



LFM Server

Autodesk AutoCAD Help Guide

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1 Preface

This chapter gives basic information about this guide, training and support.

1.1 About this Guide

This guide describes how to link the AutoCAD interface to *AVEVA LFM Server*.

1.2 Audience

This set of documentation is aimed at new users and covers the use of AVEVA LFM Server: Server Mode, its associated AutoCAD link and production of AVEVA LFM related resources such as HyperBubble data, Solid Point Cloud data and AVEVA LFM NetView projects. The contents covers operations for both Engineering Users and Project Administrators. It is assumed that the user already has *AVEVA LFM Server* installed and has the appropriate license features available.

1.3 Related Documents

Other related documents include:

- **AVEVA LFM Server – Autodesk Navisworks Interface**
- **AVEVA LFM Server – Autodesk Revit Interface**
- **AVEVA LFM Server - Aveva PDMS CAD Interface**
- **AVEVA LFM Server - Aveva Review CAD Interface**
- **AVEVA LFM Server - Bentley MicroStation CAD Interface**
Also covers Bentley ConstructSim
- **AVEVA LFM Server - Intergraph PDS CAD Interface**
- **AVEVA LFM Server - Intergraph SmartPlant 3D CAD Interface**
- **AVEVA LFM Server - Intergraph SmartPlant Review CAD Interface**
- **AVEVA LFM Server - COMOS Walkinside CAD Interface**
- **AVEVA LFM Server - Quick Start Guide**

The AVEVA LFM Server Quick Start Guide is not intended to cover every aspect of this package, but should provide designers with a 3D CAD background a quick introduction to common features and typical project requirements.

- **AVEVA LFM NetView Project Publishing Guide**

This guide covers the creation and deployment of an AVEVA LFM NetView project from the point that the AVEVA LFM Server dataset (.lfd) is available up until, and including the point where the VHD is created.

- **HyperBubble and Solid Point Cloud Creation and Use Guide**

This guide covers everything related to the new HyperBubble feature including pre-requisites, publishing and use.

Note: These documents can be accessed by opening the file browser and browsing to the location where *AVEVA LFM Server* is installed. By default, they are available at the following location:

C:\Program Files\LFM Software\LFM\helpfiles

1.4 Technical Support

Online support and more information about *AVEVA LFM* should be requested through lfm.support@aveva.com.

To aid fault diagnosis, please include the following information when contacting AVEVA LFM Support:

- Urgency
- Full version number of *AVEVA LFM Server*
- Information about any CAD package being connected to (including full version number)
- AVEVA LFM Server log files. To obtain these, go to the **File > Home** tab and click the **Copy Log Files** button. This copies a series of 5 text files to the location of your choice. These will be called **1fmServerRunA.log** - **1fmServerRunE.log**. Please send all 5 files.

AVEVA LFM Upgrades

Upgrades can be downloaded from the AVEVA LFM Software website from [https://www.aveva.com/en/Services_and_Support/AVEVA Product Support/#LFM-Support](https://www.aveva.com/en/Services_and_Support/AVEVA_Product_Support/#LFM-Support).

1.5 Product and Training Information

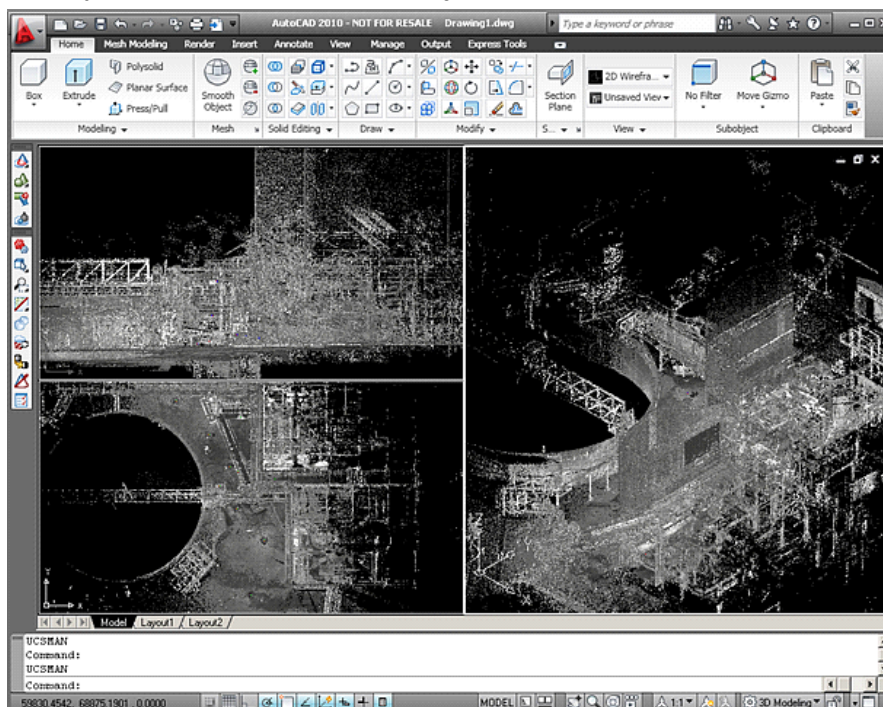
For general information and commercial enquiries, please contact lfm.info@aveva.com.

For information about product training courses, see the Product Training section of AVEVA's website (<http://www.aveva.com/training>), or contact the nearest AVEVA Regional Support Centre (<http://support.aveva.com/support>).

2 AutoCAD Link Overview

Data points can be viewed directly within AutoCAD. In operation, *AVEVA LFM Server* and AutoCAD work side by side. All of the existing *AVEVA LFM Server* functionality is still accessible, but at any time, by opening up AutoCAD, the user can view points through their familiar AutoCAD environment. *AVEVA LFM Server* works as a points server to AutoCAD providing new views dynamically as the user flies around.

After the AutoCAD Link is established, points visible within *AVEVA LFM Server* will also be displayed in each of the AutoCAD views. Each of the AutoCAD views can be zoomed and panned as normal. *AVEVA LFM Server* will detect each of these movements and place its own views to match. Normally, the low-density display will be shown initially, and any selected volumes at high density. The low-density display can be turned off to show just the selected volumes.



3 Starting the AutoCAD Link

This section provides details on AutoCAD licence feature, supported versions and setting up a communication link to *AVEVA LFM Server*.

