HELP

Trimble Access™ Pipelines

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Legal information

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CHAPTER 1

Introduction

Welcome to the Trimble® Access™ Pipelines software Help.

This document explains the capabilities of the Pipelines software, and how to efficiently survey a pipeline. This document covers features that are unique to the Pipelines software. For information on other features, refer to the *Trimble Access General Survey Help*.

For information about updates or additions to the software, refer to the *Trimble Access Release Notes*. Alternatively, visit the Trimble website (http://apps.trimbleaccess.com/help) or contact your local Trimble reseller.

This application can be used simultaneously with other Trimble Access applications. To switch between applications, tap the Trimble button in the task bar to access the menu of available applications and services currently running, including the Trimble Access menu. Select the application or service to switch to. To move between open screens, press the **Ctrl** + **Tab** keys.

To learn more about the software, see:

The Trimble Access Pipelines software

How the job, tally, and joint map files link together

The Trimble Access Pipelines software

The Trimble Access Pipelines software is designed to simplify the process of collecting pipe attribute information before the pipeline is installed and to enable easy updating of these attributes when measuring welds and other features on the as-built pipeline. Pre-recording all the attributes electronically reduces the stress and time pressure on the surveyor to survey the installed pipe as the trench is being backfilled. This enables the surveyor to focus on measuring points along the pipeline and checking the pre-recorded attributes, rather than entering a lot of new attribute information.

In addition, the Pipeline application includes techniques to automate cover calculations, simplify the process of surveying and reporting on pipeline crossings, as well as other calculations such as deflection angle computations.

The key features of the Pipelines software enable you to:

- Complete a pipeline tally after the pipes (commonly referred to as “joints”) are delivered to the job site.

  The details of each joint are stored in a .csv file for use later in the project.

- Complete a joint map once the joints are welded together.

  Each weld ID or x-ray ID/number is associated with the joint ahead and the joint behind. The information is stored in a .map CSV file for use later in the project. Bends and loose ends can also be recorded in the joint map.
- Record timestamps and positions with the tally and joint map.
- Measure the as-built pipeline using conventional survey or GNSS survey equipment to measure the position of each weld, associate the details of the joint and to calculate the depth of cover.

  By simply entering the weld ID when measuring the weld, the joint IDs from the joint mapping file and all the details for those joints from the tally .csv file are automatically copied and saved with the point in the job file and can be viewed and edited if required.

The software includes additional functionality specific to pipeline surveys:

- Compute intersection angles.
- Compute deflection angles.
- Generate reports on tally progress, joint mapping progress, and as-built survey progress.
- Exclusion zone support – recording and reporting when exclusion zones (areas you should not go) are entered and exited, or points are stored.
- Inclusion zone support – reporting if a measured point is outside the pipeline corridor.
- Automatically detecting if the length of a joint recorded in the tally is not the same as the distance computed between two measured welds.
- Automatic prompting to create a partial unit of pipe (PUP) when the joint length is edited.
- Create additional points from a centerline topo out to the width of the corridor to enable a simple surface to be created, from which cover can be calculated.

In addition, Trimble Access Pipelines enables you to:

- Key in additional points or an alignment using points or elements.
- Stake out points or the pipe alignment.

How the job, tally, and joint map files link together

To maximize the benefits of the streamlined data entry capabilities of the Pipelines software, it helps to understand the relationship between the following files:

- Job (.job) file
- Tally (.csv) file
- Joint map (.map) file

Job file

When you measure points along the as-built pipeline, the points are stored in the .job file, along with any attribute information you enter for the point.

Each point measured along the pipeline represents a feature, such as a weld, bend, or valve. When you measure the point, you select the appropriate feature code so that you can fill out the attribute fields for that feature type. The attribute fields associated with a feature code are determined by the feature library (FXL) file. Create the feature library in the office using the Trimble Feature Definition Manager.

To measure a weld feature on the as-built pipeline, the feature library file must contain a code for the weld feature, for example, "WLD". In addition, the FXL file should list the attribute names for the WLD feature. The WLD code needs the first three attributes; additional attributes can also be included:

- Weld or x-ray number
- Joint ahead
- Joint back
- Other information such as welder ID, additional comments etc.
- Could also include cover and station if you would like this recorded as an attribute

Traditionally, many surveyors would have included additional attributes to describe the joint ahead and possibly the joint back, such as the joint ID, the heat number, and length, so that you could update these if required when you measure the weld. However, in the Pipelines software only the IDs of the joint ahead and joint back are recorded as attributes. The details about the joints are copied from the tally file and are available for review and editing before they are stored as details for the measured weld in the job. This means that the joint attributes do not need to be defined as attributes of the weld in the FXL file.

Some survey companies only record the joint ahead details with a weld. However, with Pipelines the recording of the joint ahead ***as well as*** the joint behind means that the software can check that the computed distance between measured welds is the same as the joint length from the tally. In addition, you can easily produce a field report detailing the joint ahead and joint behind details associated with each weld.

Tally file

The tally file contains the details for each joint, such as the ID, heat number, and length. The details for a joint are copied to the measured pipeline point by referencing the joint ID(s) as an attribute of

the feature being measured. As described in the previous section, the joint details no longer need to be attributes of the weld or valve code. However, it is still useful to be able to control the collection and validation of tally details through the use of the feature code library. This is done using matching attribute names in the tally file and the FXL file. The easiest way to achieve this is to create a code in the FXL file called “Tally” – this “Tally” code should contain all the attributes with the appropriate properties that you use today, such as whether it is a text or numeric field, minimum and maximum values, and the contents of pick-lists such as pipe diameters or pipe manufacturers.

Tip – You don’t have to use a code called “Tally”. Pipelines uses the “Tally” code in preference, but will search the FXL file for matching attribute names if they are not found in one called “Tally”.

Recording the joint details in a separate file provides the following advantages:

- The feature library file contains only one set of joint attribute names, associated with a "tally" code. You don't need to create the same attributes for each of your pipeline feature codes that need to record joint details.
- If you need to make changes to the joint attribute names you can change them in just one place in the feature library file.
- You can easily record the attributes of both the joint ahead and the joint behind with one given code that has joint ahead and joint behind attributes.

Associating the weld feature with specific joints used in the pipeline is done by joint mapping.

Joint map file

The joint map file contains three key attributes, which are collected during joint mapping:

- Weld ID
- Joint ID of the joint ahead
- Joint ID of the joint behind

In addition, you can collect a timestamp and position and, if required, a note.

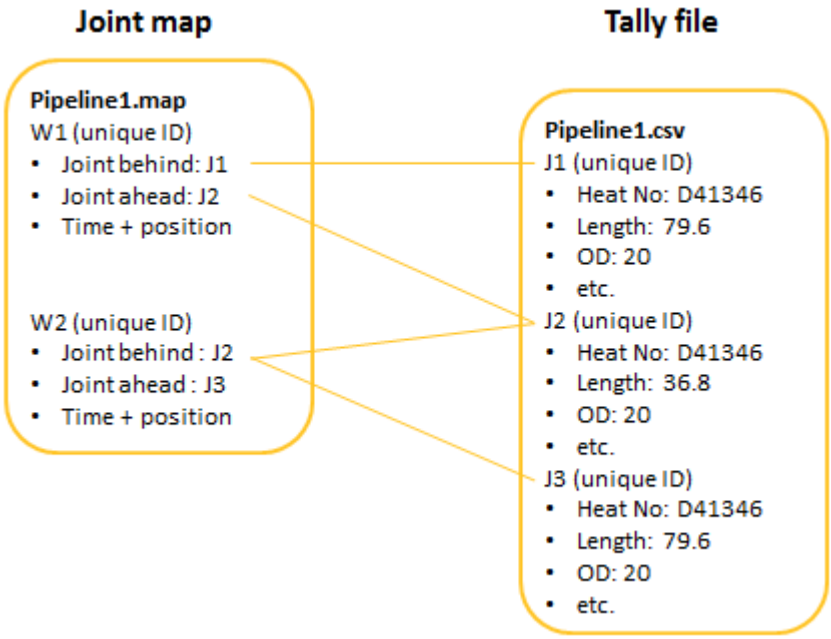
Using a joint map means that when measuring the position of the weld during the as-built survey, you can enter just the weld ID and the software attaches the following information to the measured weld:

- the joint IDs recorded with that weld ID in the joint map file
- all of the attributes for the associated joints from the tally file

Performing joint mapping as a separate task when the pipe is welded together but not yet lowered into the trench makes it easier to record the weld and joint IDs and speeds up surveying of the as-built pipeline later, during the high pressure stages of the project.

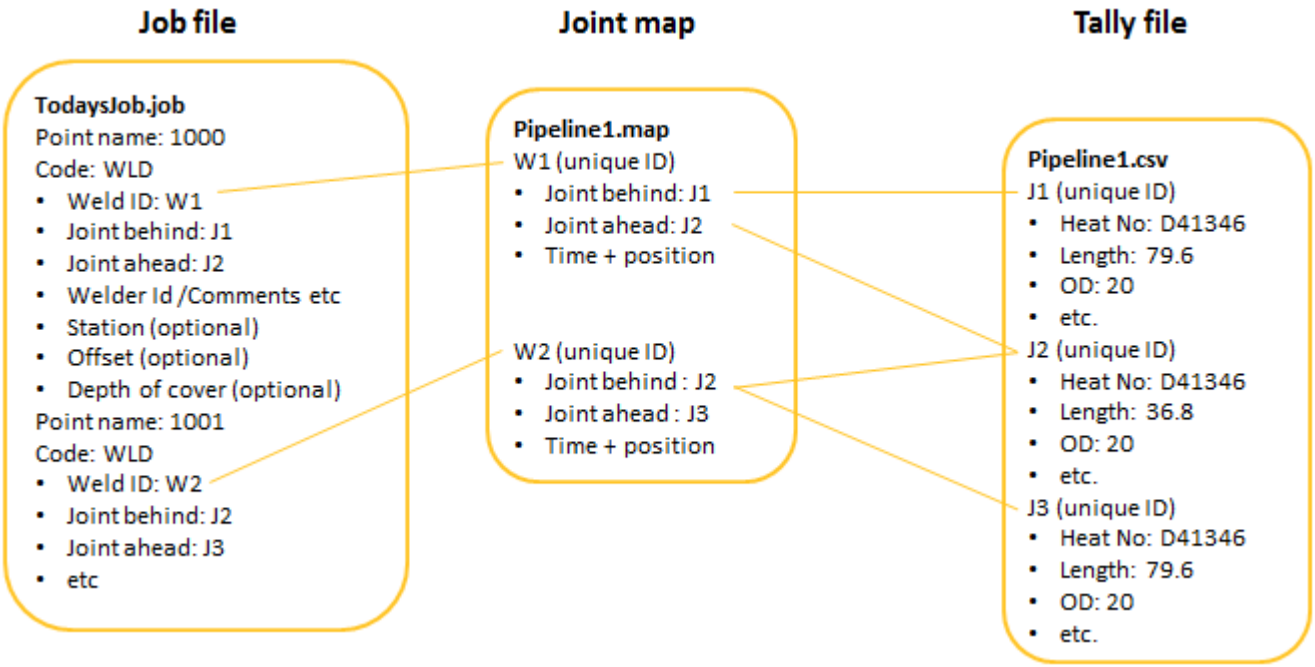
The joint map file is created automatically, however you do need to configure the linked attributes from your FXL file that identify the x-ray or weld ID name, as well as the names of the joint ahead and joint behind attributes used. This is done from the *Pipeline options* screen.

The following example shows how the joint map and tally file are linked together:



In this example, the weld W1 is linked to the joints J1 and J2. If required, the details for J1 and J2 can be updated during joint mapping and the changes are saved in the tally file.

The following example shows how the job file links to the joint map and then the tally file:



In this example, the WLD code has been created in the feature library file with the following attributes:

- Weld ID
- Joint behind
- Joint ahead
- Welder ID /Comments etc
- Station (optional)
- Offset (optional)
- Depth of cover (optional)

During survey of the as-built pipeline, the position of weld W1 is recorded and named point 1000. When the weld ID W1 is entered in the attribute entry screen for the point, the values J2 and J1 automatically populate the Joint ahead and Joint behind fields. If required, the details for J2 and J1 can then be updated and the changes are saved in the tally file.

When the point is stored, the linked joint IDs and their details are copied into the job file. As a result, every as-built measurement contains all the attributes of the weld as well as the joint ahead and the joint behind details.

Note – *The examples above discuss welds and how a weld measurement can be linked to the tally file, but any attribute can be set up to link to the tally file, such as a bend or valve.*

CHAPTER 2

Jobs

You must create a job before you can measure any points or perform any calculations.

For general information about jobs and the *Jobs* menu in the Pipelines software, refer to the chapter “Job Operations” in the *General Survey Help*.

This chapter covers information specific to Pipelines software jobs, including one additional screen provided in the *Jobs* menu when using Pipelines, the *Pipelines options* screen.

For more information, see:

- Pipeline options
- Selecting attributes to link
- Pipelines map

Pipeline options

The following settings are available in the *Pipeline options* screen. Some of these options are also available from other screens in the Pipelines software.

