RefSet Controller

Automatic Reference Line and Stakeout Program for Leica CS15/CS20 or Windows Mobile Device to control a Leica 1200 TPS

User Manual

Version 2.8

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1. RefSet Program

TPS 1200 Bluetooth Setup

- From the TPS start screen
- Select Config then Interfaces then GeoCOM Mode
- Press F3 (EDIT) to edit the interface setup
- Select Yes for the Use Interface setting
- Arrow down to *Port* and select **Port 3 (BT)**
- Press F5 (DEVCE)
- Arrow down to RS232 GeoCOM
- Press F3 (EDIT) to edit the communication settings
- Press F5 (DEFLT) to select the default settings which should be:
 - Baud Rate **19200**
 - Parity None
 - Data Bits 8
 - Stop Bit 1
- Press F1 (STORE) to save the settings
- Press F1 (CONT) then F1 (CONT) then F1 (CONT) to finish setup

RefSet Controller Installation

- Copy Install_RefSet_Controller_{version}.cab to a memory card (or directly to the controller hard drive using Windows Mobile Device Center) and then insert the card into the controller
- Using File Explorer navigate to the Install_RefSet_Controller_{version}.cab file on the controller and double tap it
- Tap on **OK** to Install RefSet Controller and then follow the prompts
- RefSet Controller will then be installed onto the controller
- A shortcut to the program will be placed in the Start menu and on the desktop

Note: Only for a Windows Mobile device - if after starting RefSet Controller for the first time an error occurs stating *This application requires a newer version of the Microsoft* .*NET Compact Framework* then do the following:

- Select Quit
- Download the <u>.NET Compact Framework 3.5 Redistributable</u> to the PC
- Connect the device to the PC
- Run the downloaded file (NETCFSetupv35.msi) on the PC to install to the device
- Restart the device
- Restart RefSet Controller

RefSet Controller Key File Installation

- Copy the **RefSet_v2_{serial number}.key** file to the memory card (or directly to the controller hard drive using Windows Mobile Device Center) and then insert the card into the controller
- Using File Explorer copy the RefSet_v2_{serial number}.key file to the \Program Files\RefSet_Controller folder on the controller

RefSet Controller Bluetooth Setup

There is one method to setup the Bluetooth connection on a Leica CS15 or CS20 controller (Direct Bluetooth Connection) and two methods to do the setup on a Windows Mobile device (Direct Bluetooth and Serial Port Connection).

TPS Connections	C 🚟 🗱	TPS Connections - Add Bluetooth	C 🚟 🗮 ⊃	TPS Connections - Ac	ld Serial Port 💦 🗮 🚆	C
TPS Connection:	<tcra1203+ r400-<="" td=""><td>Select TPS To Add:</td><td>•</td><td>TPS Name:</td><td>TPS</td><td></td></tcra1203+>	Select TPS To Add:	•	TPS Name:	TPS	
				COM Port:	COM1	•
				Baud Rate:	19200	•
				Parity:	None	•
				Data Bits:	8	-
				Stop Bit:	1	-
OK Add BT Add Serial	Remove	Add TPS	Fn	Add TPS		En

Method 1 - Direct Bluetooth Connection

- Make sure that the TPS to connect to is turned on and the <u>TPS 1200 Bluetooth Setup</u> procedure has been completed
- From the RefSet Controller Start Screen press F3 (TPS Connection)
- Press F2 (Add BT Connection) the controller will then scan for bluetooth devices
- When the TPS has been discovered, select the TPS in the *Select TPS To Add* list and then press **F1** (Add TPS) the controller will then be paired with the TPS
- Make sure that the TPS is selected in the TPS Connection list and then press F1 (OK)
- RefSet Controller will then connect to the TPS
- Repeat this procedure if you want to add other TPS's

Method 2 - Serial Port Connection

Note: This method can only be used on a Windows Mobile device and should only be used if the 1st method above (Direct Bluetooth Connection) does not work.

- Make sure that the TPS to connect to is turned on and the <u>TPS 1200 Bluetooth Setup</u> has been completed
- On the Windows Mobile device tap on Start then Settings
- Select the Connections tab then tap on Bluetooth
- Select Turn on Bluetooth and then select the Devices tab
- Tap on New Partnership the controller will then scan for Bluetooth devices
- When the TPS has been discovered it will appear in the list as <[Instrument Type] [Serial No]> (eg: <TCRA1201+R1000 #260099>)

Method 2 - Serial Port Connection (cont)

- Select the TPS in the list and then tap on Next
- Enter the Passkey as 0000 and then tap on Next
- Select Serial Port then tap on Finish
- Tap on **ok** (top right corner of screen)
- Tap on Start/Settings/Bluetooth again
- Select the COM Ports tab and then tap on New Outgoing Port
- Select the TPS in the list then tap on Next
- Select a Port (eg:COM7) and then tap on Finish
- Tap on **ok** then close the settings screen
- Start RefSet Controller
- From the RefSet Controller Start Screen press F3 (TPS Connection)
- Press F3 (Add Serial Connection)
- Enter a TPS Name or leave as "TPS"
- Select the COM Port from the list This needs to be the same as that set in the system bluetooth settings above
- Select the Baud Rate, Parity, Data Bits and Stop Bit settings This needs to be the same as that set in the <u>TPS 1200 Bluetooth Setup</u> above
- Press F1 (Add TPS)
- Make sure that the TPS is selected in the TPS Connection list and then press F1 (OK)
- RefSet Controller will then connect to the TPS
- Repeat this procedure if you want to add other TPS's

RefSet Program Configuration

• Da	ta File Type	Set to the type of control job files to use in RefSet:									
		STR GSI DXF	Surpa Leica Autoc	ac string file gsi data file ad dxf file							
• Da	ta Folder	Set to the loca	ation o	f the control job files:							
		For a Leica C	:S15 o	r Leica CS20 controller:							
		CF Card SD Card USB Stick Internal	CF m SD m USB Interr CS15 CS20	emory card (only for CS15) emory card memory stick al folder on the Controller : \Leica Geosystems\SmartWorx Viva : \Leica Geosystems\Leica Captivate							
	Image: A test and a second	For a Windows Mobile device any folder on the device or a memory card can be used - the <i>Data Folder</i> must have two subfolders (This is the same folder structure as on the Leica CF data cards used in the TPS 1200):									
	> 🎒 Data > <u>]]</u> GSI	Data So GSI Le	urpac s eica gs	string and DXF files folder i data files folder							
• Us	e Common Data File	Set to Yes to	use a	common data file name for every function							
		The Control Rings) will als Stakeout Ref the Job name	Job na so be s iline, e e chose	ame chosen in one function (eg: Stakeout et in the other functions (eg: Stakeout Holes, tc). Otherwise each function will 'remember' on previously in that function							
• Lo	g Staked Points	Set to Yes to	save t	ne automatic stakeout points to a log file							
		The points staked in all automatic modes will be saved to a file with the same name as the control job with '_log' added which will be saved in a subfolder named 'Log' under the current Data Folder									
• Lo	g File Type	Set to the type data to:	e of loo	file to save the automatic stakeout point							
		STR GSI CSV	Surpa Leica Comr	ac string file gsi data file na separated text file							
• Gr	ade Display	Sets the input	t and o	utput format for grades:							
		H:V V:H %(V/Hx100)	Ho Ve) Pe	rizontal by vertical distance rtical by horizontal distance rcentage of vertical by horizontal distance							
• Da	ta Input Method	Sets the text i methods as u	input m Ised or	mode for the program (This is the same on the TPS 1200):							
		Function Ke	eys eys	Use function key buttons to enter text Use numeric keys to enter text							