3.1 Verifying Licence feature

Before you start the AutoCAD link, ensure that you have a licence to use this feature.

To check if you have a valid licence:

- Run *AVEVA LFM Server* and select **File > Licences**. AutoCAD will be listed under the **Licence feature name** section if a licence is available.

Licence feature name	Number of licences available when this session started
Modeller Microstation	20
Converter	20
ViewerLite	20
Viewer	20
Register Option	19
Gateway	18
Modeller	20
Register	20
Generator	20
Volume Export	20
Clash	20
Segmentation	20
LFM NetView Creator	20
Hot spot	5
PDS	20
Revit	20
AutoCAD	20
Microstation	20
LFM NetView Service	20
Navisworks	20
Walkinside	20
Smart Plant 3D	20
SPR	20
PDMS	20
Server	17

Note: If AutoCAD is not listed in the AVEVA LFM Server options then the AutoCAD link licence is not valid. For information regarding licence update, contact lfm.license@aveva.com.

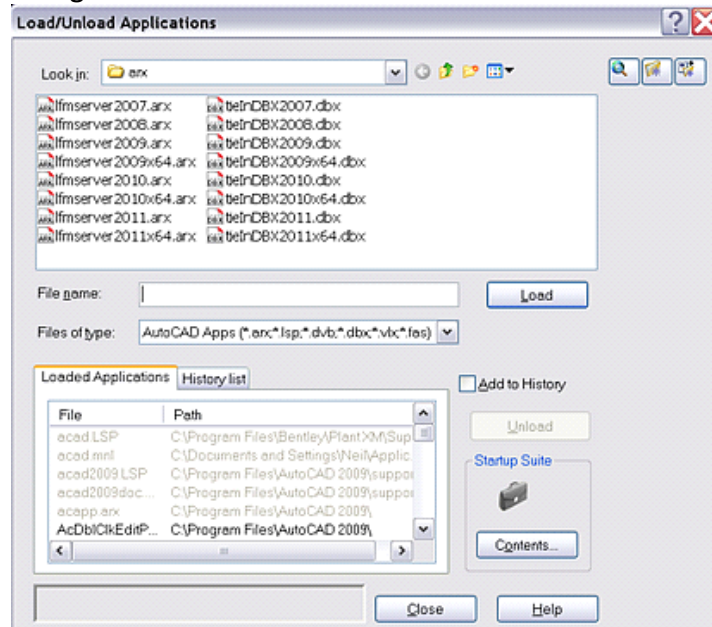
3.2 Supported versions

AutoCAD support exists for 2014-2020 (including x64 versions).

3.3 Loading the AVEVA LFM Server ARX

The ARX files are a part of the *AVEVA LFM* installation and are located at the following path:

\Program Files\LFM Software\LFM\arx



Note: Before you attempt to start the link, ensure that *AVEVA LFM Server* is running and a dataset is loaded.

To load the AVEVA LFM Server ARX:

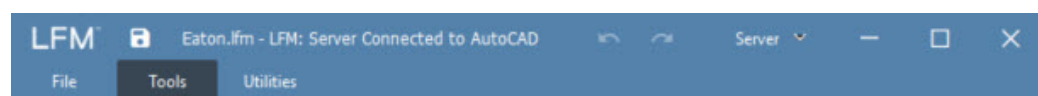
1. Within the AutoCAD command window, type **appload** to open the browser window.
2. Select the appropriate .arx file, for example, **lfmServer2017.arx for AutoCAD 2017**. After the arx application is loaded, the AVEVA LFM tool palette appears in the AutoCAD window.
3. To initiate communication between AutoCAD and *AVEVA LFM Server*, click the icon below:



The points are displayed in the relative viewpoints in AutoCAD in low density unless you select a pre-selected volume.

- Click the icon again to suspend the link until the function is re-selected.

To check if AutoCAD is connected to *AVEVA LFM Server*, refer to the AVEVA LFM Server header bar as demonstrated below:



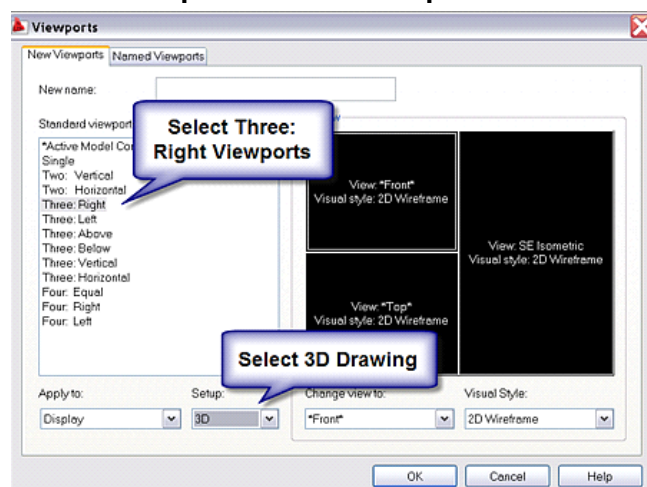
After the link starts, any screen updates will also have points overlaid, unless points display is turned off.

3.4 Recommended display settings

To allow optimal point cloud viewing and volume selection within the AutoCAD environment, it is recommended that the drawing viewports are set as shown below:

The AutoCAD menu bar options are as shown below:

View > Viewports > New Viewports > Three: Right (Setup - 3D).



The AVEVA LFM Server link to AutoCAD supports all available visual styles.

2D Wireframe has graphical limitations when working with laser point clouds, but can offer improved performance with user interactions (pan and zoom).

Note: This view style can only store the drawing depth (known as graphical 'Z' or 'depth' buffering) with respect to the point overlay within the session it was created. Subsequent use of a saved drawing with the laser survey may see an incorrect representation of the drawing relative to the point cloud.

All other visual viewport styles will display the Z depth of the drawing correctly at all times when overlaid with the point cloud, but graphical performance may be slightly impaired when using these modes.

4 Visual Palette

The visual palette shown below controls which points are displayed:



4.1 Initiate/suspend AutoCAD Link

This feature initiates communication between AutoCAD and *AVEVA LFM Server*, the points are displayed in the relative viewpoints in AutoCAD in low density unless a pre-selected volume has been chosen. Click the icon shown below again to suspend the link until the function is re-selected.



4.2 Select Volume

Selects a volume while increasing point density within that volume.

