CrossOver® Files & Data Formats

This document provides an overview of the naming convention and formats of CrossOver® data files.

Files and file-formats

CrossOver® radar profiles comprise several different files that relate to various data elements as detailed below in **Table 1**.

File Type	Description	Naming Convention	Explanation
***.IPRB**	Profile Data File	<project name>_XXXX_Y.iprb	Where Y is the channel, i.e. 0 = high frequency & 1 = low frequency. Where XXXX is the profile running number (counting from 1) [1]
***.IPRH**	Profile Header File	<project name>_XXXX_Y.iprh	Where Y is the channel, i.e. 0 = high frequency & 1 = low frequency. Where XXXX is the profile running number (counting from 1) [1]
***.COR**	Profile Coordinate File	<project name>_XXXX.cor	Where XXXX is the profile running number (counting from 1) [1]
***.TIME**	Profile Timing File	<project name>_XXXX.cor	Where XXXX is the profile running number (counting from 1) [1]
***.MKR**	Profile Marker File	<project name>_XXXX.mkr	Where XXXX is the profile running number (counting from 1) [1]
***.MLPROJ**	Multi Line Project File	<project name>.mlproj	

Table 1 *ImpulseRadar file types and descriptions*

[1] *file names are padded with zeros to replace 'X', e.g. <project name>_0001_Y.iprb*

Files/information stored in the system

Profile Data File

The Profile Data File is a binary file and has the file extension *.iprb. CrossOver® can create data files with either 16-bit or 32-bit data format (see the field "DATA VERSION" in header file). Samples are stored as signed 16-bit or 32-bit integers. The traces are stored sequentially as collected from the antenna.

No other information is stored in the binary file and the information on how to read the data is given in the accompanying *.iprh file. Don't alter the binary file.

Hint: trace numbers and sample numbers in the binary file are used to refer to specific data points.

Profile Header File

The Profile Header File is a text file and has the file extension *.iprh. This text file contains all the necessary information required to read the binary Profile Data File. It has a strict format and should not be altered. Processing software should be coded to read some, or all, of the information as needed. Most of the fields are informative, as explained below in **Table 2**.

Hint: do not relay on the last trace, rather calculate how many traces are in the file. Calculate the time window as number of samples times the sampler period (one over sampling frequency).

Example of the Header File	Explanations
HEADER VERSION: 20	Version number
DATA VERSION: 16	16b data format
DATE: 2017-06-12	Measurement date
START TIME: 14:48:13	Measurement start time
STOP TIME: 14:48:38	Measurement stop time
ANTENNA: 800 MHz	Antenna frequency
ANTENNA SEPARATION: 0.090	Antenna separation in meters
SAMPLES: 500	Number of samples in a trace
SIGNAL POSITION: 6	Signal position
CLIPPED SAMPLES: 0	Clipped samples (not in use now)
RUNS: 64	Number of runs
MAX STACKS: 512	Maximum number of stacks
AUTOSTACKS: 1	Autostacks (1 = ON)
FREQUENCY: 10240	Sampling Frequency
TIMEWINDOW: 48.828	Time Window in nS
LAST TRACE: 1741	Number of traces in the Profile
TRIG SOURCE: wheel	Trig Source – time or wheel
TIME INTERVAL: 0.010	Trig Interval if the trig source is time (sec)
DISTANCE INTERVAL: 0.009778	Trig interval if the trig source is wheel (m)
USER DISTANCE INTERVAL: 0.010000	Distance interval for interface
STOP POSITION: 17.024	Stop Position in meters
WHEEL NAME: cart	Wheel name (max 20 chars)
WHEEL CALIBRATION: 306.799877930	Wheel calibration (ticks per meter)
ZERO LEVEL: 58	Zero Level
SOIL VELOCITY: 100	Soil Velocity (m/uS)
PREPROCESSING: Unknown Preprocessing	Not in use now
OPERATOR COMMENT: _	Not in use now
ANTENNA F/W: 49000072	Receiver Firmware Version
ANTENNA H/W: F1702	Not in use now
ANTENNA FPGA: D085	Receiver FPGA Version
ANTENNA SERIAL: CO_117755	Receiver serial number
SOFTWARE VERSION: CO 1.163	Software version
POSITIONING: 0	Positioning: (0-NO; 1-TS; 2-GPS)
CHANNELS: 2	Number of channels used
CHANNEL CONFIGURATION: 1	This channel configuration
CH_X_OFFSET: 0.000	Channel Position relative to ext. positioning
CH_Y_OFFSET: 0.000	Channel Position relative to ext. positioning
MEASUREMENT DIRECTION: -1	Forward or backward
RELATIVE DIRECTION: 90	Direction to RL start (clockwise 360°)
RELATIVE DISTANCE: 1.000	Distance from RL start to cross section
RELATIVE START: 0.000	Distance from profile start to cross section