2. Stakeout Rings

Ring Definition Methods



There are three methods for defining rings in RefSet:

- a) Reference Points Has two points to define the reference line (eg: 1 & 7) and a point located on each ring (eg: 2 to 6) <u>which need to be numbered in</u> <u>consecutive order</u> to enable RefSet to increment to the next ring in auto stakeout mode
- b) Ring Spacing Has two points to define the reference line (eg: 1 & 2) with one of those points located on the first ring and a spacing between the rings
- c) Reference Lines Has two points on each ring (eg: Ring1: 1 & 2, Ring2: 3 & 4, etc) which need to be numbered in consecutive order to enable RefSet to increment to the next ring in auto stakeout mode

There are two offset values that can be pre-set for the ring stakeout:

- a) *Rig Laser Offset* This sets the distance from the laser position to the drill rod position on the particular drill rig used to drill the rings. A positive value will move the *Laser Lines* in the direction of the reference line for the **Reference Points** and **Ring Spacing** methods and to the right of the ring for the **Reference Lines** method
- b) Auto Height Offset This sets the Height offset of the points that will be staked out in the auto stakeout mode. If this setting is not used then the Height value of the first point measured when the auto stakeout is started will be used to set the stakeout Height offset

Note: These two settings can be enabled or disabled in the Stakeout Rings Configuration

Stakeout Rings Procedure

- 1. Tap or select Stakeout Rings on the start menu screen
- 2. Select the Control Job to use from the list and press F1 (OK)
- 3. Stakeout Rings by Reference Lines

Stakeout	: Rings -	Control Job)	0%	5	Stake Ri	ngs By R	ef Lines -	Setup	0%	1 5	Stake Ri	ngs By Re	f Lines		0 %	5
Control	Job:		refset	_test	•	First Po	oint On I	Ring:	1		•	Auto St	ake Pat	tern:	LRLR.		•
						Second	Point C	on Ring:	2		•	Ring Re	eference	Line:	1 - 2		
						Rig Las	er Offse	et:	1.000			Auto St	akeout	Side:	Left		
						Auto H	eight Of	fset:	1.500			Offset f	rom Las	er Line:	-1.079)	
												Height	from Ri	ng:	1.598		
ок	Config		Create New Job			ОК	Config		Enter New Point	Measure New Point	Мар		Dist	Start Auto	Previous Ring	Next Ring	New Ring

- 3.1. Select the *First Point* and *Second Point* of the ring to be staked out from the lists
- 3.2. If the Use Rig Laser Offset and/or Use Set Height Offset For Auto Stakeout settings have been set in the Configuration then enter these values and press F1 (OK)
- 3. Stakeout Rings by Reference Points

Stakeout Rii	ngs - Con	trol Job	0%	_ 5	Stake Ri	ngs By Re	ef Points -	Setup	0%	5	Stake Ri	ngs By R	ef Points		0%	5
Control Jo	b:	r	efset_test	•	Start Po	oint of F	Ref Line:	1		•	Auto Si	take Pat	tern:	LRLR.		•
					End Poi	int of Re	ef Line:	12		•	Refere	nce Line	:	1 - 12		
					Ring Re	eference	e Point:	1		-	Ring R	eference	e Point:	1		
					Rig Las	er Offse	et:	1.000)		Auto S	akeout	Side:	Left		
					Auto He	eight Of	fset:	1.500)		Offset	from La	ser Line:	-0.927	,	
											Height	from Ri	ng:	1.590		
	nfia	Crea	te		OK	Config		Enter	Measure	Man		Diet	Start	Previous	Next	New

- 3.1. Select the *Start Point* and *End Point* of the reference line used to define the rings from the lists
- 3.2. Select the Ring Reference Point of the ring to be staked out from the list
- 3.3. If the Use Rig Laser Offset and/or Use Set Height Offset For Auto Stakeout settings have been set in the Configuration then enter these values and press F1 (OK)

Stakeout	Rings -	Control Job		0 %	5	Stake Ri	ngs By R	ing Spaci	ng - Setup	0%	5	Stake Ri	ngs By R	ing Spaci	ng	0%	□ ⊅	
Control	Job:		refset	_test	•	Start P	oint of I	Ref Line:	1		•	Auto S	take Pat	tern:	LRLR.		•	
						End Po	int of R	ef Line:	12		•	Refere	nce Line	:	1 - 12			
						Ring S	oacing:		1.000			Ring N	umber:		1			
						Ring N	umber:		1		•	Auto S	takeout	Side:	Left			
						Rig Las	er Offs	et:	1.000			Offset	from La	ser Line:	-0.927	,		
						Auto H	eight Of	ffset:	1.500			Height	from Ri	ng:	1.590			
ок	Config		Create			ок	Config		Enter New Point	Measure New Point	Мар		Dist	Start	Previous	Next	New	

- 3.1. Select the *Start Point* and *End Point* of the reference line used to define the rings from the lists
- 3.2. Enter the Ring Spacing of the rings
- 3.3. The *Ring Numbers* will then be generated from the reference line points and the ring spacing ring number one will be located at the *Start Point* of the reference line
- 3.4. Select the *Ring Number* of the ring to be staked out from the list
- 3.5. If the Use Rig Laser Offset and/or Use Set Height Offset For Auto Stakeout settings have been set in the Configuration then enter these values and press F1 (OK)

All Stakeout Rings Methods

4. Choose the Auto Stake Pattern to use:

LRLR	Will stakeout the left wall, right wall, left wall, etc
LRRL	Will stakeout the left wall, right wall, right wall, left wall, etc
One Side	Will stakeout the wall on which the auto stakeout is started

5. Point the TPS towards the first ring on the wall to be staked

For the LRLR.... and LRRL.... patterns the auto stakeout needs to <u>always be started</u> <u>with the TPS pointing towards the left wall</u> - that is standing behind the instrument facing the first ring to be staked out then the left wall is the one to the left

For all patterns the auto stakeout needs to be started at a point on the wall that is as near to the first ring position as is possible