To open the *Pipelines options* screen, from the main Pipelines screen tap *Jobs* and then tap *Pipelines options*.

The options are arranged in the following groups:

- Alignment settings
- Tally file settings
- Compute cover settings
- Exclusion zone settings
- Assign computed values as attributes settings
- Joint map ID defaults
- Printer label file

Tip – To easily set up a job template from an existing Pipelines job, including all of the *Pipelines options* settings, configure the correct settings for the job in the *Pipelines options* screen and then from the Trimble Access menu, tap *Settings / Templates*. For more information about templates, refer to the topic "Templates" in the *General Survey Help*.

Alignment settings

Use these settings to select an alignment, the type of stationing used, and to define the corridor. Associating the alignment with the job enables the Pipelines software to calculate the station and offset from any point such as a measured pipeline point or the station recorded when performing a tally. A corridor/inclusion zone defines the area you should be working in and the software warns you if you try to store a point outside the working area.

Pipe alignment

Select the alignment RXL file for the pipeline. If the alignment file is a LandXML file, see Creating an RXL alignment from a LandXML file.

An alignment is a mathematical definition of the horizontal (and sometimes also the vertical) path followed by the pipeline. The alignment is used to compute stationing. You can configure the stationing to be saved as an attribute with a point.

The alignment does not appear on the map by default. To display the alignment in the map, select the alignment file using the *Layers* softkey. For more information, see Pipelines map.

Slope stationing

Select the *Slope stationing* check box to use slope stationing for alignment stations. Slope stationing takes into account the vertical distance as well as the horizontal distance when calculating distances or intervals along the pipeline. When slope stationing is enabled, stationing is computed on the slope distance instead of the horizontal distance.

Note –

- *Slope stationing can only be computed if there is a valid vertical alignment defined along with the horizontal alignment.*
- *If Slope stationing is selected, station equations are not applied.*

Corridor limits defined by

A simple corridor can be defined by left and right offsets from the alignment. If you select the *Left and right offsets* option, then enter the distance from the center of the alignment to the edge of the pipeline corridor in the corridor width left and right fields.

If the corridor is more complex, you should define the corridor limits as a polygon inclusion zone.

When measuring pipeline points with a corridor defined, the distance from the measured point to the left and right boundaries is recorded in the job. From the *Jobs* menu, select *Review job* or *Point manager* to see these values.

Note –

- *If no pipe alignment file has been selected and the corridor limits are defined by a polygon, the software has no way of knowing which is the left or right boundary. In this situation the software assumes the shorter distance is to the left boundary and the longer distance is to the right boundary.*
- *If the measured point is outside the boundary, the distance to the closest boundary is stored as a negative value.*

- *If the corridor boundary is defined by a polygon and there is no alignment associated with the pipeline the Pipelines software does not know which is the left and right boundaries. In that case the values are recorded as Dist to closest bdy and Dist to other bdy.*

To define the corridor limits as a polygon inclusion zone, select *Polygon* and fill out the remaining fields in the *Alignment* group:

Corridor limits polygon file

Select the file containing the inclusion zones. The Pipelines software supports Shapefile, DXF, and LandXML corridor inclusion zones.

Note –

- *Shapefile: must contain polygon definitions (POLYGON, POLYGONM or POLYGONZ) and use grid coordinates*
- *DXF: must contain closed polyline (POLYLINE OR LWPOLYLINE) definitions*
- *LandXML: must contain closed <Parcel> elements*

Map display color

The corridor is displayed on the map as a hatched polygon. Select the color for the polygon and hatching.

Active

Select the *Active* check box to control whether the selected file is used. If the check box is selected:

- If you try to store a point the software warns you if you are outside the corridor.
- The corridor is displayed in the map, hatched with the selected map display color.

  Note – *Selecting the corridor file in the Pipeline options screen with the Active check box selected results in the display of the hatched polygon in the map. Selecting the corridor as a layer in the map does not display the hatching or the selected color.*

Clear the *Active* check box if you wish to work outside the corridor without seeing warnings when storing points.

Tally file settings

Use the *Tally file* settings to define the relationships between fields in the tally file, the joint map file, and the attributes used to record the tally details.

You can also change these settings from the *Check tally* and *Create tally* screens.

Pipeline tally .csv file

Select the .csv file to use to perform a pipeline tally.

One tally file is usually used for the entire pipeline project and shared amongst multiple survey crews. For more information, see Merging tally and joint map updates from the field.

Unique tally ID

Once you have selected a tally file, the software lists the column headings in the *Unique tally ID* field. Select the column that identifies the unique joint ID.

Joint length ID

Select the column that identifies the joint length in the *Joint length ID* field.

Being able to identify the joint length field in the tally enables the software to automatically compare a joint length from the tally with a computed length between the two as-built welds. For more information, see Distance between pipeline point calculations.

Minimum PUP length

When a joint length is modified, if the length is shortened by more than the defined minimum PUP length, the software prompts you to add a PUP entry to the tally file. For more information, see Creating a PUP joint.

Feature library

A read-only field showing the name of the Pipeline feature library being used.

To change the feature library, select *Jobs* / *Properties of job* and then tap the *Feature library* button to associate a feature library with the job. Tap *Accept*.

Linked attributes

The linked attributes fields below this button are read-only fields showing the attributes selected from the feature library file that are used to link the weld and joint details to the points measured during the as-built survey.

Tap the *Linked attributes* button to select the attributes from the .fxl file.

For more information, see Selecting attributes to link.

Check against pipeline manifest

Select this check box to compare entered tally values against the selected manifest file.

Pipeline manifest csv file

Select the *Check against pipeline manifest* check box to enable this field.

Select the manifest file to use. When creating a tally file, the entered values are compared against the manifest file. The software warns if there are differing values. If you accept the values entered in the tally file then a note record is added to the job file recording the details.

Compute cover settings

Use these settings to enable the software to calculate the depth of cover for a point on the as-built pipeline by calculating the difference in elevation from a surface model or a previously measured point.

Note – *In addition to configuring the Compute cover settings in the Pipelines options screen, you must:*

1. *Create feature codes in the FXL file for each measurement type (for example, weld, bend, valve) and make sure that each feature code has an attribute to record the joint ID or weld ID.*

2. *For each feature code that has an attribute to record the joint ID or weld ID, use the "Select attributes to link" screen in Pipelines options to link the attribute to the joint ID or weld ID information from the tally file. For more information, see Selecting attributes to link.*

For more information, see Requirements for automatic depth of cover calculations.

Compute pipe cover

Select this check box to automatically compute the pipe cover during survey of the as-built pipeline. Selecting this check box makes the other fields in this group available.

Method

Select the reference that the software uses to calculate the cover from.

To compute the cover depth from...	Select...	And then...
The elevation of another point	Use ground point	Select the following additional settings for the ground point method: **Default ground point** Select whether by default the Pipelines software uses: • the last point measured or entered into the current job as the ground point. • the closest point. If you select closest point, the software searches the current job first, and then any other jobs or CSV files linked to the current job, and uses the closest point as the ground point. **Use only ground points with the code** Enter the code that a point must have for it to be used as a ground point. This limits the points that can be selected as the last point or the closest point to ground points that have the specified code. **Maximum pipeline to ground point distance** If required, enter the maximum distance to the ground point from the point on the as-built pipeline. During the as-built pipeline survey, the software warns if the distance from the measured position to the ground point exceeds the specified value, but you can continue to store the point. A note record is added to the job recording the distance to the ground point.
A surface model	Use surface model	Select the **surface model** to use. The surface model should be a Trimble terrain model (TTM) file created using office software such as Trimble Business Center or Trimble Link for AutoCAD Civil. Alternatively, you can create a TTM file on the controller from the Map. For more information, see Generating points for a surface. If the TTM file comes from LiDAR data, it will probably be a very large file. For best performance, Trimble recommends reducing the file to the width of the pipeline corridor. If it is still very large, you can split the TTM into sections and use one section at a time. The surface does not appear on the map by default. To display the surface on the map, see Pipelines map.
The ground elevation	Use pipe alignment	You must have selected a Pipeline alignment .rxl file in the *Alignment settings* group of the *Pipeline options* screen.

To compute the cover depth from...	Select...	And then...
interpolated from the vertical alignment of the pipeline		

Minimum cover definition method

Select the method for defining the minimum cover. The options are to specify a minimum depth and then reconfigure this as required, or to preconfigure the depths in the office based on stationing. If you select:

- *Fixed minimum cover*, enter the minimum cover in the *Minimum cover* field. Reconfigure this value as required along the pipeline.
- *From .csv file*, select the .csv file to use. The .csv file must contain a header row. The header names could be anything such as Station,Depth or Station,Cover. If the term “slope” appears anywhere in the header, then the software assumes that the station values in the first column are slope station values. The software uses the information in the .csv file to set the minimum cover from the defined station onward.

Tip – To compute cover from the original ground surface topo survey, you could use the original topo data to create a CSV file of points that can later be linked to your job to compute cover from. Alternatively you could use a surface created on the controller. For more information, see Generating points for a surface.

Exclusion zone settings

Use these settings to add an exclusion zone file to the map and to set how the file is used.

Exclusion zone file

Select the file containing exclusion zones. The Pipelines software supports Shapefile, DXF, and LandXML exclusion zones.

Note –

- *Shapefile: must contain polygon definitions (POLYGON, POLYGONM or POLYGONZ) and use grid coordinates*
- *DXF: must contain closed polyline (POLYLINE OR LWPOLYLINE) definitions*
- *LandXML: must contain closed <Parcel> elements*

Map display color

Exclusion zones are displayed on the map as hatched polygons. Select the color for the polygons and hatching. Only one exclusion zone file can be used at a time, but the file can contain multiple polygons.

Active

Select the *Active* check box to control whether the selected file is used. If the check box is selected:

- If you try to store a point the software warns you if you are inside an exclusion zone.
- If you move inside an exclusion zone, a dialog appears and you must tap OK to clear it, and a the name of the exclusion zone is shown in the status line.
- The exclusion zone(s) are displayed in the map, hatched with the selected map display color.

  Note – *Selecting the exclusion zone file in the Pipeline options screen with the Active check box selected results in the display of the hatched polygon(s) in the map. Selecting the exclusion zone as a layer in the map does not display the hatching or the selected color.*

Clear the *Active* check box if you wish to work inside the exclusion zone without seeing warnings when storing points.

Record zone entry and exit

Select whether the system records details of when the controller enters or exits from an exclusion zone. The records contain a position and a time stamp.

Assign computed values as attributes settings

During survey of the as-built pipeline, the Pipelines software stores the depth of cover, station, and offset values as records in the job. To save these values as attributes of the weld, select the appropriate attribute from the feature library.

The attributes selected for the assignment of these values must be of type string, number, or integer. If the attributes are strings then the values written into them are converted to the current display units. If they are numbers or integers, then the values written into them are converted to the display units and then displayed based on the attribute's setting for the number type.

Joint map ID defaults

When measuring points along the pipeline, by default the software automatically selects the next joint map record, based on the current point being measured.

Based on measurements taken in

To help the software select the correct next joint map ID, select the direction the measurements are being made along the pipeline.

To identify the ID of the next joint map record, the software:

1. Locates the previous point with the same code as the point being measured, and reads the previous point's joint ahead and joint behind IDs. If the:
   - measurement direction setting is downstream, the software locates the joint map record in which the joint ahead ID for the previous point is recorded as the joint behind ID.
   - measurement direction is upstream, the software locates the joint map record in which the joint behind ID for the previous point is recorded as the joint ahead ID.
2. Using the information from the located joint map record, the software automatically populates the linked weld attributes and linked joint ID fields for the point being measured.

Printer label file

Select the *Printer label file* to use when printing directly from the controller to the Zebra P4T mobile printer in the field. For more information, see Printing from a P4T mobile Bluetooth printer.

Selecting attributes to link

Linked attributes are attributes selected from the feature library file that are used to link the weld and joint details to the points measured during the as-built survey. Linked attributes also trigger automated cover computations.

Using linked attributes enables you to view and edit joint and weld attributes when measuring the as-built pipeline. It is also the mechanism used to record all the attributes along with the measurement. For more information, see How the job, tally, and joint map files link together.

Because not every organization is the same, the Pipelines software does not automatically know the name of the attributes in the feature library that should be linked to the tally file. To set up linked attributes you must select the linked attributes from the attributes in the Pipeline feature library. You can do this in the *Pipelines options* screen.

To select linked attributes:

1. From the main Pipelines screen, tap *Jobs* and then tap *Pipeline options*.
2. In the *Tally file* group, tap *Linked attributes*.

   The *Select attributes to link* screen shows the attributes defined in the feature library. The *Link* column controls whether the attribute is a linked attribute.
3. To select the attribute that holds the weld ID (commonly weld, weld ID, or x-ray), for that attribute tap the value in the *Link* column until it displays *Weld*.
4. To select the attribute that holds the ID of the joint behind the weld, for that attribute tap the value in the *Link* column until it displays *Joint behind*.
5. To select the attribute that holds the ID of the joint ahead of the weld, for that attribute tap the value in the *Link* column until it displays *Joint ahead*.
6. If you are measuring points for features that link to one joint rather than two, for example a valve or bend, you will need one attribute to store the ID of the joint. To select this attribute, tap the value in the *Link* column until it displays *Joint*.
7. Tap *OK* to confirm your changes.

