Survey Controller Version 6.0 DC File Format

A DC file is a file that contains a job in the format used by SENDFILE, GETFILE, TRIMMAP, or GPSurvey. It is in a proprietary Trimble format.

A DC file consists of various types of records, each with a number of fields. The following sections describe the various records and fields that can be used with the version 6.0 DC file format.

1 Records

This section lists the records that can occur in a DC file. Each item in the list has the following structure:

- The heading, which gives the name of the record type. This name appears in the left column when you view the job using the Survey Controller software, or edit the DC file in Trimble Survey Office or TRIMMAP. It is often abbreviated.
- The record is described, and its relationship to other records outlined.

- The fields in the record are listed as follows:
  - The first column details whether the field type is integer (a whole number), alpha (contains ASCII characters), or real (contains a real number), and gives the field size in bytes.
  - The second column names the field contents.
  - The last column indicates the data type.

For example, the fifth field of the HEADER record has:

Alpha 16	Date and time	Text

This means that the field is alphanumeric, that it is16 characters (including spaces) long, that it contains the date and time, and that the field type is ‘text’.

The first data record of each transmission is always of type 00. This is the header record which contains the information on how the rest of the fields in the file are to be interpreted. The version number field in the header record identifies the type of data recorder the file is compatible with. A number of option fields in the header record determine the measurement units in which different data fields have been recorded. A header record is always followed by a job record.

For more information about fields in DC file records or for a description of a particular field type in one of the records listed below see Fields, page 16.

1.1 Header

The HEADER record must appear in the file as the first record. It cannot appear in any other place in the file. The Units specifications contained in it apply to all relevant fields in the rest of the file.

Integer 2	Type code 00	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Version number	Version
Integer 4	Serial number	Integer
Alpha 16	Date and time	Text
Alpha 1	Angle unit	Option
Alpha 1	Distance unit	Option
Alpha 1	Pressure unit	Option
Alpha 1	Temperature unit	Option
Alpha 1	Coord prompt option	Option
Alpha 1	Angles left/right option	Option

1.2 Job

The JOB record must appear as the second record in the file. It cannot appear anywhere else in the file.

Integer 2	Type code 10	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Job identifier	Text
Alpha 1	Point ID type	Option
Alpha 1	Include elevation	Option
Alpha 1	Atmos correction	Option
Alpha 1	C & R correction	Option
Alpha 1	Refraction const	Option
Alpha 1	Sea level correction	Option

1.3 Note

NOTE records can appear anywhere in the file, but they cannot appear until after the JOB record and should not appear between related records (such as a position and its QC records). Certain items are recorded as notes—if you change a field in Cogo settings, for example, or if you compute a calibration.

Integer 2	Type code 13	Type code
Alpha 2	Derivation code	Derv code
Alpha 60	Alphanumeric note	Text

1.4 Projection

PROJECTION records can appear at any point in the file and in any quantity. If more than one PROJECTION record exists, the last one is used in all reductions; all previous ones are ignored. If a PROJECTION record exists in a file, then a LOCAL ELLIPSOID record must also exist in the file. There is no requirement as to the relative order of these two records.

Integer 2	Type code 64	Type code
Alpha 2	Derivation code	Derv code
Alpha 1	Projection type	Option
Real 16	Origin Latitude	Latitude
Real 16	Origin Longitude	Longitude
Real 16	Origin Height	Distance
Real 16	Origin North	Distance
Real 16	Origin East	Distance
Real 16	Origin Elevation	Distance
Real 16	Scale Factor	Scale Factor
Real 16	Orientation 1(skew/parallel 1)	Angle
Real 16	Orientation 2 (parallel 2)	Angle

1.5 Local Ellipsoid

LOCAL ELLIPSOID records can appear at any point in the file and in any quantity. If more than one LOCAL ELLIPSOID record exists, the last one is used in all reductions; all previous ones are ignored. The LOCAL ELLIPSOID record defines the ellipsoid parameters as required by both the projection and datum reductions.

Integer 2	Type code 65	Type code
Alpha 2	Derivation code	Derv code
Real 16	Local ellipsoid radius	Distance
Real 16	Local ellipsoid flattening (inverse)	Scale factor

1.6 Datum Transformation

DATUM TRANSFORMATION records can appear at any point in the file and in any quantity. If more than one DATUM TRANSFORMATION record exists, the last one is used in all reductions; all previous ones are ignored. If a DATUM TRANSFORMATION record exists in a file then a LOCAL ELLIPSOID record must also exist in the file. There is no requirement as to the relative order of these two records.

