Pro	Edit			
	<b>.</b>	L	Load					
	密	Load Thin Data						
*	•••	Merge						
4	Ŧ	E	Extract Elevation					
o		Convert from						
		D	Download / Convert					

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'

Input Download / Cor	nvert - Conversion of Leica - LSS default			x
Downloaded file : LSS load file :		Browse Browse	Edit Edit	Next
Feature code conve Conversion file :		Browse	Edit	
	Report detailed information Pause on each error/warning Back OK Cancel Help			

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.

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Input Download / Convert		×
0, Stations : 1 0		^
0, Set-ups : 1 0, Converted radial obs. : 52 0, Converted image items. : 8		
0, Converted image items. : 0 0, Converted textual items. : 17 0		- 1
Conversion messages: 1 warnings. Conversion completed.		
CONVERSION COMPLETED. "OK" to save LSS load file, or Cancel to terminate.		
11	Pause Continue Back OK Cancel	*

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

Output file C:\SURVEYS\LEICA FLEXLINE SURVEY\FLEXLINE\_SURVEY.001
Options
Save and LOAD file
Save
Delete
Back
OK
Cancel
Help

Input Download / Convert - File Close

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';

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#### 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. .

Input Load X	
Load Report Settings           O Device :         CutePDF Writer         on         CPW2:         Select           O Adobe Acrobat :         FLEXLINE_SURVEY.PDF         :A4:PT:Close         Configure	A Load Report file will be generated – we will accept the default _nnn.TXT file type for this exercise.
File :     FLEXLINE_SURVEY_nnn.TXT     Overwrite report file     Lines per page :     67     (File)     Bold text	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
Conversion file : Browse Edit Do not check legend for feature codes Edit	Leave the options as per default.
Load file Options Include Number : 001 Edit Errors Include	There are options;
All warnings	'Use Default'
General text settings Strings restart on Levels text style New setup Save as Default Levels text position Change of feature	'Save as Default'
Advanced	And the options to set up annotations
Configure Survey Parameters	for features, particularly for utilities surveys
Back Next Cancel Help	'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.

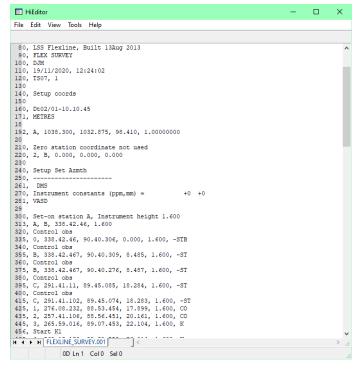
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Clicking the 'Edit' button next to the Load file 001 will open the Load file in the editor configured / reviewed earlier

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.

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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.

Input Load - Initial Set-up
Set-on Station A
E: 1000 N: 1000 Z: 100
Description :
Default scale factor 1.00000000
Backsight to Station B True bearing : 338 42 46 (dms) Mode
Back OK Cancel Help

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 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.

C COBU									
0133 : 5, o B	47, 338.42.464 HA	, 90.44.351, 8.4 VA	486, 1.600, · SD	-STB TH	Easting	Northing	Level	ObsNo	
xpected	338 42 47	90 40 31	8,485	10	1035.220	1040.781	98.310	ODSNO	
oserved		90 44 35	8,486	1.600	1035.219	1040.781	98.300	47	
		0 04 04	0.001	*	0.000	0.001	-0.010		
	slope distance)				0.000	0.002	0.010		
	rge difference.								
		lSetup, Versn 2.	30000						
	3D coordinate								
		rvations above (	0.030m = 19						
0140 : 0.	Minimum = 0.00	4							
	Maximum = 0.04								
		ormation from Le	eica - LSS d	efault data					
	Stations		1						
0148 : 0.	Set-ups		1						
	Converted radi	al obs.	52						
0152 : 0.	Converted imag	e items. :	8						
0154 : 0.	Converted text	ual items. :	17						
0156 : 9									
** Warning(	s) issued ***								
Ignored Con	trol Obs (Inval	id/Missing Data)							
l Distance	Components								
aluding 1	control toleron	ce warnings of (	0.010 emered	-					
crowing r	concror coreran	ce warnings or (	exceed	eu.					
	tinue to update								
Can	cel to terminat	e Load							
			Pause	Continue	Back	OK Can			
			Pause	Continue	Back	UN Can	Cel		
					_				