   The values in the *Linked attributes* fields in the *Pipelines options* screen reflect any changes you made in the *Select attributes to link* screen.
8. Tap *Accept*.

Tip – When you are checking the tally, mapping joints, or measuring the as-built pipeline, the colored fields highlight where the software automatically searches for valid entries and enable you to easily see the connections between the data in different screens. Fields that are colored green indicate where the software automatically searches the tally file and validates the joint ID entered in that field, and fields that are colored orange indicate where the software automatically searches and validates the joint map file for the weld ID entered in that field.

Pipelines map

The Pipelines map shows a graphical representation of features of the pipeline. This topic explains variations in the Pipelines map to the usual map in General Survey. For information on common map functions, such as supported file types, selecting points, and using map options and softkeys, refer to the chapter "Job Operations" in the *General Survey Help*.

Note – *If you are using a second generation Trimble Tablet, if you view the map in 3D the exclusion zone and corridor/inclusion zone are not shown.*

Viewing pipeline features on the map

The alignment and the surface do not appear on the map by default. To view them on the map:

1. In the main Pipelines screen, tap *Map* in the status bar.
2. Tap the arrow or press the **Shift** key to access the second row of softkeys and then tap *Layers*.
3. Tap the pipe alignment layer and the surface layer. A check mark indicates the layer is visible.
4. Tap *Accept*.
5. To return to the main Pipelines screen, tap *Esc*.

Changing the display options for the surface

If you are using a surface in the map, you can change the appearance of the surface to de-clutter the map. To do this:

1. Tap the arrow or press the **Shift** key to access the second row of softkeys and then tap *Options*.
2. In the *Surface* group, clear the *Display color gradient* and the *Display triangles* check boxes.
3. Tap *Accept*.

   The surface now appears on the map as an outline polygon.

Measuring the as-built pipeline from the map

In the map, do one of the following:

- Tap *Measure*.
- Tap and hold on the map and then from the shortcut menu select *Measure pipeline points*.

The *Measure pipeline point* screen appears.

For more information, see Measuring points along the as-built pipeline.

Tip – If the surface layer is an active map layer then the TTM elevation, current elevation, and the cut/fill is shown in the map.

CHAPTER 3

Tally

Use the *Tally* menu to complete a pipeline tally, joint mapping, and to generate reports. For information on how to set up your tally, see About pipeline tallies.

The Pipelines software has an option to create a tally or check a tally.

For more information, see:

- About pipeline tallies
- Creating tally records
- Checking tally records
- Creating a PUP joint
- Printing from a P4T mobile Bluetooth printer
- Adding photos to the tally or measured pipeline points
- Joint mapping
- Updating joint details
- Tally reports and job reports
- Merging tally and joint map updates from the field

About pipeline tallies

A pipeline tally is the process of collecting details about each joint. This is usually done once the joints have been delivered to the job site.

Details recorded for each joint are stenciled on the joint and typically include a joint number, heat number, length, size, and coating. Where the joint number provided by the manufacturer is not unique, an additional "unique" joint ID must be assigned to the pipe. This unique number is sometimes assigned in the office and will exist in the manifest, or it can be added in real time in the field during the tally process.

The tally is completed on a controller such as a TSC3 or tablet and there is no need to be connected to any survey equipment to do this. The position of a joint can also be recorded. You can use the controller's integrated GNSS to do this, or you can connect to an external GNSS receiver. If you have a GNSS position from a connected Trimble GNSS receiver than this position is always used in preference to the coarse position from the controller's GNSS.

The Pipelines software supports the creation of a completely new tally file, or you can use the pipe manufacturer’s manifest or mill data .csv file to assist with data collection. When using a manifest

you can either simply check the manifest, adding a new unique ID if required and editing the joint details as necessary. Or if the manufacturer manifest data is likely to contain data errors and you want to be more rigorous in detecting those errors, you can create a new tally file where you enter the attributes for each joint and have the Pipelines software automatically compare them to the pipe manufacturer's manifest. This method enables you to quickly and easily locate data entry errors in both the tally file and the manifest file. The software warns if any details entered for a joint are different, and allows you to easily view the differences. Tap *Add* to confirm that the data entered in the tally file is correct, or tap *Back* to correct the data entered in the tally file. You can specify the manifest file to check the new tally against in the *Pipeline options* screen.

Use the following *Pipeline tally* menu options:

If you...	Use *Create Tally*	Use *Check Tally*
Are creating a new tally, as you don't have a mill manifest	x	
Have a mill manifest, and it has unique IDs		x
Have a mill manifest, but need to add unique IDs	x	
Want to create a new tally, BUT want to check against a manifest. Select the manifest to check against in *Pipeline options*.	x	

There is one tally file per Pipelines project. If you switch between *Create tally* and *Check tally*, you are editing the same tally file. The tally file should be stored in the **Trimble Data\Common\Tally** folder. The Tally folder is created the first time you run the Pipelines software.

Format of the tally file

The tally file is a .csv file. The first row in the file is the header, which contains the names of the fields. When a new unique ID field is added to the tally, it must be labeled in the header and there must be an empty column to store that information. You can use Microsoft Excel to create the new column before saving the .csv file and transferring it to the field controller.

Note – *If required, you can edit the .csv file on the controller. However, you should always close the Pipelines software before using other software to edit any .csv files such as the tally or joint map file. When you run the Pipelines software, the .csv files are loaded into memory and if you edit the files outside the Pipelines software you risk losing any changes you have made.*

In *Pipeline options*, you must select the *Unique tally ID* name from the header of the tally .csv file. This identifies the column in the tally file that the Pipelines software searches for when looking up the unique joint ID.

The manifest used in the field should contain the attribute information you want to store with your points. If the manifest contains more attributes than you need, you may wish to remove some columns in the office before you transfer the file to the controller. If you need to create a new file, you can create the headers in the office and then transfer the file to the controller, or you can create the file on the controller the first time you create a tally record.

To make the tally entry form smarter in *Create tally* or *Check tally*, for example with drop-down fields for selecting values and with required field settings, use a feature library FXL file that has attribute fields that match the column names in the tally file. These attribute fields should be

associated with the feature code named "Tally". Each time the Pipelines software builds the tally entry form the software searches the FXL file for a feature code named "Tally" and then locates attribute fields that match the tally column names. If an attribute exists in the FXL file that matches a field name, then the properties of the attribute from the FXL file are applied to the field, giving you, for example, a drop-down list of available values and applying other properties such as whether the field is a required field.

Note – *The FXL file must have attribute names that match the column names in the tally file, although the matching is not case sensitive. In addition, when creating a list attribute in the Feature Definition Manager to define a drop-down field, you must ensure that the items defined in the list cover all the potential values to be used in the matching tally file column.*

If there is no matching attribute name in the FXL file, then the field is a text field.

Maintaining the project master set of tally and joint map files

One master set of tally and joint map files should be maintained per pipeline project and shared among multiple crews. For more information, see Merging tally and joint map updates from the field.

Creating tally records

Use the steps below if you are using the mill data or manifest from the pipe manufacturer but have added an empty ID column so that you can add a unique ID to each joint.

1. From the main Pipelines screen, tap *Tally*.
2. Tap *Create tally*.
3. If you have not already selected a tally file in the *Pipeline options* screen, select the tally file.

   The tally file must contain an empty ID column that will contain the unique ID you will assign.

   If you do not have a tally file, see Creating an empty tally file on the controller.
4. The Pipelines software needs to be able to identify which column in the tally file contains the joint unique ID. To set this, select the column name in the ID field.

   For more information on the fields in the *Tally file* screen, see Pipeline options.
5. Tap *Continue*.
6. The *Create tally* screen shows the attribute fields for the joint. Start checking the joints. For each joint:
   a. Enter the new unique ID for the joint into the attribute field being used as the unique ID field.
   b. Enter the joint number as stenciled on the joint into the joint number field and then tap *Find*.

      Tip – To speed up data entry, enter just the last few digits of the joint number into the joint number field and then tap *Find*. If there is only one joint number in the tally file that provides a partial match with the entered digits, then that joint record is selected and the fields are filled out with the appropriate values from the tally file. Otherwise, the software

displays a list of all the joints that have joint numbers partially matching the entered digits. Select the joint record from the list.

The other fields in the screen are populated with the information in the tally record for that joint.

c. Check the information for the joint and modify if required.

If an attribute is a photo attribute, capture the required image using your controller or the connected camera. For more information, see Adding photos to the tally or measured pipeline points.

d. If your controller has GPS or is connected to GNSS, the *Record position* button is available. Tap *Record position* to record the current location of the joint.

e. To enter the next tally item, tap *Add*.

When you tap *Add*, the record is automatically marked as checked.

An empty joint record appears, with the unique ID field automatically incremented.

7. Enter the joint number in the joint number field and then check the other attribute data as described in step 6b.

Note – *Changes to records are not saved until you tap Save. Tap Save regularly to save changes to the tally file.*

8. Tap *Esc* to return to the main Pipelines screen.

Tips –

- To search for a specific record, enter data in any field except a list field and tap *Find*. Enter data in more than one field to narrow your search results – *Find* returns matches only if all the data entered is found in a single entry in the tally file.
- To clear the fields for a joint record, for example if you used *Find* but the software did not find the correct record and so you want to start a clean search, tap the arrow or press the **Shift** key to access the second row of softkeys in the *Create tally* screen, and then tap *Clear*.
- If required, you can create new records for joints that were not included in the original mill data. Fill out the fields as usual. To copy information from some fields into the next joint record, tap *Options*. Fields that have data copied from the previous record are colored pale yellow.
- To change the unique ID assigned to a joint (for example, if you enter the incorrect ID), open the tally file in the *Check tally* screen, tap *Rename* and then enter the unique ID into the appropriate field and tap *Enter*. For more information, see Checking tally records.
- If a supported printer is connected, the *Print* softkey is available. Tap *Print* to print the attributes of a joint onto labels that can then be affixed to joints.

Creating an empty tally file on the controller

Use the steps below if you do not have a manifest from the pipeline manufacturer, or you are using the manifest to check against and so you need to create a new empty tally file to record the details of each joint.

Note - *Rather than following the steps below, you may find it easier to create a .csv file containing the header information in the office, and then copy the .csv file to the* ***Trimble Data\Common\Tally*** *folder on the controller.*

1. From the main Pipelines screen, tap *Tally*.
2. Tap *Create tally*.
3. Enter a name for the new tally file in the *Pipeline tally .csv file* field and tap *Enter*.

   A message asks if you want to specify the columns to be used for the new tally file fields.
4. Tap *Yes*.
   a. In the *Define tally file columns* screen, enter the column name or tap *Select library attribute* and then tap an attribute to use it as a column name.
   b. Keep adding columns until you are done. Use the softkeys at the bottom of the screen to delete columns or to change the order of the columns.
   c. Tap *OK*.
5. In the *Tally file* screen, make sure the correct columns are selected for the unique tally ID and the joint length. Select the attributes that will be linked between the tally file, weld file, and job file.

   For more information, see Pipeline options.
6. Tap *Continue*.
7. When prompted to modify the column headings, tap *No* to continue if you have finished creating the header of the tally file. Once you start adding tally data to the file, you can no longer modify the tally file header.

   The *Create tally* screen shows the attribute fields for the joint.
8. Fill out the fields for the first joint record.
   a. To configure the tally fields whose last used values should be the default values for a new tally item, tap *Defaults*. Select the attribute fields for which the values should be kept as the default values and then tap *Accept*.
   b. If your controller has GPS or is connected to GNSS, the *Record position* button is available. Tap *Record position* to record the current location of the joint.
   c. To store the information in the record and automatically mark it as checked, tap *Add*.

   The next joint record appears.

   Note – *Fields that have data copied from the previous record are colored pale yellow.*
9. Fill out the fields for the next joint, as described in step 8.
10. Tap *Esc* to return to the main Pipelines screen.

Tip – To change the unique ID assigned to a joint (for example, if you enter the incorrect ID), open the tally file in the *Check tally* screen, tap *Rename* and then enter the unique ID into the appropriate field and tap *Enter*. For more information, see Checking tally records.

Checking tally records

Use the steps below if you have a manifest which contains a unique joint ID, and you are simply checking the details of the joint.

1. From the main Pipelines screen, tap *Tally*.
2. Tap *Check tally*.

3. If you have not already selected a tally file in the *Pipeline options* screen, you are prompted to select the tally file.

   For more information on the fields in the *Tally file* screen, see Pipeline options. When you have made your changes, tap *Continue* to return to the *Check tally* screen.

4. The *Check tally* screen shows the attribute fields for the joint. Start checking the first joint. For each joint:

   a. Enter the ID of the joint into the attribute field that is being used as the unique ID and then tap *Enter* or press the **Enter** key.

      Tip – To speed up data entry, enter just the last few digits of the joint number into the unique ID field and then tap *Enter*. If the digits entered match the complete ID of a joint record in the tally file, then that joint record is selected. Otherwise, the software searches the tally file for partial matches. If the tally file contains more than one record with an ID containing those digits, then a list of the joint records is shown. Select the joint record from the list.