Integer 2	Type code 49	Type code
Alpha 2	Derivation code	Derv code
Alpha 1	Transformation type	Option
Real 16	WGS-84 ellipsoid radius	Distance
Real 16	WGS-84 ellipsoid flattening (inverse)	Scale factor
Real 16	Rotation X	Angle
Real 16	Rotation Y	Angle
Real 16	Rotation Z	Angle
Real 16	Translation X	Distance
Real 16	Translation Y	Distance
Real 16	Translation Z	Distance
Real 16	Scale factor	Scale factor

1.7 Horizontal Adjust

HORIZONTAL ADJUST records can appear at any point in the file, and in any quantity. If more than one HORIZONTAL ADJUST record exists, the last one is used in all reductions; all previous ones are ignored. A PROJECTION record must exist, otherwise this record is ignored.

Integer 2	Type code 50	Type code
Alpha 2	Derivation code	Derv code
Real 16	Origin North	Distance
Real 16	Origin East	Distance
Real 16	Translation North	Distance
Real 16	Translation East	Distance
Real 16	Rotation About Origin	Angle
Real 16	Scale Factor	Scale factor

1.8 Vertical Adjust

VERTICAL ADJUST records can appear at any point in the file and in any quantity. If more than one VERTICAL ADJUST record exists, the last one is used in all reductions; all previous ones are ignored. A PROJECTION record must exist, otherwise this record is ignored.

Integer 2	Type code 63	Type code
Alpha 2	Derivation code	Derv code
Alpha 1	Calculation method	Option
Real 16	Origin North	Distance
Real 16	Origin East	Distance
Real 16	Constant Adjustment	Distance
Real 16	Slope North	Distance
Real 16	Slope East	Distance

1.9 Equipment

EQUIPMENT records can occur at any place in the file and in any quantity. They define information about the GPS receiver and Antenna used for a survey. The details of the antenna are used in the reduction of all subsequent records that require an antenna reduction.

Integer 2	Type code 61	Type code
Alpha 2	Derivation code	Derv code
Alpha 8	Receiver type	Text
Alpha 8	Receiver serial number	Text
Integer 2	Antenna number	Integer
Integer 1	Antenna index	Integer
Alpha 30	Antenna name	Text
Alpha 8	Antenna serial number	Text
Real 16	Tape adjustment	Distance
Real 16	Horizontal offset	Distance
Real 16	Vertical offset	Distance

1.10 Survey

SURVEY records can occur at any place in the file and in any quantity. They have no effect on any other operation.

Integer 2	Type code 56	Type code
Alpha 2	Derivation code	Derv code
Integer 2	Elevation mask	Angle
Real 16	PDOP mask	Dimensionless

1.11 GPS Antenna Height

The ANTENNA HEIGHT record defines the distance from the APC of the antenna to the mark on the ground. If the measurement is True, the distance recorded is taken to be the vertical distance between the APC and ground. If the measurement is Uncorrected, the most recent EQUIPMENT record is used in conjunction with the distance recorded in order to reduce the uncorrected measurement of the APC to ground distance. An EQUIPMENT record must precede an ANTENNA HEIGHT record at some point in the file, unless a measurement type of True is specified.

Integer 2	Type code 57	Type code
Alpha 2	Derivation code	Derv code
Real 16	Antenna height	Distance
Alpha 1	Slope/vertical measurement	Option

1.12 RTK Reference

The RTK REFERENCE record defines the point that has been used as a base point for future GPS VECTOR reductions. The Point ID identifies the position of the ground point for the base. The most recent ANTENNA HEIGHT record is used to obtain the APC for the reference. The RTK REFERENCE record must have a preceding ANTENNA HEIGHT record. The Point ID of an RTK REFERENCE can refer to a point of any type, including a GPS VECTOR.

Integer 2	Type code 73	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Reference point ID	Point

1.13 GPS Position

A GPS POSITION record defines the APC of a point. In order to obtain the ground position for the point the most recent ANTENNA HEIGHT record is used. An ANTENNA HEIGHT record must have preceded a GPS POSITION at some point in the file. An arbitrary number of GPS POSITION records can appear in the file.