6. Press F3 (Start Auto) to start the auto stakeout

Stakeout Rings Configuration

Start Dist Measure	Set to Yes to start distance measuring when the function starts
Auto Offset Accuracy	Sets the accuracy at which the <i>Offset</i> value is staked out in auto stakeout mode
	(eg: if set to 0.025 the TPS will stake the rings/laser lines $Offset$ value to within ± 25 mm before moving to the next ring)
Auto Height Accuracy	Sets the accuracy at which the <i>Height</i> value is staked out in auto stakeout mode
	(eg: if set to 0.200 the TPS will stake the rings/laser lines $Height$ value to within ± 200 mm before moving to the next ring)
Auto Wait Time (secs)	Sets the time the TPS will stop on an auto stakeout point when it has been successfully staked out
	(eg: if set to 5 the TPS will wait 5 seconds after it stakes out a point before it moves on to the next ring)
Maximum Auto Search	Time (secs)
	Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite

(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next ring)

• *Ring Stakeout Method* Sets the method for defining the rings (see the Ring Definition Methods above):

Reference Lines Reference Points Ring Spacing

- Use Rig Laser Offset Set to Yes to enable a Rig Laser Offset to be set and applied to the ring positions
- Use Set Height Offset For Auto Stakeout

Set to **Yes** to enable the *Height* offset of the rings/laser lines staked in auto mode to be staked at a set value, set to **No** to stake the rings/laser lines at the *Height* offset of the first point measured when the auto stakeout is started

3. Stakeout Holes

Blast holes are defined by two points on each hole, the hole design collar and the hole design toe. (eg: Hole1: 1 & 2, Hole2: 3 & 4, etc) These points <u>need to be numbered in consecutive order</u> to enable RefSet to increment to the next hole in auto stakeout mode

Stakeout Holes Procedure

Stakeout Holes - Control Job	0%	Ð	Stakeout Holes - Poi	nt Selection	0% Ⴢ	Stakeout Holes	••• 5
Control Job:	refset_test	٠	Hole Collar Point: Hole Toe Point:	<mark>1</mark> 2	•	Hole Reference:	1 - 2
						Slope Line from Collar:	0.342
						Offset from Hole:	0.060
						Perp Height from Hole:	-0.129
OK Config C	reate		OK Config I	Hole Enter	Measure Man	Dist Start I	Previous Next New

- 1. Tap or select **Stakeout Holes** on the start menu screen
- 2. Select the Control Job to use from the list and press F1 (OK)
- 3. Select the *Hole Collar Point* and *Hole Toe Point* of the hole to be staked out from the lists and press **F1** (OK)
- 4. Point the TPS towards the wall <u>near to the first hole to be staked</u>
- 5. Press F3 (Start Auto) to start the auto stakeout

Missed Holes Procedure

If any holes are missed during the auto stakeout due to the *Maximum Auto Search Time* being exceeded then when the auto stakeout is stopped or finished a message will be shown asking to stake the missed holes manually

- 1. Tap or select Yes or No to stake the holes manually
- 2. If **Yes** the collar and toe points for the first missed hole will be loaded and the hole can then be staked by manually pointing the telescope
- 3. Press F5 (Next Hole) or F4 (Previous Hole) to cycle through the missed holes
- 4. Press F6 (New Hole) to finish the missed hole stakeout and resume normal operation

Stakeout Holes Configuration

 Start Dist Measure 	Set to Yes to start distance measuring when the function starts
Auto Position Accuracy	Sets the accuracy at which the <i>Offset</i> and <i>Perp Height</i> values are staked out in auto stakeout mode
	(eg: if set to 0.025 the TPS will stake the holes <i>Offset</i> and <i>Perp Height</i> values to within ± 25 mm before moving to the next hole)
Auto Wait Time (secs)	Sets the time the TPS will stop on an auto stakeout point when it has been successfully staked out
	(eg: if set to 5 the TPS will wait 5 seconds after it stakes out a point before it moves on to the next hole)

• Maximum Auto Search Time (secs)

Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite

(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next hole)

4. Stakeout Refline

Reference Lines (centrelines) are defined by two points, these points <u>need to be numbered</u> <u>in consecutive order</u> to enable RefSet to increment to the next refline in auto stakeout mode (eg: First Refline: 1 & 2, Second Refline 2 & 3, etc)

Stakeout Refline Procedure

Stakeout	t Refline	- Control Job	0%	5	Stakeout	t Refline	- Point S	election	0 %	1 5	Stakeou	t Refline			0 %	5
Control	Job:	refset	_test	•	Start P	oint of F	Refline:	1		•	Auto Si	take Int	erval:	1.000)	
					End Po	int of R	efline:	2		-	Auto S	take Off	set:	0.000)	
											At End	of Refli	ne:	Conti	inue	•
											Refline	Refere	nce:	1 - 2		
											Hz Line	from S	tart Pt:	0.075	5	
											Offset	from Re	fline:	-0.07	9	
											Height	from Re	efline:	1.599)	
ок	Config	Create New Job			ок	Config	Refline Info	Enter New Point	Measure New Point	Мар		Dist	Start Auto	Previous Refline	Next Refline	New Refline

- 1. Tap or select **Stakeout Refline** on the start menu screen
- 2. Select the Control Job to use from the list and press F1 (OK)
- 3. Select the *Start Point* and *End Point* of the reference line (centreline) to be staked out from the lists and press **F1** (OK)
- 4. Check the *Auto Stake Interval* value this is the slope distance between the points staked in auto stakeout mode
- 5. Check the Auto Stake Offset value this is the Offset that will be staked in auto stakeout mode (eg: for a centreline it will be zero)
- 6. Check the *At End of Refline* setting this defines the behaviour of the program when the end of the current reference line is reached in auto stakeout mode

Continue The auto stakeout will continue on the same line past the end of the current reference line

Stop The auto stakeout will stop at the end of the current reference line

Next Refline The auto stakeout will increment to the next reference line at the end of the current reference line (eg: First Refline: 1 & 2, Next Refline 2 & 3, etc)

- 7. Point the TPS towards the wall or backs <u>near to the reference line at a position near</u> where you want to start the stakeout
- 8. Press F3 (Start Auto) to start the auto stakeout

Stakeout Refline Configuration

 Start Dist Measure 	Set to Yes to start distance measuring when the function starts
Auto Offset Accuracy	Sets the accuracy at which the <i>Offset</i> value is staked out in auto stakeout mode
	(eg: if set to 0.025 the TPS will stake the reference line Offset value to within ± 25 mm of the Auto Stake Offset value before moving to the next point on the refline)
Auto Interval Accuracy	Sets the accuracy at which the slope distance interval between the points is staked out in auto stakeout mode
	(eg: if set to 0.200 the TPS will stake the points on the reference line to within ± 200 mm of the <i>Auto Stake Interval</i> setting from the previous point before moving to the next point)
Auto Wait Time (secs)	Sets the time the TPS will stop on an auto stakeout point when it has been successfully staked out
	(eg: if set to 5 the TPS will wait 5 seconds after it stakes out a point before it moves on to the next point)
Maximum Auto Search	Time (secs)
	Sets the maximum time the TPS will search for an auto stakeout

Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite

(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next point)

