Ordnance Survey®

Land-Form PANORAMA®

User guide and technical specification

Land-Form PANORAMA

User guide

Contents

v5.1 – 12/2010

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Preface

This user guide (hereafter referred to as the guide) is designed to provide an overview of Land-Form PANORAMA (hereafter referred to as the product) and it gives guidelines and advice on how a customer might derive the maximum benefit from the product. It assumes a general knowledge of geographic information. If you find an error or omission in this guide, or otherwise wish to make a comment or suggestion as to how we can improve the guide, please contact us at the address shown below under contact details or complete the product and service performance report form at annexe A and return it to us.

Contact details

Our Customer Service Centre will be pleased to deal with your enquiries:

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If you are unfamiliar with any words or terms used and require clarification please refer to the glossary at the end of the document.

Chapter 1 Introduction

Using this guide

This user guide is an introduction to Land-Form PANORAMA® which offers guidance and advice on how to deliver the maximum value from the product. The technical specification provides specific details of the structure, content and formats of Land-Form PANORAMA for customers using the data in a geographical information system (GIS) or other systems. The technical specification should be used in conjunction with the user guide.

This chapter provides an introduction to Land-Form PANORAMA and illustrates potential applications. Chapter 2 contains more detailed information about the data. These chapters are designed to enable users to make effective use of Land-Form PANORAMA and contain all the information you will need. Please refer to the glossary at annexe A of the technical specification if you are unfamiliar with any of the terms used.

All aspects of Land-Form PANORAMA discussed in this user guide relate to Land-Form PANORAMA in both BS 7567 (NTF v2.0) and DXF™ (AutoCAD® release 12) formats. If the two format versions differ in their treatment of a particular aspect, the specific differences will be stated. Icons, as shown below, will be used to denote these differences.

For convenience BS 7567 (NTF v2.0 Level 1) is referred to as NTF1 and BS 7567 (NTF v2.0 Level 5) is referred to as NTF5 in this user guide.

Data Exchange Format (DXF) is referred to as DXF in this user guide. DXF AutoCAD release 12 compatible data complies with Layer Naming Convention for CAD in the Construction Industry Version 2, which is based upon the guidelines laid down in BS 1192: Part 5.

An additional format of ASCII grid has been released via OS OpenData™ and is explained in chapter 1 of the technical specification.

Land-Form – an introduction

Land-Form is the generic name given to all Ordnance Survey digital height products. These consist of:

Land-Form PANORAMA, which is dealt with in this user guide.

Land-Form PROFILE®, which is dealt with in the *Land-Form PROFILE user guide*.

Land-Form PROFILE Plus, which is dealt with in the *Land-Form PROFILE Plus technical specification*.

OS OpenData

On 1 April 2010 Land-Form PANORAMA was made available as part of OS OpenData as contours in DXF format. On 1 May 2010 the DTM was also released as NTF and ASCII grid formats.

Prior to OS OpenData release, Land-Form Panorama was available as a licensed product and formats included contours in BS 7567 (NTF v2.0) Level 1 (see technical specification chapter 3), or DTMs in DXF AutoCAD release 12 compatible (see technical specification chapter 5).

These formats are no longer supplied but this user guide and technical specification includes all formats in order to support new and existing users. Please refer to Supply options in this user guide.

Land-Form PANORAMA features

Ordnance Survey's Land-Form PROFILE data is a dataset representing the physical shape of the real world.

The data is available to customers as:

- Land-Form PANORAMA contour tiles, which includes contours, spot heights, breakline, coastline, lakes, and ridge and form lines.
- Land-Form PANORAMA digital terrain model (DTM) tiles – a 50 m grid of heighted points derived from the contour product.

All tile sizes are 20 km by 20 km.

Land-Form PANORAMA benefits

Contours

National coverage.

Fully edgematched.

Vector format at 10 m vertical intervals.

Spot heights are to the nearest metre.

Contour accuracy is typically better than 3 m (root mean square error (RMSE)).

Coded features give each feature a specific category.

DTM

National coverage.

Fully edgematched.

Height values at each intersection of a regular 50 m horizontal grid.

Land-Form PANORAMA applications

Land-Form PANORAMA can be used in a variety of applications, in many cases in conjunction with other Ordnance Survey digital products, for analytical, modelling, planning and visual purposes.

- terrain analysis;
- drainage analysis;
- visual impact studies; and
- radio wave propagation.

What you need to use Land-Form PANORAMA

Hardware requirements will vary depending on the data volumes users wish to access.

Average tile sizes are as follows:

Contours

NTF1	2.0 Mb
DXF	5.7 Mb

DTMs

NTF5	0.72 Mb
DXF	13.5 Mb
ASCII grid	0.67 Mb

Users wishing to access large amounts of data will require large storage and processing capacities running on a workstation platform, while modern personal computer (PC) based applications will be sufficient for users only needing to use small amounts. Your system supplier will be able to advise on your requirements.

Software

Land-Form PANORAMA is inert data and does not include software for data viewing or manipulation. To fully exploit its potential it is necessary to have appropriate application software. There are many proprietary systems available from GIS, computer-aided design (CAD) and digital mapping licensed system suppliers whose software can import Land-Form PANORAMA in either ASCII grid NTF or DXF.

Land-Form PANORAMA supply options

The following formats have been selected for release under OS OpenData.

Transfer formats

Land-Form PANORAMA contours are available in:

- DXF AutoCAD release 12 compatible (see technical specification chapter 5).

Land-Form PANORAMA DTMs are available in:

- BS 7567 (NTF v2.0) Level 5 (see technical specification chapter 3); or
- ASCII grid (see technical specification chapter 1). ASCII grid is a generic, text-based DTM format which was originally developed by ESRI Inc. It is sometimes referred to as ArcInfo ASCII grid, ArcGrid ASCII format.

Media

OS OpenData supplies a single, national coverage for Land-Form PANORAMA which contains all available formats of contours and DTM for the customer to select the coverage and format best suited to their application.

Land-Form PANORAMA supply unit

Land-Form PANORAMA is supplied in tiles. Each covers an area of 20 km by 20 km. There are 812 tiles in the series.

Update options

Land-Form PANORAMA is a frozen dataset and is not updated.

Land-Form PANORAMA output options

Land-Form PANORAMA is inert data. It requires software (not provided by Ordnance Survey) to display it on a screen, manipulate it or plot it out as hard copy.

Chapter 2 Land-Form PANORAMA explained

Data overview

Basic principles

Land-Form PANORAMA contours were created from height elements depicted in the Landranger® 1:50 000 scale map series. These were originally generated from stereo aerial photography which was flown during the 1970s.

Land-Form PANORAMA DTMs consist of height values at each intersection of a 50-m horizontal grid. The values have been mathematically interpolated from the contours on the Landranger maps.

Contours

Contours are shown at a vertical interval of 10 m.

All contours consist of one continuous feature across a tile except that:

- in areas of steep slope some contours will be omitted – this is where some contours were omitted from the graphic product for cartographic purposes;
- where coincident with man-made features, contours may be broken (in general, contours were not shown on 1:50 000 scale mapping where they coincided with published man-made slopes); and
- contours are not shown in active quarries, gravel pits, spoil heaps or opencast mines.

Spot heights

These are heighted points captured by ground survey methods, and are normally positioned along the centre of roads.

Breakline

A line indicating discontinuity in a terrain surface, that is, an abrupt change in gradient.

Formline

A supplementary contour not corresponding to the normal contour vertical interval and estimated from surrounding contours; used in areas where there is insufficient height information to control the creation of DTMs. Formlines do not feature in all contour tiles.

Land-Form PANORAMA data structure

Each point or line feature itself consists of two data categories – geometric data and attribute data. Geometric data defines a feature's position in terms of National Grid coordinates and height, and attribute data defines its descriptive characteristics.

Attribute data

An attribute is the descriptive characteristic of a feature that is a non-spatial element. The geometry of the points and lines within the data would be meaningless unless they are assigned some distinguishing property. In Ordnance Survey map data terms, an attribute can be a feature code (in NTF1 these are numeric codes) or a distinctive name or number.

Feature position

The geometry of map features is identified in terms of coordinates. All coordinates used in Land-Form PANORAMA are based on the National Grid coordinate referencing system. Despite this, Land-Form PANORAMA can be no more accurate than its source, primarily 1:50 000 scale published mapping.

Feature codes

The point and line records contain feature codes describing the feature depicted. The values of these codes and their description are:

Feature code	Description
0200	Spotheight
0201	Contours
0202	Lake
0203	Breakline
0204	Coastline
0205	Ridgeline
0207	Formline

Feature serial number (FSN)

Each feature is given an FSN, which is unique within a tile.

Edgematch

All contour tiles are edgematched. Where a contour ends by intersecting the tile edge, it is matched with the corresponding contour on the adjoining tile, so that both contours:

- end on the same unique coordinate;
- have the same feature code;
- have the same height attribute; and
- have the same direction.

Coast lines may have been surveyed at different times on adjacent sheets and for this reason have been edgematched for planimetric position but not for height.

Update of Land-Form PANORAMA information

Land-Form PANORAMA is a frozen dataset and is not updated.

Land-Form PANORAMA data source

Digital contours

Land-Form PANORAMA contours are a digital representation of the graphic contours used to produce Ordnance Survey Landranger maps. Additional spot heights, and ridgelines and formlines were added to facilitate the creation of the DTMs; these additional features are included in the contour product, not necessarily on every tile.

Contours are in vector format and are at 10 m elevation intervals.

Spot heights are to the nearest metre.

Formlines are inserted into the digital contour data where there is insufficient height information to control creation of the complementary DTM product. These formlines are interpolated from the surrounding contours. Formlines do not appear on all contour tiles.

The accuracy of digital contours is typically better than 3 m (RMSE).

DTM data

A DTM consists of height values at each intersection of a 50-m horizontal grid – the values have been mathematically interpolated from the contours on the Landranger maps.

Variations in DTM accuracy are to be expected depending upon the nature of the ground. DTM height accuracy is typically better than one half of the vertical interval of the source contour data.

The data has been captured in 20 km by 20 km tiles and is available for the whole country.

DTMs

Accuracy

The process of creating DTMs utilises all the height information contained in the contour file to generate the height of each of the points in the DTM. The results achieved will depend upon the density of height data contained in the contour file and on the nature of the terrain.

In some flat areas, where there is little height information, contours and spot heights may be a great distance apart; this can cause irregularities in the DTM, which appear as slight terracing of the terrain.

Data overview

The DTM tiles in both NTF and DXF consist of a series of heighted points arranged on a 50-m grid.

The points themselves do not hold any horizontal coordinate information – their position being implied by the order in which they are held. The format of the grid is included in the map header and conforms to the following pattern: the first point is positioned on the south-west corner of the tile, with further points at 50-m intervals northwards to the northern edge of the tile; the next point will be on the south edge 50 m east of the origin, again progressing in 50-m intervals to the north edge.

The first point is positioned on the south-west corner of the tile, with further points at 50-m intervals northwards to the northern edge of the tile, creating a column of 401 points. The next column will start on the southern edge of the tile 50 m east of the origin, again progressing in 50-m intervals to the north edge of the tile.

BS 7567 NTF

The first point is positioned on the south-west corner of the tile, with further points at 50 m intervals northwards to the northern edge of the tile, creating a column of 401 points. The next column will start on the southern edge of the tile 50 m east of the origin, again progressing in 50-m intervals to the north edge of the tile.

DXF

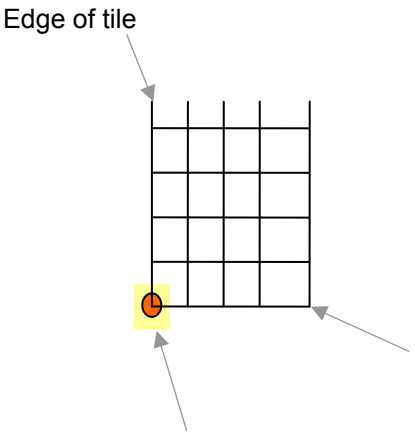
For both data formats this pattern is repeated until the final point, which falls on the north-east corner of the tile. Therefore there are a total of 160 801 points on each tile.

Note that DTMs are no longer supplied in DXF format.

Pixel centred height values in ASCII grid

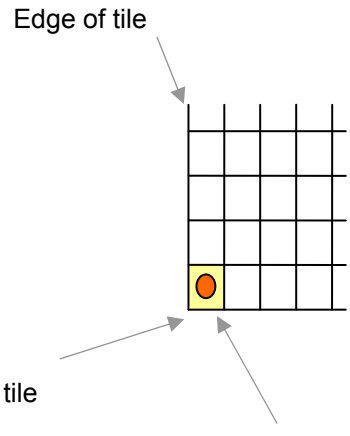
Height values in Land-Form PANORAMA DTMs have been reinterpolated at the centre of the pixel. This method of creating the data means there are no overlaps between adjoining tiles in ASCII grid format.

Land-Form PANORAMA height placing in NTF and DXF



Height value at post spacing and on the intersection of rows and columns

Land-Form PANORAMA height placing in ASCII grid



Height value at centre of pixel

The tile origin remains at the south-west corner; the true origin of the grid is half the grid interval in from the tile corner. The false origin has not been used. Coordinate reference systems for DTMs which may be used to calculate the DTM origin and coordinates of individual posts.

Chapter 3 Land-Form PANORAMA quality statement

Completeness

Completeness is a measure of the correspondence between the real world and the specified data content.

The Land-Form PANORAMA product contains the height elements (contours, spot heights) as they appeared on published 1:50 000 scale mapping at the time of creation.

Where contours are broken on the maps, for example, at embankments and cuttings or within active quarries, they are also broken in the data. Contours may also be broken at very steep slopes, where they would merge when depicted at 1:50 000 scale on the printed map.