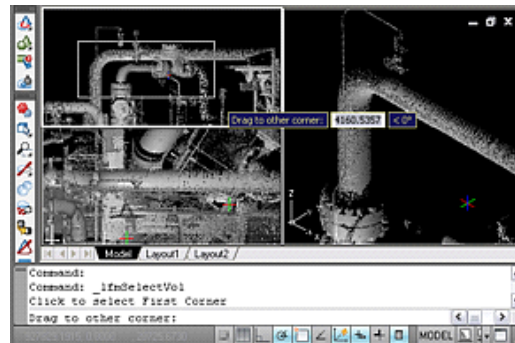
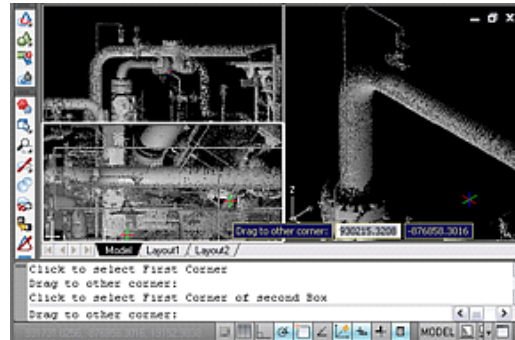


The box is shown dynamically in the isometric view. After the box is selected, *AVEVA LFM Server* will find all points within that volume and return them to the drawing. The following images show a volume being selected in two views:

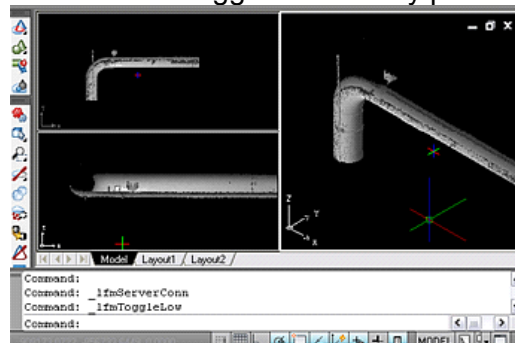
- Front view
- Top view

To select a volume, follow the steps below:

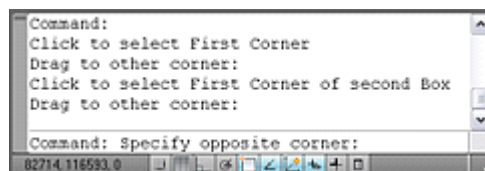
1. Click the **Select Volume** icon.
2. Click to select and drag a box in the front view.
3. Click to select and drag a box in the top view. Higher density point clouds of the selected volume are returned from AVEVA LFM Server.



4. You can now toggle low density points for greater clarity.



Note: Click into the window with the cursor to make active before attempting to make a selection.



The AutoCAD status window displays selection tips for greater clarity.

4.3 Cancel Selected Volume

To cancel the selected volume, click the highlighted option below.



4.4 Zoom to point

Select a point and the active view is zoomed and centred on the point selected.



4.5 Zoom to extents of points

This function is comparable to the **Fit View** function within AutoCAD. Click the highlighted button on the palette, then click in an AutoCAD window. The window selected should then zoom. The new extents will match the whole dataset if no volume is selected, otherwise it shows the extents of the selected volume. This function should be run at least once as it is used to decide the centre of the volume of the points displayable in AutoCAD. If this is not run, the rotation point in AVEVA LFM Server is used as the centre of this volume.



4.6 Toggle Display of Low Density points

To toggle the display of low density points:

1. Click the button shown below, and then refresh the display to switch off the display of the low-density points data.



2. Click the button again to switch on the display of low-density points.

4.7 Toggle Display of all points

To toggle the display of all points:

1. Click the button shown below, and then refresh the display to switch off the display of all points data.



2. Click the button again to switch on the display of points.

4.8 Toggle Solid Point Cloud

Use this feature to toggle Solid Point Cloud data. For more information, please refer to the [HyperBubble and Solid Point Cloud Creation and Use Guide](#).

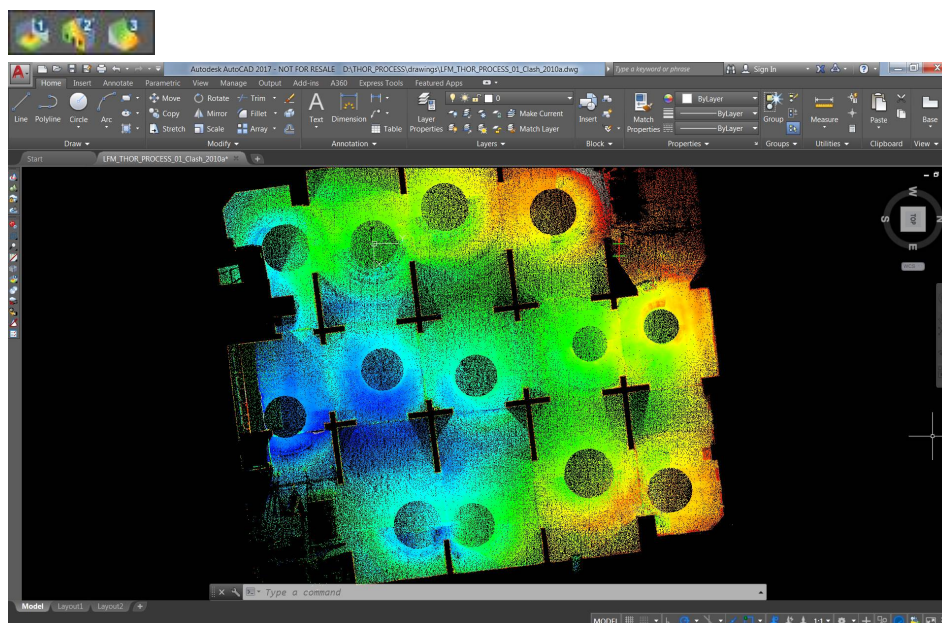
4.9 Planar Deviation Measurements

The AVEVA LFM Server/AutoCAD link has the ability to colour point cloud data by distance/depth to aid deformation visualisation and analysis. You may select one of the following planes within the point cloud data:

- Horizontal plane (1 pick)
- Vertical plane (2 picks)
- Free plane (3 picks)