5. Stakeout Gradeline

There are three methods for defining grade lines in RefSet:

a) Line	Uses two design points from the <i>Control Job</i> , these points <u>need to be</u> <u>numbered in consecutive order</u> to enable RefSet to increment to the next grade line in auto stakeout mode (eg: First Gradeline: 1 & 2, Second Gradeline 2 & 3, etc)
b) Measured Line	Uses two measured temporary points which will not be saved in a <i>Control Job</i> and optionally an entered grade
c) Arc	Uses three design points from the Control Job to define an arc

Stakeout Gradeline Procedure

- 1. Tap or select Stakeout Gradeline on the start menu screen
- 2. Select the method to Define Gradeline By
- 3. Stakeout Gradeline by Line

Stakeout	Gradeline -	- Control J	ob	0%	- 5	Stakeou	t Grade -	Point Se	ection	0 %	1 5	Stakeou	ıt Gradeli	ne		0%	5
Define	Gradeline	By:	Line		•	Start P	oint of (Gradelin	e: 1		•	Auto S	take Int	erval:	1.000)	
Control	1ah.		rofcot	tort		End Po	int of G	radeline	2		•	Auto H	leight Of	fset:	1.500)	
Control	JOD:		reisei	_test		Entor C	radolin	o Grado	Voc			At End	of Grad	eline:	Cont	inue	•
						Grade	1 in:	e diade.	50.00	0		Grade	ine Refe	erence:	1 - 2		
												Hz Lin	e from S	tart Pt:	0.075	5	
												Offset	from Gr	adeline:	-0.07	9	
												Height	from G	radeline	1.598	3	
ок	Config	Cre	ate v Job			ок	Config	Gradeline Info	Enter New Point	Measure New Point	Мар			Start Auto	Previous Gradeline	Next Gradeline	New Gradeline

- 3.1. Select the Control Job to use from the list and press F1 (OK)
- 3.2. Select the *Start Point* and *End Point* of the grade line to be staked out from the lists
- 3.3. Select **Yes** or **No** to *Enter Gradeline Grade* and if **Yes** enter the grade of the grade line (the grade line will then start at the elevation of the start point and go towards the end point at the entered grade) and press **F1** (OK)

3. Stakeout Gradeline by Measured Line

Stakeout	: Gradelii	ne - Conti	ol Job	0 %	5	Measure	Start Po	int of Gra	deline	0%	5	Stakeou	t Gradeli	ne		0%	5
Define	Gradelir	ie By:	Meas	sured Line	•	New Po	oint ID:		Meas	1		Auto St	take Int	erval:	1.000		
						Horiz A	ngle:		59° 1	2' 00"		Auto H	eight Of	fset:	0.000		
						Vert An	gle:		85° 1	9' 12"		Gradeli	ine Refe	rence:			
						Slope [Distance	:	3.034	ł		Hz Line	from S	tart Pt:	0.907		
						Northi	ıg:		101.5	649		Offset	from Gr	adeline:	0.128		
						Easting	:		102.5	98		Height	from Gi	radeline:	-0.163		
						Elevati	on:		100.2	48							
ок	Config					Meas	Dist	ок					Dist	Start Auto		c	New Gradeline

- 3.1. Press F1 (OK)
- 3.2. Point the TPS at the start point of the grade line (eg: at a point on an existing grade paintline) and press **F1** (Meas)
- 3.3. Point the TPS at the end point of the grade line (eg: at a point near the drive face) and press F1 (Meas)
- 3.4. Select **Yes** or **No** to *Enter Gradeline Grade* and if **Yes** enter the grade of the grade line (the grade line will then start at the elevation of the start point and go towards the end point at the entered grade) and press **F1** (OK)

3. Stakeout Gradeline by Arc

Stakeout	Gradeline - Contro	ol Job 🛛 🕬	5	Stakeou	t Grade -	Point Sel	ection	0 %	1 5	Stakeou	t Gradeli	ne		0%	1 5
Define G	Fradeline By:	Arc	•	Start P	oint of G	Gradelin	e: 1		•	Auto Si	ake Int	erval:	1.000		
Control	Job:	refect test	•	Mid Po	int of Gr	adeline:	2		•	Auto H	eight Of	ffset:	1.500		
control	505.	reiset_test		End Po	int of Gı	radeline	3		•	Gradeli	ine Refe	erence:	1 - 2 -	3	
				Enter O	iradelin	e Grade:	No		•	Hz Arc	from St	art Pt:	0.079		
										Offset	from Gr	adeline:	-0.074		
										Height	from G	radeline:	1.595		
ок	Config	Create New Job		ОК	Config	Gradeline Info	Enter New Point	Measure New Point	Мар		Dist	Start Auto			New Gradeline

- 3.1. Select the Control Job to use from the list and press F1 (OK)
- 3.2. Select the *Start Point*, *Mid Point* and *End Point* of the grade line to be staked out from the lists
- 3.3. Select **Yes** or **No** to *Enter Gradeline Grade* and if **Yes** enter the grade of the grade line (the grade line will then start at the elevation of the start point and go on an arc through the midpoint towards the end point at the entered grade) and press **F1** (OK)

All Stakeout Gradeline Methods

- 4. Check the *Auto Stake Interval* value this is the distance between the points staked in auto stakeout mode
- 5. Check the *Auto Height Offset* value this is the *Height* offset that will be staked in auto stakeout mode
- 6. Check the *At End of Gradeline* setting this defines the behaviour of the program when the end of the current grade line is reached in auto stakeout mode
 - **Continue** The auto stakeout will continue on the same line past the end of the current grade line
 - Stop The auto stakeout will stop at the end of the current grade line
 - **Next Gradeline** The auto stakeout will increment to the next grade line at the end of the current grade line (eg: First Gradeline: 1 & 2, Next Gradeline 2 & 3, etc)
- 7. Point the TPS towards the wall at a position near where you want to start the stakeout
- 8. Press F3 (Start Auto) to start the auto stakeout

Stakeout Gradeline Configuration

 Start Dist Measure 	Set to Yes to start distance measuring when the function starts
Auto Height Accuracy	Sets the accuracy at which the <i>Height</i> value is staked out in auto stakeout mode
	(eg: if set to 0.025 the TPS will stake the grade line $Height$ value to within ± 25 mm of the Auto Height Offset value before moving to the next interval on the grade line)
Auto Interval Accuracy	Sets the accuracy at which the distance <i>Interval</i> between the points is staked out in auto stakeout mode
	(eg: if set to 0.200 the TPS will stake the points on the grade line to within ± 200 mm of the <i>Interval</i> setting from the previous point before moving to the next interval)
Auto Wait Time (secs)	Sets the time the TPS will stop on an auto stakeout point when it has been successfully staked out
	(eg: if set to 5 the TPS will wait 5 seconds after it stakes out a point before it moves on to the next point)
Maximum Auto Search	Time (secs)

Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite

(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next point)