Gaps for contour labels, which occur on paper maps, do not appear in Land-Form PANORAMA – these gaps are always closed in the data.

Currency

Currency identifies when Land-Form PANORAMA was created. The contours were originally generated from stereo aerial photography which was flown during the 1970s.

Land-Form PANORAMA is a frozen dataset and is not updated.

Geometric connectivity

Connectivity is the measure of how well feature representations relate to each other spatially and in comparison to the real world. Due to their nature, no two contours should ever intersect – contours cannot represent vertical cliffs or overhangs. This rule is enforced in the data, which will contain no contour intersection. Where contours cross high water at a steep angle that could be interpreted as a cliff, they are truncated at the high water. This means an intersection between a contour and a coastline can exist.

Contours or coastlines that cross the edge of a data tile have common coordinates at the point of intersection with the tile edge. In addition to the plan coordinates, the feature code and contour height values are also matched across tile boundaries.

Attribute accuracy

Attribute accuracy measures the correct interpretation and representation of the metadata elements within the data structures, that is, the correct value of an attribute has been recorded. For example, attribute accuracy will identify that all contours have feature code 0201 and that no other features have been incorrectly recorded as that feature code. The verification of attribute accuracy forms part of the quality checking procedures carried out on Land-Form PANORAMA data.

Logical consistency

The logical consistency of Land-Form PANORAMA is a measure of how well the files supplied to customers match the specification laid down for the files, regardless of content. This covers the logic within the data and the syntax of the files supplied.

All Land-Form PANORAMA data is validated to ensure that it conforms to the specification in terms of syntax, integrity and feature code range.

All Land-Form PANORAMA data undergoes stringent testing by software to ensure that the syntax of the files supplied conforms to the standard defined for the format. Customers must ensure that the software they use conforms to the same standard.

Media

Land-Form PANORAMA is supplied on media in predefined formats, for which two different measures of quality are used:

- tests on the logical consistency of the data; and
- integrity of the supply media.

The media are new and from recognised, branded sources. Error rates have been found to be very low and the media are checked to ensure that they are free from any known viruses.

Absolute accuracy

Absolute accuracy is a measure that indicates how closely the coordinates, in a particular reference system, of a point in the data agree with the real coordinates of the same point on the ground.

The planimetric coordinates of Land-Form PANORAMA data are in the National Grid coordinate reference system, which is defined by the OSGB36® triangulation. The heights are normally related to mean sea level at Newlyn. Any comparison between Land-Form PANORAMA and coordinates given by the Global Positioning System (GPS), which are in the WGS84 system, must take into account the differences between the two reference systems.

Although contours do not exist as visible features on the ground, the plan position of points along a contour can be extracted from the map (or the data) and heights can be determined at these points using high-accuracy surveying techniques.

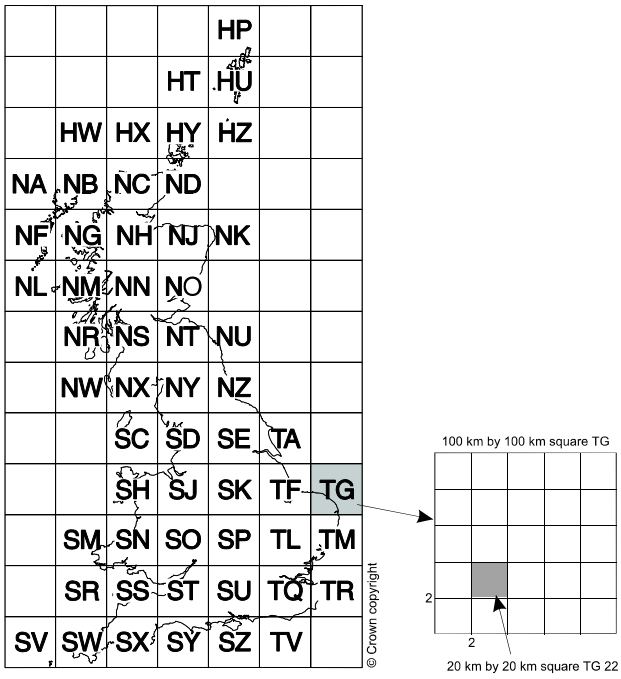
The accuracy of the contours has been found to be of the order of ±3.0 m RMSE. These refer to the differences between the contour height recorded on the map and the measured height (above mean sea level) at the points on the ground represented by that contour. The measured heights are defined with respect to local control points connected to the Ordnance Survey network of levelled heights, which relate to mean sea level – normally Newlyn datum.

Chapter 4 Tile numbering and the National Grid

Land-Form PANORAMA tiles are identified by quoting the National Grid (NG) reference of the south-west corner of the area they cover. The Ordnance Survey NG divides Great Britain into squares 100 km by 100 km. Each of these squares has a unique two-letter reference, for example, TG in the diagram below.

Each Land-Form PANORAMA 20 km by 20 km tile is described by adding a two-digit reference to the 100 km by 100 km square reference, with the easting first followed by the northing, for example, TG24.

For additional information on how to use the NG, visit Ordnance Survey's website at: www.ordnancesurvey.co.uk.



Annexe A Product and service performance report form

Ordnance Survey welcomes feedback from its customers about Land-Form PANORAMA.

If you would like to share your thoughts with us, please print a copy of this form and when completed post or fax it to the address below.

Your name: .....

Organisation: .....

Address: .....

.....

.....

Postcode: .....

Phone: .....

Fax: .....

Email: .....

Quotation or order reference: .....

Please record your comments or feedback in the space below. We will acknowledge receipt of your form within three (3) working days and provide you with a full reply or a status report within 21 working days.

If you are posting this form, please send it to:

Land-Form PANORAMA Product Manager, Ordnance Survey, Adanac Drive, SOUTHAMPTON, SO16 0AS.

If you wish to return it by fax, please dial +44 (0)8450 990494.

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Land-Form PANORAMA

Technical specification

Contents

v5.1 – 12/2010

Introduction

Purpose of this specification and disclaimer

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Chapter 1 ASCII grid explained

The purpose of this chapter and chapter 2 is to:

- provide a brief description of the presentation of Land-Form PANORAMA in ASCII grid; and
- provide Licensed System Suppliers with as much detail as necessary to enable Land-Form PANORAMA files in ASCII grid to be easily understood and processed by application software.

The term data structure refers to the organisation and sequence of the records in the data file and not to the geographical topology of the data.

An overview of Land-Form PANORAMA in ASCII grid

Under OS OpenData the Land-Form PANORAMA DXF format for DTMs has been replaced with the introduction of a new format. DTMs are now also supplied as ASCII grid and adhere to that specification.

Chapter 2 ASCII grid file structure for Land-Form PANORAMA

General

The following paragraphs contain examples of ASCII grid records with explanatory notes.

Data structure

Header section

The data is specified as a raster grid with the height values being calculated at the centre of the pixel. To represent this in ASCII grid format the initial coordinates in the map header are the south-west corner of the tile.

Number of points

ncols	401
nrows	401
xllcenter	320000
yllcenter	180000
cellsize	50

Data section

The height values are presented in the standard ASCII grid format as a series of real values. The height values are given to the nearest decimetre.

The accuracy values are presented in the standard ASCII grid format as a series of integer values.

Chapter 3 NTF explained

The purpose of this chapter and chapter 4 is to:

- provide a brief description of the presentation of Land-Form PANORAMA in NTF: BS 7567 (NTF v2.0 Levels 1 and 5); and
- provide licensed system suppliers with as much detail as necessary to enable Land-Form PANORAMA files in NTF to be easily understood and processed by application software.

The term data structure refers to the organisation and sequence of the records in the data file and not to the geographical topology of the data.

An overview of Land-Form PANORAMA in NTF

Land-Form PANORAMA is supplied in the British Standard national format common to the majority of Ordnance Survey's digital map data products, namely NTF, and is transferred in Level 5 for DTMs. Prior to OS OpenData it was supplied in Level 1 for contours.

An overview of the data structure of a Land-Form PANORAMA data file is shown in diagrammatic form in figure 5.1. The convention used for this diagram is in the industry standard adopted for Jackson Structured Programming (JSP).

The British Standard for NTF stipulates the following for level 1:

The main purpose of this level is to permit the addition of many attributes to the lines and points. Text may be linked to a feature as an attribute. This is used for simple vector data. Lines, points and text are separate entities and may be given one feature code and one attribute value, for example, a contour height.

Level 1 also introduces information about the data in the form of quality records.

The British Standard for NTF stipulates the following for level 5:

This is a user-definable format and is intended mainly for highly specialised datasets, such as those that contain complex semantic relationships.

Level 5 carries a data dictionary comprising data description and data format records and is the point at which NTF becomes self-documenting.

The governing body for the industry standard NTF is now the British Standards Institution (BSI®).

Their address is:

389 Chiswick High Road
LONDON
W4 4AL

Phone: +44 (0)20 8996 9001

Fax: +44 (0)20 8996 7001

Email:cservices@bsigroup.com

Full details of the British Standard can be accessed through the British Standards Institutions web site at: http://www.bsigroup.com/en/Standards-and-Publications.

Any queries relating to the Land-Form PROFILE product should be referred to Customer Services at the address given in contact details at the beginning of this user guide.

Conventions used in this technical specification

Certain conventions are adopted as an aid to interpretation. In some cases the convention is dropped where the context is self-evident.

[ ] Square brackets are placed around record names, for example, [VOLHDREC].

[ ] 99 A two-digit number following square brackets denotes the record descriptor that uniquely identifies the record name between the brackets.

{ } A pair of braces denote field names, for example, {REC_DESC} is the record descriptor field.

<S> This is the space character (ASCII code 32).

<3S> This denotes three successive space characters.

% The percentage character denotes end of record (ASCII code 37).

| This denotes repeating fields (ASCII code 124).

Data overview

File structure

An overview of the data format of a Land-Form PANORAMA data file in NTF is shown below. The convention used for this diagram is in the industry standard adopted for Jackson Structured Programming (JSP).

Fig 5.1: Overall logical structure of an NTF file

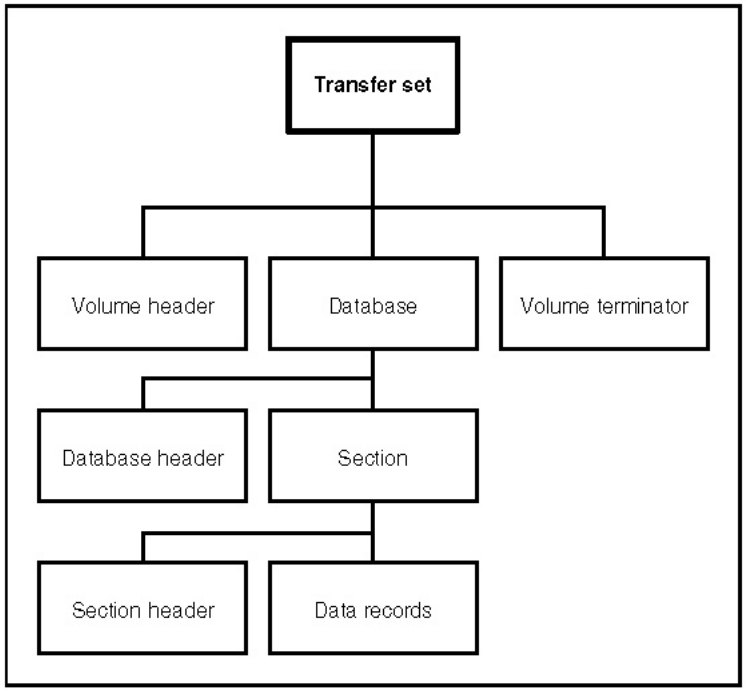
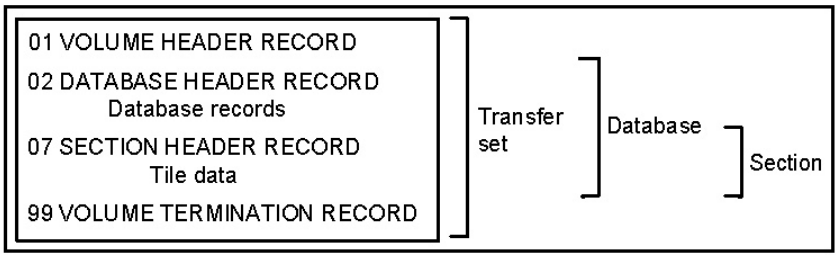


Figure 5.2: Physical file structure of an NTF file



Version management

Product copyright

The copyright date is shown in the {COPYRIGHT} field of the Section Header Record [SECHREC].

NTF version

The current version is NTF 2 level 1 for contours and NTF 2 level 5 for DTMs. Version 2.0 will be supplied until further notice.

The NTF version is indicated by the {NTFVER} field of the Volume Header Record [VOLHDREC]. The effective date of the definition of NTF v2.0 in Land-Form PANORAMA is 19920515 and is indicated by the {DDATE} field of the Database Header Record [DBHREC].

General

Record size

NTF data is written to the output device in variable length records, with a maximum record length of 80 characters, which includes {CONT_MARK} and {EOR}.

Continuation mark {CONT_MARK}

Continuation records are used where the maximum physical record length of 80 characters does not permit a logical record to be transferred wholly within one physical record. The presence of a continuation record is indicated by the value of the Continuation mark {CONT_MARK}, which immediately precedes the Record terminator {EOR}. The value of {CONT_MARK} is 1 if there is a continuation record present and 0 if there is not.

Record terminator {EOR}

The end of record terminator is the per cent (%) (ASCII 37) character for both formatted and unformatted media.

Transfer set

A transfer set normally equates to a single file except where continuation volumes are used when the transfer set exceeds the capacity of the medium. The data the customer receives is in one or more transfer sets.