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

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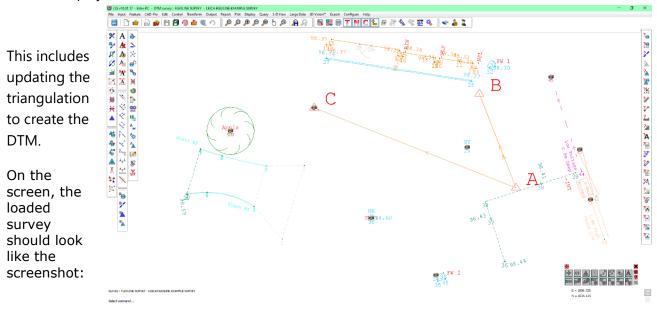
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0135 ; 0. Stn setup, ApplSetup, Versn			
0135 : 0, Sth setup, Appisetup, Versn 0137 : 0. 3D coordinate guality values			
0139 : 0. Number of observations above			
0140 : 0, Minimum = 0.004			
0141 : 0, Maximum = 0.048			
0144 : 0, Conversion information from			
0146 : 0, Stations : 0148 : 0, Set-ups :	1		
0150 : 0, Converted radial obs. :	52		
0152 : 0, Converted image items. :			
0154 : 0, Converted textual items. :	17		
0156 : 9			
*** Warning(s) issued ***			
Ignored Control Obs (Invalid/Missing Dat	a)		
1 Distance Components			
Including 1 control tolerance warnings of	0.010 exceeded.		
Press : Continue to update DTM or			
Cancel to terminate Load			
l duplicate points / obs lev			
4 crossing links sent to Non-te	crain		
File loaded successfully.			

'OK' to complete the load.

#### LSS will display the data.



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

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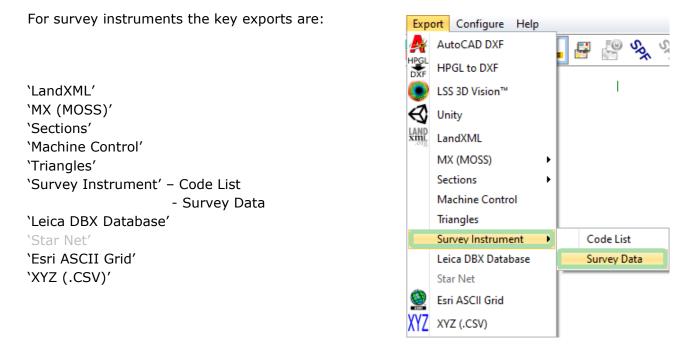
#### Exporting Data to Leica Instruments 4.1

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;



Choose which is the most appropriate for your particular logger.

For Leica Mid-Range including the Flexline loggers the most likely format would be Leica GSI Files.

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

#### **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 dialogue box;

Export Surve	y Data		×
	·	nstrument type / data format eica - LSS default	Change
Create file :	POINTS FOR SETOU	T.GSI	Browse Edit
	Back	Next Cancel Help	]

Specify a name for the exported file and

click 'Next'.

This dialog allows the selection of observation and station data;

Export Survey Data     ×       Create file :     C:\SURVEYS\LEICA FLEXLINE SURVEY\POINTS FOR SET OUT.GSI	The defaults assume that the 'Observations' will be
Select / Data type       Options         O Individual observation(s)       Point ID :         O Observations by Selection Filter       Image: Construction of the second sec	exported using the Selection filter.
Point number as per     Observation     Renumbered in sequence for unique values     SPF chainage (rounded) :     Browse Edit     Request SPF Start/End chainages	<b>Note:</b> The observations can have the code added to the point number, whic can be related to the SPF
Back Next Cancel Help	chainage.

#### 'Stations' first

Click 'Next'.	
Export Survey Data X	We will be offered
Upload file : C:\SURVEYS\LEICA FLEXLINE SURVEY\POINTS FOR SET OUT.GSI	'Add more data to file'
Add more data to file ?	
Back Yes No Help	'Yes'

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

Create file : C:\SURVEYS\LEICA FLEXLINE SURVEY\POINTS FOR SET OUT.GSI
Select / Data type Individual observation(s) Observations by Selection Filter Stations
Back Next Cancel Help

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which SPF

#### Instrument Manual - Interface to Leica Mid-Range

We make our selection through the various

Selection Filter options;