6. Stakeout Laser

Stakeout Laser Procedure

Stakeout	Laser -	Job Selection	0%		Stakeou	t Laser - I	Point Sel	ection	0%	5	Stakeou	t Laser -	Point Sele	ection	0%	5
Control	Job:	r	fset_test	•	Start P End Po	oint of E int of De	Design: esign:	6 14		•	N.	2	A TP		A 60	
					Enter L	aser Gra	ade:	No		•			1 Acast	7 11 7 10 7 10 7 20 7 20	12	D¢ ₽¢ ¥
											 ← 6.3 → 				14 15 16 17 18	t≟,
ок	Config	Creat New 2	e ob		ок	Config	Laser Info	Enter New Point	Measure New Point	Мар	ок	Config				

- 1. Tap or select Stakeout Laser on the start menu screen
- 2. Select the Control Job to use from the list and press F1 (OK)
- 3. Select the *Start Point* and *End Point* of the laser design reference line to be staked out from the lists or press **F6** (Map) and select the points there
- 4. Select **Yes** or **No** to *Enter Laser Grade* and if **Yes** enter the grade of the laser (the laser design reference line will then start at the elevation of the start point and go towards the end point at the entered grade) and press **F1** (OK)
- 5. Stakeout Laser on Curve

Stakeout	t Laser			0%	5	Stakeout	Laser			0%	5	Stakeou	ıt Laser			0%	5
Auto St	ake Offs	et:				Offset:	0.528	Ht	OS:	1.499	⊲⊸⊳	Auto S	take Off	set:	0.528		
Auto He	eight Off	set:	1.500)		-N.5	-	_ /	/	60	Ð	Auto H	leight Of	fset:	1.499		
Laser R	eference	e:	6 - 14	ł			÷ 19.	10 m 7 m 8 m 0	59		Q	Laser	Referenc	e:	7 - 15		
Hz Line	from St	art Pt:						$\sim \!$	a 10		► ● 4	Hz Lin	e from S	tart Pt:	-5.751		
Offset f	from Des	ign:							d II	2	∱ ^z	Offset	from De	sign:	0.528		
Height	from De	sign:							1	13	\rightarrow	Height	from De	esign:	1.499		
						 ←4.8→ 				15 15 16							
Meas Laser	Dist	Start Auto			Мар		Dist				Stake	Meas Laser	Dist	Start Auto			Мар

- 5.1. In the Stakeout Laser screen press **F6** (Map) to go to the map view and then window in the map to the relevant area
- 5.2. Point the TPS towards the drive wall at a good position for the laser and Press F2 (Dist) to start measuring the measured position will then be shown on the map view with a blue dashed line showing the offset line from the laser design reference line
- 5.3. While measuring, turn the TPS and/or reselect the laser design reference line *Start* and *End Points* (by tapping on or near a point symbol) to adjust the dashed offset line to the best position for the laser including using the displayed *Ht OS* value to position the laser vertically
- 5.4. When the best laser position has been found, mark the position on the drive wall and then press **F6** (Stake) to go back to the laser stake view
- 5.5. With the TPS still pointing towards the laser position, press **F1** (Meas Laser) the TPS will then measure the laser position and set the *Auto Stake Offset* and *Auto Height Offset* values on the stake screen to the measured values

- 5.6. Point the TPS towards the drive face <u>near to the laser target position</u> and press **F3** (Start Auto) to start the auto stakeout of the laser target position
- 5. Stakeout Laser on Straight

Stakeout Laser	<u> </u>	Stakeout Laser	0% ⊃
Auto Stake Offset:	-1.500	Offset: -1.497 Ht OS:	1.501 💠
Auto Height Offset:	1.500		(
Lacar Deference	E2 EE	· · · · · · · · · · · · · · · · · · ·	Q
Laser Reference:	22 - 22	¥/ . /	Q
Hz Line from Start Pt:	-5.102	// 4 34/	►
Offset from Design:	-1.497		t ^z .
Height from Design:	1.501	A2	→
			A60
		I←7.4→I	\$6 AZ . 0 59
Stop Start Auto	Мар	Stop	Stake

- 5.7. In the Stakeout Laser screen enter the Auto Stake Offset value and check the Auto Height Offset value these are the values that will be staked out in the auto stakeout mode
- 5.8. Point the TPS towards the drive wall <u>near to the laser position</u> and press **F3** (Start Auto) to start the auto stakeout of the laser position
- 5.9. When the laser position has been established and marked point the TPS towards the drive face <u>near to the laser target position</u> and press F3 (Start Auto) to start the auto stakeout of the laser target position

Stakeout Laser Configuration

- Start Dist Measure Set to Yes to start distance measuring when the function starts
 Auto Position Accuracy Sets the accuracy at which the Offset and Height Offset values are staked out in auto stakeout mode (eg: if set to 0.005 the TPS will stake the laser point Offset and Height Offset values to within ±5mm)
- Default Auto Height OS The Auto Height Offset value that is used for the auto stakeout will be reset to this value when the function starts

7. Stakeout Points

Stakeout Points Procedure

Stakeout	: Points -	Control Job		0%	5	Stakeout	: Points -	- Point Se	lection	0 %	J 5	Stakeou	t Points			0%	c
Control	Job:		refset_te	est	•	Point to	Staked	out:	1		•	Point I	D:		1		
						Northir	ig:		101.6	34		^Hz to	Point:		-1° 1	0' 57"	
						Easting	:		95.20	5		^Lengt	th to Poi	nt:	0.030)	Away
				Elevati	on:		98.40	0		^Cross	to Poin	t:	-0.10	5	Left		
											^Heigh	it to Poi	nt:	-1.60	0	Cut	
									5 -1					61t			
ок	Config	Cr Ne	eate w Job			ок	Config		Enter New Point	Measure New Point	Мар			Start Auto	Previous Point	Next Point	Point

- 1. Tap or select Stakeout Points on the start menu screen
- 2. Select the Control Job to use from the list and press F1 (OK)
- 3. Select the Point to Stakeout from the list and press F1 (OK)
- 4. Point the TPS towards the backs near to the first point to be staked
- 5. Press F3 (Start Auto) to start the auto stakeout

Missed Points Procedure

If any points are missed during the auto stakeout due to the *Maximum Auto Search Time* being exceeded then when the auto stakeout is stopped or finished a message will be shown asking to stake the missed points manually

- 1. Tap or select Yes or No to stake the points manually
- 2. If **Yes** the first missed point will be loaded and the point can then be staked by manually pointing the telescope
- 3. Press F5 (Next Point) or F4 (Previous Point) to cycle through the missed points
- 4. Press **F6** (New Point) to finish the missed point stakeout and resume normal operation

Stakeout Points Configuration

• Turn to Point at Start	Set to turn the starts:	TPS towards the stakeout point when the function
	Yes – 2D Yes – 3D No	Turns the horizontal axis only Turns both the horizontal and vertical axis Does not turn the TPS
Start Dist Measure	Set to Yes to	start distance measuring when the function starts
Auto Position Accuracy	Sets the accuare staked our	aracy at which the <i>Length</i> and <i>Cross</i> offset values tin auto stakeout mode
	(eg: if set to <i>Cross</i> values	0.025 the TPS will stake the points <i>Length</i> and to within ± 25 mm before moving to the next point)
Auto Wait Time (secs)	Sets the time has been suce	the TPS will stop on an auto stakeout point when it cessfully staked out
	(eg: if set to so the set to so the set to solution before it	5 the TPS will wait 5 seconds after it stakes out a moves on to the next point)
Maximum Auto Search	Time (secs)	

Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite

(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next point)

8. Stakeout Profile

Profile Job Data Files

The *Profile Job* data files used in RefSet need to be setup in plan view coordinates (ie: Easting=Drive Width and Northing=Drive Height) with the coordinate origin (0E,0N) located at the centreline point of the profile. Note: The centreline does not need to be located on the profile outline (eg: it may be at the centre point of the profile).