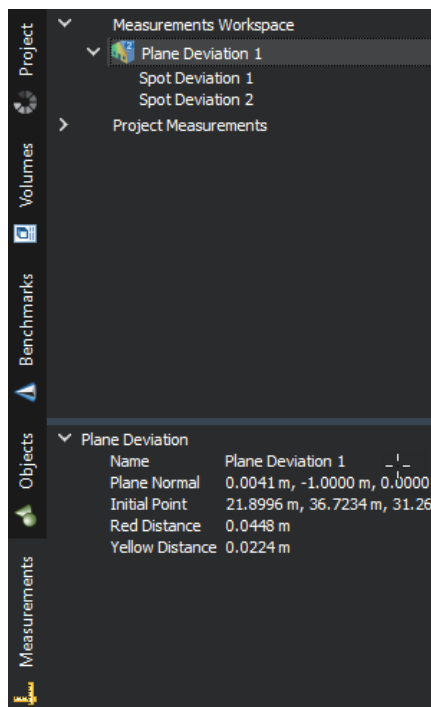
To measure a plane, follow the steps below:

1. Select the corresponding icon for the plane you wish to measure and then pick the relevant number of points within the AutoCAD 3D window. On the final pick, a blue grid is displayed which tracks the mouse cursor, this gives a preview of the plane that is selected should you pick that point.



2. For example, to measure the deviation of a wall, select the Vertical icon and click on 2 points on the wall to be measured. An initial deviation measurement is displayed.
3. At this point, you may roll the mouse wheel to increase or decrease the depth of the plane. When you are happy with the deviation measurement, click to complete the measurement.

4. You can then save this to the AVEVA LFM Server project by going into the AVEVA LFM Server interface and dragging the Plane Deviation measurement from the Measurements Workspace to the Project Measurements area within the Measurements tab.



Note: If you want to cancel the deviation measurement, right-click or press the **Esc** key.

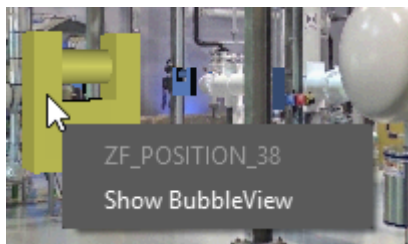
4.10 Pick Point to Show in BubbleView

Displays the scan intensity BubbleView of a picked point in the AutoCAD environment. The BubbleView enables the designer to place themselves at any scan location and to perform a virtual fly-through in the laser scan. Real time zooming and panning gives the user the sensation of actually flying around the scanned environment. Coordinate extraction and measurement functionality is then available to the user. A position marker will be displayed in the BubbleView to highlight the point of interest.



Note: Because the Dataset is compiled from potentially hundreds of separate scans, the BubbleView displayed is from the original scan of a selected point, which may not be the most appropriate viewpoint.

You can refine this by re-selecting the function, and picking in another area of the point cloud.



Alternatively, other scan sites that are close by are visible in the BubbleView as 3D scanner icons. To load the BubbleView for that scan, right-click the scan icon and click **Show BubbleView**.

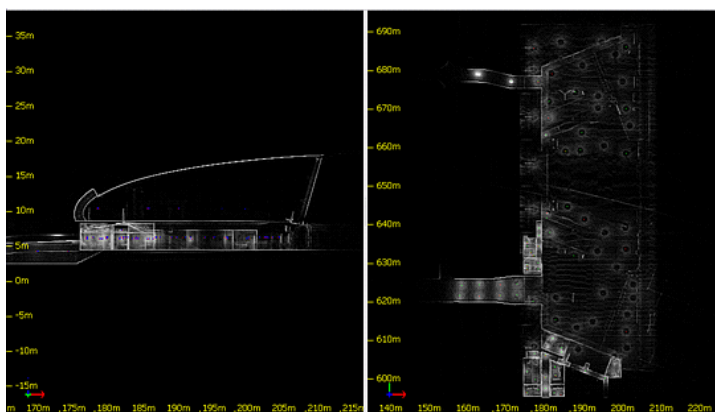
4.11 Cloud Selection

After an aligned volume has been selected in an AutoCAD window, this feature enables the user to further refine the volume by omitting points that are of no interest. Select the area of interest with the left mouse button, and closing the fence with the right mouse button. If the user closes or selects a point outside the current viewport, this function resets.



4.12 Toggle Edge Mode

This mode is ideal for visualising the edges of features, such as walls and pavements, in laser scanned data.



4.13 Options

These options may be adjusted to suit the project. Default values are recommended for typical applications.

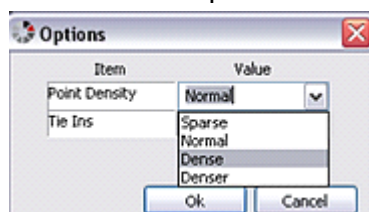


Options include the following:

- Point Density Options
- Tie-in(s) Display

Point Density Options

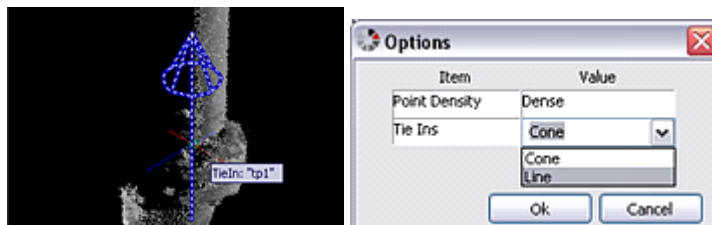
This varies the point cloud density displayed on the screen after volume selection.



Note: Very dense points may affect performance.

Tie-in(s) Display

Set this as appropriate for displaying tie-ins in the CAD drawing. Selecting the Line option displays a centreline with a “flick” at each end to indicate the radius.



5 Clash Palette

The clash palette shown below controls clash functionality, pipe fitting and CAD object and tie-in display.