Data supply structure

Supply of data on formatted media

The data is available on CD-ROM only.

The transfer set has one dataset and one section. One or more transfer sets are put onto the medium.

If your order is larger than the capacity of the medium, it is put onto two or more of that medium.

Continuation volumes are only used if a transfer set is larger than the capacity of the medium.

Formatted media (transfer set less than media capacity).

Transfer set structure

Volume records

Each transfer set starts with a compulsory Volume Header Record [VOLHDREC] and terminates with a compulsory Volume Terminator Record [VOLTERM].

As a transfer set may span one or more volumes, {VOLNUM} within the Volume Header Record will indicate which volume in the sequence of volumes within the transfer set it is. Similarly, the Volume Termination Record may end either a single volume or a complete transfer set. A field similar to the Continuation mark is used to indicate completion or continuation.

Database records

Database records transfer information common to all data and their presentation in the subsequent section(s).

An NTF transfer set will comprise one database. The database commences with a Database Header Record [DBHREC] that sets up the database. It will be followed by a number of other database records as indicated below.

Database Header Record [DBHREC]

This mandatory record indicates the commencement of a database and gives details of:

- the database name;
- NTF release date;
- feature classification table name; and
- release data that applies to the whole transfer set.

Attribute Description Record [ATTDESC]

These records list and give descriptions of the attributes that can be applied to features within the transfer set. These records are not present in Land-Form PANORAMA DTMs.

Feature Classification Record [FEATCLASS]

These records list and give descriptions of all possible feature codes for the transfer set. These records are not present in Land-Form PANORAMA DTMs.

Data Description Record [DATADESC]

These records list and define new data fields used within new records defined in Data Format records [DATAFMT]. These records are not present in Land-Form PANORAMA contours.

Data Format Record [DATAFMT]

These records list and define new records used to transfer data in the DTM. These records are not present in Land-Form PANORAMA contours.

Section records

The section records contain the data within the map tile. The section starts with the Section Header Record [SECHREC] followed by the section data records.

Section Header Record [SECHREC]

This mandatory record starts a section. It contains information and parameters essential for understanding, interpreting and processing some of the fields within the data. It establishes the unit of measure for x, y and z coordinates, origins and other constants.

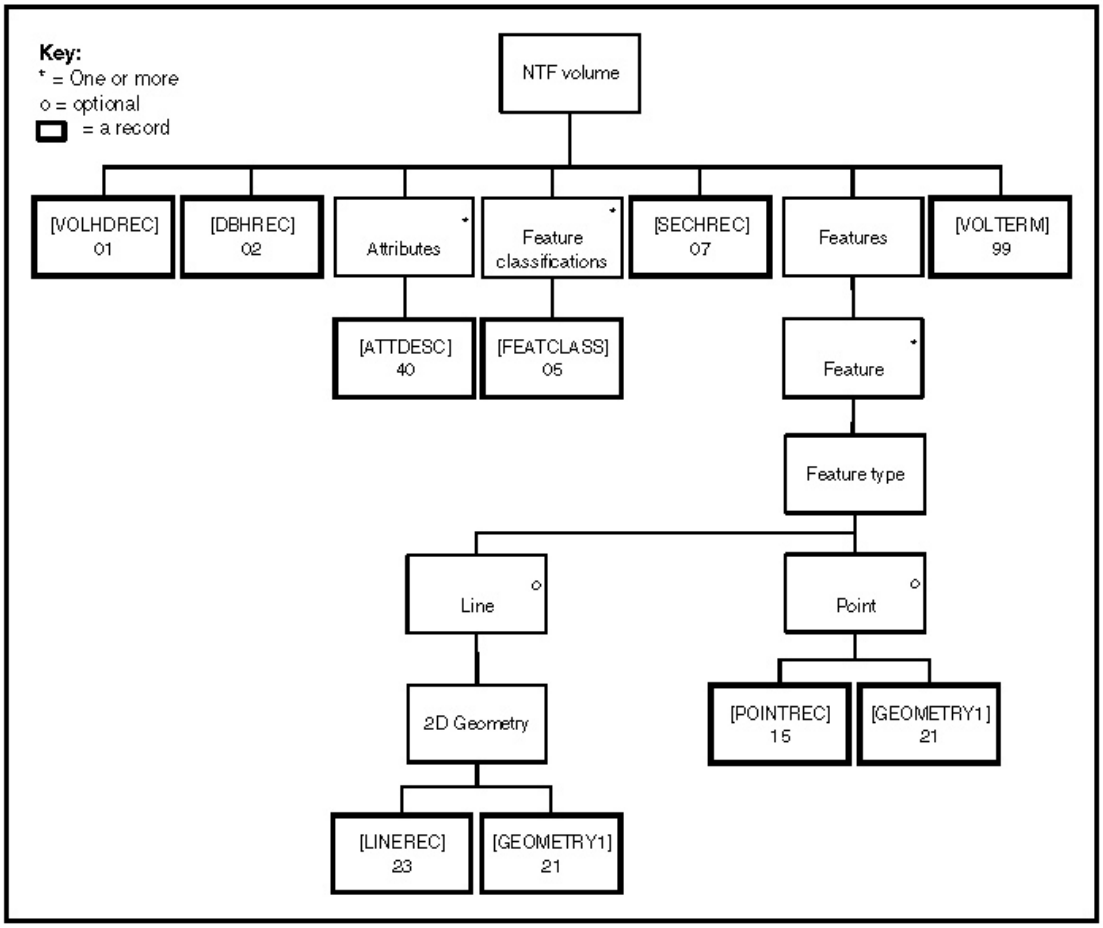
Section data records

These contain all the features within the section. The records used within Land-Form PANORAMA contours and DTMs differ.

Structure of Land-Form PANORAMA contours in NTF

Land-Form PANORAMA contours have a vector point and line data structure: within this structure a feature may be a point or a line. Each feature is free-standing; that is its topological relationship to any other feature is not expressed in the data. Features are classified by type and each type is placed as a separate feature code.

Figure 5.3: Record configuration for Land-Form PANORAMA contours data in NTF



Section data records for contours

These records contain all the features within the section and are listed as they apply to Land-Form PANORAMA contours:

- Point Record [POINTREC] contains attribute information for point features, including the height data.
- Line Record [LINEREC] contains attribute information for line features, including the height value.
- Geometry Records contain the coordinate position(s) of features. Geometry records for point features will contain one coordinate pair whilst those for line features will contain two or more coordinate pairs.
- [GEOMETRY1] Records, which contain x and y coordinates, are used for all features.
- Geometry continuation records will be used where required.

Coordinate referencing system for contours

Abbreviated NG coordinates are supplied and are given in metres. The coordinates (eastings, northings and height) have a field width of 10 (as indicated in the {XYLEN} and {ZLEN} fields in the Section Header Record [SECHREC]). Leading zeros will be present to complete the field width. Negative values for height may be present; in which case the minus sign appears as the first character.

All eastings and northings are measured from the south-west corner of the 20 km by 20 km square tile.

Full horizontal NG coordinates are calculated by using the {XY_MULT}, {X_ORIG} and {Y_ORIG} values in the Section Header Record [SECHREC] 07 and the conversion formulae below:

X = ({XY_MULT} x {X_COORD}) + {X_ORIG}

Y = ({XY_MULT} x {Y_COORD}) + {Y_ORIG}

where {X_ORIG} and {Y_ORIG} are additive constants, always added to {X_COORD} and {Y_COORD}, respectively, whilst {XY_MULT} is a multiplication factor applied to the coordinates before the addition of {X_ORIG} and {Y_ORIG}.

In a similar manner, using the {Z_MULT} value in the Section Header Record [SECHREC] 07, heights may be expressed in metres above datum using the following conversion formula:

Z = {Z_MULT} x {VALUE}

Structure of Land-Form PANORAMA DTMs in NTF

The overall structure of a Land-Form PANORAMA DTM data file in NTF, and of the transfer set(s) contained within it, is the same as described in chapter 3.

Unlike Land-Form PANORAMA contours, there are no point or line features supplied for DTMs. Instead, the 20 km by 20 km tile is equally divided by a 50-m grid and the heights are represented as values at the intersections of this grid.

Record configuration for Land-Form PANORAMA DTM data in NTF

Database records for DTMs

Following the mandatory Database Header Record [DBHREC], two types of database record are used to define section data records used within the section records part of the file:

- Data Description Record [DATADESC]
  These records list and define new data fields used within new records defined in Data Format Records [DATAFMT].
- Data Format Record [DATAFMT]
  These records list and define new records used to transfer data in the DTM.

Section records for DTMs

Following the mandatory Section Header Record [SECHREC], two types of section record, defined in the database records part of the file, are used to transfer the height information:

Grid Header Record [GRIDHREC]

This record describes the 50 m grid structure.

Grid Data Record [GRIDREC]

Each Grid Data record gives the 401 height values (reading south to north) for one column of the grid. The first Grid Data Record in the file describes the westernmost column, that is, the western edge of the tile. Each subsequent record details the next column eastwards until the 401st and final record lists the height values for the eastern edge of the tile.

Coordinate reference system for DTMs

Abbreviated NG coordinates are supplied and are given in metres. The height coordinate has a field width of four, as indicated in the {ZLEN} field in the Section Header Record [SECHREC], not the NTF default width of 10. Leading zeros will be present to complete the field width. Negative values for height may be present, in which case the minus sign appears as the first character.

- The Grid Header Record contains the horizontal coordinates of the origin of the DTM.
- The Grid Data Records contain no horizontal coordinates. Instead, the horizontal position of an individual height value may be calculated from the field {GRID_ID} and the position of the height within the record.

The height above Ordnance Survey datum, or specified datum, in metres of a height value may be calculated by using the {Z_MULT} value in the Section Header Record [SECHREC] using the following conversion formula:

Z = {Z_MULT} x {GRIDVAL}

Chapter 4 Record structures for the transfer of Land-Form PANORAMA in NTF

NTF record list for Land-Form PANORAMA contours

This list comprises the valid record types used in the NTF v2.0 Level 1 transfer set for Land-Form PANORAMA contour data.

Descriptor	Description	Record name
00	Continuation Record – continues a logical record when the physical limit of 80 characters for other record types is exceeded.	[CONTREC]
01	Volume Header Record – defines the donor and data type.	[VOLHDREC]
02	Database Header Record – transfers data about the database.	[DBHREC]
05	Feature Classification Record – defines data classifications (feature codes).	[FEATCLASS]
07	Section Header Record – coordinate and structure types, unit scale, factors, and so on.	[SECHREC]
15	Point Record – identifies the definition of node points.	[POINTREC]
21	Two-dimensional Geometry Record – defines the two-dimensional geometry for a link or node.	[GEOMETRY1]
23	Line Record – identifies the definition of a link.	[LINEREC]
40	Attribute Description Record – defines attribute descriptions and their fields.	[ATTDESC]
99	Volume Terminator Record – defines the end of the transfer set.	[VOLTERM]

Volume Header Record [VOLHDREC] 01

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	01	
DONOR	03:22	A20	ORDNANCE SURVEY<5S>	
RECIPIENT	23:42	A20	<20S>	Not used
TRANDATE	43:50	D8	19940120	Date of transfer: yyyymmdd
SERIAL	51:54	I4	0000	Not used
OLNUM	55:56	I2	01	Volume number 01 to 99
NTFLEVEL	57:57	I1	1	NTF Level 1
NTFVER	58:61	R4,2	0200	NTF version 2.00
NTFOR	62:62	A1	V	Variable length records
EOR	63:63	A1	%	Character used for EOR on unformatted media
			or <S>	Default: EOR is % on formatted media
DIVIDER	64:64	A1	\	Divider used to terminate variable length text fields
CONT_MARK	65:65	I1	0	No continuation record
EOR	66:66	A1	%	Record terminator

Record example:

```
01ORDNANCE SURVEY                          19981118000001102OOV \0%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Database Header Record [DBHREC] 02

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	02	
DBNAME	03:22	A20	OS_LANDRANGER_CONT<2S>	Database name indicating PANORAMA contours
DDNAME	23:42	A20	DEFAULT_02.00<7S>	Standard NTF data dictionary name
DDATE	43:50	D8	19920515	Date of standard data dictionary
DDBASE	51:70	A20	<20S>	Not used
DDBDATE	71:78	D8	00000000	Not used
CONT_MARK	79:79	I1	1	Continuation record follows
EOR	80:80	A1	%	Record terminator

Continuation of Database Header Record

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
FCNAME	03:22	A20	<20S>	Not used
FCDATE	23:30	D8	000000000	Not used
DQNAME	31:50	A20	<20S>	Not used
DQDATE	51:58	D8	00000000	Not used
DATA_MODEL	59:60	I2	00	Data model type – undefined
CONT_MARK	61:61	I1	0	No continuation record
EOR	62:62	A1	%	Record terminator

Record example:

```
02OS_LANDRANGER_CONT  DEFAULT_02.00       19920515                    000000001%
00                    00000000                    00000000000%
```

```
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Feature Classification Record [FEATCLASS] 05

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	05	
FEAT_CODE	03:06	A4	0200	Feature code
CODE_COM	07:16	A10	<10S>	Not used
STCLASS	17:36	A20	<20S>	Not used
FEATDES	37:*	A*	Spotheights	Feature description
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields
CONT_MARK	*:*	I1	0	No continuation record
EOR	*:*	A1	%	Record terminator

Note: * = variable integer.