- a) Profile File Contains the full (detailed) profile outline string. The profile outline string needs to be a closed string in a clockwise direction. The point numbering is not important (eg: the point id's of the string may be blank). This outline is used to calculate the *Profile Offset* which is the shortest distance between a measured point and the profile and can be used to check for overbreak and underbreak.
- b) Stakeout Point File Contains the points that are to be staked out on the face in the auto stakeout mode. These points need to have individual point id's in consecutive order. Note: These points do not need to be located on the profile outline (eg: there can be a point on the centreline at gradeline height Pt 1 in the above diagram).

The *Profile Job* data files need to be in the same format that is set in the *Data File Type* in the RefSet Program Configuration (ie: str, gsi, dxf or ascii). These files need to be located in a subfolder of the data files folder called *Profiles*. (ie: for str, dxf and ascii files the files need to be located in the *Profiles* folder under the *Data* folder and for gsi files in the *Profiles* folder under the *GSI* folder)

Profile Job Data Files Setup Procedure

- 1. Create a *Profiles* folder on the memory card under the data folder for the *Data File Type* set in RefSet (ie: for str and dxf files under the *Data* folder and for gsi files under the *GSI* folder)
- 2. Create a profile outline string (<u>see diagram above</u>) and **ensure the** profile outline string is a closed string in a clockwise direction
- 3. Use this string to create the Profile File in the same *Data File Type* set in RefSet and **ensure that this file contains only the outline string**
- 4. The Profile File needs to be named with a '_profile' suffix (eg: 5x5_profile.gsi)
- 5. Create the profile stakeout points to be staked out on the face (<u>see diagram above</u>) and **ensure these points have individual point id's in consecutive order**
- 6. Use these points to create the Profile Stakeout Point File in the same *Data File Type* set in RefSet
- 7. The Stakeout Point File needs to be named with the same name as the Profile File but with a '_stake' suffix (eg: 5x5_stake.gsi)
- 8. Copy both the Profile File and the Stakeout Point File to the *Profiles* folder on the memory card (Note: These two files will represent one *Profile Job* in RefSet)

Stakeout Profile Procedure

- 1. Tap or select Stakeout Profile on the start menu screen
- 2. Select the method to Define Centreline By
- 3. Select the Control Job to use from the list
- 4. Select the Profile Job to use from the list and press F1 (OK)
- 5. Stakeout Profile Centreline by Line

Stakeout	t Profile -	Job Sele	ction	0%	5	Stakeout	t Profile -	Point Se	lection	0%	5	Stakeout	t Profile			0%	5
Define	Centreli	ne By:	Line		•	Start P	oint of C	entrelin	e: 1		•	Centre	ine Refe	erence:	1 - 2		
Contro	Job:		refset	test	-	End Po	int of Ce	entreline	2		-	Slope L	ine fron	n Start P	t: 12.23	2	
Profile	lohi		tect n	rofilo		Drofile	Stakeou	t Doint:	1			Offset f	from Ce	ntreline:	-0.237	7	
FIOINE	505.		test_p	Tome		FIOINE	Slakeou	r romt.	T			Perp H	t from C	entreline	: 1.369		
												Profile	Stakeou	t Point:	1		
												Offset f	from Sta	ke Pt:	-0.237	7	
												Perp H	t from S	take Pt:	-0.13	L	
												Offset	from Pro	ofile:	-1.369	Ð	
ОК	Config		Create New Job			ок	Config	Centreline Info	Enter New Point	Measure New Point	Мар		Dist	Start Auto	Previous Stake Pt	Next Stake Pt	New Stake Pt

- 5.1. Select the *Start Point* and *End Point* of the centreline of the profile to be staked out from the lists
- 5.2. Select the Profile Stakeout Point to be staked out from the list and press F1 (OK)



Profiles
System

5. Stakeout Profile Centreline by Arc

Stakeout Profile - Job Selec	tion 👓 🐂	5 S	itakeout I	Profile -	Point Se	lection	0%	1 5	Stakeou	: Profile			0%	5
Define Centreline By:	Arc	· s	Start Poi	int of C	entrelin	e: 1		•	Centre	ine Refe	erence:	1 - 2	- 3	
Control Job:	refset_test	· N	Mid Poin	t of Ce	ntreline	: 2		-	Slope A	rc from	Start Pt:	11.78	1	
Profile John	tect profile	. E	End Poin	it of Ce	ntreline	: 3		-	Offset f	rom Cei	ntreline:	-2.04	3	
FIOINE JOD.	test_prome		Profile S	takeou	t Point	1		•	Perp H	t from C	entreline	: 1.647		
			Tome 5	lakcou	e i onici	-			Profile	Stakeou	t Point:	2		
									Offset f	rom Sta	ke Pt:	0.307		
									Perp H	t from S	take Pt:	0.147		
									Offset	rom Pro	file:	-0.30	7	
OK Config	Create New Job		ок	Config	Centreline	Enter New Point	Measure New Point	Мар		Dist	Start	Previous Stake Pt	Next Stake Pt	New Stake Pt

- 5.1. Select the *Start Point*, *Mid Point* and *End Point* of the centreline of the profile to be staked out from the lists
- 5.2. Select the *Profile Stakeout Point* of the profile to be staked out from the list and press **F1** (OK)

Both Stakeout Profile Methods

- 6. Point the TPS towards the drive face <u>near to the first point to be staked</u>
- 7. Press F3 (Start Auto) to start the auto stakeout

Check Profile Procedure

- 1. Tap or select Stakeout Profile on the start menu screen
- 2. Setup the Profile Centreline and *Profile Job* as per points 1-5 in the <u>Stakeout Profile</u> <u>Procedure</u> above.
- 3. Point the TPS towards the point to be checked and Press F2 (Dist) to start measuring
- 4. The Offset from Profile value can be used to check for overbreak and underbreak of the drive. Overbreak will have a positive Offset from Profile while underbreak will be negative (Note: ensure the profile outline string in the Profile File is a closed string in a <u>clockwise</u> direction otherwise this convention will be the opposite)