5.1 Clash Detection

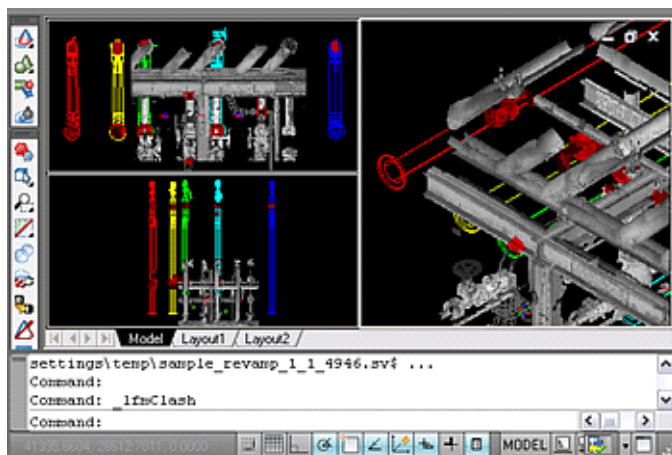
Clash Detection is a powerful tool for the designer. It allows entire AutoCAD design files to be clashed against the point cloud data in *AVEVA LFM Server*. The result of this Clash Detection process is a detailed and structured report which lists each interference. By clicking on each result in the list, *AVEVA LFM Server* shows the specific object interfering with the point cloud data. Clash Detection functions in both AutoCAD, MEP, CADWorx and AutoPlant environments. It is also fully compatible with design files which contain XREFs.



AVEVA LFM Clash Evaluation Overview

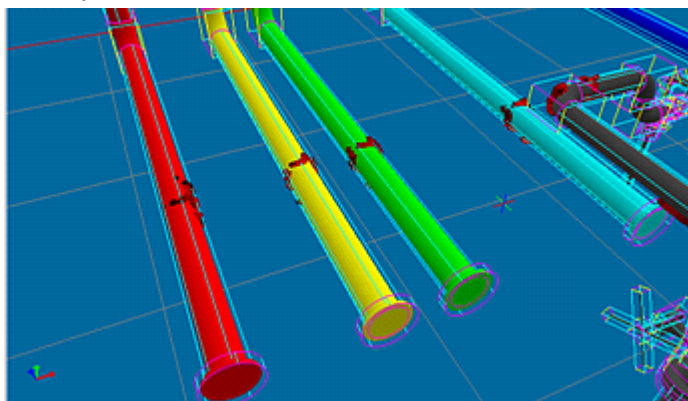
When the Clash button is pressed in AutoCAD, *AVEVA LFM Server* receives the entire design file from AutoCAD. Bounding boxes relating to each of the modelled elements are sent across the link into the AVEVA LFM Server environment. These are then analysed for collisions within the Dataset.

The design is copied into *AVEVA LFM Server*, and clashes are visually highlighted for the operator to review. Clashes can be assessed in turn and actioned, and then removed from the Clash Display Table. Clashes can be reviewed in the 3D point cloud, or in the BubbleView. If a collision occurs with a redundant object in the measured point cloud, *AVEVA LFM Server* can remove areas of the point cloud that have changed after the survey was completed.



Clash Detection should then be rerun and applied to existing conditions.

Points which clash with the design drawings are coloured red in the AutoCAD display, as shown below:

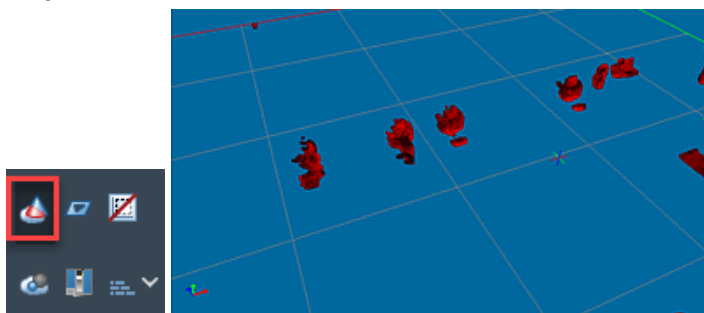


AVEVA LFM Server also displays clash points in red.

The CAD objects are displayed, in addition to the object clash bounding boxes. Clashes can be manually reviewed by looking at imported AutoCAD CAD objects which are fully rendered.

The illustration shows the clash in *AVEVA LFM Server* displaying clashes between points and AutoCAD primitives in RED.

The operator may turn off the clashed objects for clarity by toggling the **CAD Objects** button on the Visualisation menu in *AVEVA LFM Server*.



Clash shown in *AVEVA LFM Server* displaying clashes between points and AutoCAD primitives in RED.

Clash Detection in AutoCAD - Workflow

This allows AutoCAD design files to be compared to the measured point clouds in *AVEVA LFM Server*. There are two options under this icon in the AutoCAD clash palette, which include:

- Clash whole Dataset
- Clash only selected volume.

Both these options can be used in conjunction with the Quick Clash function.

To access the clash options:

1. Click and hold over the icon, then drag and release over the desired selection in the sub-menu which is opened.



Running a Full Dataset Clash Check

This works by passing each of the modelled CAD elements across the link to the AVEVA LFM Server environment. These are then analysed for collisions within the Dataset. The design is copied in *AVEVA LFM Server*, and clashes are visually highlighted for the operator to review. Clashes can be assessed in turn and actioned, and then removed from the Clash Display Table. Clashes can be reviewed in the 3D point cloud, or in the BubbleView.

If a collision occurs with a redundant object in the measured point cloud, *AVEVA LFM Server* can remove areas of a point cloud that have changed after the survey was completed. Clash Detection should then be rerun and applied to existing conditions.



Running a Reduced Volume Clash Check

This option will only clash the AutoCAD drawing against the volume selected, allowing smaller areas of interest to be clashed individually for added clarity.



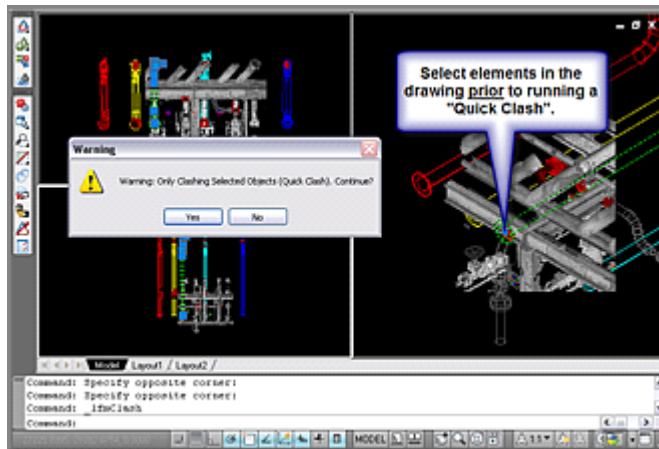
Note:

- The volume must be selected before the clash is started.
- Reduced volume clash check performs a tentative check which is stored in a separate database and is not saved for future examination.
- Existing clashes will not be displayed with the Reduced Volume clash results.