Record example:

```
050200                                Spotheights\0%
050201                                Contours\0%
050202                                Lakes\0%
050203                                Breakline\0%
050204                                Coastline\0%
050205                                Ridgelines\0%
050207                                Formlines\0%
```

```
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Section Header Record [SECHREC] 07

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	07	
SECT_REF	03:12	A10	SS68<6S>	PANORAMA sheet number
COORD_TYP	13:13	I1	2	Rectangular coordinates
STRUC_TYP	14:14	I1	1	Vector data
XYLEN	15:19	I5	00000	Default length of 10 characters for X and Y coordinates
XY_UNIT	20:20	I1	2	Metres
XY_MULT	21:30	R10,3	0000001000	Multiply X and Y coordinates by 1.000
ZLEN	31:35	I5	00000	Default length of 10 characters for Z coordinates
Z_UNIT	36:36	I1	2	Metres
Z_MULT	37:46	R10,3	0000001000	Multiply Z coordinates by 1.000
X_ORIG	47:56	I10	0000260000	NG eastings of south-west corner of tile
Y_ORIG	57:66	I10	0000180000	NG northings of south-west corner of tile
Z_DATUM	67:76	I10	0000000000	Defines which datum is used for height
CONT_MARK	77:77	I1	1	Continuation record follows
EOR	78:78	A1	%	Record terminator

Continuation of Section Header Record

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
XMIN	03:12	I10	0000000000	Abbreviated eastings of south-west corner of tile
YMIN	13:22	I10	0000000000	Abbreviated northings of south-west corner of tile
XMAX	23:32	I10	0000020000	Abbreviated eastings of north-east corner of tile
YMAX	33:42	I10	0000020000	Abbreviated northings of north-east corner of tile
XY_ACC	43:47	R5,2	00000	Not used
Z_ACC	48:52	R5,2	00500	Statement of vertical accuracy: 5 metres
SURV_DATE	53:60	D8	19851008	Nominal date of survey: yyyymmdd
LAST_AMND	61:68	D8	19931101	Date of last amendment: yyyymmdd
COPYRIGHT	69:76	D8	19931101	Copyright date: yyyymmdd
CONT_MARK	77:77	I1	0	No continuation record
EOR	78:78	A1	%	Record terminator

Record examples:

```
07NT48      21000002000000100000000200000010000000340000000068000000000000001%
00000000000000000000000000002000000000200000000000500198801011993110119931101 0%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Point Record [POINTREC] 15

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	15	
POINT_ID	03:08	I6	000001	Feature serial number
VAL_TYPE	09:10	A2	HT	Attribute mnemonic
VALUE	11:16	A6	000258	Value of HT (in metres)
FEAT_CODE	17:20	A4	0200	Feature code
CONT_MARK	21:21	I1	0	No continuation record
EOR	22:22	A1	%	Record terminator

Record example:

```
15000001HT00025802000%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Two-dimensional Geometry Record [GEOMETRY1] 21

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	21	
GEOM_ID	03:08	I6	000000	Not used
GTYPE	09:09	A1	2	Point feature: 1, Line feature: 2
NUM_COORD	10:13	I4	0005	Number of coordinates, a counter for {X_COORD}, {Y_COORD} and {Q_PLAN}
| X_COORD	14:*	I10		X coordinate or easting
| Y_COORD	*:*	I10		Y coordinate or northing
| QPLAN	*:*	AI	<S>	Not used
CONT_MARK	*.*	I1	0 or 1	No continuation record or continuation record follows
EOR	*:*	A1	%	Record terminator

Note: The group of fields {X_COORD}, {Y_COORD} and {QPLAN} may repeat to end of physical record and through one or more Continuation Records {NUM_COORD} times.

Record example:

```
2100000020006000002000000000004334 0000019993000000433 2 0000019957000000430 9%
0000000199700000004287 00000199870000004269 00000200000000004276 0%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Line Record [LINEREC] 23

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	23	
LINE_ID	03:08	I6	000103	Feature serial number
VAL_TYPE	09:10	A2	HT	Attribute mnemonic
VALUE	11:16	A6	000040	Value of HT (in metres)
FEAT_CODE	17:20	A4	0201	Feature code
ONT_MARK	21:21	I1	0	No continuation record
EOR	22.22	A1	%	Record terminator

Record example:

```
23000015HT00001702020%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

Attribute Description Record [ATTDESC] 40

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	40	
VAL_TYPE	03:04	A2	HT	Attribute mnemonic, for example, height
FWIDTH	05:07	I3	006	Field width of attribute value
FINTER	08:12	A5	I6<3S>	Interpretation of field, for example, I6
ATT_NAME	13:*	A*	HEIGHT	Name given to attribute
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields
FDESC	*:*	A*	CONTOUR VALUE	Textual description of attribute
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields
CONT_MARK	*:*	I1	0	No continuation record
EOR	*:*	A1	%	Record terminator

Volume Terminator Record [VOLTERM] 99

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	99	
FREE_TEXT	03:*	A*	End of transfer set	See note below
CONT_VOL	*:*	I1	0 or 1	No further volumes or continuation volume
EOR	*:*	A1	%	Record terminator

Notes:

If there are further volume(s) to follow then the FREE_TEXT field comprises the following message:
`'End Of Volume (nn). Transfer Set Continues On Volume (nn+1)'`

If there are no further volumes then the FREE_TEXT field will read:
`'End Of Transfer Set'`

* = variable integer.

Record examples:

```
99End Of Volume 01 Transfer Set Continues On Volume 021%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

```
99End Of Transfer Set0%
....|....1....|....2....|....3....|....4....|....5....|....6....|....7....|....8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
```

Template

NTF record list for Land-Form PANORAMA DTMs

This list comprises the valid record types used in the NTF v2.0 Level 5 transfer set for PANORAMA DTMs.

Descriptor	Description	Record name
00	Continuation Record – continues a logical record when the physical limit of 80 characters for other record types is exceeded.	[CONTREC]
01	Volume Header Record – defines the donor and data type.	[VOLHDREC]
02	Database Header Record – transfers data about the database.	[DBHREC]
03	Data Description Record – transfers data dictionary field definitions.	[DATADESC]
04	Data Format Record – transfers data dictionary record definitions.	[DATAFMT]
07	Section Header Record – coordinate and structure types, unit scale, factors and so on.	[SECHREC]
50	Grid Header Record – defines DTM grid.	[GRIDHREC]
51	Grid Data Record – defines DTM height values for grid.	[GRIDREC]
99	Volume Terminator Record – defines the end of the transfer set.	[VOLTERM]

Volume Header Record [VOLHDREC] 01

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	01	
DONOR	03:22	A20	ORDNANCE SURVEY<5S>	
RECIPIENT	23:42	A20	<20S>	Not used
TRANDATE	43:50	D8	19940120	Date of transfer: yyyymmdd
SERIAL	51:54	I4	0000	Not used
VOLNUM	55:56	I2	01	Volume number (01 to 99) in transfer set
NTFLEVEL	57:57	I1	5	NTF level 5
NTFVER	58:61	R4,2	0200	NTF version 2.00
NTFOR	62:62	A1	V	Variable length records
EOR	63:63	A1	%	Character used for EOR on unformatted media
			or <S>	Default: EOR is % on formatted media
DIVIDER	64:64	A1	\	Divider used to terminate variable length text fields
CONT_MARK	65:65	I1	0	No continuation record
EOR	66:66	A1	%	Record terminator

Database Header Record [DBHREC] 02

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	02	
DBNAME	03:22	A20	OS_LANDRANGER_DTM<3S>	Database name indicating PANORAMA DTM
DDNAME	23:42	A20	DEFAULT_2.00<8S>	Standard NTF data dictionary name
DDATE	43:50	D8	19920515	Date of standard data dictionary
DDBASE	51:70	A20	<20S>	Not used
DDBDATE	71:78	D8	00000000	Not used
CONT_MARK	79:79	I1	1	Continuation record follows
EOR	80:80	A1	%	Record terminator

Continuation of Database Header record

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
FCNAME	03:22	A20	<20S>	Not used
FCDATE	23:30	D8	00000000	Not used
DQNAME	31:50	A20	<20S>	Not used
DQDATE	51:58	D8	00000000	Not used
DATA_MODEL	59:60	I2	00	Data model type – undefined
CONT_MARK	61:61	I1	0	No continuation record
EOR	62:62	A1	%	Record terminator

Data Description Record [DATADESC] 03

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	03	
FIELD_NAME	03:12	A10	GRID_ID	Name of field being defined
FWIDTH	13:15	I3	010	Width of field being defined
FINTER	16:20	A5	I10<2S>	Format description if fixed, A* if variable
FDESC	21:*	A*	GRID IDENTITY	Textual description of field
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields.
NO_DATA	*:*	A*	<10S>	Field value when no data available. {FWIDTH} wide.
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields.
RANGE_MIN	*:*	*:*	<10S>	Minimum value for data. {FWIDTH} wide
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields.
RANGE_MAX	*:*	A*	<10S>	Maximum value for data. {FWIDTH} wide
DIVIDER	*:*	A1	\	Divider used to terminate variable length text fields
UNITS	*:*	A2	<2S>	Not used
CONT_MARK	*:*	I1	0	No continuation record
EOR	*:*	A1	%	Record terminator

Note: * = variable integer.

Data Format Record [DATAFMT] 04

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	04	
REC_TYPE	03:04	A2	50	{REC_DESC} of record being defined
REC_NAME	05:14	A10	GRIDHREC<2S>	Name of record being defined
NUM_FIELD	15:16	I2	29	Number of fields in the record
| FIELD_NAME	*:*	A10	GRID_ID,3S>	Corresponds to entry in [DATADESC] or BS 7567
| FUSE	*:*	A1	c or o	Use of field (c = compulsory, o = optional)
CONT_MARK	*:*	I1	1 or 0	Continuation record follows or no continuation record
EOR	*:*	A1	%	Record terminator

Notes:

The group of fields {FIELD_NAME} and {FUSE} may repeat to end of physical record and through one or more continuation records {NUM_FIELD} times.

The use of brackets within this record around any {FIELD_NAME} and {FUSE} entries indicates that the field or group of fields may repeat one or more times.

Section Header Record [SECHREC] 07

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	07	
SECT_REF	03:12	A10	SS68<6S>	PANORAMA sheet number
COORD_TYP	13:13	I1	2	Rectangular
STRUC_TYP	14:14	I1	1	Vector
XYLEN	15:19	I5	00000	Default length of 10 characters for X, Y coordinates. Not used in Land-Form PANORAMA DTM, see note
XY_UNIT	20:20	I1	2	Metres
XY_MULT	21:30	R10,3	0000001000	Multiply X and Y coordinates by 1.000
ZLEN	31:35	I5	00000	Default length of 10 characters for Z coordinates.
Z_UNIT	36:36	I1	2	Metres
Z_MULT	37:46	R10,3	0000001000	Multiply Z coordinates by 1.000
X_ORIG	47:56	I10	0000260000	X coordinate of south-west corner
Y_ORIG	57:66	I10	0000180000	Y coordinate of south-west corner
Z_DATUM	67:76	110	0000000000	Defines which datum is used for heights
CONT_MARK	77:77	I1	1	Continuation record follows
EOR	78:78	A1	%	Record terminator

Continuation of Section Header record

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
XMIN	03:12	I10	0000000000	Abbreviated eastings of south-west corner of tile
YMIN	13:22	I10	0000000000	Abbreviated northings of south-west corner of tile
XMAX	23:32	I10	0000020000	Abbreviated eastings of north-east corner of tile
YMAX	33:42	I10	0000020000	Abbreviated northings of north-east corner of tile
XY_ACC	43:47	R5,2	00000	Not used
Z_ACC	48:52	R5,2	00500	Statement of vertical accuracy (5 metres)
SURV_DATE	53:60	D8	19850901	Nominal date of survey: yyyymmdd
LAST_AMND	61:68	D8	19850901	Date of last amendment: yyyymmdd
COPYRIGHT	69:76	D8	19850901	Copyright date: yyyymmdd
CONT_MARK	77:77	I1	0	No continuation record
EOR	78:78	A1	%	Record terminator

Notes:

The default length of 10 characters will in practice be overwritten by the redefinition of the {X_COORD}, {Y_COORD} and {Z_COORD} fields to a six-character field in a [DATADESC] 03 record.

The heights at the intersections of the grid are four-character fields defined as {GRIDVAL} in a [DATADESC] 03 record. GRIDVAL is defined as an I4 field in the 03 record.

Grid Header Record [GRIDHREC] 50

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	50	
GRID_ID	03:12	I10	0002600180	Grid identity (based on grid origin)
N_COLUMNS	13:16	I4	0401	Number of columns in DTM
N_ROWS	17:20	I4	0401	Number of rows in DTM
N_PLANES	21:24	I4	0001	Number of planes in DTM
X_COORD	25:34	I10	0000260000	Easting of grid corner
Y_COORD	35:44	I10	0000180000	Northing of grid corner
Z_COORD	45:30	I6	000000	Height of grid corner
X_COORD	51:60	I10	0000280000	Easting of grid corner
Y_COORD	61:70	I10	0000180000	Northing of grid corner
Z_COORD	71:76	I6	000000	Height of grid corner
CONT_MARK	77:77	I1	1	Continuation record follows
EOR	78.78	A1	%	Record terminator

Continuation of Grid Header Record (repeated three times)

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
X_COORD	03:12	I10	0000280000	Easting of grid corner
Y_COORD	13:22	I10	0000200000	Northing of grid corner
Z_COORD	23:28	I6	000000	Height of grid corner
X_COORD	29:39	I10	0000260000	Easting of grid corner
Y_COORD	39:49	I10	0000200000	Northing of grid corner
Z_COORD	49:54	I6	000000	Height of grid corner
CONT_MARK	55:55	I1	0 or 1	No continuation record or continuation record follows
EOR	56:56	A1	%	Record terminator

Note:

This record allows the definition of a three-dimensional grid showing the lowermost and uppermost planes. In practice, there is only one plane and the grid corner values of each are identical.

