THE TOUCHDOWN MONITOR

ROV TOUCHDOWN FIXES · PIPELAY

User Manual

Touchdown, field joint and anode fixes, layback and the lay corridor,
from live ROV and lay vessel positions

Version 0.2

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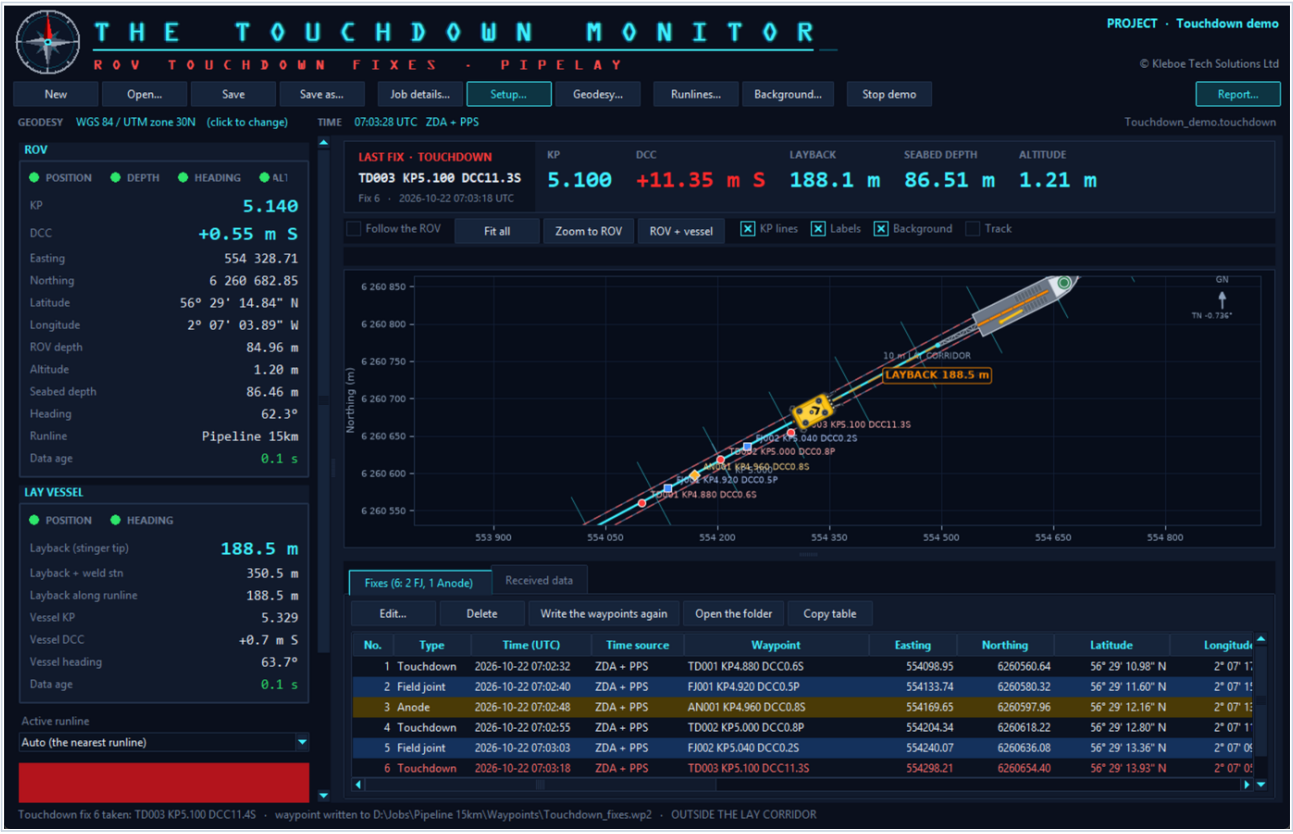
1 Introduction

The Touchdown Monitor takes the touchdown fixes during pipelay or cable lay. The ROV sits on the seabed at the touchdown point, you press **TAKE FIX**, and the program averages a set of live ROV positions into one fix. It works out the KP and DCC of the fix against the runline, the seabed depth from the ROV depth and altimeter, and the **layback** from the lay vessel's stinger tip. Each fix is stamped with its UTC time, from the PC clock or from a ZDA string and PPS pulse. The fix goes into the fix table and straight away into a .wp2 waypoint file, so it appears in the navigation software with no typing. At the end of the job the fixes go into a PDF, Word or CSV report.

Besides touchdown fixes, **FIELD JOINT** and **ANODE** fixes mark where each field joint and anode lands. They are numbered on their own, coloured on the plan and highlighted in the report. A **lay corridor** alarm warns as soon as the touchdown wanders too far from the runline, and **The Touchdown Remote** shows the live picture on the bridge.



The Touchdown Monitor: the ROV and the lay vessel on the runline, the layback, the last fix, and touchdown, field joint and anode fixes in the table.

Part of the screen	What it's for
Toolbar	Files, job details, Setup (ROV live data and altimeter, lay vessel, time, remote display, fix, corridor and waypoints), geodesy, runlines, background drawings, demo data and the report.
Geodesy and time line	The coordinate system in use, and the UTC time with where it comes from (amber when it isn't synchronised). Click either to change it.
ROV box (left)	Lights for the position, depth, heading and altimeter, and the live values: KP, DCC, Easting, Northing, latitude, longitude, ROV depth, altitude, seabed depth, heading, the runline and the age of the data.
Lay vessel box	The live layback from the stinger tip, the layback to the welding station (if switched on), the layback along the runline, the vessel KP, DCC and heading (shown when the lay vessel is switched on).
TAKE FIX, FIELD JOINT, ANODE	Take a fix of that type (or press F2, F3, F4). The progress bar shows the positions as they are collected.

Part of the screen	What it's for
Last fix (above the plan)	The type, name and time of the latest fix, with its KP, DCC, layback, seabed depth and altitude in large figures.
Corridor alarm	A red bar above the last fix when the touchdown is outside the lay corridor (amber when it is close to the edge).
The plan	The ROV and the lay vessel at their positions and headings, the pipe and the layback between them, the tracks, runlines, KP lines, corridor edges, fixes and background drawings.
Tables (bottom)	The fixes, and the data received from the ports.

1.1 Words used in this manual

Word	Meaning
Fix	One position: the average of a number of live positions taken one after another. A fix is a touchdown, a field joint or an anode.
Fix point	The point on the ROV that is on the seabed at the touchdown, worked out from the position being sent and the ROV offsets.
KP	Kilometre point: the distance along the runline in kilometres.
DCC	Distance cross course: how far the fix is off the runline. + starboard (S), - port (P), looking along the runline as the KP increases (the sign can be inverted, section 8.3).
Runline	The planned route of the pipeline or cable, imported from an .rlx runline file or a Runline Generator project.
Stinger tip	Where the pipe leaves the lay vessel: the point the layback is measured from.
CRP	The vessel's common reference point. If the vessel position sent is the CRP, offsets move it to the stinger tip.
Welding station	Where the pipe is welded on the vessel. The layback to it (layback plus the pipe from the stinger tip) can be shown as extra information.
Layback	The horizontal distance from the stinger tip to the touchdown point.
Layback along runline	The stinger tip KP minus the touchdown KP, in metres.
Altitude	The ROV's height above the seabed, from its altimeter.
Seabed depth	The depth of the seabed under the ROV: its depth plus the altitude (section 5.4).
ZDA	An NMEA string with the UTC date and time, from a GNSS receiver or time server.
PPS	Pulse per second: an electrical pulse at the exact start of each second, usually on pin 9 of an RS-232 serial port (the ring indicator).
Lay corridor	The band either side of the runline the pipe must be laid in, for example ±10 m.
SD	Standard deviation: the spread of the positions in the fix. A small SD means the ROV was steady.
.wp2	A waypoint file for the navigation software.

New in version 0.2

- The fix time: the PC clock, or a ZDA string with the PPS pulse; each fix records its time source (section 6).
- The lay vessel: its position and heading, offsets from the CRP to the stinger tip, the layback from the stinger tip, and the layback to the welding station as extra information (section 7).
- The ROV altimeter: altitude and seabed depth at every fix, set up with the other ROV data (section 5.4).
- FIELD JOINT and ANODE fixes as well as touchdowns (section 11).
- The last fix in large figures above the plan: KP, DCC, layback, seabed depth and altitude.
- The lay corridor alarm (section 9) and the DCC sign setting (section 8.3).
- The Touchdown Remote, a display for the bridge (section 15).
- Layback, altitude and fix types in the reports.