Quick Clash Evaluation

Ensuring that each proposed new element of a brownfield re-design is quickly found to be clash free against the entire laser scan data set is of critical importance. Conversely, once a clash is located against a proposed design object, designers need to know exactly where the clashes would be located against the laser scan data. Swift action then needs to be taken to resolve this.

For a rapid tentative clash check, use the AutoCAD element selection tool to select object(s) to clash check against the point cloud, and then click the **Clash Detection** icon.



Run the clash check.



When the clash check procedure is initiated, *AVEVA LFM* will first check to see if any elements of the drawing are selected.

If *AVEVA LFM* detects any selected items, the user will be prompted to accept the clash check relates to the selection only - or all the drawing.

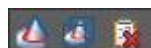
Note:

- Quick Clash check performs a tentative check which is stored in a separate database and is not saved for future examination.
- Existing clashes will not be displayed with the Quick Clash results.
- Object clash, or volumetric clash analysis is possible with this feature.
- Results of quick clashes are not added to the clash text file or database.

Clearing the Clash List

To clear the clash list in the AVEVA LFM Server Clash Manager:

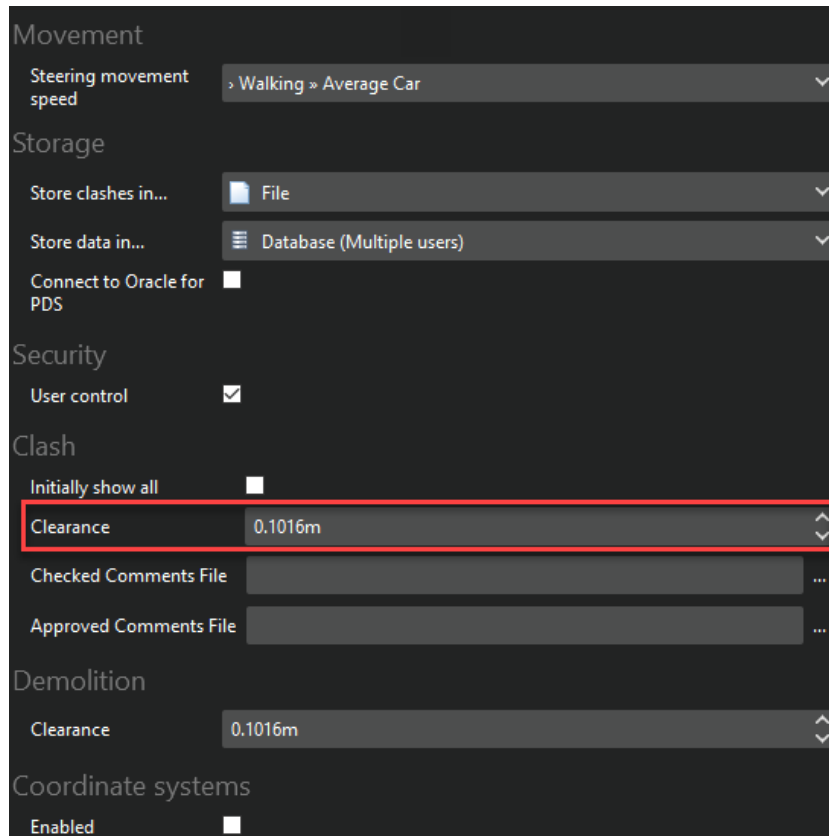
1. Expand the clashing sub-menu by clicking and holding the left mouse button.



2. Move over the **Clear Clash List** button and release the left mouse button. A confirmation dialog appears asking you if you wish to proceed.
3. Click **Yes** to clear the clash manager within *AVEVA LFM Server*.

5.2 Options - Clash Clearance

The default clash clearance can be adjusted to suit the project needs as shown below:



The screenshot shows the 'Options' dialog box with the 'Clash' section selected. The 'Clearance' value is set to 0.1016m. The 'Initially show all' checkbox is unchecked. The 'Checked Comments File' and 'Approved Comments File' fields are empty. The 'Demolition' section shows a 'Clearance' value of 0.1016m. The 'Coordinate systems' section shows the 'Enabled' checkbox unchecked.

5.3 Reviewing a clash report

The clash report indicates the drawings that have been checked against the point cloud, and if the drawing is clash free. The parent group is displayed as a pass or a fail in the listing, and is highlighted as a green tick or a red cross. The group checked could be a drawing or a layer.

Clash shown adjacent in AVEVA LFM Server 3D. All clashes between points and CAD primitives are displayed in RED.

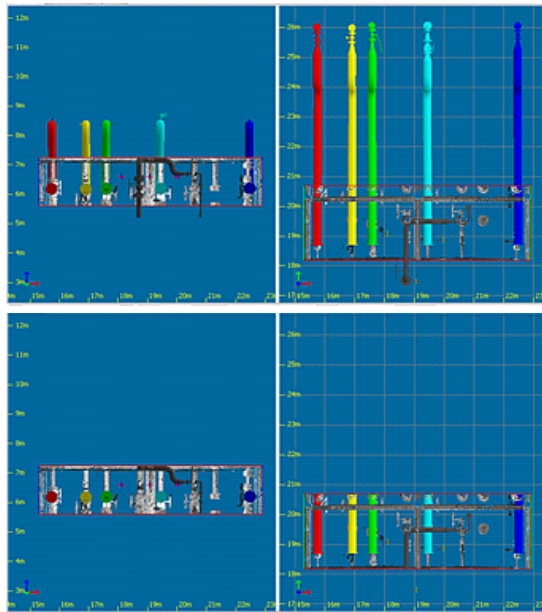
For detailed information about interpreting and customising these reports for project work, refer to the [AVEVA LFM Server Home Guide - Show Clash Manager](#).

Any 3D solid object in an active AutoCAD model will be displayed in *AVEVA LFM Server*. This enables visual clash detection or point cloud versus model reviews in the AVEVA LFM Server environment. The objects can also be viewed in the BubbleView for greater clarity.

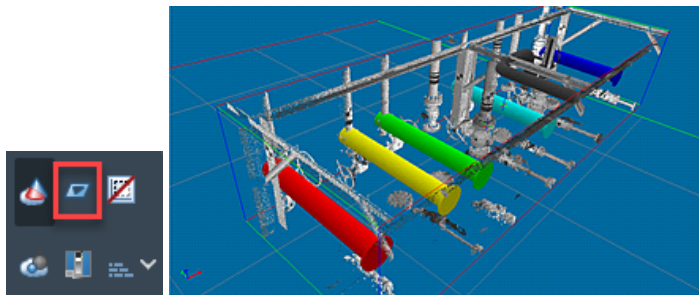


If the CAD drawing is large it can be difficult to review the displayed points around a relevant area. The working zone can be displayed in isolation to aid clarity, based on the dimensions of the current selected volume on the screen.