Grid Data Record [GRIDREC] 51

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	51	
GRID_ID	03:12	I10	0002600180	Grid identity (based on grid origin)
SURVEY	13:19	A7	0850901	Method and date of survey
CHANGE	20:26	A7	0000000	Type and date of change
COL_START	27:30	I4	0001	First column in [GRIDREC]
COL_END	31:34	I4	0001	Last column in [GRIDREC]
ROW_START	35:38	I4	0001	First row in [GRIDREC]
ROW_END	39:42	I4	0401	Last row in [GRIDREC]
PLA_START	43:46	I4	0001	First plane in [GRIDREC]
PLA_END	47:50	I4	0001	Last plane in [GRIDREC]
COL_INV	51:51	I1	0	Column inversion: 0 = false
ROW_INV	52:52	I1	0	Row inversion: 0 = false
PLA_INV	53:53	I1	0	Plane inversion: 0 = false
ORDER	54:34	I1	1	Order in which the data is organised: 1 = column, row, plane
INTERPRET	55:55	I1	1	Interpretation of data: 1 = numeric
V_OFFSET	56:65	I10	0000000000	Additive constant to be added to values after scaling
V_SCALE	66:75	R10,3	0000001000	Scaling factor for data values, that is, 1.000
CONT_MARK	76:76	I1	1	Continuation record follows
EOR	77:77	A1	%	Record terminator

Continuation of Grid Data Record

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
N_GRIDVAL	03:10	I8	00000401	Number of values in [GRIDREC] – always 401
CONT_MARK	11:11	I1	1	Continuation record follows
EOR	12:12	A1	%	Record terminator

There follow 21 continuation records like this:

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
GRIDVAL	*:*	I4	0061	Height at grid intersection (repeated 19 times)
CONT_MARK	79:79	I1	1	Continuation record follows
EOR	80:80	A1	%	Record terminator

and a final continuation record like this:

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	00	
GRIDVAL	*:*	I4	0022	Height at grid intersection (repeated twice)
CONT_MARK	11:11	I1	0	No continuation record
EOR	12:12	A1	%	Record terminator

Volume Terminator Record [VOLTERM] 99

Field	Position	Format	Value example	Description
REC_DESC	01:02	A2	99	
FREE_TEXT	03:*	A*	End of Transfer Set	See note below
CONT_VOL	*:*	I1	0 or 1	No continuation volumes or continuation volume
EOR	*:*	A1	%	Record terminator

Notes:

If there are further volume(s) to follow then the FREE_TEXT field comprises the following message:
`'End Of Volume (nn). Transfer Set Continues On Volume (nn+1)'`

If there are no further volumes then the FREE_TEXT field will read:
`'End Of Transfer Set'`

*** = variable integer.**

Chapter 5 DXF explained

An overview of Land-Form PANORAMA

This chapter describes the representation of Land-Form PANORAMA in Ordnance Survey's implementation of DXF, including the DXF group and section structure.

It is assumed that the reader of this guide is familiar with the sections about DXF in the appropriate AutoCAD manual, published by Autodesk Ltd, 1 Meadow Gate Avenue, Farnborough Business Park, Farnborough, Hampshire, GU14 6FG, or an equivalent document published by the reader's software supplier if a CAD package other than AutoCAD is to be used.

Structure of Land-Form PANORAMA contours

Land-Form PANORAMA contour data has a vector point and line structure; within this structure a feature may be a point or a line. Each feature is free standing: its topological relationship to any other feature is not expressed in the data.

Features are classified by type and each type is placed in a separate DXF layer.

Line features

A feature is a subjective entity; that is, so long as the constituent lines are of the same description (layer), a feature need not fully describe a logical piece of detail. The extent of a feature is determined by digitising conventions and will not always coincide with the topology.

Each line feature is composed of a string of coordinate pairs (or triples) implicitly joined by straight lines. Vector (point and line) data was originally intended for map production.

Structure of Land-Form PANORAMA DTMs

Prior to OS OpenData, Land-Form PANORAMA DTMs were also available in DXF format. This is no longer supplied in DXF due to the introduction of ASCII grid format for DTMs.

The DTM tiles in DXF consist of a series of heighted points arranged on a 50 m grid comprising 401 points by 401 points.

Each of these points has full three-dimensional coordinates.

The first point is positioned on the south-west corner of the tile, with further points at 50 m intervals northwards to the northern edge of the tile, creating a column of 401 points. The next column will start on the southern edge of the tile, 50 m east of the origin, again progressing in 50 m intervals to the north edge of the tile.

This pattern is repeated until the final point, which falls on the north-east corner of the tile. Therefore, there are a total of 160 801 points on each tile.

Land-Form PANORAMA DXF layers

Generalised feature record representation

The following is a simplified generalisation of the way individual feature records are organised in Ordnance Survey's implementation of DXF:

Point	LAYER	Coordinate triple		
2-D polyline	LAYER	Coordinate triple	Coordinate triple	Height

A 2-D polyline in DXF actually has three dimensions, that is, x, y and z coordinates at each vertex on the line. It is known as a 2-D polyline because its height (z) value does not vary along its length.

Land-Form PANORAMA footnotes

Map footnotes

Each map data file contains a set of map footnotes. This includes data on the source and history of the geometric data (the features) contained in the map data file. The following items are all included in the footnotes and are available for display and plotting from a Land-Form PANORAMA map file:

Note 1: Top Margin centrally aligned, 700 ground metres, Layer: G8040571

```
Ordnance Survey®
```

Note 2: Top Margin centrally aligned, 600 ground metres, Layer: G8040571

```
Land-Form PANORAMA® DTM Data
```

Note 3: Lower left margin, 200 ground metres, Layer: G8040571

```
Translation Date dd Mmmmmmmmm CCYY
```

Note 4: Lower left margin, 200 ground metres, Layer: G8040571

```
Tile reference number __ __ __ for example NS46
```

Note 5: Lower left margin, 200 ground metres, Layer: G8040571

```
Reproduced from Ordnance Survey Land-Form PANORAMA®Data
with the permission of the controller of Her Majesty's Stationery
Office.
© Crown Copyright CCYY
```

Note 6: Lower right margin, 200 ground metres, Layer: G8040571

```
The derived scale of the product is dependent upon the source data.
```

Note 7: Lower right margin, 200 ground metres, Layer: G8040571

```
Height given in metres above Newlyn Datum.
```

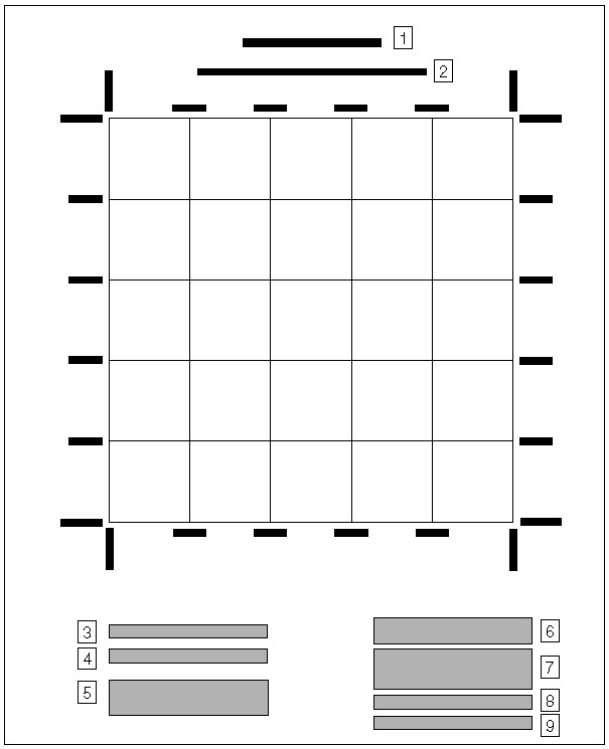
Note 8: Lower right margin, 200 ground metres, Layer: G8040571

```
Date of last amendment dd Mmmmmmmmm CCYY
```

Note 9: Lower right margin, 200 ground metres, Layer: G8040571

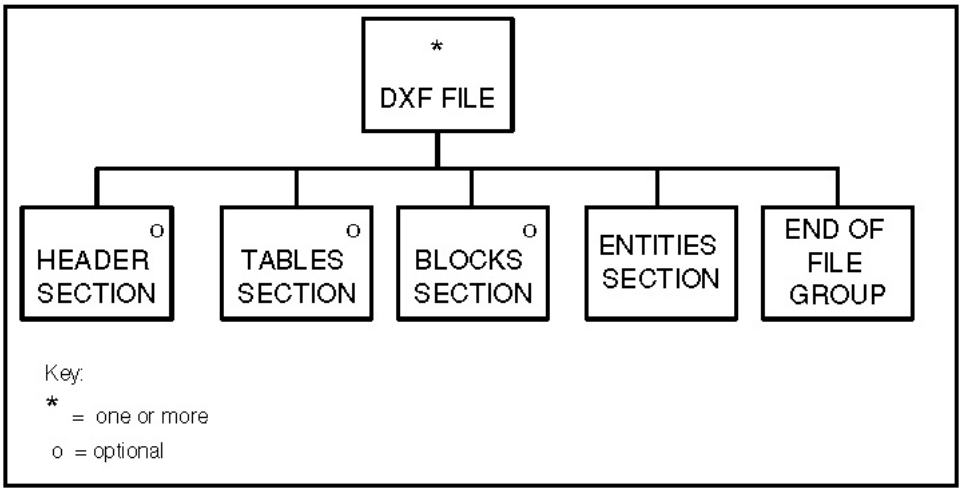
```
Product specification OS_LANDRANGER_DTM
```

Figure 7.1: Layout of footnotes



DXF file structure for Land-Form PANORAMA

The DXF file is structured into a number of sections, each of which holds specific information relating to the drawing. The overall organisation of the file is as follows:



Layers lists

The following are lists of layers that may be included in a Land-Form PANORAMA DXF data file and are shown in numerical order of feature code.

Layer names and descriptions for Land-Form PANORAMA contours in DXF

Layer name	Description	Linetype	Entity	Colour	Symbol
G8040200	Spot heights	CONTINUOUS	INSERT	WHITE	SPOTH
G8040201	Contours	CONTINUOUS	POLYLINE	BROWN	
G8040202	Lakes	CONTINUOUS	POLYLINE	CYAN	
G8040203	Break line	CONTINUOUS	POLYLINE	WHITE	
G8040204	Coastline	CONTINUOUS	POLYLINE	BLUE	
G8040205	Ridgelines	CONTINUOUS	POLYLINE	GREEN	
G8040207	Formlines	CONTINUOUS	POLYLINE	WHITE	
G8040571	Footnotes and grid values	STANDARD	INSERT	WHITE	
G8040572	Grid lines	CONTINUOUS	LINE	WHITE	
G8040573	Grid values	STANDARD	TEXT	WHITE	
G8040575	Default	CONTINUOUS	POLYLINE	WHITE	

Layer names and descriptions for Land-Form PANORAMA DTMs in DXF

Layer name	Description	Linetype	Entity	Colour	Symbol
G8100030	DTM height data	CONTINUOUS	POINT	WHITE	
G8100571	Footnotes and grid values	STANDARD	INSERT	WHITE	
G8100572	Grid lines	CONTINUOUS	LINE/TEXT	WHITE	
G8100573	Grid values	CONTINUOUS	TEXT	WHITE	
G8100575	Default	CONTINUOUS	LINE	WHITE	

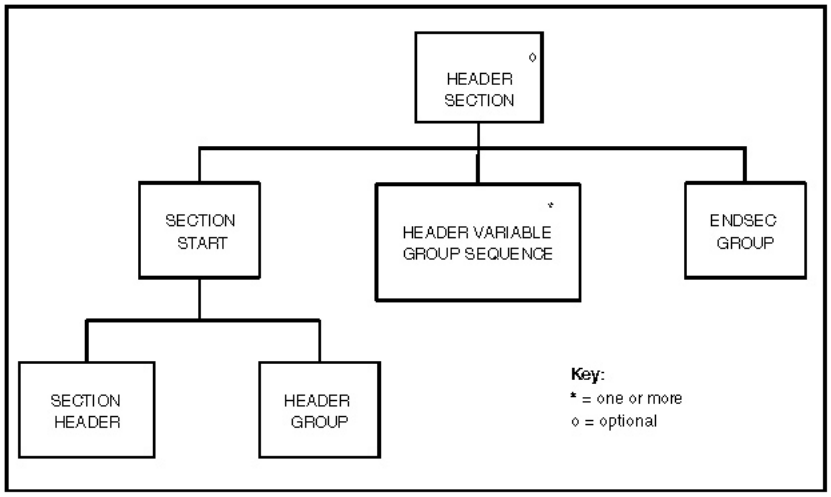
Chapter 6 DXF file structure for Land-Form PANORAMA

General

The following pages contain examples of DXF records with explanatory notes alongside.

Header section

A DXF file will commence with a header section, which will contain general information about the drawing. Each of the groups consists of a variable name and an associated value or values.