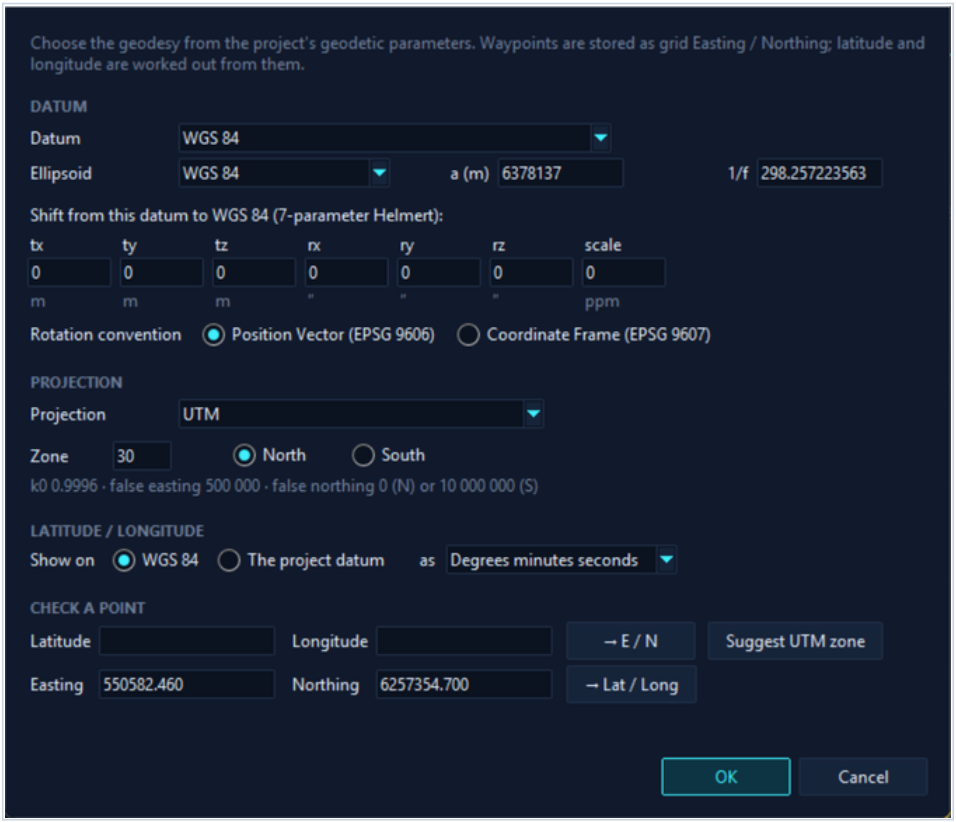
2 Quick start

1. Click **Geodesy…** and choose the datum and projection of the job (section 3).
2. Click **Runlines…** and open the runline of the pipeline (an .rlx runline file or a .runlines project). Add the route drawing with **Background…** if you have one (section 4).
3. Click **Setup…**. On **ROV live data** choose where the ROV position, depth, heading and (if there is one) altimeter come from, and check that each RECEIVED box shows the data and a green Reading: line (section 5).
4. On **Lay vessel** tick **Show the pipelay vessel**, choose where its position and heading come from, and fill in the offsets to the stinger tip if the position sent is the vessel CRP (section 7).
5. On **Time** choose the PC clock (when the acquisition software keeps it on GPS time) or a ZDA string with the PPS pulse (section 6).
6. On **Fix and offsets** set the number of positions in a fix, the rate, the ROV offsets and the DCC sign (section 8).
7. On **Lay corridor** tick **Watch the lay corridor** and enter the corridor width (section 9).
8. On **Waypoints** choose the folder the navigation software reads the waypoint file from (section 10).
9. For the bridge display, tick **Send to the remote display** on **Remote display** (section 15). Click **OK**.
10. Click **Save** and give the project a name. The fixes are saved in it as they are taken.
11. When the ROV is on the seabed at the touchdown, press **TAKE FIX**; at a field joint or an anode press **FIELD JOINT** or **ANODE** (section 11).
12. At the end, click **Report…** for the PDF, Word or CSV report (section 13).

> **Tip**
> To see how it works without any live data, open **Touchdown_demo.touchdown** and click **Demo data**. A pretend ROV works along the 15 km pipeline and stops every 50 m, with the stinger tip about 180 m ahead. Now and then it stops near the edge of the 10 m corridor, or outside it, so you can see the corridor alarm.

3 Geodesy

Click **Geodesy…** (or the geodesy line under the toolbar) and choose the settings from the geodetic parameters of the job: the datum (WGS 84, ETRS89, ED50, OSGB36, NAD83, GDA94, GDA2020, CGCS2000, WGS 72 or your own ellipsoid and 7-parameter shift) and the projection (UTM, Gauss-Kruger, Transverse Mercator, Lambert Conformal Conic, Mercator or a local grid). These are the same settings as in The Runline Generator.



The geodesy settings.

The geodesy is used in two ways:

- A **GGA** or **LLD** string gives latitude and longitude on WGS 84. The program turns it into Easting and Northing on the project grid. This applies to the ROV and the lay vessel.
- Every Easting and Northing is shown with its latitude and longitude, on WGS 84 or the project datum (**Latitude / longitude: show on**).

If the positions come in as grid Easting and Northing already (for example from the navigation software), the geodesy only affects the latitude and longitude shown.

> **Note**
> Check the geodesy against a known point from the job with **Check a point** before the work starts. Fixes already taken keep their Easting and Northing if the geodesy is changed.

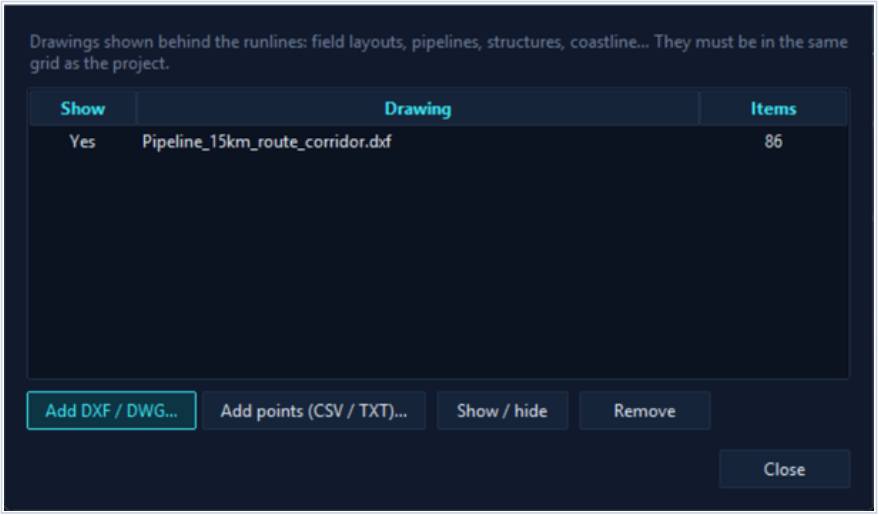
4 Runlines and backgrounds

Click **Runlines…** and choose a runline file (.rlx) or a Runline Generator project (.runlines). A .runlines project can also bring its geodesy and background drawings with it: the program asks. More than one runline can be imported.

The **Active runline** list under the vessel values chooses the line used for the KP and DCC:

- **Auto (the nearest runline)**: the runline nearest the ROV is used, so the program changes line by itself as the ROV moves.
- **A runline name**: that line is always used.

Click **Background…** to show DXF drawings of the field layout behind the runlines (DWG drawings too, with the free ODA File Converter installed), or points from a CSV / TXT file. They must be in the same grid as the project. **Show / hide** (or a double-click) turns a drawing on and off.