      The other fields in the screen are populated with the information in the tally record for that joint.

   b. Check the information and correct it as necessary.

      If you change the length of the joint by more than the value set in the *Minimum pup length* field in the *Pipeline options* screen, the software prompts you to create a PUP joint definition. For more information, see Creating a PUP joint.

      If an attribute is a photo attribute, capture the required image using your controller or the connected camera. For more information, see Adding photos to the tally or measured pipeline points.

   c. Tap *Checked* to mark the record as checked. The icon on the *Checked* button changes to a green tick.

   d. If your controller has GPS or if you are connected to GNSS, the *Record position* button is available. Tap *Record position* to record the current location of the joint.

   e. Tap *Next*.

      The next joint record appears. The software automatically steps to the next joint in the tally file and shows the details for that joint.

5. Tap *Esc* to return to the main Pipelines screen.

Tips –

- When you first open the file, tap *Prev* to view the first record in the file or tap *Next* to move to the last record in the file.
- To change the unique ID assigned to a joint, tap *Rename* and then enter the new ID.
- If required, you can create new records for joints that were not included in the original mill data. To do this, open the tally file in the *Create tally* screen and create the record there. For more information, see Creating tally records.
- If a supported printer is connected, the *Print* softkey is available. Tap *Print* to print the attributes of a joint onto labels that can then be affixed to joints.

Creating a PUP joint

PUP joints are partial units of pipe. They are usually offcuts from a "mother" joint.

The Pipelines software automatically prompts you to create a PUP joint definition when the original length specified for a joint is shortened by more than the *Minimum PUP length* value specified in the *Pipeline options* screen.

You might change the original joint length when doing any of the following:

- Editing joint information provided in a manifest in the *Check tally* screen.
- During joint mapping or when measuring the as-built pipeline. To do this, tap *Details* and then edit the details for the appropriate joint.

When prompted to create a PUP joint, do one of the following:

- Tap *No* if a PUP joint is not required, for example if the change is a correction to incorrect information provided in the manifest.

  The next joint in the tally file appears.
- Tap *Yes* to add a PUP joint definition to the tally file.

  If you tap *Yes*:

  The *Create PUP joint* screen appears.

  The software assumes that the joint you were editing is the mother joint and so the same details for that joint are used to populate the fields in the *Create PUP joint* screen. However, the value in the *Length* field is updated to show the remaining length of the joint.

  1. Edit the information for the PUP joint as required. By default, the name of the PUP joint is the same as the mother joint. To make the name unique you must add an appropriate suffix or prefix to indicate it is a PUP joint.
  2. If an attribute is a photo attribute, capture the required image using your controller or the connected camera. For more information, see Adding photos to the tally or measured pipeline points.
  3. Tap *Checked* to mark the record as checked. The icon on the *Checked* button changes to a green tick.
  4. If your controller has GPS or if you are connected to GNSS, the *Record position* button is available. Tap *Record position* to record the current location of the PUP.
  5. Tap *Add*. The record is automatically marked as checked.

     If you created the PUP by editing a joint in the *Check tally* screen, then the next joint in the tally file appears.

     Tip – If you have not yet finished checking or editing information for the mother joint, tap *Prev* to view the joint record for the mother joint.

Printing from a P4T mobile Bluetooth printer

You can print directly from controllers in the field to the Zebra P4T mobile printer. The mobile P4T printer prints barcode labels and documents up to 4” wide that are designed for outdoor use.

The Zebra P4T printer is available in several different configurations. Trimble recommends purchasing a model that has Bluetooth wireless technology. The P4T includes a rechargeable battery, but may not include an AC adapter. Printer ribbon and paper/labels must also be purchased separately. Check with your supplier regarding consumables and a suitable charging system to meet your needs.

From the *Check tally* and *Create tally* screens you can print the attributes of a joint, including the joint ID as a barcode if required, on labels that can then be applied to joints. This is particularly useful for adding extra labels to a joint or PUP.

From the Stakeout *View before storage* screen, you can print the stakeout details displayed. This is particularly useful for creating labels that can be affixed to the stake.

Setting up and using the P4T printer

1. Turn on the P4T Bluetooth printer.
2. From the Trimble Access screen, select *Settings* / *Bluetooth* and then tap *Config* and scan for the printer. The printer name displayed is the serial number displayed on the back of the printer. When setting up the Bluetooth pairing you should not need to enter a passcode, or enable the *Serial Port* check box.

   If required, rename the printer and set up a passcode using the Zebra Setup Utilities (https://www.zebra.com/us/en/support-downloads/mobile/p4t.html).
3. Select the printer in the *Connect to printer* field and tap *Accept*. The *Print* button is now available in the Pipelines *Create tally* and *Check tally* screens, and the Stakeout *View before storage* screen.

To print, turn on the printer and tap *Print*. When you tap *Print* the controller connects to the P4T using the Bluetooth wireless connection you have set up, and then prints the label.

P4T printer label layout

Printer layout is user-configurable through *.lbl files. The .lbl file defines the information to print including additional items such as company logos, static text, and date and time. The .lbl file also defines the appearance of the printed information, such as font size and the position of logos.

For Pipelines tally labels the TallyLabelDefn.lbl file is installed to the Trimble Data\System Files folder. It includes definitions to print the unique ID and a barcode for the ID, and attribute names and attribute values from the tally file. To create a different label style, copy the TallyLabelDefn.lbl file to your desktop and modify the file as required using a text editor such as Notepad++. Save the file with a new name so that it is not overwritten after a software upgrade, and then copy it back to the Trimble Data\System Files folder folder. You can configure the name of the lbl file to be used when printing tally labels in *Pipeline options*.

The deltas shown in the Stakeout *View before storage* screen depend on the entity being staked, options configured and the selected *Staked deltas format* selected. A display format must have a print style associated with it for the *Print* softkey to be available. Because of this complexity, Trimble has developed printer formats only for point, line and arc stakeout when the selected *Staked deltas format* is the "Default" format. To print from any of the other staked delta formats you must define your own print format .lbl file.

For more information, go to www.trimble.com/Survey/Trimble-Access-IS.aspx and click *Downloads*.

Adding photos to the tally or measured pipeline points

If the feature code library assigned to the job has photo attributes defined on one or more codes then, if the name of a tally file column matches the name of a photo attribute, the field is displayed in the Pipelines software as a photo attribute field.

A photo attribute field has a pop-up menu ( ) with the options *Review* and *Select file*. If the controller has an integrated camera, the context menu includes the *Take photo* option, and the *Camera* softkey is also available at the bottom of the screen.

Capturing images using the controller's integrated camera

To capture an image from within the Pipelines software using the controller's integrated camera:

1. Do one of the following:
   - To capture an image for a specific photo attribute field, tap next to the photo attribute field and select *Take photo*.
   - To capture an image for the first empty photo attribute field in the current Pipelines screen, tap *Camera*.
2. Use the integrated camera to take a photo. For information on using the camera application on your controller, refer to the topic "Using a camera to capture an image" in the *General Survey Help*.

   The name of the captured image file is inserted in the photo attribute field. The photo file is saved to the **<jobname> Files** folder in the project folder.

   If you tapped *Camera* and all the photo attribute fields in the screen have data entered in them then the last photo attribute field is updated with the file name of the new image.

Capturing images using an external camera

1. Set up a wireless connection between the controller and the camera.

   For information on supported cameras and setting up a connection, refer to the topic "Using a camera to capture an image" in the *General Survey Help*.
2. Take the photo using the external camera. The image is automatically transferred to the to the controller and saved to the **<jobname> Files** folder in the project folder.

   If you are using an Eye-Fi memory card to facilitate image transfer to the controller, then the file name of the first image received by the controller is inserted in the first empty photo attribute field in the current Pipelines screen. If all the photo attribute fields in the screen have data entered in them then the last photo attribute field is updated with the file name of the new image.
3. If you are not using an Eye-Fi memory card, tap next to the photo attribute field and select *Select file*. Navigate to the **<jobname> Files** folder and select the appropriate photo. The name of the image file is inserted in the photo attribute field.

Reviewing images

To review an image entered in an attribute field, tap and select *Review*.

Large images may not be able to be viewed using the *Review* option. Capture the image using a smaller image size (configured within the camera) or review the image in *Jobs* / *Review job*.

Joint mapping

Joint mapping records relationships between welds and joints, as well as recording bends and loose ends. Joint mapping has two purposes:

- It enables you to create reports in the office showing welding progress, including the location of bends and loose ends.
- It streamlines data entry when you measure points along the as-built pipeline so that by entering just the weld ID, the details for the linked joints are available for review and editing and are stored with the point.

Joint mapping is completed on a controller such as a TSC3 or tablet and there is no need to be connected to any survey equipment to do this. The position and station can also be recorded. You can use the controller's integrated GNSS to do this, or you can connect to an external GNSS receiver. If you have a GNSS position from a connected Trimble GNSS receiver than this position is always used in preference to the coarse position from the controller's GNSS.

Joint mapping types

Welds

Typically, joint mapping is done after the pipeline has been welded but before it is lowered into the trench.

When two pipe joints are welded together, the welder records an ID number for the weld, and this ID is typically used as the unique weld or x-ray ID. The unique weld ID, along with the joint ahead and joint behind ID, are then recorded. You can also configure the *Joint mapping* screen to capture additional information for the weld, for example the welder's initials or the date, from the joint mapping *Options* screen.

The Pipelines software allows you to map welds by working along the pipeline in a downstream or upstream direction. When working in a ***downstream*** direction, the ID of the previously entered joint ahead automatically becomes the ID of the joint behind for the following weld. When working in an ***upstream*** direction, the ID of the joint behind automatically becomes the ID of the joint ahead of the following weld.

Bends

Some companies like to record bend details along with the joint ID when the pipeline is above ground. Default bend mapping simply records the bend ID, the joint ID with the bend in it, and a position and station if required. Additional bend information, for example the bend type and direction, can be recorded in the following ways:

- When creating the tally file, include columns to record additional bend information. The bend information can be easily updated in the tally for the defined joint ID when creating the bend map.
- Set up the *Joint mapping* screen to provide the extra fields to capture the additional information for the bend. This can be configured from the joint mapping *Options* screen.

Loose ends

A loose end is the unwelded end of a section of welded pipeline. Some companies record loose ends as sections of the pipeline are welded so that they have a complete picture of progress on the pipeline. To update the joint map as loose ends are welded, delete the loose end record and then create a new joint map record for the weld.

Joint mapping options

Tap *Options* in the *Joint mapping* screen to configure the following options.

Warn if joint not found in tally file

Select this check box to display a warning message if the joint ID entered does not exist in the tally file. If you enter a joint ID that does not exist in the tally file, you must reopen the tally file in the *Create tally* screen and enter the details for the joint. You can do this before or after you complete the joint map record.

By default, this check box is selected (warnings are shown).

Default next joint ID from tally

Select this check box so that the software searches the tally file for the next joint ahead (or joint behind if working upstream) and automatically fills out the ID field.

Weld ID default

When mapping welds, you can match the default weld ID selection with the direction along the pipeline that the joints were welded. Select *Increasing* or *Decreasing* when the weld IDs routinely increment or decrease. If the weld IDs have no regular pattern, select *No default* to disable this feature.

Present joint map in

Select whether the joint maps are presented in *File order* or *Sequence order*. *File order* presents the joint maps in the order that they were recorded in the field. *Sequence order* presents the joint maps by matching the joint ahead and joint behind IDs to create linked sequences. The default setting is

File order and provides faster presentation for larger files over *Sequence order* since no extra processing is needed.

In general, *File order* is most useful when you are collecting data and creating a joint map. If you are reviewing the data that has been collected, then you may find it more useful to run a Joint mapping report with *Sequence order* selected.

Adding weld or bend information fields

To capture additional details relating to welds or bends, add extra fields to the form. To do this:

1. In the *Joint mapping* screen, tap *Options*.
2. In the *Weld fields* or *Bend fields* group, tap *Define* and then enter the field names or tap *Select library attribute* and then tap the attribute to add. Keep adding fields until you are done. This is a one-time only change to the fields in the form.
3. Use the softkeys at the bottom of the screen to change the order of the fields, or to delete fields.
4. Tap *OK*.
5. In the *Options* screen, review your changes and tap *Accept*.

   WARNING – When you tap *Accept*, a message warns that you will not be able to make further modifications to the fields for the weld or bend.

Performing joint mapping

1. From the main Pipelines screen, tap *Tally*.
2. Tap *Joint mapping*.

   An empty joint map record appears.
3. Select the mapping method: WELD, LOOSE END, or BEND.
4. Make sure the arrow on the Direction button matches the direction that joint mapping will be carried out along the pipeline. Tap the button to toggle the direction between downstream ⇦ and upstream ⇨.
5. If you are mapping welds, tap *Options* and select whether the next default weld ID should increase (for downstream joint mapping), decrease (for upstream joint mapping), or select no default.
6. Enter the ID of the weld, bend, or loose end, and the IDs of the associated joints.
7. To check the details of the joint, tap *Details*. For more information, see Updating joint details.
8. If you need to capture additional details relating to welds or bends, add extra fields to the form (see Adding weld or bend information fields above).
9. Tap *Add* to store the joint map record.