Export Survey Data - Selection Filter	×
Data     All observations     All text items     Individual obs selection     Individual link selection	To be Included Excluded
O Point features : PGP, PGY, PMO Select Locate	From overlay Terrain
O Link features : MH, MHR, UE1C Select Locate	✓ Non-terrain ✓ Crossing links
Restrict by         Polygon       Rectangle/cursor       Rectangle/limits       Current screen       Use previous         Surface features :       No features selected       Select       Locate         Load File Number :       001       Locate       Setup :       1       Locate         Instrument Height	Type □ 3-D □ Radials □ 2-D □ XYZ State ○ Calculated ○ Amended Obs from □ Within boundary □ On boundary
Level range         Obs no range           Max :         0         (m)         Locate           Min :         0         (m)         Locate	
Back Apply Finish Help	

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

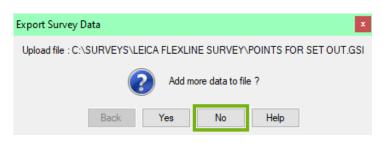
As soon as there are observations selected then the

'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.





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

Ē	HiE	ditor							-		×
File	E	dit	View	Tool	s Help						
1	*11	0001	+0000	00000	A0000000	110+000000001038300 8210+00000	00001032875	8310+000000000098410	71+000000000000-S	Г	,
2	*11	0002	+0000	00000	0000000B	110+000000001035219 8210+00000	00001040781	8310+000000000098310	71+000000000000-S	ľ	
3	*11	0003	+0000	00000	0000000C	110+000000001021310 8210+00000	00001039630	8310+000000000098489	71+000000000000-S	r	
4	*11	0004	+0000	00000	00000003	110+000000001016253 8210+00000	00001031326	8310+000000000098746	71+0000000000000K	1	
5	*11	0005	+0000	00000	00000004	110+000000001012289 8210+00000	00001032519	8310+000000000098562	71+0000000000000K	1	
6	*11	0006	+0000	00000	00000006	110+000000001010624 8210+00000	00001032343	8310+000000000098568	71+0000000000000K	1	
7	*11	0007	+0000	00000	00000006	110+000000001010624 8210+00000	00001032343	8310+000000000098568	71+00000000000000CS	2	
8	*11	0008	+0000	00000	00000007	110+000000001011726 8210+00000	00001036109	8310+000000000098528	71+0000000000000CS	2	
9	*11	0009	+0000	00000	00000007	110+000000001011726 8210+00000	00001036109	8310+000000000098528	71+0000000000000K	3	
10	*11	0010	+0000	00000	00000008	110+000000001013534 8210+00000	00001035574	8310+000000000098566	71+0000000000000K	3	
11	*11	0011	+0000	00000	00000009	110+000000001017282 8210+00000	00001034719	8310+000000000098679	71+0000000000000K	3	
12	*11	0012	+0000	00000	00000012	110+000000001022341 8210+00000	00001044921	8310+000000000098370	71+0000000000000B	1	
13	*11	0013	+0000	00000	00000013	110+000000001022692 8210+00000	00001044883	8310+000000000098365	71+000000000000B	4	
• •		<b>N</b>		SEOR	SET OUT.						
		-	Canal	STOR	521 001.0	1 1,					
			(	0D Ln	1 Col 0	el O					

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

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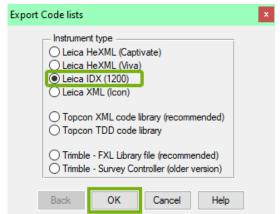
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### 4.2 Exporting LSS Code List to Leica Flexline

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.



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'

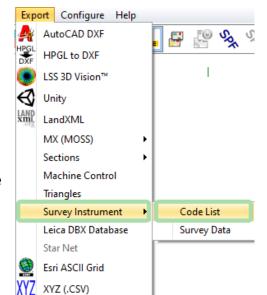
'Select' the required Link features.

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';

Export Code Listinstruments - Leica	x
Create file : FLEX CODES.CLS	Browse
Back OK Cancel Help	



To update to a

new Code List for Leica Flexline we

Use LSS to generate the IDX code list

'Leica IDX (1200)

'OK'

Export Code Listinstruments - Leica	x
Point feature(s)	
Points : all Select Loc	ate
Use trailing digits as dimension attributes	
Link feature(s)	
Links : all Select Loc	ate
Include attribute for string numbers	
Tree features	
Spread : PD1 Select Trunk : PS1 Select	
<ul> <li>Include height choice list</li> <li>✓ Include species choice list</li> </ul>	
Code list type       Other         ○ TPS100       ✓ LSS reserved codes + extras         ○ TPS300       ○ TPS400         ○ TPS700       ○ GPS500         ○ TPS1100       ● Flextine         ○ TPS1200/Viva       Back	

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#### **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.

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#### 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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