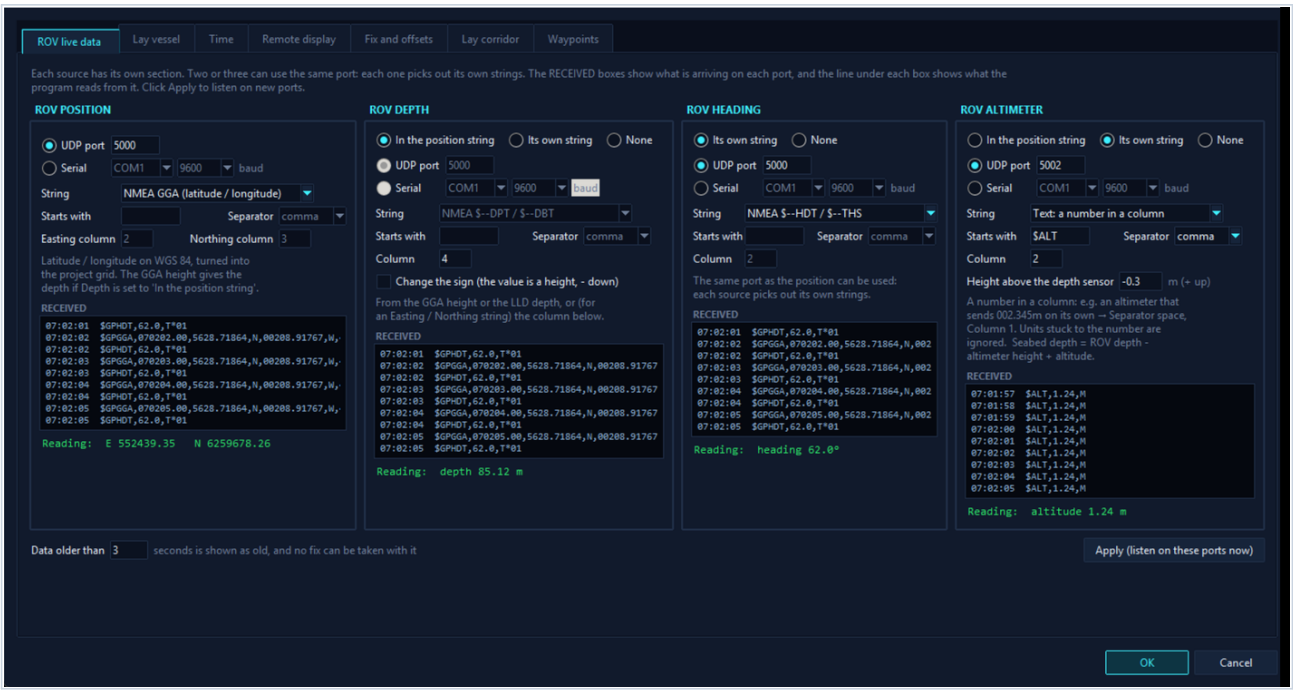


The background drawings: here the mock route drawing of the demo project.

> **Tip**
>
> The demo project comes with **Mock data\Pipeline_15km_route_corridor.dxf**: the proposed route with a 10 m lay corridor either side, KP markers, a platform with its 500 m zone, an existing cable crossing at KP 6.200, a charted wreck and a boulder field.

5 ROV live data

Click **Setup…** and choose the **ROV live data** tab. The ROV position, depth, heading and altimeter each have their own section. Each one can come in on its own UDP port or serial port, or several can share a port: each section picks out its own strings.



The ROV live data settings, with GGA and HDT arriving on UDP port 5000 and the altimeter on port 5002.

5.1 Where the data comes from

Setting	What it does
UDP port	Listens for UDP messages on this port (on all the PC's network connections). Several sections can use the same port number.
Serial	Reads a COM port at the baud rate you choose (8 data bits, no parity, 1 stop bit).
Depth: In the position string	The depth is taken from the position string: the GGA height, the LLD depth, or a column of an Easting / Northing string.
Its own string	The depth or heading comes in its own string.
None	Not used. With no heading the ROV is drawn pointing north and X / Y offsets can't be used.

5.2 The strings

Section	String	Notes
ROV position	NMEA GGA	Latitude and longitude on WGS 84, any talker ($GPGGA, $GNGGA, $INGGA…).
	USBL LLD ($PSONLLD)	USBL beacon positions, with the beacon depth.
	Easting / Northing text	Any text string with the Easting and Northing in columns.
	Automatic	Works out whether it is GGA, LLD or an Easting / Northing string with a header.
Depth	NMEA $--DPT / $--DBT	Depth strings from an echo sounder or the navigation system.
	Text: a number in a column	Any text string, such as a depth sensor output.
Heading	NMEA $--HDT / $--THS	True heading from the gyro or INS.
	Text: a number in a column	Any text string.

For a text string, fill in:

- **Starts with**: the text at the start of the string, such as **$DEPTH**, so the right strings are picked out. Leave it blank if the string has no fixed start (for example one starting with the date).
- **Separator**: comma, semicolon, tab or space.
- **Column** (or the **Easting** and **Northing** columns): the columns count from 1.
- **Change the sign** (depth only): for a sensor that sends a height, negative down.

For example, a user-defined output from the navigation software with the date, time, Easting, Northing, depth, heading and altitude:

```
19/10/2026,07:15:28.12,550582.46,6257354.70,85.10,123.4,1.25
```

Position: **Easting / Northing text**, Starts with blank, Separator comma, Easting column 3, Northing column 4. Depth: **In the position string**, column 5. Heading: **Its own string**, the same port, **Text**, Starts with blank, column 6. Altimeter (section 5.4): **In the position string**, column 7.

5.3 Checking the data

The RECEIVED box of each section shows the last strings arriving on its port, and the line under it shows what the program reads from them:

Message under the box	Meaning
Reading: E … N … (or depth, heading)	All good: this is the value the program uses.
Not listening on … yet - click Apply	The port has been changed. Click **Apply** to listen on it.

Message under the box	Meaning
Nothing received on …	No data on that port. Check the cable, the IP address the data is sent to, the port number and the PC's firewall.
Data is arriving, but not this string	Data is coming in, but the string type, Starts with or column doesn't match it.
Found the string but: …	The string was found but a value in it can't be read.

Data older than … seconds (normally 3) sets when data counts as old. Old data turns the light next to POSITION, DEPTH, HEADING or ALT red, and no fix can be taken with an old position.

> **Tip**
> Windows may ask whether to let the program through the firewall the first time it listens on a UDP port. Allow it on the networks the data comes from.

5.4 The ROV altimeter

With an altimeter, every fix records the ROV depth, the **altitude** (the ROV's height above the seabed) and the **seabed depth** under the ROV. Choose where the altitude comes from in the **ROV ALTIMETER** section, the fourth on the ROV live data tab:

- **In the position string**: a column of an Easting / Northing position string (not a GGA or LLD).
- **Its own string**: on its own UDP or serial port, as a number in a column of a text string or an NMEA depth string ($--DBT / $--DPT). An altimeter sending 002.345m on its own is Separator space, Column 1: units stuck to the number are ignored.
- **None**: no altimeter. The fix depth is then the ROV depth moved by the Z offset.

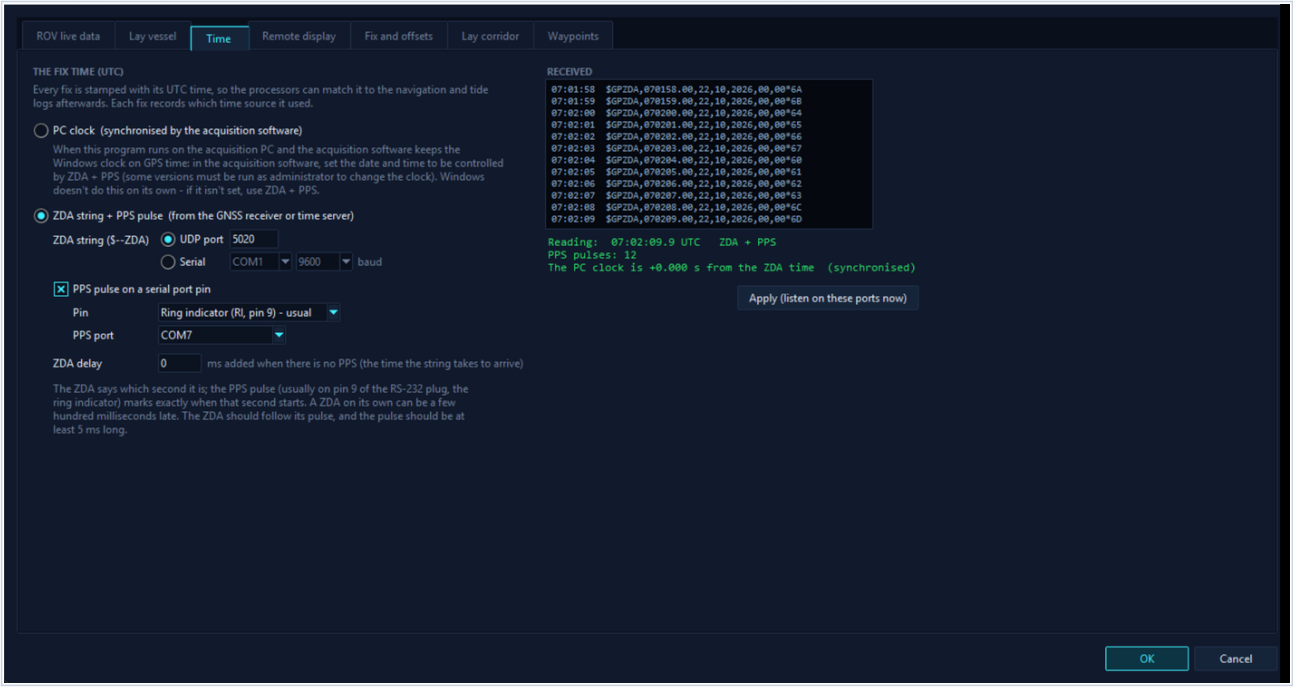
The seabed depth is worked out as:

```
seabed depth = ROV depth - altimeter height + altitude
```

Height above the depth sensor is how far the altimeter is above the ROV's depth sensor (+ up, - below it): 30 cm below the sensor is -0.3. The altitude is averaged over the fix with the position, shown live in the ROV box, and written in the fix table and the report. A negative altitude is ignored.