Table 2 *Profile header file information*

Profile Coordinate File

The Profile Coordinate File is a text file that contains details of GPS positions and has the file extension *.cor. The file format is simply a parsed version of the NMEA 0183 data string written with tab separators as follows:

TRACE NUMBER <TAB> DATE <TAB> TIME <TAB> LATITUDE <TAB> ”N” <TAB> LONGITUDE <TAB> “E” <TAB> HEIGHT ABOVE MSL <TAB> “M” <TAB> FIX QUALITY (4 – RTK)*

Trace number is counted from 1 (not from 0). Trace number is connected to positions exactly using time from internal GPS.

Example:

Trace	Date	Time	Latitude	N	Longitude	E	Height	M	Fix*
1	2017-03-15	10:12:19:601	65.18991723150	N	18.72870853800	E	317.289	M	4
2	2017-03-15	10:12:19:796	65.18991695317	N	18.72870772433	E	317.527	M	4
5	2017-03-15	10:12:20:000	65.18991630983	N	18.72870888283	E	317.528	M	4
8	2017-03-15	10:12:20:203	65.18991530700	N	18.72871088067	E	317.525	M	4
12	2017-03-15	10:12:20:398	65.18991406333	N	18.72871390350	E	317.562	M	4
17	2017-03-15	10:12:20:601	65.18991227283	N	18.72871711767	E	317.588	M	4
23	2017-03-15	10:12:20:796	65.18991046267	N	18.72872101300	E	317.557	M	4
33	2017-03-15	10:12:21:000	65.18990848683	N	18.72872542550	E	317.557	M	4

* Fix quality field:
0 = invalid
1 = GPS fix (SPS)
2 = DGPS fix
3 = PPS fix
4 = Real Time Kinematic
5 = Float RTK
6 = estimated (dead reckoning) (2.3 feature)
7 = Manual input mode
8 = Simulation mode

Profile Time File

The Profile Time File is a text file and has the file extension *.time. The file contains precise timing information when an external GPS is in use, and the internal is set up for timing. The precision is down to ms accuracy.

Example:

Trace	Date	Time
5	2018-07-18	08:49:03:017
6	2018-07-18	08:49:03:116
7	2018-07-18	08:49:03:216
8	2018-07-18	08:49:03:316

Profile Marker File

The Profile Marker File is a text file and has the file extension *.mkr. The file contains information on the position of markers inserted into the data during data collection.

Example:

```
HEADER VERSION:100
  32      40      1
  34      40      1
  36      40      1
```

Multi Line Project Header File

The Multi Line Project Header File is a text file and has the file extension *.mlproj. This text file contains details of the profiles included in a multi-line project.

Example:

Format:
ML_PROJECT_TYPE: GPS or REF_LINE

<profiles>

Profile_001 // without extension and path

Profile _002

...

</profiles>

Example:
ML_PROJECT_TYPE: GPS
<profiles>
Pipe Project_001
Pipe Project_002
Pipe Project_003
</profiles>