The following image shows a sample volume with the full CAD drawing displayed.

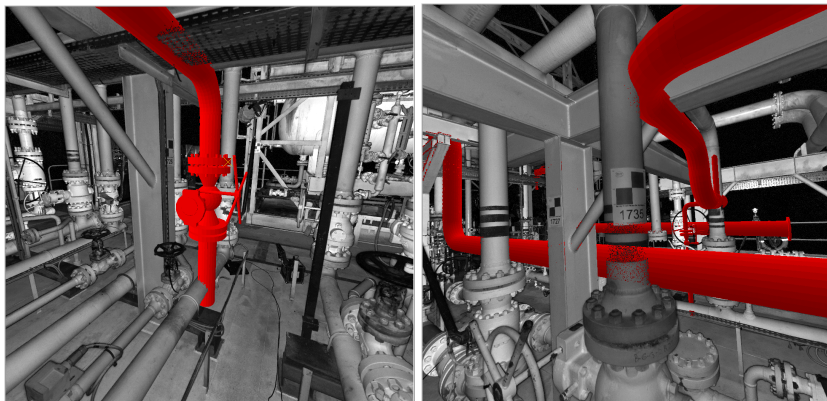


Selecting **Clip** on the Visualisation menu will then mask any part of the drawing outside the volume of interest. This can be reset by clicking the **Clip** button again, which shows all the drawings in addition to the displayed points. Toggle **CAD Objects** to turn off the CAD objects.



Note: Clip display works in Perspective and Orthographic views.

This will also display the AutoCAD drawing objects inside the BubbleView window. This function should be applied after a suitable BubbleView is selected. This is particularly useful for gauging free space in congested areas, and should complement 3D point cloud evaluation. This may take a small amount of time to process, depending on how many objects are passed to the BubbleView.



After the appropriate BubbleView has been loaded, show the objects in the BubbleView by clicking the **Objects** button as shown below:

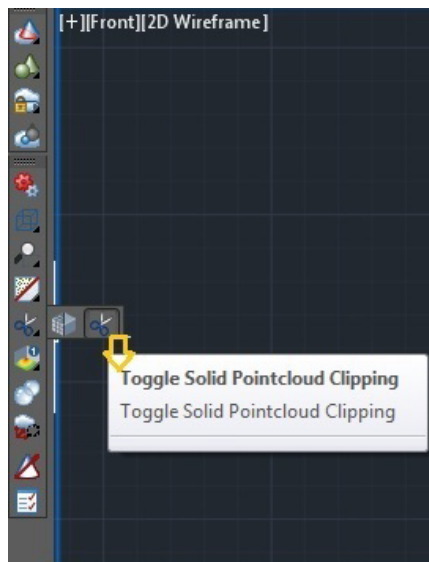


Selecting **All Objects** shows all objects. Selecting **Dynamic Objects** shows an object when the mouse is hovered over it. Selecting **None** does not display any objects.

5.6 Toggle Solid Point Cloud Clipping

To clip a Solid Point Cloud image in the AutoCAD interface:

1. Click **Volumes** on the tool palette, and on the *Volume Settings* dialog enable **Clip**. This overrides the clipping done on the AVEVA LFM Server interface.
2. To view only the clipped portion of the image, click **Toggle Solid Point Cloud Clipping**.



5.7 Find Objects

This will centre the last CAD object passed to *AVEVA LFM Server* on the screen. This enables rapid navigation in the AVEVA LFM Server environment based upon the CAD design.

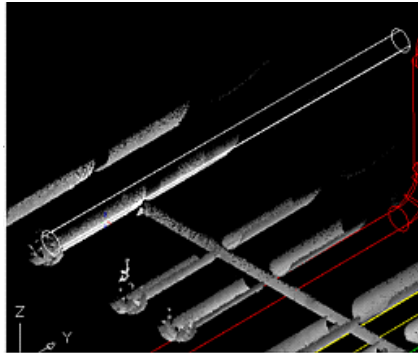


5.8 Fit Pipe

Uses a Segmentation algorithm to fit a pipe-to-point data in AutoCAD.

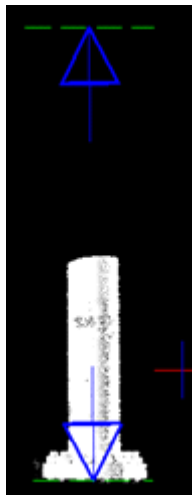


Select any point associated with a pipe point cloud. The result is a best fit 3D solid model.



5.9 Import Tie-ins

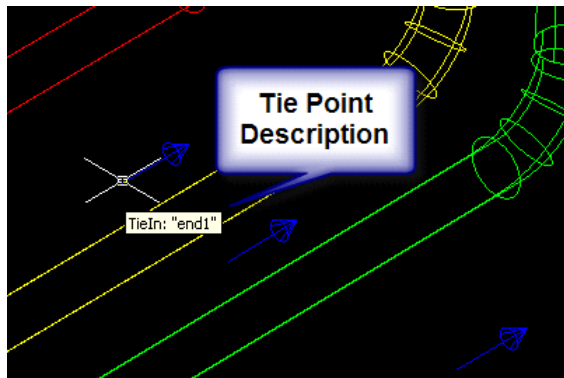
This is used to import plant tie-in points from *AVEVA LFM Server*.



The user will be prompted with the tie point description when the cursor is placed near the base of the tie point. This functionality is linked to the relevant AVEVA LFM Server connection application [for example, `1fmserver2013.arx`].

If you want to view these descriptions when not connected to *AVEVA LFM Server*, you must load the application **TieIn20XX.dbx** which is stored in the same directory as the Server AutoCAD arx files. [C:\Program Files\LFM Software\LFM\arx].