Thus:

DXF example	Notes
0	
SECTION	
2	
HEADER	
9	
$ACADVER	AutoCAD drawing database version number
1	
AC1009	This indicates Release 11 or 12
9	
$EXTMIN	X and Y drawing extents, lower left corner
10	
nnnnnnn.nnn	Minimum eastings, (NG coordinates)
20	
nnnnnnn.nnn	Minimum northings, (NG coordinates)
9	
$EXTMAX	X and Y drawing extents, upper right corner
10	
nnnnnnn.nnn	Maximum eastings, (NG coordinates)
20	
nnnnnnn.nnn	Maximum northings, (NG coordinates)
9	
$LIMMIN	X and Y drawing limits, lower left corner
10	
nnnnnn.nnn	X drawing limit, lower left corner, (in the AutoCAD World Coordinate System (WCS))
20	
nnnnnn.nnn	Y drawing limit, lower left corner, (in WCS)
9	
$LIMMAX	X and Y drawing limits, upper right corner
10	
nnnnnn.nnn	X drawing limit, upper right corner, (in WCS)
20	
nnnnnn.nnn	Y drawing limit, upper right corner, (in WCS)
9	
$LTSCALE	Global linetype scale
40	
1.00	
9	
$ATTMODE	Attribute visibility
70	
1	This sets attributes to on when the tile is open
9	

```
$FILLMODE     Fill mode on if non-zero
 70
1.000
  9
$TEXTSIZE     Default text height
 40
1.000
  9
$TEXTSTYLE    Current text style name
  7
STANDARD
  9
$CELTYPE      Entity line type name
  6
BYLAYER
  9
$CECOLOR      Entity colour number
 62
256           Indicates colour id BYLAYER
 9
$LUNITS       Units format for coordinates and distances
 70
2
  9
$LUPREC       Units precision for coordinates and distances
 70
1
  9
$AUPREC       Units precision for angles
 70
1
  9
$ANGBASE      Angle zero direction
 50
0.000
  9
$ANGDIR       Angle rotation
 70
0             1 = clockwise angles, 0 = counter clockwise angles
  9
$PDMODE       Point display mode
 70
1
```

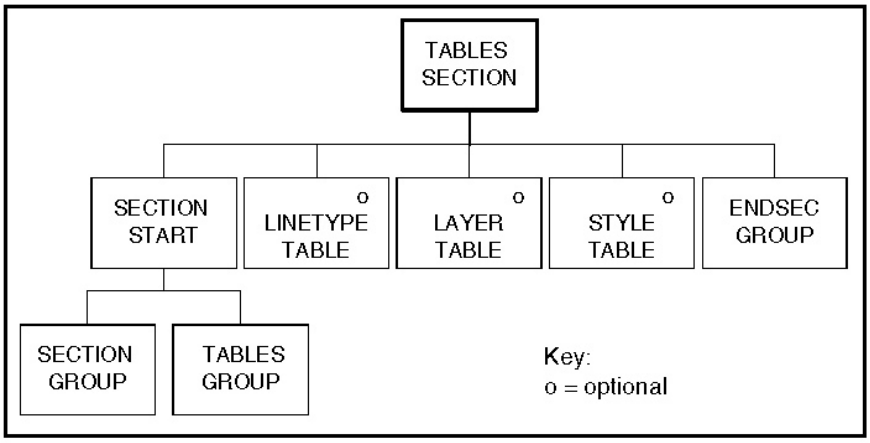
```
  9
$PDSIZE
 40
0.000
  9
$PLINEGEN
 70
1
  0
```
ENDSEC End of section

Tables section

The tables section will follow the header section and contains definitions of named items. Within Land-Form PANORAMA it will normally contain three tables:

- The linetype table will contain the definition for the solid line linetype.
- The layer table will contain the layer definitions (and their colours and linetypes) for the layers within the drawing.
- The style table may define the files from which to access symbols and text fonts. Currently, Land-Form PANORAMA contours does not specify any styles.

Level 2



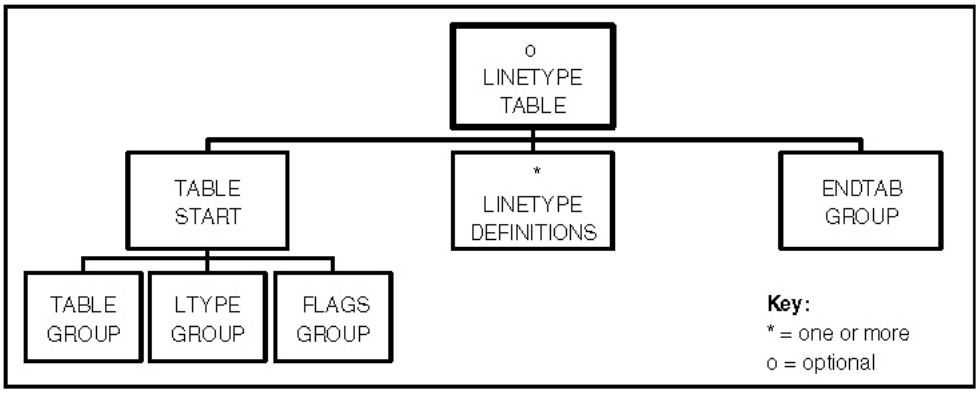
The tables section will follow the header section and will contain three tables:

- Linetype table
- Layer table
- Style table

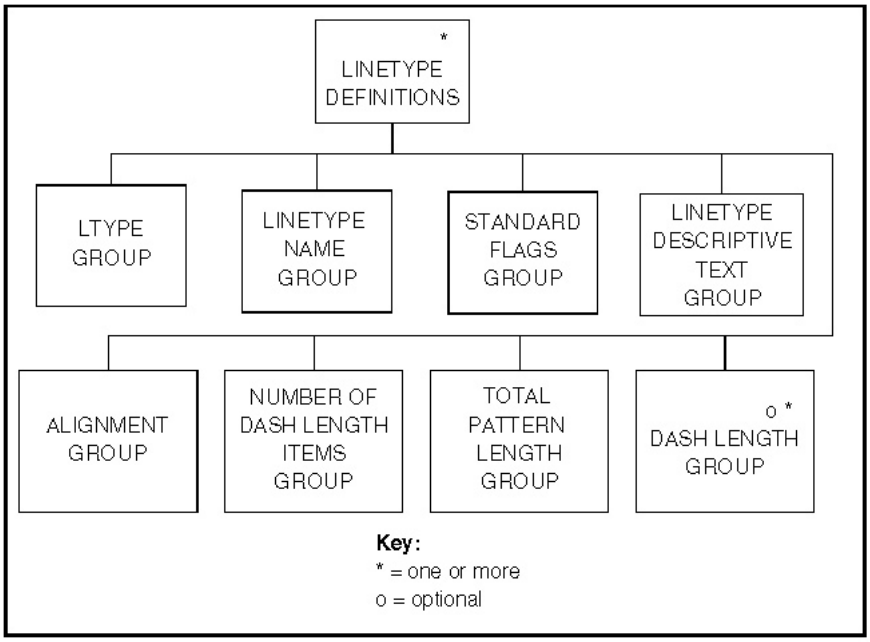
Linetype table

The linetype table will contain definitions for the following line type:

- solid line.



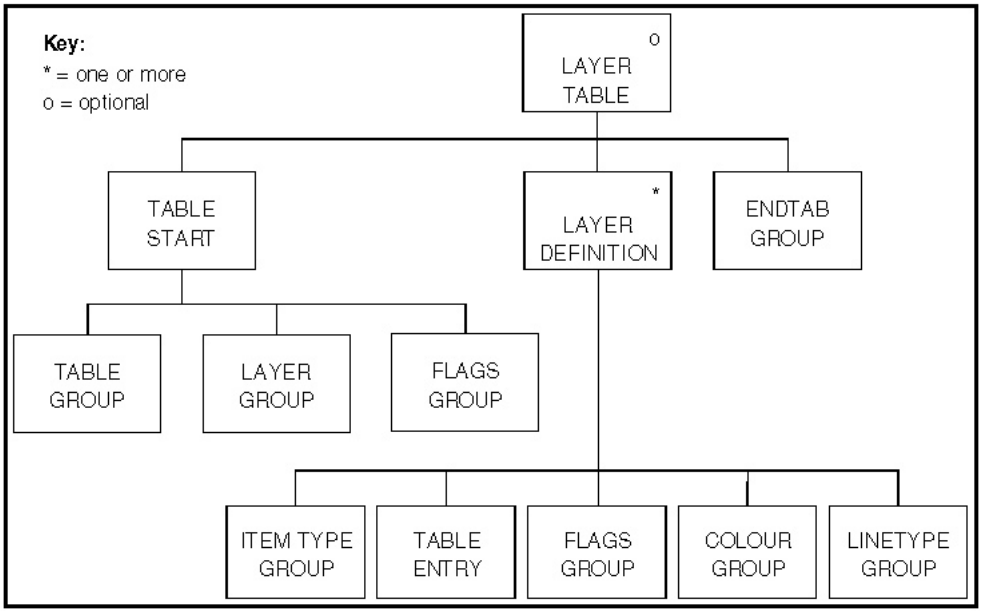
Level 4



DXF example	Notes
0	
TABLE	Table start
2	
LTYPE	Linetype table
70	
1	Flags group
0	
LTYPE	Linetype definition
2	
CONTINUOUS	Name of linetype
70	
64	Flags group
3	
solid line	Linetype description
72	
65	Alignment
73	
0	Number of dash items
40	
0.0	Pattern length
0	
ENDTAB	End of Linetype table

Layer table

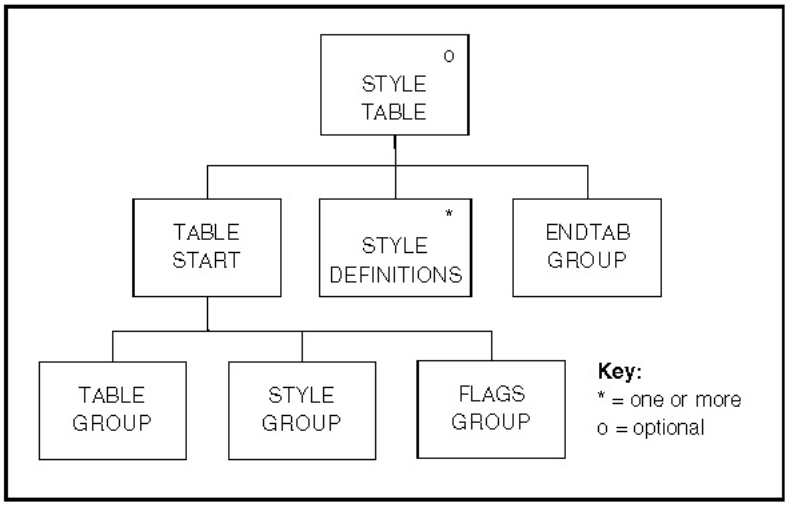
Level 3



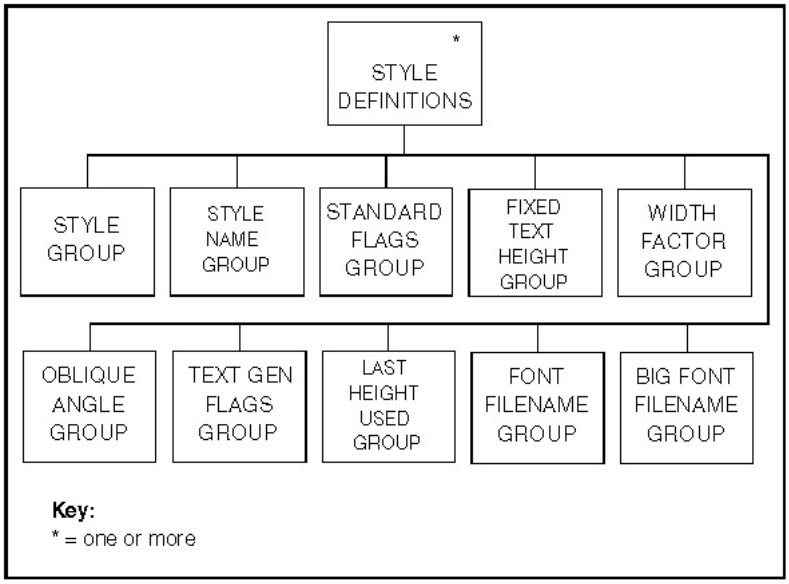
Style table

The style table is part of the tables section and defines the files from which to access symbols and text fonts.

Level 3



Level 4



DXF example Notes

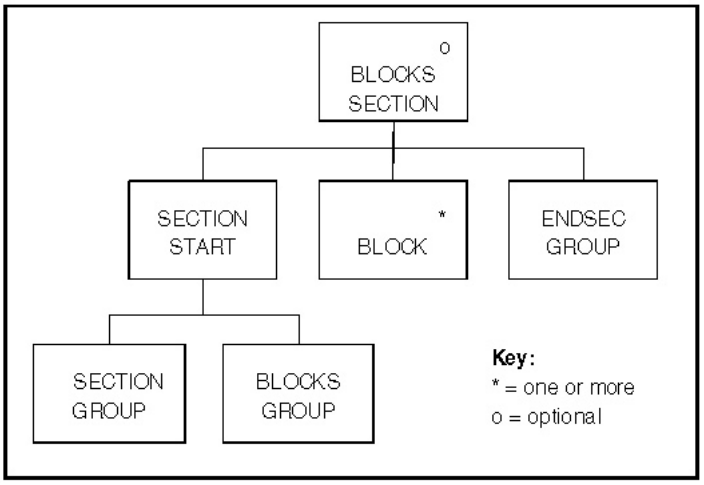
```
 0
TABLE
 2
STYLE
 70
    5
 0
STYLE
 2
STANDARD
 70
    64
 40
 0.0
 41
 1.0
 50
 0.0
 71
    0
 42
 1.0
 3
SIMPLEX.SHX
 4
 0
STYLE
 2
MONOTEXT
```

```
 70
    0
 40
 0.0
41
 1.0
 50
 0.0
 71
    0
 42
 1.0
 3
MONOTXT.SHX
 4
 0
STYLE
 2
ONOTXT
 70
    0
 40
 0.0
 41
 1.0
 50
 0.0
 71
    0
 42
 1.0
 3
MONOTXT.SHX
 4
0
ENDTAB
```

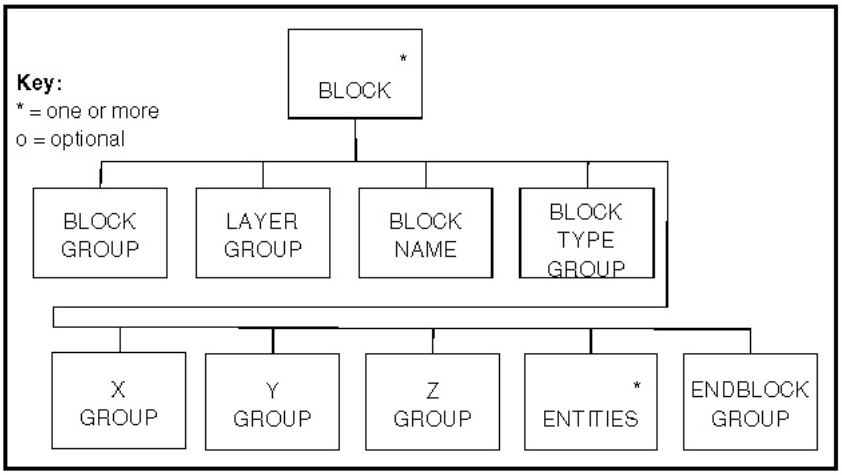
Blocks section

The blocks section defines the symbols (or blocks) that may appear in the drawing. These can be made up from any number of entities, such as polylines.