   A new joint map record appears. If you are working:

   - downstream along the pipeline, the joint ahead previously entered is now the joint behind
   - upstream along the pipeline, the joint behind previously entered is now the joint ahead

Notes –

- *The joint behind and joint ahead fields are not automatically filled out if the previous joint map record contains joint IDs that do not exist in the tally file.*
- *The software warns if you enter a joint ID that has already been used. If required, dismiss the warning and continue to store the record.*
- *You cannot store a weld that has the same joint ID entered in the joint ahead and the joint behind fields. When dealing with loose ends, leave one of the joint fields empty.*

10. Tap *Esc* to return to the main Pipelines screen.

Tips –

- To quickly change between mapping welds, bends, or loose ends, tap the arrow next to the ID field and then select *Next ID* of the required type.
- Tap the *Prev* or *Next* softkey to view the next or previous joint map record for the pipeline. This enables you to view joint map records in the order that they are used in the pipeline. The order is determined by the IDs entered in the joint behind and joint ahead records and is continually updated as you add new joint map records.
- To delete a joint map record or change the ID assigned to the joint map (for example, if you enter the incorrect ID), enter the ID to load the record and then use the appropriate softkey to change or delete the record.
- To swap the joint behind ID and the joint ahead ID, tap *Swap*.
- If a weld has been cut out and replaced with a new weld but you want to keep the original joint map record, tap the weld icon  next to the Weld ID field. The icon changes to the cut out weld icon  . Tap *Update*. The "cut out" weld record is moved out of the joint map sequence and added to the end of the joint map list so that it is available to reference and for reporting. When you create the joint map record for the replacement weld, enter the new weld ID and the appropriate joint IDs so that the joint map record references the same behind and ahead joints as the cut out weld.

Updating joint details

When you perform joint mapping or during survey of the as-built pipeline, you can easily update the details of the associated joint(s). To do this, tap *Details*.

The ID of the joint is displayed in red if the joint has not yet been checked.

Tap *Next* and *Prev* to switch between the joint ahead and the joint behind.

Changes you make in this screen are used to update the tally file, and if you have made changes then the record is now marked as checked. Tap *Store* to save your changes.

Note – *The Details screen only allows you to edit details for joints that already exist in the tally file. You cannot use the Details screen to enter details for joint IDs that you have entered manually in the joint map file or Measure pipeline point screen and which do not exist in the tally file.*

If you change the length of the joint ahead or the joint behind by more than the value set in the *Minimum pup length* field in the *Pipeline options* screen, the software prompts you to create a PUP joint definition. For more information, see Creating a PUP joint.

Tally reports and job reports

The *Tally* menu provides two options for generating reports. Select:

- *Tally reports* to create reports on tally and joint mapping details.
- *Job reports* to create custom reports of the as-built pipeline.

Create custom ASCII files on the controller while in the field. Use the predefined formats or create your own custom formats. Use these files to check data in the field, or to produce reports which you can transfer from the field directly to your client or back to the office.

Use the KML report formats to generate a KML file that you can drag and drop onto Google maps, to view the data against a map background.

To create a report:

1. From the main Pipelines screen, tap *Tally*.
2. Do one of the following:
   - Tap *Tally reports* to create reports on tally and joint mapping details.
   - Tap *Job reports* to create custom reports of the as-built pipeline.
3. In the *File format* field, select the type of file to create.

   For job reports, the available file formats are a list of style sheets (*.xsl). The ones that specifically apply to the pipeline are prefixed with "Pipeline".
4. Tap to select an existing folder or create a new one.
5. Enter a file name.

   By default, the *File name* field shows the name of the current job. The file name extension is defined in the XSLT style sheet. Change the file name and extension as required.
6. If more fields are displayed, complete them.

   You can use the XSLT style sheets to customize files and reports based on your own particular requirements.

   For example, you could create:
   - A tally report that lists any tally items that were modified, or that lists the joints that were tallied or mapped on a particular day or week.
   - A job report that lists any joints that were measured on the as-built pipeline, or that lists the depth of cover of points on the as-built pipeline
7. To automatically view the file after you create it, select the *View created file* check box.
8. To create the file, tap *Accept*.

The following factors affect whether the report file can be created:

- The amount of program memory available to the device.
- The size of the job being exported.
- The complexity of the style sheet being used to create the report file.
- The amount of data being written to the report file.

If it is not possible to create the report file on the controller, copy the .xml file with the same name as the tally file to a computer.

To create the report file from the .xml file using the same XSLT style sheet, use the ASCII File Generator utility program. You can modify a predefined format to meet your specific requirements, or use it as a template to create a completely new custom ASCII export format.

To download the utility, go to www.trimble.com/Survey/Trimble-Access-IS.aspx and then click *Downloads / Trimble ASCII File Generator Utility / Trimble ASCII File Generator Installation*.

Merging tally and joint map updates from the field

Large pipeline projects have many survey crews working on multiple sections of the pipeline at any one time. In addition, different survey crews can work on different phases and sections of the pipeline on a daily basis, collecting tally and joint mapping data or using the previously collected tally and joint mapping data. To maximize the efficiency of each survey crew, all crews should have access to the tally and joint map data collected by other field crews the previous day.

Use the Tally and Joint Map Updater utility to merge the updated tally and joint map data from multiple field crews into a master set of files in the office at the end of each day. You can then send out the updated master files to each field crew, ready for the next day's work. An XML file containing all the merged data is also available for generating custom reports from.

To download the Tally and Joint Map Updater utility, go to www.trimble.com/Survey/Trimble-Access-IS.aspx and then click *Downloads*.

The steps for merging tally and joint map data are:

1. To obtain a complete set of tally and joint map files that you can use as a master set, set up the Pipelines project on one controller and use that controller to open/create the tally file and add at least one joint map record.
2. Transfer the set of tally and joint map files from the controller to a folder on the office computer. This folder now contains the master set of CSV, DFN, IDX, and MAP files.
3. Below the folder containing the master files, create a subfolder for each field crew that updates the tally and joint map files.
4. To update the files in the field crew subfolders on the office computer, copy the tally files from the controllers to the office computer as you usually would, for example using TCC and Trimble AccessSync.
5. Use the Tally and Joint Map Updater utility to merge the updated data from the field crew subfolders on the office computer into the master set of files.
6. If required, click **Edit** in the Tally and Joint Map Updater utility to delete joint definitions from the master file or to rename joint IDs in the master file.

   The **Rename** button in the *Edit master tally file* dialog is available only when a valid joint ID is entered into the *Current joint ID* field. The utility will check to ensure that the specified *New joint ID* does not already exist in the master tally file.
7. Copy the master set of files onto each controller, using your usual data synchronization method, so that each field crew has the latest data ready to begin field work at the start of the following day.

   Note – *If using AccessSync to transfer files to the field, by default the updated tally and joint map files are duplicated on the controller. To make sure the tally and joint map files are* ***replaced*** *on the controller rather than duplicated, create a File Synchronization Options*

(.fsoxml) file containing the appropriate settings and place the .fsoxml file in the same folder as the tally and joint map files. For more information, refer to the topic "AccessSync Overview" in the Trimble Access Services Help.

Automating merging using a batch file

When the UpdateMasterCsvFileInstaller.exe installation program is run, it installs the updater program by default into the folder:

- Program Files\Common Files\Trimble\Pipelines Update Master Csv File (on a 32-bit operating system)
- Program Files (x86)\Common Files\Trimble\Pipelines Update Master Csv File (on a 64-bit operating system)

As part of the installation it creates an Update.bat batch file that can be used to automate the process of merging tally and joint map updates from the field into master tally and joint map files. The Update.bat batch file that is created is designed to work with a folder structure where the crew file folders are subfolders of the folder containing the master files. Once you have created an appropriate structure you can copy the Update.bat file from the program installation folder into the folder containing the master files and then run it from there.

By default the Update.bat batch file is designed to operate with the master .csv file name supplied to it as a command line parameter, which means that it needs to be run from a Command Prompt window (DOS Shell). However, you can edit the batch file to have the name of the master .csv file specified directly in the batch file if you wish. This allows the batch to be run by simply double clicking on the batch file name from Windows Explorer. To do this do the following:

1. Open the Update.bat file in a suitable text editor (for example, Notepad).
2. Modify the 4th line in the file. This line is initially created as: set masterCsvFile=%1. Change the %1 at the end of the line to the name of the master tally .csv file, remembering to include the file name in double quotes if it includes space characters.

   For example, if your master tally .csv file name is ‘My tally file.csv’ then replace the %1 characters with “My tally file.csv”. The double quotes are optional if there are no space characters in the file name. No file path is required in the specification of the master .csv file name since the Update.bat file being edited is in the same folder as the master .csv file.
3. Save the edited Update.bat file.

When the master tally and joint map files are updated by the utility program, an updated copy of the associated XML file (used for reporting purposes) is also created alongside both the master and contributing field files (in their subfolders). This means that these XML files are available for creating reports on the computer using the ASCII File Generator program. The ASCII File Generator program can also be run in an automated fashion from a batch file. If the ASCII File Generator program has been installed on the computer prior to the UpdateMasterCsvFileInstaller.exe installation program being run, the created Update.bat batch file will include some commented out report commands to show how reports can be automatically produced as part of the data merging process.

For more information on the ASCII File Generator, see Tally reports and job reports.

Tally folder files

The tally file and its associated files are stored in the **Trimble Data\Common\Tally** folder on the controller.

The Tally folder contains the following files:

File	Type	Contains	Created when
Tally	.csv	Joint attribute data	One of the following occurs: • A .csv file (such as the pipe manufacturer manifest) copied to the controller is opened in the *Check tally* or *Create tally* screen. • A new file is created in the *Create tally* screen.
Manifest	.csv	Joint attribute data	A .csv file from the pipe manufacturer is copied to the controller for checking against data entered in the *Create tally* screen.
Definition	.dfn	Configured tally options	Tally options are configured in the *Pipeline options* screen.
Master index	.idx	Unique ID, status flags, and timestamp and position information for each joint	Tally options are configured in the *Pipeline options* screen.
Joint map	.map	Joint map records, including timestamp and position information	The first time a joint map record is added to the pipeline project.
Report	.xml	Data from the other files in the folder	Files are updated using the Tally and Joint Map Updater utility. The .xml file is used for creating reports on the office computer.

The .idx file may contain any of the following flags:

0 – The joint has not been checked or modified

1 – The joint has been checked

2 – Existing attribute values for the joint have been modified

3 – The joint has been checked and modified

Position information in the .idx and .map file is provided as Lat, Long, Height values, then Northing, Easting, Elevation values, followed by the Station value.

When merging updated data from the field, the Tally and Joint Map Updater utility searches for matching unique tally ID values, so it can handle files where there are extra or missing, lines. It can also handle the situation where a unique tally ID has been entered for an existing master file entry that previously had no unique tally ID (as long as no other changes have been made to the line). Parallel updating of the master index file is also carried out to keep the indices in step with the csv file and to update any recorded positions. If joint mapping files (*.map) are available alongside the

selected csv files, then the master joint mapping file is updated using any new/updated details available in the new joint mapping file. A log of all the changes made to the master files is recorded in a log file stored alongside the master files, and it can be viewed at the completion of the update process.

CHAPTER 4

Measure

You can measure the as-built pipeline in a conventional survey or in a GNSS survey.

Note – *The Measure pipeline point and Measure point menu options provide access to the same point measurement methods. However, to link points to joints in the tally and compute cover you must use the Measure pipeline point menu option.*

You must be connected to survey equipment to use the options in the *Measure* menu. For information on how to configure your survey style, set up your equipment, and start a survey, refer to the following:

- "Conventional Survey – Setup" chapter in the *General Survey Help*
- "GNSS Survey – Setup" chapter in the *General Survey Help*

For information on measuring the as-built pipeline, see:

Measuring points along the as-built pipeline

To be able to view and edit joint details for features measured along the pipeline, you must use the *Measure pipeline point* menu item and then select a feature code that has joint ID attributes linked to the tally file.

1. From the main Pipelines screen, tap *Measure* and select *Measure pipeline points*. Alternatively, from the map, tap *Measure*.
2. Enter the measurement details for the point:
   a. Enter the *Point name*.
   b. Enter the *Code* for the point.

      Note – *To see Pipelines measurement features such as cover calculation, joint and attribute details, and to store computed values as attributes, you must select an appropriate code from the list.*

Note – *The Pipelines software can only provide joint linking to the tally file from the first code in a Code field. Attributes on any secondary codes in the Code field will not be available.*

c. Select the measurement method and then enter either the antenna details or the target details.

d. When you are ready to record the position, tap *Measure*.

e. When the preset occupation time and precisions have been reached, tap *Store*.

If the *Compute cover* check box is selected in the *Pipeline options* screen, the *Compute pipe cover* screen appears. For more information, see Automatic depth of cover calculations.

If you have not already entered the attribute details using the *Attrib* soft key then the *Attributes* screen appears.

3. Fill out the attributes for the point:

a. If you are measuring a weld, enter the weld or x-ray ID for the weld you are measuring.