The following image displays the tie point description on the interface:



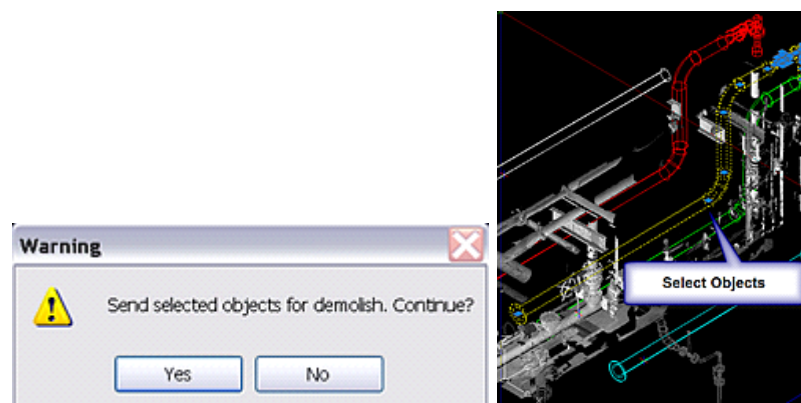
5.10 Demolish points about objects

To demolish points about objects:

1. Select an element in the AutoCAD display, then select the icon shown below to create a volume in *AVEVA LFM Server* and to allow precise demolition based on the object volume.

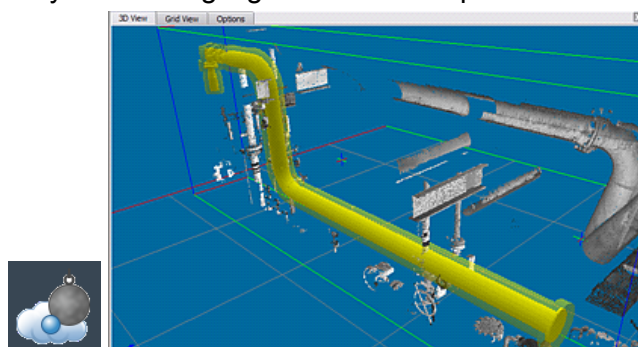


The dialogue window shown below gives the user the option to confirm that the selected elements represent the desired volume.



2. Click **Yes** to pass the selection over to *AVEVA LFM Server*.

3. Within AVEVA LFM Server, click the **Demolition Objects** button on the **Visualisation** menu bar to display the demolition objects. The selected objects are displayed within a translucent overlay which represents the selected demolition clearance. This may be altered through the main AVEVA LFM Server options window. Points which are within this volume may then be highlighted or hidden prior to demolition.



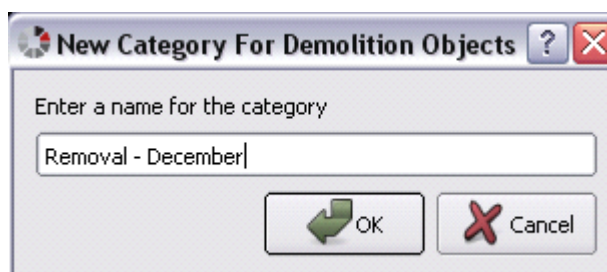
Add to Volume List

To add to the volume list:

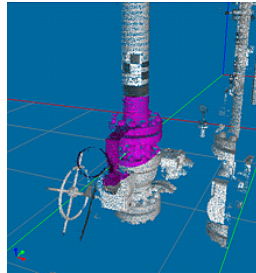
1. After the CAD objects have been passed across for demolition, select the icon shown below to add to the Volume Manager. All Volume Manager functionalities may then be applied to these volumes.



2. Type in a category name to receive the volume.



3. The volume is displayed in the Volumes Manager, and can then be demolished or used as described in the [AVEVA LFM Server Home Guide](#).



Highlight Tentative Demolition

To highlight tentative demolition:

1. Select a volume around the points to be highlighted.
2. Right-click on the category within the Volume Manager and select **Identify Volumes** to highlight the points within the category in pink.

Tentative Demolition

To apply tentative demolition:

1. Select a volume around the points to be highlighted.
2. Right-click on the category within the Volume Manager and select **Tentative Demolition** to give an accurate preview of the post-demolition state.
3. Click the **Demolition Objects** button to toggle the object bounding boxes on and off for a clear view of the point cloud data.

6 Useful Commands

This section covers some of the commands that a user can perform in the AutoCAD interface.

6.1 Snapping to Scanned Data Points

Snapping to 3D points is useful for constructing primitives in AutoCAD.

To snap to scanned data points:

1. First activate the appropriate AutoCAD window by clicking in it. Snapping to a point is achieved by first pressing and holding down the **Ctrl** key and simultaneously moving the mouse over the desired 3D point. When the point is within snapping range, a small blue circle appears.
2. The snapping process is completed by then clicking the left mouse button. As long as the **Ctrl** key is held down, snapping will continue and in this way, multiple points can be snapped to.



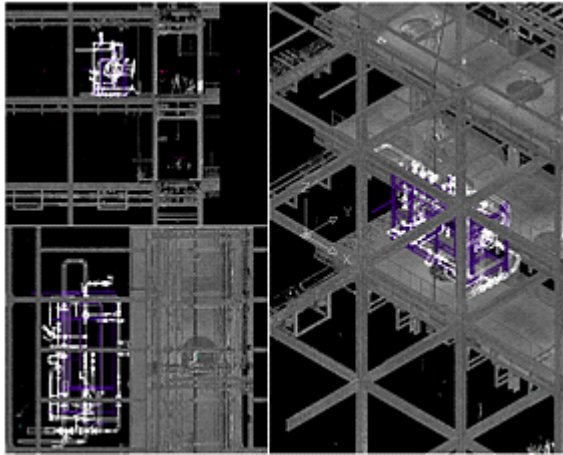
All AutoCAD drawing commands may be used with scanned data points by using the snap-to-point facility.

6.2 Plotting from AutoCAD

This feature enables the user to print out plots that have the scanned data and the models correctly merged. This can be especially useful for discussions away from the normal computing environment or for displaying it to the clients.

Plotting takes place from the active window in AutoCAD. For this reason, it is recommended that only one window is displayed and that it covers the full screen. After the correct view is established, it is a matter of typing the plot in the command window. Execution of this command may take around 10 minutes to complete. After it is done, the view can be plotted as normal.

After this view is finished with, type **LFMremoveplot** to erase the data. More plots can then be created as required.



6.3 Create Extents

The **createext** command creates a bounding box around the extents of the scanned data points. This command is normally needed when an AutoCAD file, without any extents defined, is being connected to a Dataset. This ensures that the zoom extents command functions correctly and that the clipping planes are set correctly in AutoCAD.



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