6 The fix time (ZDA and PPS)

Every fix is stamped with its UTC time, so the data processors can match it to the navigation and tide logs afterwards, for example to take the tide off the touchdown depths. A fix time that is out by even half a second puts the fix where the vessel and ROV were half a second earlier, so the clock matters. Choose where the time comes from on the **Time** tab of Setup.



The time settings: a ZDA string on UDP port 5020 with the PPS pulse on the ring indicator pin of COM7.

6.1 PC clock (synchronised by the acquisition software)

Use this when The Touchdown Monitor runs on the same PC as the acquisition software, and the acquisition software keeps the Windows clock on GPS time. Windows does **not** do this by itself just because the acquisition software reads a ZDA and PPS: it has to be switched on, in the acquisition software's date and time settings (set it to be controlled by ZDA + PPS). Some versions must be run as administrator to change the clock.

6.2 ZDA string + PPS pulse

Use this when the PC clock isn't kept on GPS time, or the program runs on its own PC. The two work together:

- The **ZDA** string ($GPZDA, $GNZDA…) says which second it is: the date and the time. On its own it can be a few hundred milliseconds late, because the string takes time to make and send.
- The **PPS** pulse marks exactly when each second starts. It comes in on a pin of an RS-232 serial port, normally pin 9, the **ring indicator**; DCD (pin 1), CTS (pin 8) or DSR (pin 6) can be chosen instead.

Setting	What it does
ZDA string	The UDP port or serial port the ZDA arrives on.
PPS pulse on a serial port pin	Watches the pin for the pulse. Leave it unticked to use the ZDA alone.
Pin	The serial pin the pulse is wired to (the ring indicator, pin 9, as standard).
PPS port	**Same port as the ZDA** when the ZDA and the pulse share a serial cable, or another COM port (needed when the ZDA comes in on UDP).
ZDA delay	Milliseconds added to the ZDA time when there is no PPS: how late the string arrives.

The program can't change the Windows clock, so it keeps its own UTC time from a high-resolution timer, set by each ZDA and lined up on each pulse. It expects the ZDA to follow its pulse and name the second the pulse started, as most receivers do. The pulse should be at least 5 ms long.

6.3 Checking the time

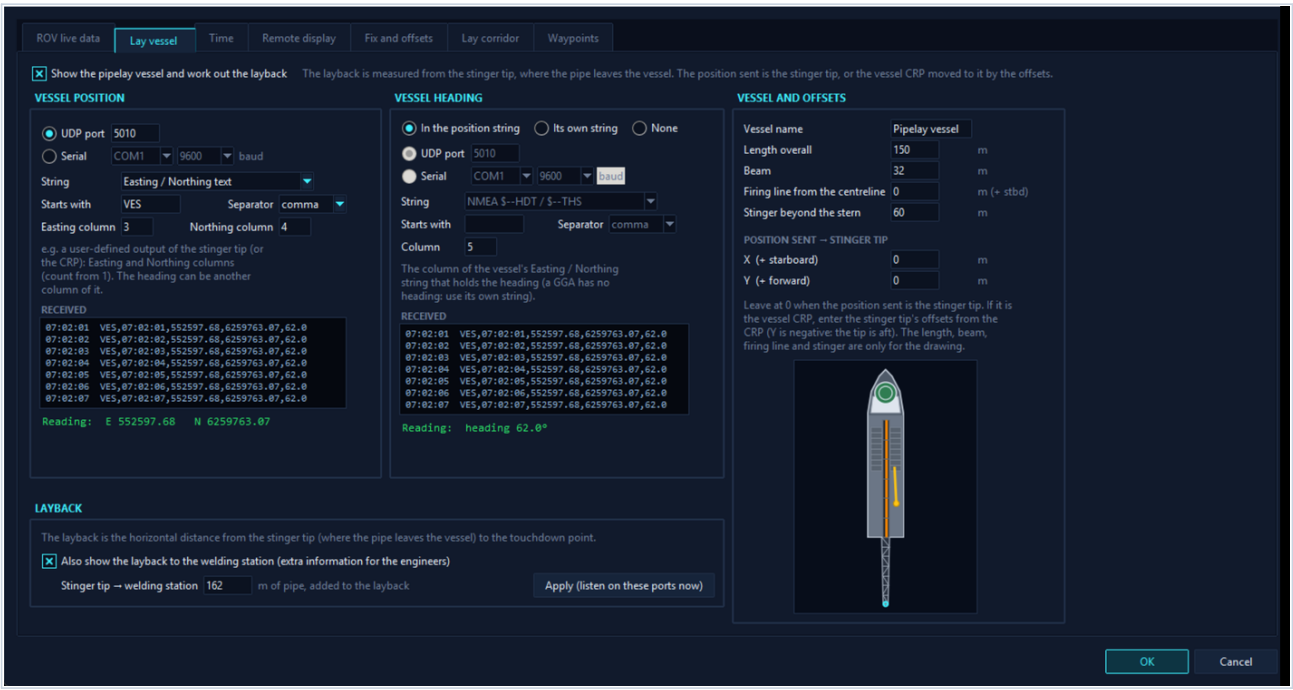
The RECEIVED box on the Time tab shows the ZDA strings, and the lines under it show the time read, the time source, the number of PPS pulses received, and how far the PC clock is from the ZDA time. When the PC clock is within a few hundredths of a second it says **(synchronised)**: a quick way to check whether the acquisition software really is keeping the PC clock on GPS time.

Time source	Meaning
PC clock	The Windows clock is used (6.1).
ZDA + PPS	All good: the ZDA and the pulse are both arriving.
ZDA (no PPS)	The ZDA is arriving but no pulses: check the pin and the cable. The time may be a few hundred milliseconds late.
ZDA	The ZDA alone, with the PPS unticked.
ZDA lost - held	No ZDA for over 5 seconds: the time is carried on from the timer for up to a minute.
PC clock (no ZDA)	No ZDA at all: the program falls back on the PC clock.

The time and its source are shown on the line under the toolbar, next to the geodesy; it turns amber when the time isn't synchronised. Every fix records its time source in the fix table, the CSV and the report, and the status line warns if a fix was taken without a synchronised time.

7 The lay vessel and layback

The program can show the pipelay vessel on the plan and work out the **layback**: the horizontal distance from the **stinger tip**, where the pipe leaves the vessel, to the touchdown point. Set it up on the **Lay vessel** tab of Setup and tick **Show the pipelay vessel and work out the layback**. Click **Apply (listen on these ports now)** to see the vessel strings arriving without closing Setup.



The lay vessel settings: its position, its heading, the vessel and offsets, and the layback.

7.1 The vessel position and heading

The vessel position sent to the program is either the **stinger tip** itself, or the vessel's **CRP** (common reference point), for example a node output from the navigation software, on its own UDP or serial port (5010 by default). It can be an **Easting / Northing text** string or a **GGA** from the vessel's GNSS, turned into the project grid.

The heading can be **In the position string** (a column of the Easting / Northing string), **Its own string** ($--HDT / $--THS or a text column), or **None**. With no heading the vessel is drawn along the runline, and the X / Y offsets can't be used.

7.2 The vessel and offsets

Setting	What it does
Position sent → stinger tip X, Y	**0 and 0 when the position sent is the stinger tip** (the default). When it is the vessel CRP, enter the stinger tip's offsets from the CRP: X + starboard, Y + forward. The tip is aft of the CRP, so Y is negative. They are turned with the vessel heading.
Vessel name	Shown on the plan and in the report.
Length overall, Beam	The size of the vessel drawing.
Firing line from the centreline	Where the pipe runs along the deck (+ starboard), for the drawing.
Stinger beyond the stern	How far the stinger reaches past the stern, for the drawing. The vessel is drawn around the stinger tip.