Level 2



Level 3



Entities section

The entities section will contain DXF entities for:

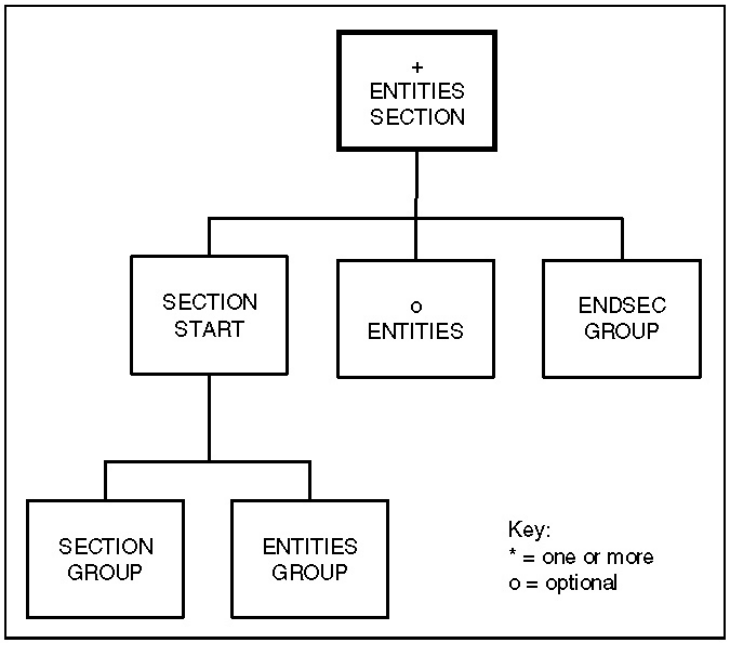
- Ordnance Survey map footnotes data, (INSERT entities);
- Grid and neatline, (TEXT and LINE entities); and
- Ordnance Survey map features, (TEXT, POLYLINE and INSERT entities).

The structure of each different entity is as follows:

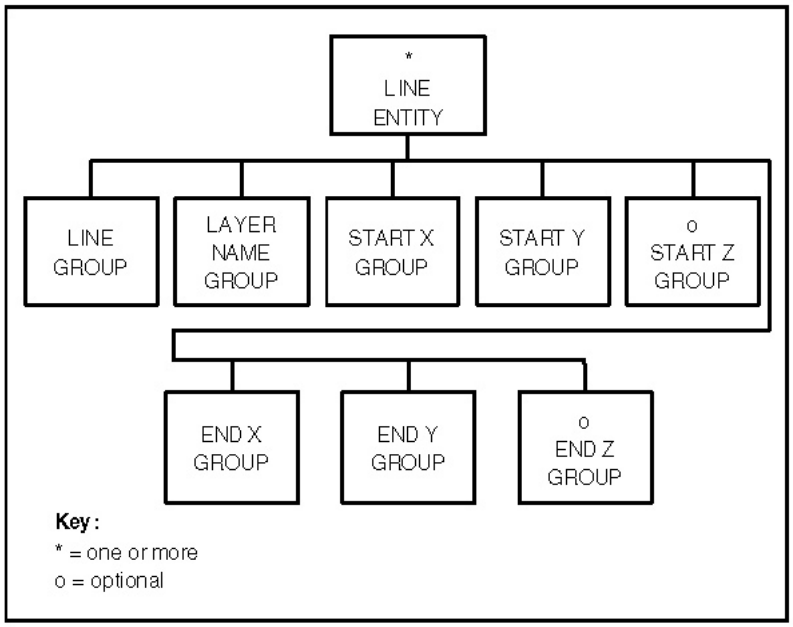
- INSERT entities – these consist of:
  - INSERT entity type group (Attribute number: 0)
  - Layer name group (8)
  - Block name group (2)
  - X coordinate group (10)
  - Y coordinate group (20)
  - Z coordinate group (30)
  - X scale factor (41) [optional]
  - Y scale factor (42) [optional]
  - Orientation group (50) [optional if 0]
- LINE entities – these consist of:
  - LINE entity type group (0)
  - Layer name group (8)
  - Start X coordinate group (10)
  - Start Y coordinate group (20)
  - End X coordinate group (11)
  - End Y coordinate group (21)

- POLYLINE entities – these consist of:
  - POLYLINE entity type group (0)
  - Layer name group (8)
  - Vertices follow flag group (66)
  - Polyline elevation (30)
  - Polyline flag group (70) [optional]
  - A number of VERTEX entities [shown below]
  - SEQEND group (0)
- VERTEX entities – these consist of:
  - VERTEX entity type group (0)
  - Layer name group (8)
  - X coordinate group (10)
  - Y coordinate group (20)
  - Z coordinate group (30)
- TEXT entities – these consist of:
  - TEXT entity type group (0)
  - Layer name group (8)
  - X coordinate group (10)
  - Y coordinate group (20)
  - Text height group (40)
  - Text string group (1)
  - Justify type group (72) [optional if 0]
  - Justify type group (73) [optional if 0]
  - Orientation group (50) [optional if 0]
  - Text style group (7) [optional]
  - Align X group (11) [only present if Justify group is present and has a value of 2]
  - Align Y group (21) [only present if Justify group is present and has a value of 2]

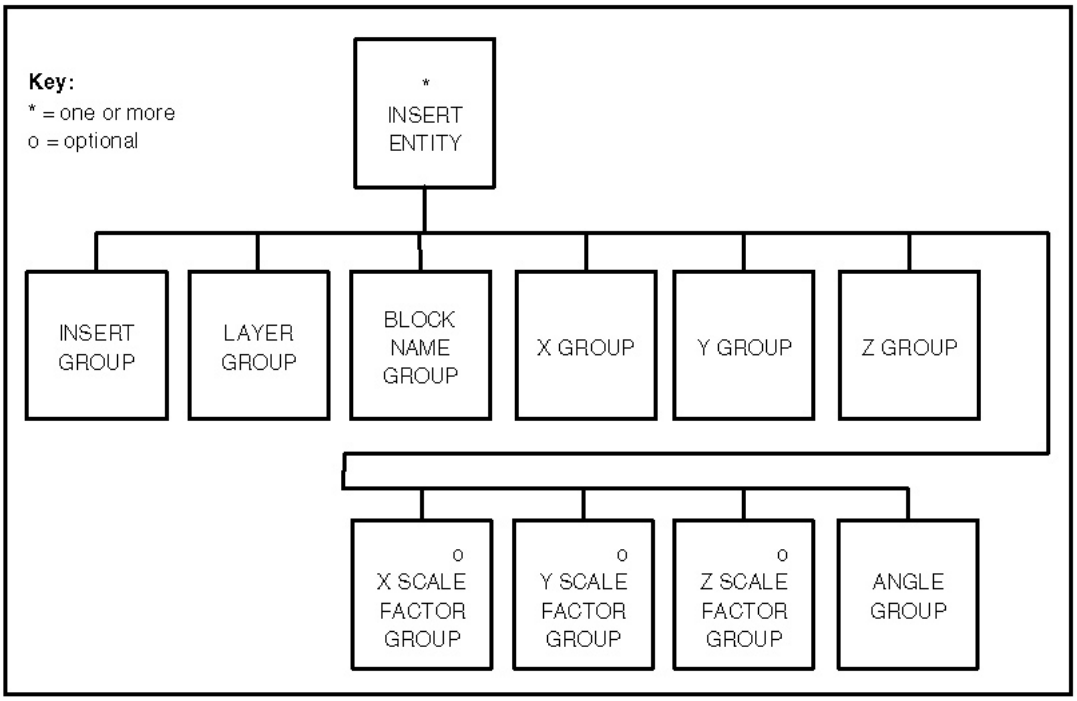
Level 2



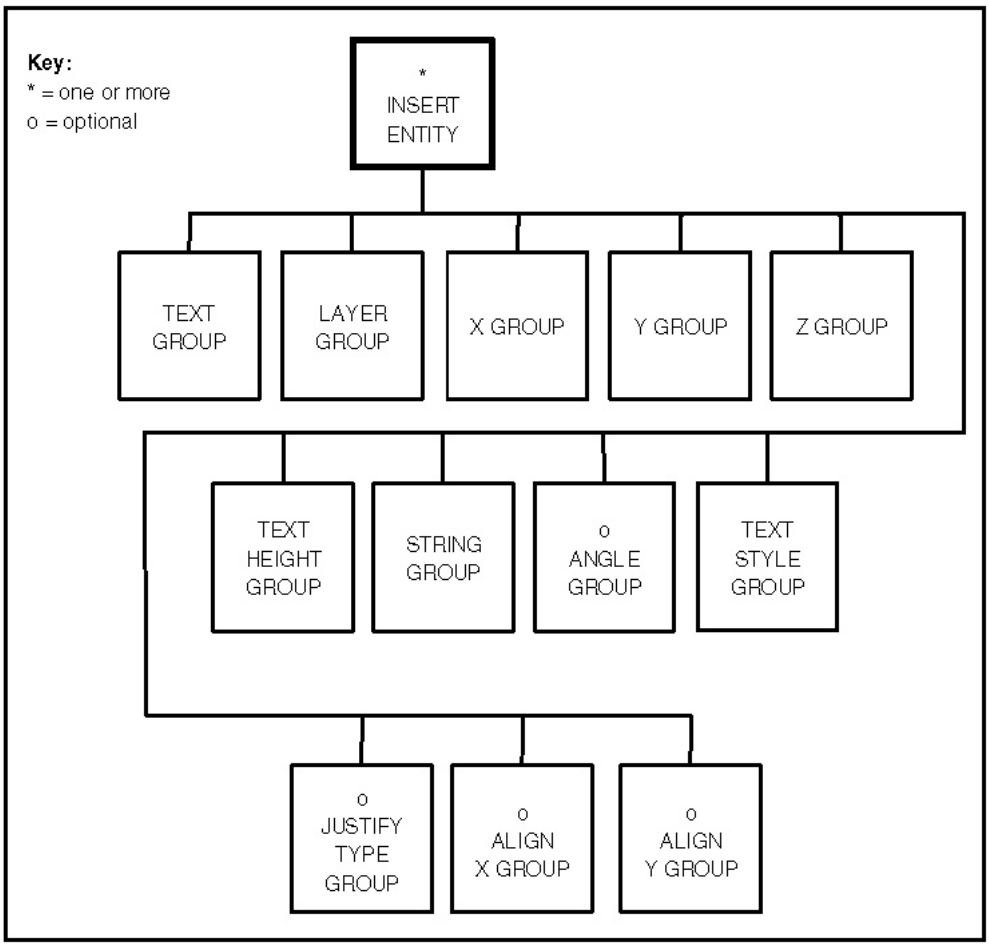
Level 3



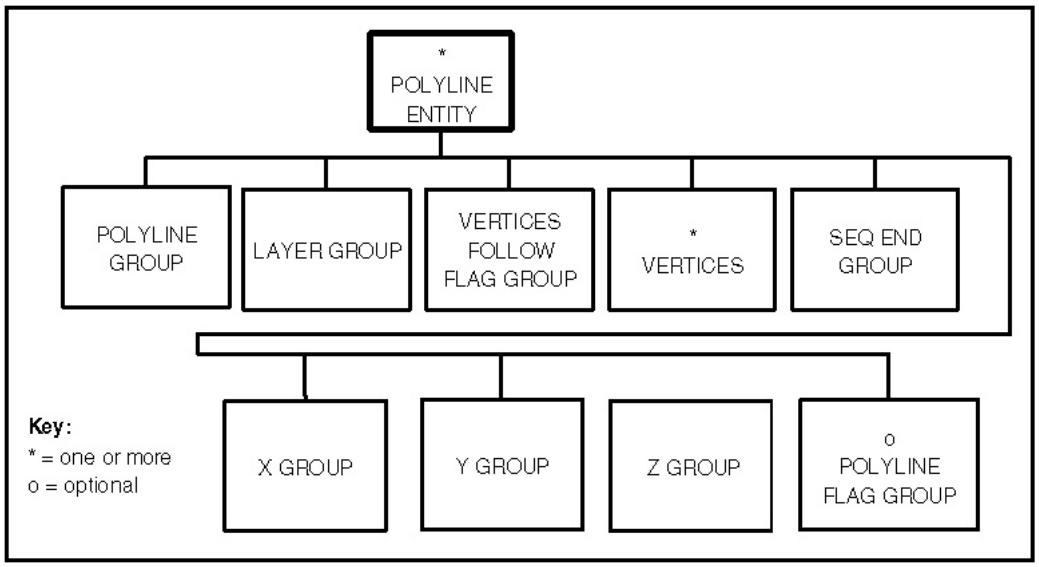
Level 3



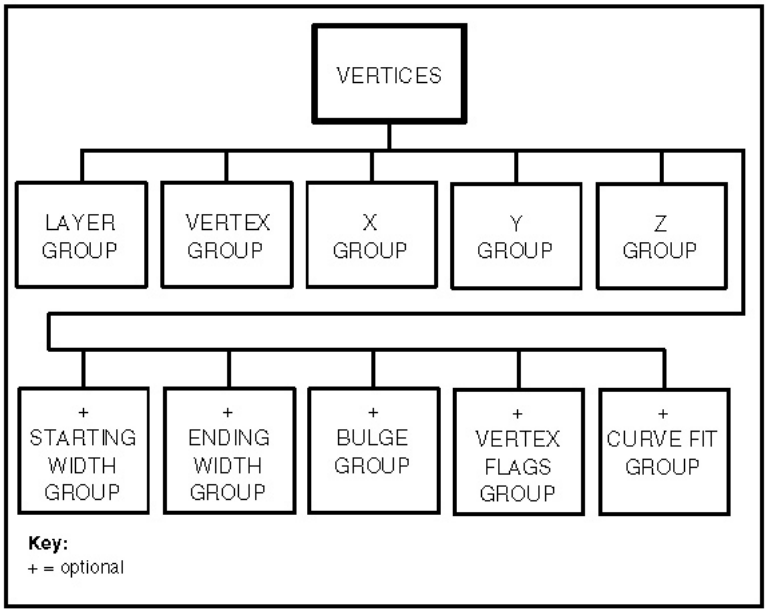
Level 3



Level 3



Level 3



End of file group

This group will end with DXF EOF (end of file) group.