Stakeout Profile Configuration

Start Dist Measure	Set to Yes to start distance measuring when the function starts
Auto Position Accuracy	Sets the accuracy at which the stakeout point <i>Offset</i> and <i>Perp Height</i> values are staked out in auto stakeout mode
	(eg: if set to 0.025 the TPS will stake the profile stakeout point <i>Offset</i> and <i>Perp Height</i> values to within ± 25 mm before moving to the next stakeout point)
 Auto Wait Time (secs) 	Sets the time the TPS will stop on an auto stakeout point when it has been successfully staked out
	(eg: if set to 5 the TPS will wait 5 seconds after it stakes out a point before it moves on to the next point)
Maximum Auto Search	Time (secs)
	Sets the maximum time the TPS will search for an auto stakeout point. If set to zero the search time is infinite
	(eg: if set to 30 the TPS will search for 30 seconds and if the point is not found it moves on to the next point)
• Auto Search Limit (m)	Sets the distance limit for the point search in the auto stakeout mode. The auto stakeout will be restricted to within this distance from the start point of the auto stakeout

9. Survey

Survey Procedure

Survey - Job Selection	0%	Surv	ey - 130116	i.str		0%	5	Survey -	130116.	str		0%	5
Working Job:	130116	· Poi	nt ID:		81			TN #	A14				4
		Co	e:		1			4 12/	dan A	d5	16		Ð
		Tar	get Height	:	0.00	0		Lik	51 71	A74 A75	57 617 6	18	Q
		Ho	iz Angle:		25° 3	37' 23"		14.81	Q- 70	4	76 A77 B	59 660 640	Q
		Ver	t Angle:		93° ()7' 23"	-	10	0 A 69	A 68	@ TMP1	A79	180 PO4
		Slo	oe Distanc	e:	3.283	3			Stal .	27 A 46 A 64	6		t ^z
		No	thing:		102.9	956				D-26-2-4	5 44 664	∆ 63	\hookrightarrow
		Eas	ting:		101.4	118					22	A2 A 22 41	
		Ele	vation:		99.82	21	-	 ←2.6 → 				20 2 21	_
OK Config	Create New Job	Me	ns Dist	Store	Start Auto	Offsets	Мар	Meas	Dist	Store	Start Auto	Offsets	Survey

- 1. Tap or select **Survey** on the start menu screen
- 2. Select the *Working Job* to use from the list or press **F3** (Create New Job) to create a new working job file
- 3. Press **F1** (OK)
- 4. Press **F1** (Meas) to measure and store the point using the **Reflectorless Standard** EDM mode this method can be used where more accuracy is needed
- Press F2 (Dist) to start measuring using the Reflectorless Continuous EDM mode and then press F3 (Store) to store the measured point - this method can be used where more speed is needed

Note: When **F3** (Store) is pressed the TPS will not store the point until it has measured two shots that are within 50mm - this ensures that the stored point coordinates are not affected by any large TPS movements during measurement

Auto Survey Procedure

Point the TPS towards the first point to survey and press **F4** (Start Auto) to start the Auto Survey - the TPS will start measuring using the Reflectorless Continuous EDM mode and will then store the first point - then move the TPS to the second point to survey and stop - the TPS will then auto store the second point - continue moving the TPS and stopping to survey the points and then press **F1** (Stop) to stop the auto survey

Note: The Auto Survey Mode is based on the TPS movement - the TPS will not store the point while it is moving and when the TPS is stopped the TPS will store the point only when it has measured two shots that are within 50mm and then wait until it is moved again

Measured Point Offsets

- 1. Press **F5** (Offsets) to enter and apply offsets to the measured points
- Select the Offset Mode to use. Select Reset After Store to apply the offsets to a single measured point or select Permanent to apply the offsets to all following measured points
- 6. Enter the offsets to use for the following measured point/s and then press **F1** (OK)

Survey - Enter Offsets	<u>□</u> ‰ ⊃
Offset Mode:	Reset After Store •
Offset Left/Right:	0.000
Offset In/Out:	0.000
Offset Down/Up:	0.000



Measured Point Offsets



Survey Configuration

- Flash EGL on Pt Stored When set to **Yes** the guide light will flash briefly when the point has been stored as a visual indicator
- Save Raw Data DAT File Set to **Yes** to save the raw survey data (Hz Angle, Vt Angle, Slope Dist, etc) to a DAT file. The raw data will be saved to a file with the same name as the *Working Job* with a '_srvrep' suffix and '.*dat*' extension which will be saved in the 'Survey Reports' subfolder under the same folder as the *Working Job* file (ie: for str, dxf and ascii files the file will be located in the 'Data\Survey Reports' folder and for gsi files in the 'GSI\Survey Reports' folder)

Survey Screen Configuration

Survey - 130116.str	0%	_ ⊅_	Survey - Screen	Configuration	0%	5
Point ID:	1	•	1st Line:	Po	int ID	•
Code:	1		2nd Line:	Со	de	•
Target Height:	0.000		3rd Line:	Та	rget Height	-
Horiz Angle:	237°31'49"		4th Line:	Но	riz Angle	-
Vert Angle:	89°30'36"	-	5th Line:	Ve	rt Angle	-
Slope Distance:			6th Line:	Slo	pe Distance	-
Northing:			7th Line:	No	rthing	-
Easting:			8th Line:	Ea	sting	-
Elevation:		•	9th Line:	Ele	vation	•
Screen		Quit	ок			

- 1. In the Survey screen
- 2. Press Fn then F2 (Screen Config)
- 3. Adjust the display settings to define the parameters shown on each line of the Survey screen

10. Survey Rig/Holes

The *Survey Rig/Holes* function can be used to either check the alignment (azimuth and dip) of a drill rig setup (raise bore, blasthole rig, diamond drill rig, etc) or to survey completed drill holes and produce a drill hole survey report with the collar coordinates, azimuth and dip for each hole recorded.