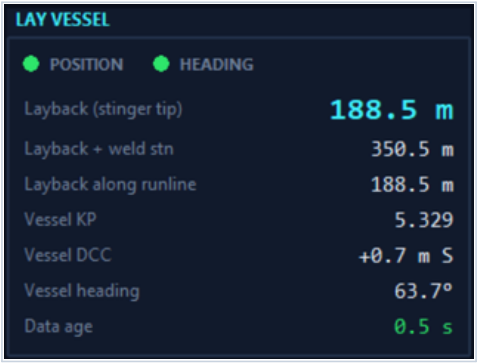
For example, with the stinger tip 135 m aft of the CRP and 1.5 m to port of it, X is -1.5 and Y is -135.

7.3 The layback to the welding station

The welding station isn't needed for the layback, but the engineers sometimes want the layback measured to it. Tick **Also show the layback to the welding station** and enter **Stinger tip → welding station**: the length of pipe from the stinger tip to the welding station. The program then also shows the layback plus this distance, live and in every fix.

7.4 What is shown

With the vessel switched on, the **LAY VESSEL** box under the ROV values shows the live figures, and the plan shows the vessel, its track, the pipe from the stinger tip to the touchdown, and the layback.



The lay vessel box, with the layback to the welding station switched on.

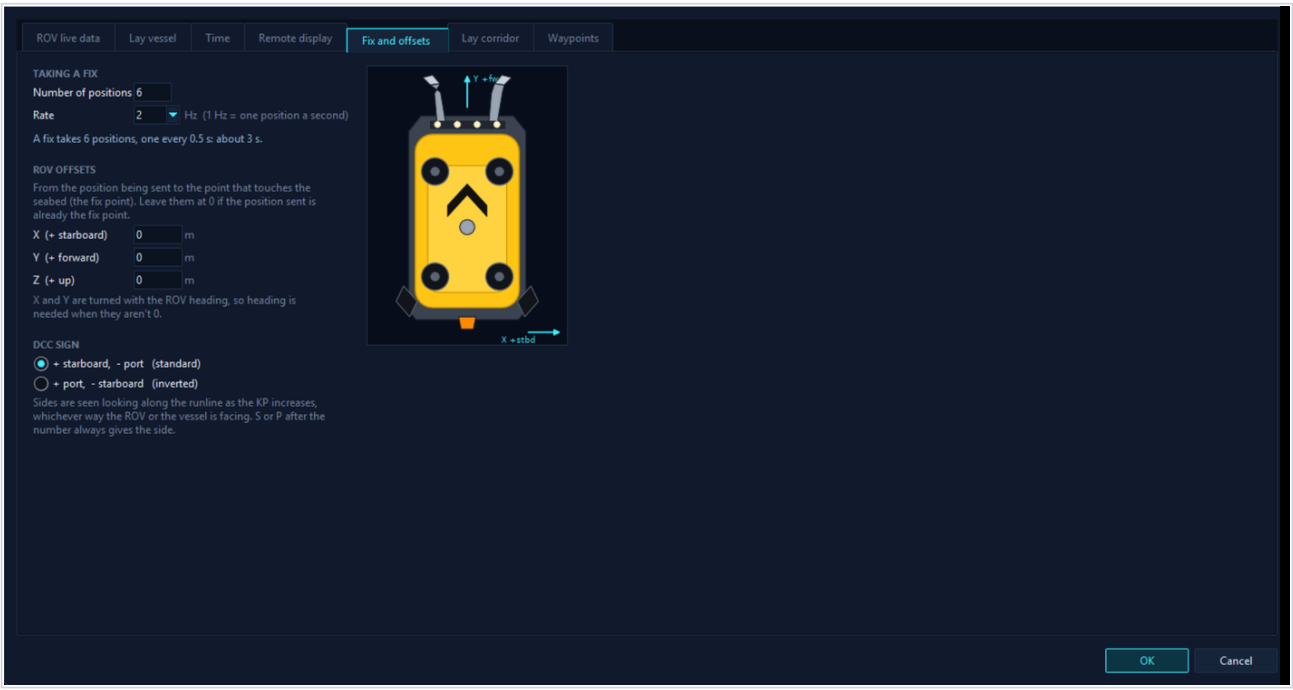
Value	Meaning
Layback (stinger tip)	The straight-line horizontal distance from the stinger tip to the touchdown (fix) point.
Layback + weld stn	The layback plus the pipe from the stinger tip to the welding station (only when switched on, 7.3).
Layback along runline	The stinger tip KP minus the touchdown KP, in metres: the layback measured along the route.
Vessel KP, Vessel DCC	Where the stinger tip is on the runline.

Value	Meaning
Vessel heading	From the heading string, or “along runline” without one.
Data age	Seconds since the last vessel position.

Every fix records the layback, the layback to the welding station (when switched on), the layback along the runline and the vessel KP and DCC, averaged over the same positions as the fix. They are shown in the last fix display, the fix table and the report.

> **Note**
> Projects saved by earlier versions had their vessel offsets to the welding station. When one is opened, the offsets are moved on to the stinger tip using its old drawing sizes, and that distance is put in **Stinger tip** → **welding station**, so the layback is measured from the stinger tip from then on.

8 Fix and offsets



The fix, ROV offset and DCC sign settings.

8.1 Taking a fix

Number of positions is how many positions are averaged into each fix, and **Rate** is how often one is taken (1 Hz = one a second). The line underneath shows how long a fix takes: for example 10 positions at 1 Hz take about 10 s. Set the rate to the rate of the incoming positions or slower; if the data is slower than the rate, the fix note says how many positions were repeated.

8.2 ROV offsets

The offsets go from the point whose position is being sent (normally the USBL beacon or the ROV reference point) to the point that is on the seabed at the touchdown:

Offset	Direction
X	+ to starboard of the ROV
Y	+ forward

Offset	Direction
Z	+ up. A fix point 1.5 m below the beacon is Z = -1.5, and makes the depth 1.5 m deeper.

X and Y are turned with the ROV heading, so the heading is needed when they aren't 0. Leave them all at 0 if the position sent is already the touchdown point.

8.3 DCC sign

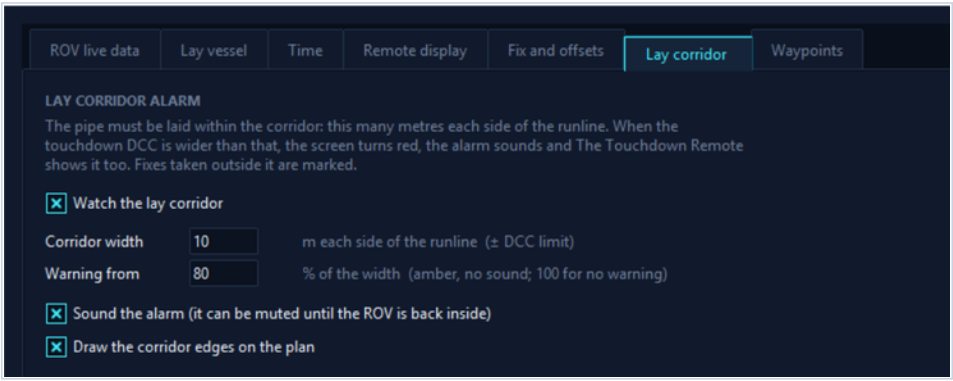
The DCC is measured looking along the runline as the KP increases, whichever way the ROV or the vessel is facing. Choose the convention of the job:

Setting	DCC
+ starboard, - port (standard)	Starboard of the runline is +, port is -. The usual convention.
+ port, - starboard (inverted)	For a job that uses the opposite sign.

S or **P** after the number always gives the side, for example **+1.23 m S**, so the side is clear whichever sign is used. The sign is used on the screen, in the waypoint names, the reports and The Touchdown Remote.

9 The lay corridor

The pipe must be laid inside the lay corridor: a set distance either side of the runline. The program watches the touchdown DCC all the time and sets off an alarm as soon as it is outside the corridor. Set it up on the **Lay corridor** tab of Setup.