If you have selected attributes to store the Depth of cover, Station, or Offset values calculated during the point measurement, these attributes are displayed with their values automatically filled out.

The fields for the joint behind and the joint ahead are automatically filled out.

b. To check the details of the joint, tap *Details*. For more information, see Updating joint details.

c. Fill out any other attribute information for the point you are measuring, as required.

If an attribute is a photo attribute, capture the required image using your controller or the connected camera. For more information, see Adding photos to the tally or measured pipeline points.

d. To select the default attribute behavior, tap *Options*. Choose from *Last used* or *From library*.

4. To save the point, tap *Store*.

Tip – When measuring welds, a message warns if the length of a joint recorded in the tally is not the same as the distance computed between two measured welds. For more information, see Distance between pipeline point calculations.

Note – *You cannot edit the joint details for surveyed point. If you need to update joint details, re-measure the point, edit the joint details, and then choose to overwrite the previous measurement.*

Distance between pipeline point calculations

To save expensive rework, the Pipelines software automatically detects and warns of possible errors in the tally during measurement of the as-built pipeline. When you measure a point, the Pipelines software selects a point in the job (including all linked jobs) that has a joint with a unique ID that matches the ID of the joint for the point currently being measured. The software computes the distance between the two measured points and then compares this distance to the length value

entered for the joint in the tally file. If this distance does not match the length of a joint recorded in the tally, then a warning appears.

Note – *The comparison is only possible if:*

- *the current job or a linked job contains the weld measurement for the joint behind.*
- *the joint map includes the IDs of both the joint ahead and the joint behind.*

If the two values differ by more than 0.2 m, the software warns that the joint length does not match the computed distance.

Tip – The 0.2 m value is specified in the JointLengthInverseComparisonTolerance property in the config.cfg file in the **Trimble Data\<username>** folder and can be modified if required.

If the software warns "The joint length does not match the computed inverse length" when you attempt to store a measured pipeline point, do one of the following:

- Tap *Yes* to continue storing the point.
- Tap *No* to return to the *Measure pipeline point* screen. Then:
  a. Tap *Attrib* to view the attributes screen and then tap *Details* to view the information recorded for the joint ahead and the joint behind the weld and update the information if required.
  b. Re-measure the point and then tap *Store* to store the point.

Automatic depth of cover calculations

If you have correctly configured your system, then the Pipelines software automatically calculates the depth of cover on the pipelines when you store a point. If the depth of cover calculated for the point does not meet the minimum cover requirement defined in the *Pipeline options* screen, the a warning appears.

Requirements for automatic depth of cover calculations

The assumption the Pipelines software makes to determine if cover should be computed, is based on whether it believes you are taking a measurement on a pipe – and it determines this based on whether the code selected has an attribute for a weld ID or joint ID.

To correctly configure the system to automatically compute depth of cover for points measured on a weld, bend, valve, tee, or any pipeline feature, do the following:

1. Configure the *Compute cover settings* in the *Pipelines options* screen so that the software computes the cover using your preferred method. For more information, see Compute cover settings.
2. Create feature codes in the FXL file for each measurement type (for example, weld, bend, valve) and make sure that each feature code has an attribute to record the joint ID or weld ID.
3. For each feature code that has an attribute to record the joint ID or weld ID, use the *Select attributes to link* screen in the Pipelines software to link the attribute to the joint ID or weld ID information from the tally file. For more information, see Selecting attributes to link.

Overriding system depth of cover settings

To override the job compute cover settings for the current as-built pipeline point, change the details in the *Compute pipe cover* screen. If you:

- Know the name of another point you want to use, then enter it in the *Ground point name* field.
- Know the ground elevation, you can enter it in the *Ground elevation* field.
- Have computed the cover by other means, then you can enter the cover in the *Depth of cover* field.
- Have set the *Compute pipe cover* method to *Use ground point* and the default setting to:
  - *Last point in job* and you want to select the point ***closest*** to the point you just measured, then tap *Closest*.
  - *Closest point* and you want to select the ***last*** point you measured in the job, then tap *Last*.
- Have set the *Compute pipe cover* method to *Use ground point*, tap *Options* to:
  - Change the default ground point option.
  - Enter or change the code that a point must have for it to be used as a ground point.

Tip – If you have set the *Compute pipe cover* method to *Use surface model* or *Use pipe alignment* and you have selected a point to define the ground elevation but you wish to return to the elevation derived from the surface model or alignment, tap next to the *Ground elevation* field and select the appropriate option.

Measuring points

Select *Measure point* to measure points that are not on the pipeline and do not need to be linked to joint details.

Note – *The Measure pipeline point and Measure point menu options provide access to the same point measurement methods. However, to link points to joints in the tally and compute cover you must use the Measure pipeline point menu option.*

For more information on the measurement methods available in the *Measure point* screen, refer to the following:

- "Measure Points" in the “Conventional Survey – Measure” chapter in the *General Survey Help*
- "Measure Points" in the “GNSS Survey – Measure” chapter in the *General Survey Help*

Measuring laser points

To measure points or distances using a laser rangefinder connected to the controller, first configure the laser rangefinder in your Survey Style. For more information, refer to the topic "Laser Rangefinder" in the chapter "Survey Settings" in the *General Survey Help*.

When measuring laser points, you should measure three laser points for each point on the pipeline you want to measure, and then compute an averaged laser position.

To measure laser points:

1. From the main Pipelines screen, tap *Measure*.
2. Tap *Measure laser points*.
3. Enter the point name and a code for the point.
4. In the *Start point* field, do one of the following:
   - Select the point you are measuring the laser point from.
   - Measure a new point using the connected GNSS receiver. To do this:
     a. Select *Measure* in the *Start point* field.
     b. Enter the details for the point and then tap *Measure*.
     c. Tap *Store*.

     The software returns to the *Measure laser points* screen and the point you just measured is selected in the *Start point* field.
5. Enter the laser height and the target height.
6. Tap *Measure*.
7. Use the laser rangefinder to measure the distance to the target.

   The details for the measurement appear in the *Measure laser points* screen.
8. Tap *Store*.
9. Move to the next start position, and repeat steps 3 through 8. Repeat so that you have recorded three laser points to the target from three different start positions.

To compute an averaged position from the three laser points, see Calculating an averaged laser position.

CHAPTER 5

Cogo

Use the *Cogo* menu to carry out coordinate geometry (cogo) functions.

For more information, see:

Compute inverse

Compute intersection angle

Compute deflection angles

Calculating an averaged laser position

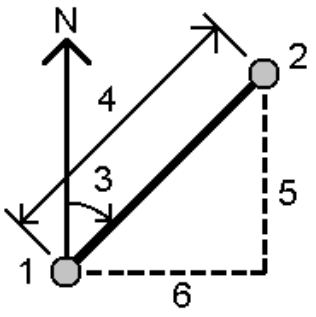
Generating points for a surface

You can also access some of these cogo functions from the tap and hold menu in the map, as well as additional cogo functions that are not available from the *Cogo* menu. For information on all available cogo functions, refer to the "Cogo" chapter in the *General Survey Help*.

Compute inverse

To compute the inverse between two existing points:

1. From the map, select the From point (1) and To point (2), as shown in the diagram below.
2. Tap and hold on the map and select *Compute inverse* from the shortcut menu. Alternatively, select *Cogo / Compute inverse* from the main menu.
3. Tap and hold on the map and select *Compute inverse* from the shortcut menu.
4. The following values are computed:
   - azimuth (3)
   - horizontal distance (4)
   - the change in elevation, slope distance and grade between the two points
   - delta north (5) and east (6)

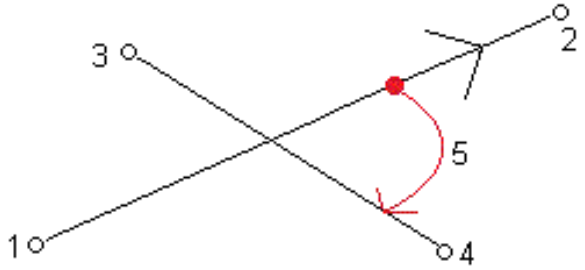


Compute intersection angle

Use the *Compute intersection angle* function to calculate the angle that other pipelines or utilities cross the pipeline. The pipeline can be defined by:

- Two points
- An alignment

Calculating the intersection angle when the pipeline is defined by two points



1. From the map, select the two points that define the pipeline (1 and 2 in the diagram above). Typically these points are previously measured weld points. Then select the two points that define the object crossing the pipeline (3 and 4 in the diagram). If they are not already either side of the pipeline, these two points are projected to determine the crossing point for the object.

   Note – *When two points are selected to define the pipeline, the direction between point 1 and point 2 is assumed to be the direction of flow. However, if an alignment has been defined in Pipeline options, then the alignment is used to define the direction of flow and the order of points 1 and 2 does not matter.*

2. Tap and hold on the map and select *More* / *Compute intersection angle* from the shortcut menu. Alternatively, from the main Pipelines screen select *Cogo* / *Compute intersection angle*.

   The *Compute intersection angle* screen displays the pipeline definition method and the selected points defining the pipeline and the object crossing the pipeline.

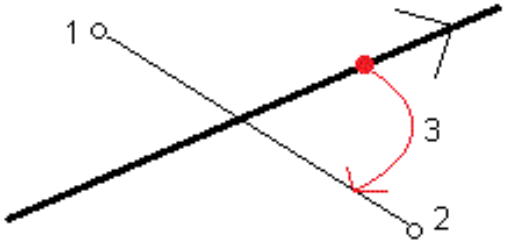
3. Tap *Calc*.

   The intersection angle (5) is shown. The reported intersection angle is the first angle clockwise, measured from the pipeline in the direction of flow.

If the selected points have elevation values, the software also reports the vertical clearance. The vertical clearance is calculated assuming the points defining the pipeline are located on the top of the pipe.

4. If required, specify a diameter for the object that crosses ***above*** the other object.
5. To store the intersection point as a new point, select the *Store* check box and edit the point details as required.
6. Tap *Store* to store the calculation and, if applicable, the new point in the job.

Calculating the intersection angle when the pipeline is defined by an alignment



1. From the map, select the two points that define the object that crosses the pipeline (1 and 2 in the diagram above).

   If they are not already either side of the pipeline, these two points are projected to determine the crossing point for the object.
2. Tap and hold on the map and select *Compute intersection angle* from the shortcut menu. Alternatively, from the main Pipelines screen select *Cogo* / *Compute intersection angle*.

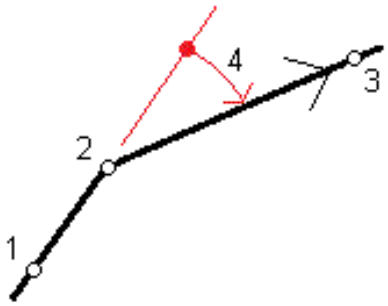
   The *Compute intersection angle* screen displays the pipeline alignment selected in the *Pipeline options* screen and the selected points defining the object crossing the pipeline.
3. Tap *Calc*.

   The intersection angle (3) is shown. The reported intersection angle is the first angle clockwise, measured from the pipeline in the direction of flow.

   If the pipeline has a vertical alignment and the selected points have elevation values, the software also reports the vertical clearance. The vertical clearance is calculated assuming the vertical alignment defines the top of the pipe.
4. If the pipeline has no vertical alignment, you can measure and key in the vertical clearance.
5. If required, specify a diameter for the object that crosses ***above*** the other object.
6. To store the intersection point as a new point, select the *Store* check box and edit the point details as required.
7. Tap *Store* to store the calculation and, if applicable, the new point in the job.

Compute deflection angles

Use the *Compute deflection angles* function to calculate the horizontal, vertical, and true deflection angles between three points. The ***true deflection angle*** is the deflection angle in the plane that the three points lie on.



1. From the map, select the three points (1, 2, and 3 in the diagram above). These points may be previously measured weld points. The software will calculate the deflection angles to the third point in relation to the (projected) straight line drawn connecting the first two selected points.
2. Tap and hold on the map and select *More* / *Compute deflection angles* from the shortcut menu. Alternatively, from the main Pipelines screen select *Cogo* / *Compute deflection angles*.

   The *Compute deflection angles* screen displays the selected points.
3. Tap *Calc*.

   The horizontal deflection angle (4) is shown. If the three points have elevations, the vertical deflection angle is also shown.

   The horizontal deflection angle is shown as a negative value if the third point is to the left of the projected line between the first two points, and as a positive value if the point is to the right.

   The horizontal deflection angle value is automatically copied to the clipboard so that you can easily paste it into the tally file (using **Ctrl** + **V**), if you wish.

   The vertical deflection angle is shown as a negative value if the third point lies above the projection of the line running from the first to the second point and positive if it lies below this line.
4. To record the computed deflection angles and the names of the three selected points in the job, tap *Store*.

Calculating an averaged laser position

Use the *Averaged laser position* function to calculate an averaged position from three laser rangefinder observations. For information on measuring a laser point, see Measuring laser points.

To calculate an averaged laser position:

1. From the main Pipelines screen, tap *Cogo*.
2. Tap *Averaged laser position*.

In the *Contributing laser observations* group, the three most recently measured laser points are listed.