Survey Holes Procedure

Survey Rig/Holes - Job Sele	ction	5	Survey Rig/Holes - Hole De	etails 💿 🔿	Survey Rig/Holes - Hole In	fo 💿 🕤
Working Job:	130320	-	Survey Type:	Rod (2 Points) -	Hole ID:	HOLE1
Compare to Design Hole	No	-	Hole ID:	HOLE1	Measured Azimuth:	112° 22' 22"
			Collar Offset:	0.150	Measured Dip:	-45° 42' 16"
					Collar Northing:	144.991
					Collar Easting:	123.240
					Collar Elevation:	100.600
OK Config	New Job		OK Config		ОК	

- 1. Tap or select Survey Rig/Holes on the start menu screen
- 2. Select the *Working Job* to use from the list or press **F3** (Create New Job) to create a new working job file
- 3. Select No to Compare to Design Hole and press F1 (OK)
- 4. Select the *Survey Type* of the survey. Select **Rod (2 Points)** to measure 2 points on a drill rod to calculate the azimuth and dip of the hole as well as the collar position of the hole or select **Collar (1 Point)** to measure just the collar position
- 5. Enter the Hole ID of the hole being surveyed
- 6. If using the **Rod** *Survey Type* enter the *Collar Offset* which is the slope distance from the front measured point on the rod to the collar position in line with the back measured point
- If using the Rod Survey Type point the TPS towards the front point on the rod and press F1 (Meas), then point the TPS towards the back point on the rod and press F1 (Meas)
- 8. If using the **Collar** *Survey Type* point the TPS towards the collar point of the hole and press **F1** (Meas)



Rod Survey - Section View

- 9. The measured hole information will then be displayed and will also be written to the survey drill hole report file which is saved in the same folder and has the same filename as the *Working Job* with either a '.csv' or '.txt' extension depending on the *DH Report File Type* set in the Survey Rig/Holes Configuration
- 10. Press F1 (OK) to survey the next drill hole

Check Drill Rig Procedure

Survey Rig/Holes - Job Selec	tion 🚥 🔿	Survey Rig/Holes - Design	Hole 💿 🏷	Survey Rig/Holes - Hole De	tails 👓 🔊
Working Job:	130320 •	Design Hole Collar:	1	Survey Type:	Rod (2 Points) ·
Compare to Design Hole:	Yes -	Design Hole Toe:	2 -	Hole ID:	1
Control Job:	holestest -			Collar Offset:	0.000
OK Config C	Create lew Job	OK Config Design Hole Info	Enter Map New Point	OK Config	

- 1. Tap or select Survey Rig/Holes on the start menu screen
- 2. Select the *Working Job* to use from the list or press **F3** (Create New Job) to create a new working job file
- 3. Select **Yes** or **No** to *Compare to Design Hole* and then if **Yes** select the *Control Job* to use from the list and press **F1** (OK)
- 4. If comparing to a design hole select the *Design Hole Collar* and *Design Hole Toe* points from the lists and press **F1** (OK)
- 5. Select **Rod (2 Points)** for the *Survey Type*
- 6. Enter the *Hole ID* of the drill rig survey this is not really relevant for a drill rig check so can be set to a dummy number (eg: 1)
- 7. Enter the *Collar Offset* of the drill rig survey which is the slope distance from the front measured point on the rig or rod to the collar position in line with the back measured point
- Point the TPS towards the front or bottom point on the rig or rod and press F1 (Meas), then point the TPS towards the back or top point on the rig or rod and press F1 (Meas)





9. The drill rig check information will then be displayed and will also be written to the survey drill hole report file which is saved in the same folder and has the same filename as the *Working Job* with either a '.csv' or '.txt' extension depending on the *DH* Report File Type set in the Survey Rig/Holes Configuration

Note: If comparing to a design hole the drill rig check information includes the *Projected Toe* coordinates. These coordinates are calculated using the measured dip and azi and projecting the hole from the collar position for the same length as the design hole

10. Press **F1** (OK) to resurvey the drill rig check

Check Drill Rig Info



Survey Rig/Holes Configuration

- DH Report File Type Set to the type of drill hole report file to save the drill hole information to. This file will be saved in the 'Survey Reports' subfolder under the same folder as the Working Job with a '_dhrep' suffix (ie: for str, dxf and ascii files the file will be located in the 'Data\Survey Reports' folder and for gsi files in the 'GSI\Survey Reports' folder):
 - **CSV** Comma separated text file
 - **TXT** Space separated text file
- *DH Report Angle Format* Set to the angle format used for the azimuth and dip in the drill hole information display and the drill hole report file:

Deg Min Sec	Degrees, minutes, seconds
Decimal Deg	Decimal degrees

- Set Pt Code to Hole ID Set to **Yes** to automatically set the Point Code stored for the points to the same as the Hole ID
- Save Raw Data DAT File Set to **Yes** to save the raw survey data (Hz Angle, Vt Angle, Slope Dist, etc) to a DAT file. The raw data will be saved to a file with the same name as the *Working Job* with a '_srvrep' suffix and '.*dat*' extension which will be saved in the 'Survey Reports' subfolder under the same folder as the *Working Job* file (ie: for str, dxf and ascii files the file will be located in the 'Data\Survey Reports' folder and for gsi files in the 'GSI\Survey Reports' folder)

11. RefSet General

- Press F5 (SmartWorx) in the main start menu to exit RefSet and start the Leica SmartWorx program
- Press Fn, F6 (Quit) to return to the main start menu from any screen in the program
- The *Control Job* lists can be searched using the alpha keys (eg: press **3** once to jump to the control jobs starting with the letter D, twice to jump to E, etc)
- It is important to number the points in the control job in a logical consecutive order to enable RefSet to increment to the next feature in auto stakeout modes
- <u>Always</u> point the TPS towards the first feature to stakeout before starting any of the auto stakeout modes, RefSet basically uses a trial and error method to do the auto stakeout, so it helps if it is near the first feature when it starts
- In the **Measure New Point** function pressing **Meas** will measure the point in standard reflectorless mode, while pressing **Dist** will measure in reflectorless continuous mode

Reference Line Offsets Description



Map View

The Map View may be accessed from the point selection screens in the stakeout functions to display the control job and select the design point/s used in the functions or from the survey function to display the working job as points are surveyed.



Map View Menu Functions

Icon	Key	Description
∢_►	1	Zoom All – Fits all the map data to the screen
Ð	2	Zoom In - Zoom in to the map a set amount
Θ	3	Zoom Out - Zoom out of the map a set amount
		Zoom Window - The zoom window can be defined by either tapping and dragging to draw a rectangle or by tapping the two corners of the rectangle. The map will then zoom to the selected window
		Centre - Centre the map on the TPS position
Ĺ,		Section View - The section view can be defined by either tapping and dragging to draw a line or by tapping the two ends of the line. The map will then change to the section view. Note: Tapping on or near a point symbol will snap the section line to that point
Ĺ ¥		Plan View - Change the map back to the plan view
Ē	6	Step Section Forward - Steps the section view forward by the step distance set in the map configuration
ð	4	Step Section Backward - Steps the section view backward by the step distance set in the map configuration
	$\leftarrow \uparrow \downarrow \rightarrow$	Pan Map - Tap anywhere on the screen and drag to pan the map

Design Point / Line Selection

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The design points used in the stakeout functions can be selected by tapping on or near a point symbol. The point will then be highlighted with a blue box



The design lines used in the stakeout functions can be selected by tapping on or near a point symbol and will alternate from the start point of the line to the end point of the line. The line will then be highlighted in blue with the line direction show by an arrow

Map View Configuration

 Section View Width 	Sets the width of the section view. Only points and lines that are within this width around the section line will be visible in the map section view
Section View Step	Sets the step distance when stepping forward and backward in the map section view
Display Points	Set to Yes to display the points in the map view
Display Point IDs	Set to Yes to display the point IDs of the points in the map view
 Display Lines 	Set to Yes to display the lines in the map view