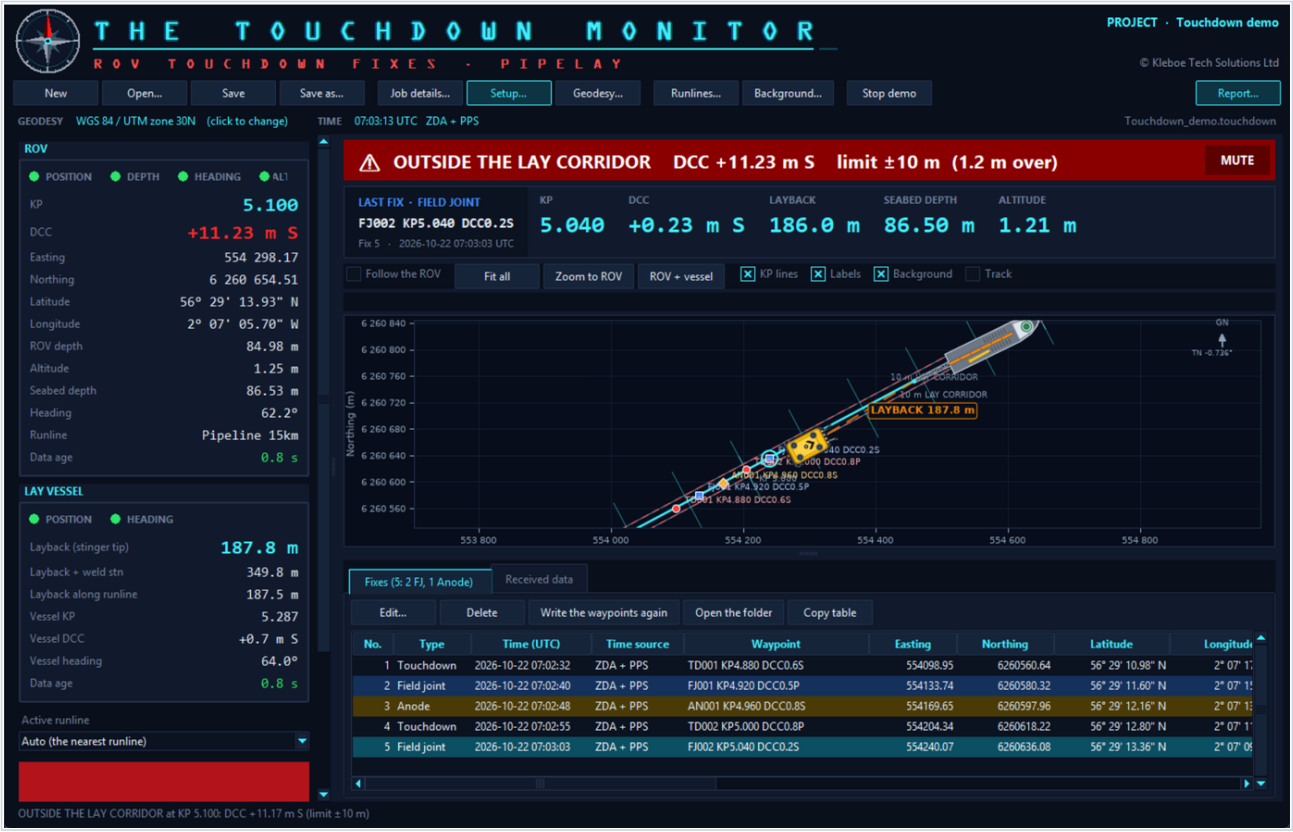


The lay corridor settings.

Setting	What it does
Watch the lay corridor	Switches the corridor check on.
Corridor width	Metres either side of the runline: the ± DCC limit. 10 means the touchdown must be within 10 m to port or starboard.
Warning from	A share of the width (normally 80 %) where the amber warning starts, before the edge is reached. 100 means no warning.
Sound the alarm	Beeps every 2 seconds while the touchdown is outside the corridor.
Draw the corridor edges on the plan	Dashed red lines either side of each runline, on The Touchdown Monitor and The Touchdown Remote.

9.1 The alarm

When the touchdown DCC is wider than the corridor, a flashing red bar appears above the last fix, the live DCC turns red and the alarm sounds. The bar gives the DCC, the limit and how far over the limit the touchdown is. Near the edge (from the warning share) the bar is amber, with no sound, and says how much room is left.



The touchdown outside the 10 m corridor: the red bar, the red DCC and the MUTE button.

- **MUTE** silences the alarm until the touchdown is back inside the corridor. The red bar stays. The next time it goes outside, the alarm sounds again.
- The alarm only uses fresh data: with no position, or an old one, there is no alarm.
- The Touchdown Remote shows the same red or amber bar on the bridge (section 15).

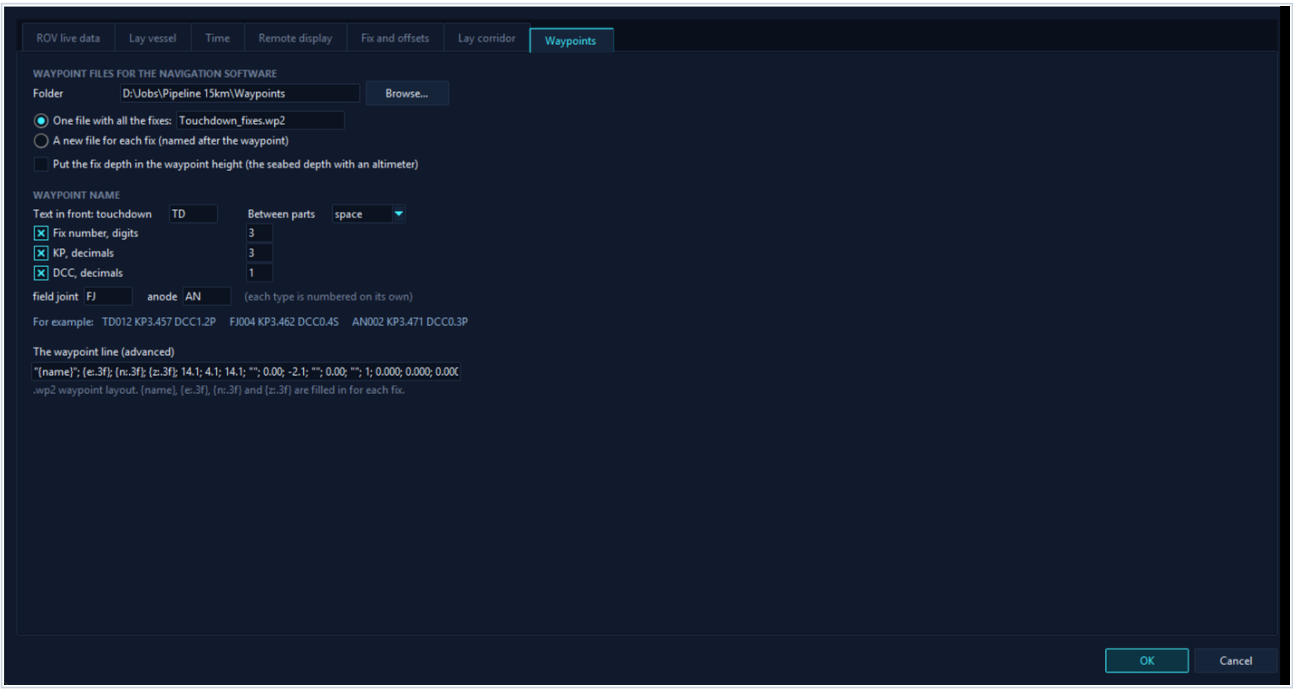
9.2 Fixes outside the corridor

A fix taken outside the corridor is marked: its row in the fix table is red, its comment says, for example, **Outside the ±10 m corridor (1.4 m over)**, and the DCC in the last fix display is red. The report counts the fixes outside the corridor in its summary, and the comment is in the table of fixes.

> **Important**
>
> The corridor is measured from the runline in the program. Check that the runline is the approved route and the corridor width is the one in the job specification. The corridor drawn in a background drawing is only a picture: the alarm uses the width set here.

10 Waypoints

Each fix is written as a waypoint for the navigation software the moment it is taken. Choose the settings on the **Waypoints** tab of Setup….



The waypoint settings.

Setting	What it does
Folder	Where the waypoint files are written: normally a folder the navigation software reads, such as a shared folder on the navigation PC.
One file with all the fixes	One .wp2 file (Touchdown_fixes.wp2) with every fix, written again after each fix. Load it once in the navigation software.
A new file for each fix	A separate .wp2 file for each fix, named after the waypoint.
Put the fix depth in the waypoint height	The seabed depth with an altimeter, otherwise the fix depth. Without it the height is 0.
Waypoint name	Text in front, the fix number, the KP and the DCC, with the separator you choose. Each type has its own text in front and its own numbering: for example TD012 KP3.457 DCC1.2P, FJ004 KP3.460 DCC0.8P and AN002 KP3.471 DCC0.4P.
The waypoint line (advanced)	The layout of each line of the .wp2 file. {name}, {e:.3f}, {n:.3f} and {z:.3f} are filled in for each fix.