Integer 2	Type code 66	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Point ID	Point
Real 16	WGS-84 latitude	Latitude
Real 16	WGS-84 longitude	Longitude
Real 16	WGS-84 ellipsoidal height	Distance
Alpha 16	Description	Text
Alpha 1	Survey method	Option
Alpha 1	Classification	Option
Real 16	Horizontal precision	Precision
Real 16	Vertical precision	Precision

1.14 GPS Vector

A GPS VECTOR record defines the deltas between the most recent RTK REFERENCE point and the named point. The deltas are in the WGS-84 ECEF coordinate system and are between the APC of the reference point and the APC of the target point. In order to reduce the point to a ground position the WGS-84 latitude, longitude, and height of the APC for the target point is calculated and then reduced to ground using the most recent ANTENNA HEIGHT record.

An ANTENNA HEIGHT record and an RTK REFERENCE record must precede a GPS VECTOR.

Integer 2	Type code 67	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Point id	Point
Real 16	Delta X	Distance
Real 16	Delta Y	Distance
Real 16	Delta Z	Distance
Alpha 16	Description	Text
Alpha 1	Survey method	Option
Alpha 1	Classification	Option
Real 16	Horizontal precision	Precision
Real 16	Vertical precision	Precision

1.15 Local Position

A LOCAL POSITION defines the absolute coordinates of the ground position of a point on the local ellipsoid coordinate system. It is dependent on no other records. If the position is to be converted into some other coordinate system the records that define that conversion must be in the file.

Integer 2	Type code 68	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Point id	Point
Real 16	Local latitude	Latitude
Real 16	Local longitude	Longitude
Real 16	Local ellipsoidal height	Distance
Alpha 16	Description	Text
Alpha 1	Survey method	Option
Alpha 1	Classification	Option

1.16 Grid Position

A GRID POSITION record defines the absolute coordinates of the ground position of a point on the local projection coordinate system. It is dependent on no other records. If the position is to be converted into some other coordinate system the records that define that conversion must be in the file.

Integer 2	Type code 69	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Point ID	Point
Real 16	Northing	Distance
Real 16	Easting	Distance
Real 16	Elevation	Distance
Alpha 16	Description	Text
Alpha 1	Survey method	Option
Alpha 1	Classification	Option

1.17 Ground Vector

A GROUND VECTOR record defines the deltas between two points. The vector is between the two ground positions. There is no requirement that any other record exists.

Integer 2	Type code 70	Type code
Alpha 2	Derivation code	Derv code
Alpha 16	Point id	Point
Alpha 16	Reference id	Point
Real 16	Azimuth	Angle
Real 16	Ground distance	+Distance
Real 16	Vertical distance	Distance
Alpha 16	Description	Text
Alpha 1	Survey method	Option
Alpha 1	Classification	Option

1.18 Initialization

The INITIALIZATION record documents changes in the initialization state of a survey. Any number of them can appear in the file in any order.

Integer 2	Type code 71	Type code
Alpha 2	Derivation code	Derv code
Alpha 1	Initialization event	Option
Integer 4	GPS week	GPS Time
Real 16	GPS second to 3 d.p.	GPS Time
Alpha 1	Initialization type	Option
Alpha 1	Survey method	Option
Integer 4	Initialization counter	Integer
Alpha 16	Point ID	Point
Real 16	Plate azimuth	Azimuth
Real 16	Plate horizontal distance	+Distance
Real 16	Plate vertical distance	Distance

1.19 Quality Control 1

The QUALITY CONTROL 1 record relates to the preceding GPS POSITION or GPS VECTOR record. Any other such records can exist, but serve no purpose.

Integer 2	Type code 62	Type code
Alpha 2	Derivation code	Derv code
Integer 2	Number of satellites (minimum)	Integer
Real 16	PDOP (maximum)	Accuracy
Real 16	HDOP (maximum)	Accuracy
Real 16	VDOP (maximum)	Accuracy
Integer 4	Number of GPS positions used	Integer
Real 16	Horz Standard deviation	Distance
Real 16	Vert Standard deviation	Distance
Integer 4	Start week	GPS time
Real 16	Start second to 3 d.p.	GPS time
Integer 4	End Week	GPS time
Real 16	End second to 3 d.p.	GPS time
Alpha 1	Monitor status	Option

1.20 Quality Control 2

The QUALITY CONTROL 2 record relates to the preceding GPS POSITION or GPS VECTOR record. Any other such records can exist but serve no purpose.