Annexe A Glossary

The purpose of this chapter is to provide a glossary of terms used in the definition of products, services, licensing and other terms and conditions for Land-Form PANORAMA.

absolute accuracy
A measure that indicates how closely the coordinates of a point in Ordnance Survey map data agree with the true National Grid coordinates of the same point on the ground.

As the true position can never be known exactly, the statistic is quoted relative to the best known position determined by precise survey methods.

absolute coordinates
A coordinate pair or triplet measured directly from the origin of the coordinate system in which it lies and not to any other point in the system.

accuracy
The closeness of the results of observations, computations or estimates to the true values or the values accepted as being true. Accuracy relates to the exactness of the result, and is a measure of the exactness of the operation by which the result is obtained.

air height
A coordinated control point, which can be identified on the ground and also in aerial photos, that is used to provide vertical control.

alphanumeric
Information in character form.

area
A spatial extent defined by circumscribing lines that form a closed perimeter that does not intersect itself.

ASCII
American Standard Code for Information Interchange – a standard binary coding system used to represent characters within a computer.

basic scale
The scale at which the survey is undertaken. For Ordnance Survey mapping, three scales (1:1250 – urban, 1:2500 – urban and rural, 1:10 000 – mountain and moorland) are used.

basic scale file and/or unit tile (sheet)
A grouping of topographic information relating to a specific spatial extent, in the form of a map either held as a data file or realised on paper.

bit
An acronym for binary digit.

byte
A unit of computer storage of binary data usually comprising 8 bits, equivalent to a character. Hence megabyte (one million bytes) and gigabyte (one thousand million bytes).

cartography
The organisation and communication of geographically related information in either graphic or digital form. It can include all stages from data acquisition to presentation and use.

CD-ROM
A data storage medium. A 12 cm disc similar to an audio CD.

character
A distinctive mark; an inscribed letter; one of a set of writing-symbols.

character set
A set of letters, numerals, punctuation marks, mathematical and other symbols. Standard sets, such as ANSI, ISO and others, have been drawn up.

character string
A one-dimensional array of characters held either in memory or in another storage medium.

coded string data
A type of vector data in which the strings of coordinates have been feature coded.

coding
Allocation of a feature code to a feature being created from constituent construction data (points and/or segments); with optional linking to an existing feature of the same feature code.

continuation mark
A logical record may contain more data than can be held in a single physical record. The physical record contains a continuation mark (the penultimate character of the record in NTF) to indicate whether more data is to be found in a continuation record.

continuation record
A specific NTF term. A continuation record is used where space does not allow one logical record to be contained wholly within one physical record.

coordinate pair
An X and Y value measured with reference to Cartesian axes. In mapping a coordinate pair normally consists of an easting and a northing.

coordinates
Pairs of numbers expressing horizontal distances along orthogonal axes. Alternatively, triplets of numbers measuring horizontal and vertical distances. Row and column numbers of pixels from raw imagery are not considered coordinates for the purpose of this convention. (See coordinate pair.)

currency
An expression of the up-to-dateness of data.

data
A representation of facts, concepts or instructions in a formalised manner suitable for communication, interpretation or processing.

data capture
The encoding of data. In the context of digital mapping this includes map digitising, direct recording by electronic survey instruments, and the encoding of text and attributes by whatever means.

data format
A specification that defines the order in which data is stored or a description of the way data is held in a file or record.

data point
A coordinate pair that defines the position of a point feature, or one of a series of coordinate pairs that defines a line feature.

data quality
Attributes of a dataset that define its suitability for a particular purpose, for example, completeness, positional accuracy, currency, logical structure and so on.

data structure
The defined logical arrangement of data as used by a system for data management; a representation of a data model in computer form.

data transfer medium
This is the means by which computer files are transferred from one computer to another. Transfer media may be subdivided into communications media and physical media.

data type
This defines the structure of a data item. This in turn determines the range of values it can take and the range of operations that can be applied to it. Integer, real and character string are examples of data type. Some modern programming languages allow user-defined types.

databank
A collection of data in a common location relating to a given set of subjects.

database
An organised, integrated collection of data stored so as to be capable of use by relevant applications, with the data being accessed by different logical paths. Theoretically, it is application-independent, but in reality it is rarely so.

dataset
An identifiable collection of related data.

density
A measure of the number of units of data held on a stated length of storage surface. For example, some magnetic tapes may be recorded at a density of 1 600 bits per inch (bpi). Often referred to as packing density.

derived map
A map that has been produced by reference to other source data rather than directly from a survey.

digital
Data that is expressed as numbers (digits) in computer-readable form is said to be digital.

digital archive
Archival map data stored in digital format.

digital elevation model (DEM)
A generic term describing a digital representation of a topographic surface. The surface elevation values can be represented in various forms, for example, by contours, spot heights or breaklines; a regular grid or triangulated irregular network (TIN); and so on. A DEM may also include surface features such as buildings, vegetation and so on.

digital map
A term used by Ordnance Survey to describe a particular tile of digital map data.

digital map data
The digital data required to represent a map. The data includes not only map detail but also feature header data, map header data and management data.

digital map file
The digital map data comprising a map sheet unit.

digital terrain image (DTI)
A two-dimensional model representing the topographic surface. Surfaces between contours, or sets of contours, are coloured or shaded as required.

digital terrain model (DTM)
A DEM primarily defining the ground surface. This will normally exclude ground surface features such as buildings, woodland and so on. Note: This is a well established term, which preceded DEM as a generic description.

digitising
The process of converting analogue (hand-drawn) maps and other sources to a computer-readable form. This may be point digitising, where points are only recorded when a button is pressed on a cursor, or stream digitising, where points are recorded automatically at preset intervals of either distance or time as the cursor is traced along a map feature.

DXF (Data Exchange Format)
A proprietary data format, devised by Autodesk®, by which digital drawings may be transferred between users of CAD (computer-aided design) systems. DXF has become an industry standard data format and is an option for the transfer of Ordnance Survey Land-Form PANORAMA.

eastings
See rectangular coordinates.

EBCDIC (extended binary coded decimal interchange code)
An 8-bit character encoding scheme.

edgematch
The process of ensuring that data along the adjacent edges of map sheets, or some other unit of storage, matches in both positional and attribute terms.

edit
The process of validating and correcting errors in digital map data.

feature
An item of detail within a digital map that can be represented by either a point, symbol, text or line.

feature classification record
A specific, named NTF record that lists the feature codes in use in the current database.

feature code (FC)
A numeric attribute used in digital map data to describe each feature in terms either of the object surveyed or its representation on the map (or both). A feature code is equivalent to a layer in DXF.

feature identifier
A unique code to identify an individual feature. (See also feature serial number.)

feature serial number (FSN)
A number used as a feature identifier usually allocated on a sequential basis. For example, the order in which features are digitised.

field
A specified part of a record containing a unit of data, such as the date of digitising. The unit of data may be a data element or a data item. In NTF a field is a subdivision of a physical record. Every field has a name and a predefined interpretation.

font
The style of text character used by a printer or plotter.

formline
A supplementary contour – not corresponding to the normal contour vertical interval – estimated or interpolated from surrounding contours, used in areas where there is insufficient height information to control the creation of a grid DEM.

footnotes
Supplementary or explanatory notes pertaining to a map sheet that are normally included below the southern neatline of a printed map and supplied with DXF data.

format
The specified arrangement of data. For example, the layout of a printed document, the arrangement of the parts of a computer instruction, the arrangement of data in a record.

generalisation
The process of abstraction from the real world – through selection, aggregation, simplification and symbolisation – for the purpose of representation in spatial data.

geographical information system (GIS)
A system for capturing, storing, checking, integrating, analysing and displaying data that is spatially referenced to the Earth. This is normally considered to involve a spatially referenced computer database and appropriate applications software.

geographical coordinates
These are coordinates, usually expressed as latitudes and longitudes, which define position on the Earth's surface.

geometric data
Data about position within an absolute or relative coordinate system.

grid
The planimetric frame of reference, for example, the National Grid.

hard copy
A print or plot of output data on paper or some other tangible medium.

header
See map header.

kilobyte (Kb)
A total of 1 024 bytes; a measure of data storage capacity.

line
A series of connected coordinated points forming a simple feature with homogeneous attribution.

line segment
A vector connecting two coordinated points.

logical record
A logical record contains all the information relating to a data entity, for example, a feature record. A logical record may comprise one or more physical records.

map
A graphical or digital representation of the landscape, including natural and/or man-made features.

map generalisation
The process of reducing the complexity of the detail on a map when reducing the map scale.

map header
Data at the start of the digital map file describing that data. It may contain information on the source and history of the geometric data within the map and the coordinate system in use.

map projection
The systematic arrangement of meridians and parallels portraying the curved surface of the sphere or spheroid upon a plane.

map scale
The ratio between the extent of a feature on the map and its extent on the ground, normally expressed as a representative fraction, for example, 1:1250 scale or 1:50 000 scale.

map sheet unit
The ground area covered by a single map.

mean high water/springs (MHW or MHWS)
Depiction of the encroachment of land by tidal waters at mean highest levels – spring tides in Scotland.

mean low water/springs (MLW or MLWS)
Depiction of limits of tidal waters at mean lowest ebb – spring tides in Scotland.

megabyte (Mb)
A total of 1 048 576 bytes; a measure of data storage capacity.

National Grid
The metric grid on a Transverse Mercator projection used by Ordnance Survey on all post-war mapping to provide an unambiguous spatial reference in Great Britain for any place or entity, whatever the map scale.

northings
See rectangular coordinates.

NTF (National Transfer Format)
A format designed in 1988 specifically for the transfer of spatial information. Administered by the British Standards Institution (BSI), its present version (2.0) conforms to BS 7567. NTF is used to supply Land-Form PANORAMA (see also DXF).

origin
The zero point in a system of rectangular Cartesian coordinates.

parity
The practice of appending a check-bit to binary values to make the sum of the 1-bits always odd or always even. A mechanism for error detection.

physical record
In NTF a physical record may be fixed length (in which case it contains 80 characters) or variable length (which contains up to 80 characters). (See also logical record.)

point
A zero-dimensional spatial abstraction of an object represented as a coordinate pair.

point feature
A zero-dimensional spatial abstraction of an object with its position defined by a coordinate pair. Points may also be represented by symbols, which may have attributes such as orientation and size.

positional accuracy
The degree to which the coordinates define a point's true position in the world, directly related to the spheroid and/or projection on which the coordinates system is based.

precision
The exactness with which a value is expressed, whether the value be right or wrong.

rectangular coordinates
Also known as x-y coordinates and as eastings and northings. These are two-dimensional coordinates that measure the position of any point relative to an arbitrary origin on a plane surface, for example, a map projection, a digitising table or a VDU screen.

sheet
See map sheet unit.

source scale
The scale of the source information from which the map was digitised, that is, the scale of survey for a basic-scale map, or the scale of the source map for a derived map.

spot height
A point on the Earth's surface for which the height, above a reference datum, is known and which has been fixed by observation.

structure
See data structure.

surveying
The determination of the absolute and relative positions of points on or near the Earth's surface by means of measurement in the three elements of space – distance, direction and elevation – and hence their subsequent representation onto a plane surface, exhibiting them in their correct horizontal and vertical relationships.

terminator
A character, or character string, or field, or record used to signal the end of a record, or section, or volume, or database.

topographic database
A database in which data relating to the physical features and boundaries on the Earth's surface is held.

topography
Topography is the study of the physical features of the earth. A topographic map's principal purpose is to portray and identify the features of the earth.

transfer format
The format used to transfer data consistently between computer systems. In general usage this can refer not only to the organisation of data but also to the associated information, such as attribute codes, which are required in order to successfully complete the transfer.

transfer medium
The physical medium on which digital data is transferred from one computer system to another, for example, CD-ROM.

transfer set
A specific NTF term for the data, together with its supporting information, which the customer receives.

vector
A straight line joining two data points.

vector data
Positional data in the form of coordinates of the ends of line segments, points, text positions and so on.

volume
A physical unit of the transfer medium, that is, a single disk, a single DAT, a single CD-ROM and so on.