The waypoint file looks like this:

```
"TD001 KP3.021 DCC0.7S"; 552457.788; 6259687.950; 0.000; 14.1; 4.1; 14.1; ""; 0.00; -2.1; ""; 0.00;
""; 1; 0.000; 0.000; 0.000; 0; 0.05
"FJ001 KP3.033 DCC0.4P"; 552467.512; 6259694.410; 0.000; 14.1; 4.1; 14.1; ""; 0.00; -2.1; ""; 0.00;
""; 1; 0.000; 0.000; 0.000; 0; 0.05
```

The folder also gets **Touchdown_fixes.csv**, a table of every fix written after each fix, as a backup that can be opened in Excel. If the project hasn't been saved yet, it is also saved there as **Touchdown_autosave.touchdown**.

11 Taking a fix

There are three kinds of fix, each with its own button and key:

Button	Key	Use it for	On the plan
TAKE FIX (red)	F2	The touchdown point of the pipe.	Red circle
FIELD JOINT (blue)	F3	A field joint at the touchdown.	Blue square
ANODE (amber)	F4	An anode at the touchdown.	Amber diamond

When the ROV is on the seabed at the point, press the button. It turns orange and counts the positions; the progress bar fills as they come in. Press the same button again to cancel the fix. The other buttons wait until the fix is finished.

A fix being taken: 3 of 6 positions collected.

When the fix is finished:

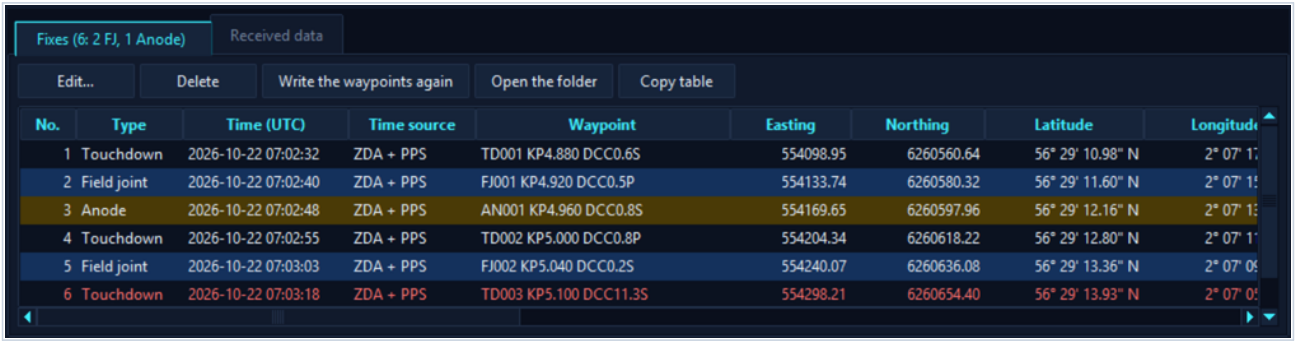
- The positions are averaged, with the ROV offsets applied, into one Easting, Northing and depth; the ROV depth, altitude and seabed depth are averaged too.
- The KP and DCC are worked out against the active runline (or the nearest one).
- With the lay vessel on, the layback from the stinger tip, the layback along the runline and the vessel KP / DCC are worked out from the vessel positions over the same time.
- The fix is stamped with its UTC time and the time source (section 6).
- The fix is checked against the lay corridor and marked if it is outside it.
- The fix is added to the table and drawn on the plan with its name.
- The waypoint file is written to the folder, and the CSV backup and the project are saved.
- The last fix display above the plan shows it in large figures, and The Touchdown Remote is told at once.

The last fix display: KP, DCC, layback, seabed depth and altitude.

A fix isn't started if there is no live position, or the position is older than the data age set in Setup. If the position stops coming in during a fix, the program waits for it, and abandons the fix after 15 s.

> **Tip**
> Look at the SD of each fix. If it is much bigger than usual, the ROV may have moved during the fix or the positions may be noisy: take the fix again.

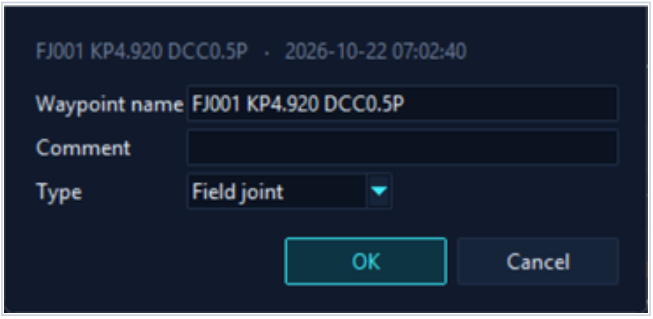
12 The fix table



No.	Type	Time (UTC)	Time source	Waypoint	Easting	Northing	Latitude	Longitude
1	Touchdown	2026-10-22 07:02:32	ZDA + PPS	TD001 KP4.880 DCC0.6S	554098.95	6260560.64	56° 29' 10.98" N	2° 07' 1
2	Field joint	2026-10-22 07:02:40	ZDA + PPS	FJ001 KP4.920 DCC0.5P	554133.74	6260580.32	56° 29' 11.60" N	2° 07' 1
3	Anode	2026-10-22 07:02:48	ZDA + PPS	AN001 KP4.960 DCC0.8S	554169.65	6260597.96	56° 29' 12.16" N	2° 07' 1
4	Touchdown	2026-10-22 07:02:55	ZDA + PPS	TD002 KP5.000 DCC0.8P	554204.34	6260618.22	56° 29' 12.80" N	2° 07' 1
5	Field joint	2026-10-22 07:03:03	ZDA + PPS	FJ002 KP5.040 DCC0.2S	554240.07	6260636.08	56° 29' 13.36" N	2° 07' 0
6	Touchdown	2026-10-22 07:03:18	ZDA + PPS	TD003 KP5.100 DCC11.3S	554298.21	6260654.40	56° 29' 13.93" N	2° 07' 0

The fix table: field joints are shaded blue, anodes amber, and a fix outside the corridor is red.

Button	What it does
Edit…	Changes the waypoint name, the comment or the type of fix (or double-click a fix). The waypoint file is written again.
Delete	Deletes the selected fixes (or press Delete). The numbers of the other fixes stay the same.
Write the waypoints again	Writes all the waypoint files again, for example after changing the folder.
Open the folder	Opens the waypoint folder in Explorer.
Copy table	Copies the table to paste into Excel.

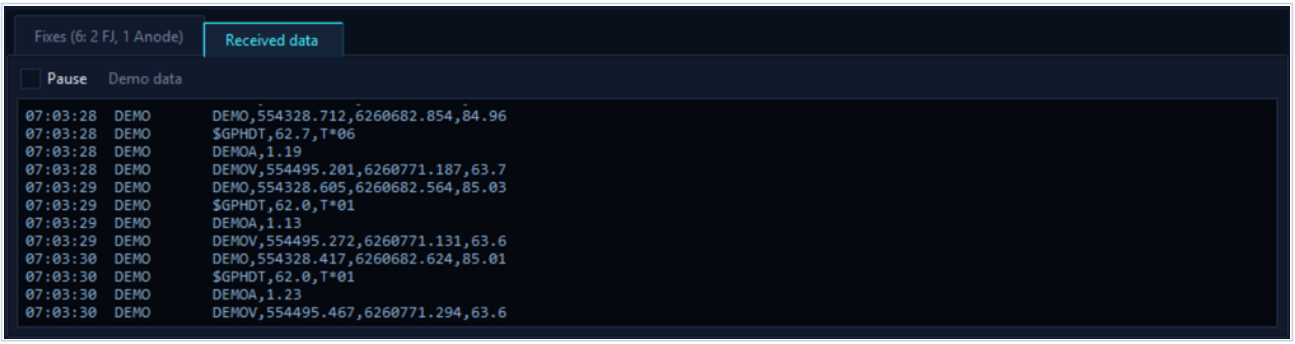


Editing a fix.