3. If required, change the selected laser points.
4. Enter a point name and code for the new averaged position.
5. Tap *Calc*.

   The averaged position is calculated. To view the details for the averaged position, you may need to view the second page of the *Averaged laser position* screen.

   The estimated accuracy of the averaged position is shown in the horizontal RMS and vertical RMS fields. These values are calculated by determining the mean point where the three contributing points intersect, and then calculating the root mean square of the delta coordinates (horizontal) or the delta heights (vertical).
6. Tap *Store*.

Generating points for a surface

Using a surface model of the natural ground surface to compare to a measured weld is a great way to compute the cover depth. If you have LIDAR data then that data can be used as the surface, but if you have to complete a topo survey to define the surface then this can be a lot of work. The pipeline route is usually surveyed to determine elevations along the route and identify changes in grade, but the survey is often in a single line along the proposed alignment with little width to the survey. To create a surface model, you need elevation data that has some width. Given that the pipeline will be positioned fairly close to the alignment, it is safe to assume that in many situations, projecting the topo data for the alignment out to the width of the corridor along the alignment will be accurate enough to create a surface from the projected points, as any cover calculations will be for positions close to the alignment.

The *Generate points for a surface* cogo function allows you to select topo points along the alignment and then project them to the left and right of the alignment, creating new points at the same elevation as those that were projected. From the map, the original points and the projected points can then be used to create a surface.

Creating the corridor surface points

1. From the main Pipelines screen, tap *Cogo*.
2. Tap *Generate points for a surface*.

   Note – *The fields in the Generate points for a surface screen show the width values selected in the Pipelines options screen. Any changes you make to the fields in this screen are also made in the Pipelines options screen.*
3. If required, select a pipe alignment file in the *Pipe alignment* field and edit the values in the *Corridor width* fields.

4. To add the points surveyed at ground level above the alignment:
   a. Tap *Add*.
   b. In the *Start point* and *End point* fields, enter the point name, or use the arrow to select the point from a list of points in the job, by search, or from a list of points currently selected in the map.
   c. Tap *Add*.
5. In the *Generate points for a surface* screen, select the name to use for the first new point created in the surface.
6. If required, enter the code to use for the surface points in the *Code* field. If the code you want to use is not listed in the feature library screen, enter the code in the text field at the top of the feature library screen and then tap *Enter*.
7. Tap *Create*.

   A message confirms the number of new points created.
8. Tap *OK*.

   The *Generate points for a surface* screen closes and you are returned to the main Pipelines screen.

Creating the surface

1. Tap *Map* in the status bar.
2. Select the points to use to create the surface:
   - Graphically in the map.
   - Using the *Select* option from the tap and hold menu. For more information, see "Selecting points" in the *General Survey Help*.
3. From the tap and hold menu, select *Create surface*.
4. Enter a name for the surface.

   A surface is generated from the current point selection and stored as a Trimble Terrain Model file (surface name.ttm) in the current project folder.

   The newly-created surface appears on the map.
5. To use the surface you have just created for depth of cover calculations, see Pipeline options.

Tip – To declutter the map and to change the appearance of the surface in the map, see Pipelines map.

CHAPTER 6

Key in

Use the *Key in* menu to create or edit an alignment, or to key in additional notes or points, such as control points.

You can:

- Key in points
- Key in notes
- Create or edit an alignment using points
- Create or edit an alignment using elements
- Create an RXL alignment from a LandXML file

You can also access additional key in functions from the tap and hold menu in the map. For more information, refer to the "Key In" chapter in the *General Survey Help*.

Keying in points

With this function, you can enter coordinates to define a new point:

1. From the main Pipelines screen, tap *Key in / Points*.
2. Enter the point name.
3. Enter the values.
4. Tap *Store* to calculate or store the point.

Tip – To change the method used to key in the point, tap *Options* and then select the method from the *Coordinate view* field, and enter any additional details as required.

To understand assigning attributes to a point, refer to the topic "Using Feature Codes with Predefined Attributes" in the *General Survey Help*.

To enter a point from the map:

1. Make sure the current selection is cleared.
2. Tap and hold on the area of the map to which you want to add the point.
3. From the shortcut menu, select *Key in point.* The *Point* screen appears.
4. Complete the fields as required.

Keying in notes

You can enter a note in the job database at any time. To do this:

1. To access the *Note* screen, do one of the following:
   - From the main Pipelines screen, tap *Key in* / *Notes*.
   - In the status bar, tap *Favorites* / *Key in note*.
   - On the controller keyboard, press **CTRL** + **N.**
2. Type in the details to be recorded. Alternatively tap *T/Stamp* to generate a record of the current time.
3. To store the note do one of the following:
   - Tap *Store* to store the note in the database.
   - Tap *Prev* to attach the note to the previous observation.
   - Tap *Next* to attach the note to the next observation to be stored.

   Note – *When you tap Next, the note is only stored with the next observation if another observation is stored during the current survey. If the survey is ended without storing another observation the note is discarded.*
4. To exit *Key in notes,* tap *Esc.* Alternatively, if the *Note* form is empty, tap *Store.*

Note – *If a feature code list is already selected for the job, you can use codes from the list when keying in a note. From the Note screen, press* ***Space*** *to display the feature code list. Select a code from the list or type the first few letters of the code.*

In *Review,* tap *Note* to add a note to the current record.

In *Point manager,* scroll to the right and tap in the *Note* field to add a note to the point record.

Creating or editing an alignment using points

To key in an alignment by a point name range:

1. From the main Pipelines screen, tap *Key in* / *Alignments*.
2. To key in a new alignment, enter the point names that define the alignment (if the *Key in alignment* screen is displayed). If the *Select an alignment* screen is displayed, tap *New* to enter the point range.

The following name range techniques are supported:

Enter	Result
1,3,5	Creates a line between points 1 to 3 to 5
1-10	Creates lines between all points from 1 through 10
1,3,5-10	Creates a line between points 1 to 3, to 5, and 5 through 10
1(2)3	Creates an arc between points 1 and 3, through point 2
1(2,L)3	2 (Radius point), L (left) or R (right) Creates a **Left** hand arc between points 1 and 3, with point 2 as the radius point
1(100,L,S)3	1 to 3, radius=100, L (left) or R (right), L (large) or S (small) Creates a **Left** hand **Small** arc between points 1 and 3 with a radius of 100

3. To store the alignment, select the *Store alignment* check box, enter an *Alignment name,* enter a *String name* (if required) and a *Start station* and *Station interval* and then tap *Store.*

   Alignments are stored as .rxl files. If you save the alignment, you can easily stake it again, view it in the map, and share it with other jobs and with other controllers.

   Alignments always have a horizontal component; the vertical component is optional. If an alignment is created using entities that have elevations, the alignment has a vertical component.
4. To offset an alignment, tap *Offset.*
5. Enter the offset distance.
   To offset to the left, enter a negative value.
6. To store the offset alignment, enable the *Store alignment* check box, enter an *Alignment name,* enter a *String name,* if required, and then tap *Store.* The alignment is stored as an .rxl file.
7. To store node points at the vertices of the offset alignment, enable the *Store points at nodes* check box, enter a *Start point name,* enter a *Code,* if required, and then tap *Store.*

   An offset alignment has a vertical component if the vertical geometry of the original alignment is coincident with the horizontal geometry and the vertical geometry consists only of points. The offset vertical geometry cannot include curves. If the vertical geometry of an alignment cannot be offset, only the horizontal component exists in the offset alignment. You cannot offset an alignment that includes transitions.

You can also define the horizontal component (and vertical component if the line work has elevations), from features (points, lines, and arcs), in a file. To do this:

1. From the map, tap the *Layers* softkey, select the file and then make active the appropriate layer(s) that will be used to define the horizontal component.
2. Select the feature.
3. From the tap and hold menu, select *Key in alignment.*
4. Select *Store alignment* and then enter a name, start station, and station interval.
5. Tap *Store.*

Creating or editing an alignment using elements

Tip – The Pipelines software provides complete functionality for managing alignments, including handling transitions and superelevations. Only the most common features used for pipelines are documented here. For information on the less common features you can use for pipeline alignments, refer to the *Trimble Access Roads Help*, which you can download from http://apps.trimbleaccess.com/help.

1. From the main Pipelines screen, tap *Key in*.
2. Tap *Alignment by elements*.
3. Tap *New* and enter a name for the alignment. To edit an existing an alignment, select the alignment and then tap *Edit*.
4. Select a component to define:

   Horizontal alignment

   Vertical alignment

   Station equations
5. When you have defined all of the elements in the alignment, tap *Store*.

Tips –

- Use *Rename* and *Delete* to rename or delete an alignment.
- Tap *Options* to specify a *Scale factor* for the road.

  The specified scale factor scales a horizontal alignment definition but retains the original station values. When defining the alignment, all values are entered and appear as unadjusted values. The scale factor is applied to the length/radius values defining each element/curve when computing the coordinates for the alignment. When surveying and reporting the alignment, the station values are not adjusted by the scale factor.

  For an alignment defined by End coordinates or End points, Trimble recommends you do not change the scale factor after initial entry. Otherwise the scale factor rescales the alignment elements, and since the End coordinates/End point coordinates are not changed a change in station values must occur. For an alignment defined by PI (Points of Intersection), Trimble recommends you do not change the scale factor after initial entry. Otherwise the scale factor rescales the curve components, and since the PI coordinates are not changed a change in station values must occur.

Notes –

- *The Pipelines software treats all distances, including station and offset values, as grid distances. The value in the Distances field (accessed from the Trimble Access menu by selecting Settings / Units Cogo / Cogo Settings) has no effect on the road definition or the way road distances are displayed.*
- *If a ground coordinate system is defined in the job, the grid coordinates are, in effect, also ground coordinates.*
- *Alignment files are saved to the <username> folder as .rxl files.*
- *Alignment files created from the map, or during Stakeout Alignment, contain a Horizontal alignment. If elevations exist, the files also contain a Vertical alignment.*

Horizontal alignment

To add a horizontal alignment to a new road definition, select *Horizontal alignment.* You can enter the alignment using one of the following methods:

Length/coordinates

End station

PI

You can also define the horizontal alignment (and vertical alignment if the linework has elevations), from features (points, lines, and arcs) in a file. To do this:

1. From the map, tap the *Layers* softkey, select the file and then make active the appropriate layer(s) that will be used to define the horizontal alignment.
2. Select the features.
3. From the tap and hold menu, select *Store road.*
4. Enter a name, start station, and station interval.
5. Tap *OK.*

From the *Define* menu, you can view the horizontal (and vertical alignment if applicable) for the resultant alignment and add station equations if required.

Entry by length / coordinates

To add a horizontal alignment to a new alignment by entering the lengths of the elements or the end coordinates:

1. From the main Pipelines screen, tap *Key in / Alignment by elements*. Select the alignment and then select *Horizontal alignment*.
2. Tap *New* to enter the first element that defines the alignment. The *Element* field is set to *Start point.* You cannot change this.
3. Enter the *Start station.*
4. In the *Method* field, choose one of the following options:
   - *Key in coordinates*
   - *Select point*

   If you choose the *Key in coordinates* method, enter values in the *Start north* and *Start east* fields.
   If you choose the *Select point* method field, enter a value in the *Point name* field. The *Start north* and *Start east* fields will update with the values for the entered point.

   Tip – To edit the *Start north* and *Start east* values when they have been derived from a point, change the method to *Key in coordinates.*
5. Enter the *Station interval.* To add the horizontal element, tap *Store.*
6. To enter the next horizontal element, tap *New.* In the *Entry Method* field, select *Length/Coordinates* and then tap *OK.*
7. Select the *Element* and *Method,* enter the required information and then tap *Store.*
8. When you have entered the last element, tap *Accept.*

Tip – To delete an element, highlight it and tap *Delete.* When you add an element, it appears below the previous element that you added. To insert it at a particular place in the list, highlight the element that you want it to follow. Tap *New* and enter details of the element.

9. Enter the other road components or tap *Store* to store the road definition.

Line elements

If you select *Line* in the *Element* field, the *Start station* field displays the start station value for the line that you are defining. You cannot edit this.

The following table shows the available methods and the fields that appear when you select each one.

Method	Procedure
Azimuth and length	In the *Azimuth* and *Length* fields, enter values that define the line. The *End north* and *End east* fields update with the values entered.
End coordinates	In the *End north* and *End east* fields, enter values that define the line. The *Azimuth* and *Length* fields update with the values entered.
Select end point	In the *Point name* field, enter a value. The *Azimuth, Length, End north,* and *End east* fields update with the values entered.

Tip – For a line defined by *Azimuth and length,* the *Azimuth* field shows the azimuth as calculated from the previous element. To edit the azimuth, select *Edit azimuth* from the pop-up menu in the *Azimuth* field. If the element is non tangential a solid red circle is shown at the start of the element. To reload the original azimuth, select *Restore tangency* from the pop-up menu.

For information on other element types, refer to the *Trimble Access Roads Help*.