Integer 2	Type code 59	Type code
Alpha 2	Derivation code	Derv code
Integer 2	Number of satellites (minimum)	Integer
Real 16	Error scale	Accuracy
Real 16	VCV xx	Accuracy
Real 16	VCV xy	Accuracy
Real 16	VCV xz	Accuracy
Real 16	VCV yy	Accuracy
Real 16	VCV yz	Accuracy
Real 16	VCV zz	Accuracy

1.21 Quality Control 3

The QUALITY CONTROL 3 record relates to the preceding GPS POSITION or GPS VECTOR record. Any other such records can exist but serve no purpose.

Integer 2	Type code 60	Type code
Alpha 2	Derivation code	Derv code
Real 16	Sigma north	Distance
Real 16	Sigma east	Distance
Real 16	Sigma up	Distance
Real 16	Covariance east-north	Dimensionless
Real 16	Semi-major axis	Distance
Real 16	Semi-minor axis	Distance
Real 16	Orientation	Angle
Real 16	Unit variance	Dimensionless

1.22 Postprocess

The POSTPROCESS record specifies the name of the file that has been used by the Survey Controller to store the raw GPS data for a particular survey. These records do not require the existence of any other records.

Integer 2	Type code 72	Type code
Alpha 2	Derivation code	Derv code
Alpha 8	Postprocess data file name	DOS filename

2 Fields

Each record in a DC file is made up of fields. The following sections describe the field types that can be present.

2.1 Integer Fields

The integer data format holds a non-negative integer value. The field can have one of two formats:

- The field consists of a sequence of the digits from 0 to 9. No space characters are allowed. Leading zeros must be used if the integer is smaller than the field size. The numerical value of the field is the value of the integer.
- If the entire field consists of space characters then the field is null (not measured). This is denoted on display outputs as <null>. The Survey Controller does not accept null values for certain fields.

2.2 Text Fields

Text fields contain ASCII characters with no particular format.

2.3 Real Fields

The real data format holds a real number. The field has one of the following formats:

- The field starts with an optional minus character, followed by a sequence of at least one digit from 0 to 9, followed by a decimal point (period character), followed by at least one digit from 0 to 9, followed by space characters if required to pad out the field.
- If the entire field consists of space characters then the field is null (not measured). This is displayed as <null>. The Survey Controller does not accept null values for certain fields.

2.4 Angles, Large Angles, and Azimuths

These are real values. Angles are displayed in degrees, gons, or mils. If the angle option in the header record is quadrant bearings, then azimuths are displayed in a special format, but other angles are displayed in degrees. An angle can range from 0° up to (but not including) 360° (or 0 to 400 gons, or 0 to 6400 mils). A large angle can range from 0° to 720° (or 800 gons).

Angles in degrees are displayed in the form DDD°MM'SS" with the seconds given to 0 (the default), 1, or 2 decimal places.

Angles in gons are displayed to 3, 4 (the default), 5, or 6 decimal places.

Angles in mils are displayed to 2, 3, 4 (the default), or 5 decimal places.

Azimuths in quadrant bearings are displayed in the form NDD°MM'SSE or NDD°MM'SSW or SDD°MM'SSE or SDD°MM'SSW (with the specified number of decimal places). Angles are measured clockwise from North so 120.0, for example, is displayed as S60°00'00E. If the data value when rounded to the nearest second is an exact multiple of 90 degrees then the value is displayed as Due North, Due East, and so on.

2.5 Latitudes and Longitudes

These are real values. Latitudes or longitudes hold the value of a global bearing in degrees. They are displayed in the form DDD°MM'SS.ssss"*x* where the letter *x* is N for a positive (or zero) latitude, S for a negative latitude, E for a positive (or zero) longitude, or W for a negative longitude. The value is displayed to four decimal places of the second. A latitude must be less than 90° and a longitude must be less than 180°.

2.6 Distances and +Distances

These are real values. Distances are measured in the units defined by the distance units field of the header record (meters or feet). They are displayed to 1, 2, 3 (the default), 4, or 5 decimal places. +Distances can only have positive values.

2.7 Scale Factors

These are real values. A Scale Factor is a real value that is displayed to its full precision.

2.8 Scalar

These are real values. They have no units.

2.9 Type Code

A Type Code is a two-digit integer that identifies the type of record. The actual values that are valid are identified in the description of each record.

2.10 Derv Code

A Derivation Code is a two-digit alphanumeric field that indicates how a particular record was created. Derivation codes that the Survey Controller version 6.0 will produce include:

AC	Arc
AT	Attribute note
AV	Auto GPS
BA	Start base program
CB	Calibration record
CD	Code differential class
CN	Control point

CT	Continuous storage
FC	Feature code note
GE	Geometry class
IN	Inverse program
IX	Intersections
KD	RTCM-corrected GPS
KI	Keyboard input program or time and date function
KM	Kinematic GPS
KP	Postprocessed GPS
LN	Stake out lines
NM	Not measured
OS	Offset reading
PD	Phase differential class
SG	Slope stakeout
SI	Survey initialization
SN	System note
SO	Stake out
TM	TRIMMAP
TP	Topography mode
TS	Automatic time stamp note

2.11 Version

The Version field indicates the version of the DC file. In the case of the Survey Controller version 6.0, this will be V06.

3 Options

Note – This section describes the options that can occur in a HEADER record.

3.1 Angle Unit

The Angle Unit option appears in the header record only and indicates the units of subsequent angle fields. Valid values are:

1 Degrees

2 Grads

3 Mils

3.2 Distance Unit

The Distance Unit option appears in the header record only and indicates the units of subsequent distance fields. Valid values are:

1 Meters

2 Feet

3 US Feet

3.3 Pressure Unit

The Pressure Unit option appears in the header record only and is not otherwise used in the Survey Controller. Valid values are:

1 mm Hg

2 inch Hg

3 mbar

3.4 Temperature Unit

The Temperature Unit option appears in the header record only and is not otherwise used in the Survey Controller. Valid values are:

1 Celsius

2 Fahrenheit

3.5 Coordinate Order

The Coordinate Order option appears in the header record only and indicates the order of coordinates in subsequent records. Valid values are:

1 N-E-Elev

2 E-N-Elev

3 Y-X-Z

3.6 Angle Direction

The Angle Direction option appears in the header record only and is not otherwise used in the Survey Controller. Valid values are:

1 Right

2 Left

3.7 Include Elevation

The Include Elevation option appears in the job record only and is not otherwise used in the Survey Controller. Valid values are:

1 No

2 Yes

3.8 Atmos Correction

The Atmos Correction option appears in the job record only and is not otherwise used in the Survey Controller. Valid values are:

1 No

2 Yes

3.9 Refraction Constant

The Refraction Constant option appears in the job record only and is not otherwise used in the Survey Controller. Valid values are:

1 0.14

2 0.20

3.10 Sea Level Correction

The Sea Level Correction option specifies whether values are reduced to sea level. Valid values are:

1 No

2 Yes

3.11 Projection Type

The Projection Type option specifies one of a number of projection algorithms that the Survey Controller version 6.0 is capable of using. Valid values are:

1 No Projection

2 Plane

3 Transverse Mercator

4 Mercator

5 Single Parallel Lambert

6 Double Parallel Lambert

7 New Zealand Map Grid

8 Rectified Skew Orthomorphic

9 Cassini

10 Oblique Stereographic

11 RD Stereographic

3.12 Datum Transformation

The Datum Transformation option defines the type of datum transformation that is to be used. Valid values are:

1 None

2 Seven-parameter

3 Three-parameter

3.13 Vertical Adjustment Method

The Vertical Adjustment method option defines the type of vertical adjustment that is to be used. Valid values are:

1 Inclined plane

2 Geoid model

3 Geoid / Inclined Plane

3.14 Slope/Vertical Measurement

The Slope/Vertical Measurement option is used to specify if an antenna height has been measured to the antenna phase center (True) or to some point on the outside of the antenna (Uncorrected). Valid values are:

1 True

2 Uncorrected

3.15 Survey Method

The Survey Method option specifies the type of GPS (or otherwise) that was used to create a point. Valid values are:

1 User input

2 Autonomous

3 RTK Float or RTCM

4 RTK Fixed

3.16 Classification Field

The Classification Field option specifies the level of importance of the point created. Valid values are:

1 Normal

2 Control

3 Staked

3.17 Monitor Status

The Monitor Status option indicates what level of monitor station checking has been performed with respect to a point. The only valid value is:

1 None