Entry by end station

To add a horizontal alignment to a new road definition by entering end station values:

1. From the main Pipelines screen, tap *Key in / Alignment by elements*. Select the alignment and then select *Horizontal alignment*.
2. Tap *New* to enter the first element that defines the alignment. The *Element* field is set to *Start point.* You cannot change this.
3. Enter the *Start station.*
4. In the *Method* field, choose one of the following options:
   - *Key in coordinates*
   - *Select point*

   If you choose the *Key in coordinates* method, enter values in the *Start north* and *Start east* fields.
   If you choose the *Select point* method field, enter a value in the *Point name* field. The *Start north* and *Start east* fields will update with the values for the entered point.

   Tip – To edit the *Start north* and *Start east* values when they have been derived from a point, change the method to *Key in coordinates.*
5. Enter the *Station interval*. To add the horizontal element, tap *Store.*

6. To enter the next horizontal element, tap *New.* In the *Entry Method* field select *End station* and then tap *OK.*
7. Select the *Element* and *Method,* enter the required information and then tap *Store.*
8. When you have entered the last element, tap *Accept.*

   Tip – To delete an element, highlight it and tap *Delete.* When you add an element, it appears below the previous element that you added. To insert it at a particular place in the list, highlight the element that you want it to follow. Tap *New* and enter details of the element.
9. Enter the other road components or tap *Store* to store the road definition.

   Tip – Tap *Method* to change the entry method to *Length.*

Line elements

If you select *Line* in the *Element* field, the *Start station* field displays the start station value for the line that you are defining. You cannot edit this.

In the *Azimuth* and *End station* fields, enter values that define the line. The *End North* and *End East* fields update to display the coordinates at the end of the element just added.

Tip – If this line is not the first line to be defined, the *Azimuth* field displays an azimuth calculated from the previous element. To edit the azimuth, select *Edit azimuth* from the pop-up menu in the *Azimuth* field. The icon preceding the element name is shown red if adjoining elements are non tangential.

For information on other element types, refer to the *Trimble Access Roads Help*.

Entry by PI

To add a horizontal alignment to a new road definition by entering the points of intersection (PI):

1. From the main Pipelines screen, tap *Key in / Alignment by elements*. Select the alignment and then select *Horizontal alignment*.
2. Tap *New* to enter the first element that defines the alignment. The *Element* field is set to *Start point.* You cannot change this.
3. Enter the *Start station.*
4. In the *Method* field, choose one of the following options:
   - *Key in coordinates*
   - *Select point*

   If you choose the *Key in coordinates* method, enter values in the *Start north* and *Start east* fields.
   If you choose the *Select point* method field, enter a value in the *Point name* field. The *Start north* and *Start east* fields will update with the values for the entered point.

   Tips –
   - The selected entry method will be the default for subsequent elements. To change the entry method, select the *Method* option.
   - To edit the *Start north* and *Start east* values when they have been derived from a point, change the method to *Key in coordinates.*
5. Enter the *Station interval.* To add the horizontal element, tap *Store.*

6. To enter the next horizontal element tap *New.* In the *Entry method* field, select *PI* and then tap *OK.*
7. Tap *New* and select the *Curve type,* enter the required information, and then tap *Store.* For details on supported curve types, refer to the *Trimble Access Roads Help*.
8. When you have entered the last element, tap *Accept.*

   Tip – To delete an element, highlight it and tap *Delete.* When you add an element, it appears below the previous element that you added. To insert it at a particular place in the list, highlight the element that you want it to follow. Tap *New* and enter details of the element.
9. Enter the other alignment components or tap *Store* to store the alignment definition.

Vertical alignment

To add a vertical alignment to a new road definition, select *Vertical alignment.* You can enter the alignment using one of the following methods:

Vertical points of intersection

Start and end points

Note – *The selected entry method applies to all elements defining the vertical alignment.*

Tip – If you defined the horizontal alignment for your road from linework in a file, and the linework has elevations, these are used to define the vertical alignment as a series of *Point* elements. See *Horizontal alignment* for further details. The vertical alignment can be edited if required.

Entry by Vertical Points of Intersection (VPI)

To add a vertical alignment to a new road definition by entering Vertical Points of Intersection (VPI):

1. From the main Pipelines screen, tap *Key in* / *Alignment by elements*. Select the alignment and then select *Vertical alignment*.
2. To enter the first element that defines the alignment, tap *New.*
3. In the *Station* and *Elevation* fields, key in the values that define the first vertical point of intersection. The *Element* field is set to *Start point.* You cannot change this.
4. Tap *Store* to add the vertical element record.
5. Tap *New.* In the entry method field select *VPI* and then tap *OK.*
6. Select the *Element*, enter the required information and then tap *Store.*

   If you select *Point* in the *Element* field, use the *Station* and *Elevation* fields to key in values that define the VPI. The *Slope in* field updates to display the calculated slope value. The *Slope out* field updates when the next element is added.

   Notes –

   - *A vertical alignment defined by VPIs must end with a point.*
   - *When you edit an element, only the selected element is updated. All adjoining elements remain unchanged.*

   Tip – To confirm the entry, use the *Slope in, Slope out, K factor* and *Sag / Summit* values.

   For details on other supported elements, refer to the *Trimble Access Roads Help*.
7. When you have entered the last element, tap *Accept.*

Tip – To delete an element, highlight it and tap *Delete.* When you add an element, it appears below the previous element that you added. To insert it at a particular place in the list, highlight the element that you want it to follow. Tap *New* and enter details of the element.

8. Enter the other road components or tap *Store* to store the road definition.

Entry by start and end points

To add a vertical alignment to a new road definition by entering start and end points:

1. From the main Pipelines screen, tap *Key in / Alignment by elements*. Select the alignment and then select *Vertical alignment*.
2. To enter the first element that defines the alignment, tap *New.*
3. In the *Station* and *Elevation* fields, key in the values that define the first vertical point of intersection. The *Element* field is set to *Start point.* You cannot change this.
4. Tap *Store* to add the vertical element record.
5. Tap *New.* In the entry method field select *Start and End points* and then tap *OK.*
6. Select the *Element,* enter the required information and then tap *Store.*

   If you select *Point* in the *Element* field, use the *Station* and *Elevation* fields to key in values that define the start point. The *Slope in* field updates to display the calculated slope value. The *Slope out* field updates when the next element is added.

   Note – *When you edit an element, only the selected element is updated. All adjoining elements remain unchanged.*

   Tip – To confirm the entry, use the *Slope in, Slope out, K factor* and *Sag / Summit* values.

   For details on other supported elements, refer to the *Trimble Access Roads Help*.
7. When you have entered the last element, tap *Accept.*

   Tip – To delete an element, highlight it and tap *Delete.* When you add an element, it appears below the previous element that you added. To insert it at a particular place in the list, highlight the element that you want it to follow. Tap *New* and enter details of the element.
8. Enter the other road components or tap *Store* to store the road definition.

Station equations

Use *Station equations* when the horizontal alignment has changed but you wish to retain the original station values.

Note – *Station equations are not applied if Slope stationing is selected in the Pipelines options screen.*

To define an equation:

1. From the main Pipelines screen, tap *Key in / Alignment by elements*. Select the alignment and then select *Station equations*.
2. Tap *New.*
3. In the *Back station* field, enter a station value.
4. In the *Ahead station* field, enter a station value. The *True station* value will be calculated.
5. Tap *Store.*
   The values entered in the *Back station* and *Ahead station* fields are shown. The zone is indicated by a number after the colon in each field. The calculated *Progression,* indicating whether the station value increases or decreases after the station equation, is also shown.

   Note – *The zone up to the first station equation is zone 1.*

   Tip – To change the progression for the last station equation, tap *Edit.*
6. To add further equations, tap *New.* To delete an equation, tap *Delete.* To accept the entered equations, tap *Accept.*

Creating an RXL alignment from a LandXML file

The alignment file for the pipeline must be an RXL file.

To create an RXL file from a LandXML alignment file:

1. From the main Pipelines menu, select *Key in / Alignment by elements*.
2. Select the LandXML file.
3. If the file contains more than one alignment, select the alignment in the *Alignment name* field.
4. Tap *Edit*.
5. Tap *Store*.
6. Enter a name for the RXL file and then tap *OK*.

   The RXL file is stored in the <username> folder.

CHAPTER 7

Stakeout

Use the *Stakeout* menu to stake out the alignment or to stake out points.

You can also access additional stakeout functions from the tap and hold menu in the map. For more information, refer to the "Survey – Stakeout" chapter in the *General Survey Help*.

You must be connected to survey equipment to use the options in the *Survey* menu. For information on how to configure your survey style, set up your equipment, and start a survey, refer to the following:

- “Conventional Survey – Setup” chapter in the *General Survey Help*
- “GNSS Survey – Setup” chapter in the *General Survey Help*

For information on staking out, refer to the "Survey – Stakeout" chapter in the *General Survey Help*.

Note – *You cannot use the tally, joint mapping, and cover computations available in Measure pipeline points in other measure or stakeout functions.*

Glossary

alignment

When used with respect to pipeline design, an alignment is a mathematical definition of the horizontal (and optionally, the vertical) path followed by the pipeline. The alignment is used to compute stationing.

bend

A curve in a joint or length of pipe. Details such as the type and direction are typically recorded for each bend.

corridor

The corridor defines the distance to the left and right of the pipeline in which access by work crews is allowed. The Trimble Access Pipelines software enables you to define the allowable work area by defining the corridor width along the pipeline or by using a shapefile that defines inclusion zones. You may also define areas where entry is not allowed by using a shapefile that defines exclusion zones. The software allows multiple polygons in a file defining exclusion zones, but only one polygon in a file defining the inclusion zone.

cover

The depth of material between the top of the pipe and the surface elevation.

crossing

A pipeline crossing is where the pipeline crosses another asset, such as another pipeline, a power line, road, etc.

digital terrain model

A mathematical model of the shape of a surface. The represented surface may be an existing terrain, proposed grade surfaces, or a combination of both. The DTM includes random points, breaklines, interior and exterior limits. A Trimble Terrain Model (TTM) is a type of DTM, and is the only type of DTM supported by the Pipelines software.

DN

See nominal diameter.

downstream

Away from the source of the pipeline and in the direction of the pipeline contents.

DTM

See digital terrain model.

exclusion zone

An area into which entry is restricted or forbidden. The system warns when you try to store a point measured inside an exclusion zone. The system records details of when the controller running Trimble Access Pipelines enters or exits from an exclusion zone. The records contain a position and time stamp.

feature library

A file containing information that describes features that will be located in the field. This description includes feature names, feature codes, attribute names, and attribute values. After being created using office software, the feature library is transferred to a controller for use in the field.

heat number

A heat number is an identification number that is stamped onto each pipe after manufacture. The heat number is similar to a lot number and is used to identify production runs of pipes for quality control purposes.

inclusion zone

A geographic area that the pipeline and field crews are expected to remain inside. The system warns when you try to store a point measured outside the inclusion zone. See also corridor.

joint

A length of pipe. The term joint refers to straight sections of pipe as well as bends and branches. Joints are connected by welds.

joint mapping

The process of recording relationships between welds and joints, as well as recording bends and loose ends. You can also record a position and timestamp.

loose end

A loose end is the unwelded end of a section of welded pipeline.

manifest

Data about the pipes delivered to the site, supplied by the pipe manufacturer. Also known as mill data.

mill data

Data about the pipes delivered to the site, supplied by the pipe manufacturer. Also known as manifest.

mother

The pipe from which a PUP is cut.

NB

nominal bore

nominal bore

See nominal pipe size.

nominal diameter

The European equivalent of nominal pipe size. Nominal diameter is specified in millimeters.

nominal pipe size

One of the two non-dimensional numbers for specifying pipe size. Nominal pipe size (NPS) is the diameter based on inches (USA). See also schedule. The European equivalent is nominal diameter (DN) and is specified in millimeters.

NPS

nominal pipe size

pipe size

Pipe size is specified with two non-dimensional numbers: a nominal pipe size (NPS) for diameter based on inches, and a schedule for wall thickness.

PUP

A partial unit of pipe. A PUP is an offcut piece of pipe. Depending on its length and suitability, a pup is usually used later on the pipeline. The length of pipe from which the PUP is cut is often referred to as the mother.

schedule or schedule number

One of the two non-dimensional numbers for specifying pipe size. The pipe schedule (Sched. or Sch.) refers to the specification of pipe size in terms of wall thickness. See also nominal pipe size.

slope stationing

The distance or interval along the pipeline, taking into account the vertical distance as well as the horizontal distance.

stationing

The horizontal distance or interval along the pipeline.

tally

An inventory of the pipes delivered to the field. The tally is often performed using data provided by the manufacturer (in the form of mill data or a manifest), or you can create your own tally on-site.

TTM

A Trimble Terrain Model file, which represents a triangulated 3D surface model.

upstream

Toward the source of the pipeline and against the flow of the pipeline contents.

wall thickness

A value that indicates the thickness of the pipe wall. Wall thickness may remain unchanged as the outside diameter and inner diameter change.

weld

The junction of two pipes (joints) formed by welding.

weld ID

The unique identification number used to identify a weld. The weld ID can be recorded during surveying of the as-built pipe, or in a separate process before the pipe is laid, called joint mapping.