The table shows the fix number, the type, the time (UTC) and its source, the waypoint name, Easting, Northing, latitude, longitude, the seabed depth, ROV depth and altitude, the layback, the layback to the welding station, the layback along the runline, the vessel KP and DCC, the heading, runline, KP, DCC, the number of samples, the horizontal SD and the comment. The tab title counts the fixes of each type.

12.1 Received data

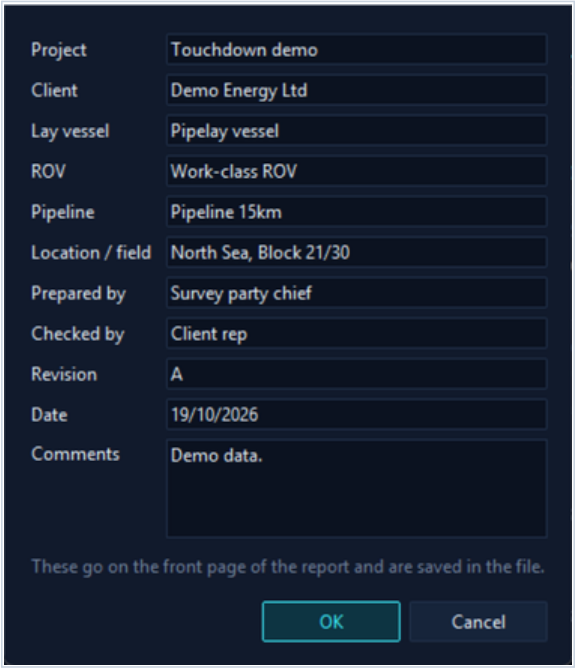
The **Received data** tab shows every string arriving from all the ports, with the time and where it came from. Tick **Pause** to stop it scrolling.



The received data (here from the demo).

13 The report

Fill in **Job details…** first: project, client, lay vessel, ROV, pipeline, location, who prepared and checked it, the revision, the date and comments. They go on the front page of the report.

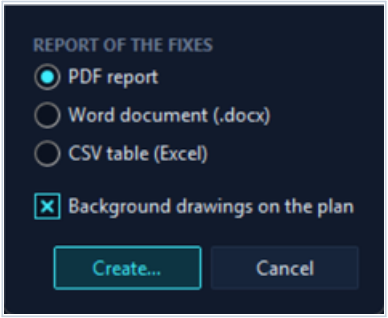


The job details.

Then click **Report…** and choose:

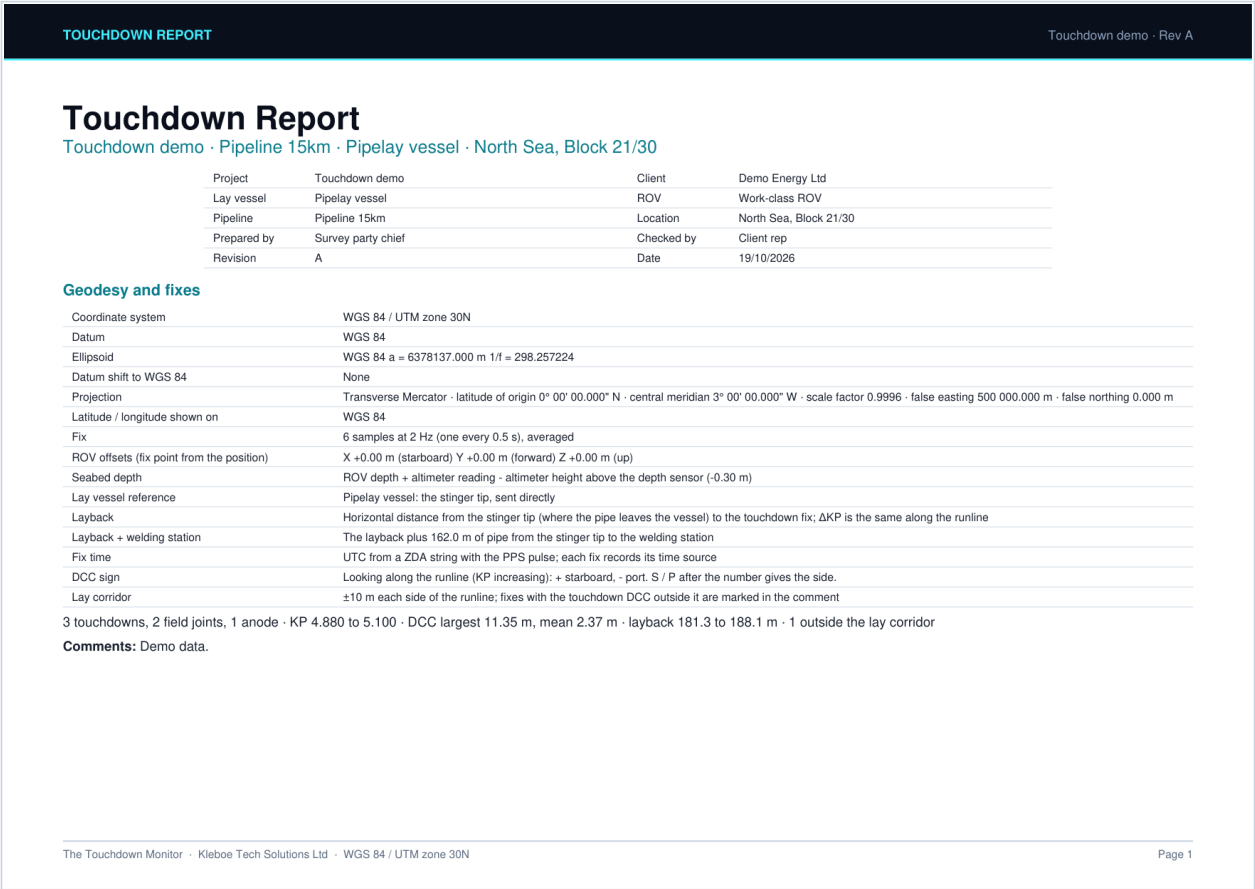
- **PDF report**: A4 landscape, with the job details, the geodesy, fix, vessel and corridor settings, a summary, a plan of the fixes, and the table of fixes.
- **Word document (.docx)**: the same report, to edit or add to in Word.
- **CSV table (Excel)**: the fixes as a table.

Tick **Background drawings on the plan** to draw the background drawings behind the fixes.



The report choices.

The summary on the front page gives the number of fixes of each type, the KP range, the largest and mean DCC, the layback range and how many fixes were outside the lay corridor. In the table of fixes, field joints are shaded blue and anodes amber, and the seabed depth, altitude and layback have their own columns.



TOUCHDOWN REPORT — Touchdown demo · Rev A

Touchdown Report

Touchdown demo · Pipeline 15km · Pipelay vessel · North Sea, Block 21/30

Project	Touchdown demo	Client	Demo Energy Ltd
Lay vessel	Pipelay vessel	ROV	Work-class ROV
Pipeline	Pipeline 15km	Location	North Sea, Block 21/30
Prepared by	Survey party chief	Checked by	Client rep
Revision	A	Date	19/10/2026

Geodesy and fixes

Coordinate system	WGS 84 / UTM zone 30N
Datum	WGS 84
Ellipsoid	WGS 84 a = 6378137.000 m 1/f = 298.257224
Datum shift to WGS 84	None
Projection	Transverse Mercator · latitude of origin 0° 00' 00.000" N · central meridian 3° 00' 00.000" W · scale factor 0.9996 · false easting 500 000.000 m · false northing 0.000 m
Latitude / longitude shown on	WGS 84
Fix	6 samples at 2 Hz (one every 0.5 s), averaged
ROV offsets (fix point from the position)	X +0.00 m (starboard) Y +0.00 m (forward) Z +0.00 m (up)
Seabed depth	ROV depth + altimeter reading - altimeter height above the depth sensor (-0.30 m)
Lay vessel reference	Pipelay vessel: the stinger tip, sent directly
Layback	Horizontal distance from the stinger tip (where the pipe leaves the vessel) to the touchdown fix; ΔKP is the same along the runline
Layback + welding station	The layback plus 162.0 m of pipe from the stinger tip to the welding station
Fix time	UTC from a ZDA string with the PPS pulse; each fix records its time source
DCC sign	Looking along the runline (KP increasing): + starboard, - port. S / P after the number gives the side.
Lay corridor	±10 m each side of the runline; fixes with the touchdown DCC outside it are marked in the comment

3 touchdowns, 2 field joints, 1 anode · KP 4.880 to 5.100 · DCC largest 11.35 m, mean 2.37 m · layback 181.3 to 188.1 m · 1 outside the lay corridor

Comments: Demo data.

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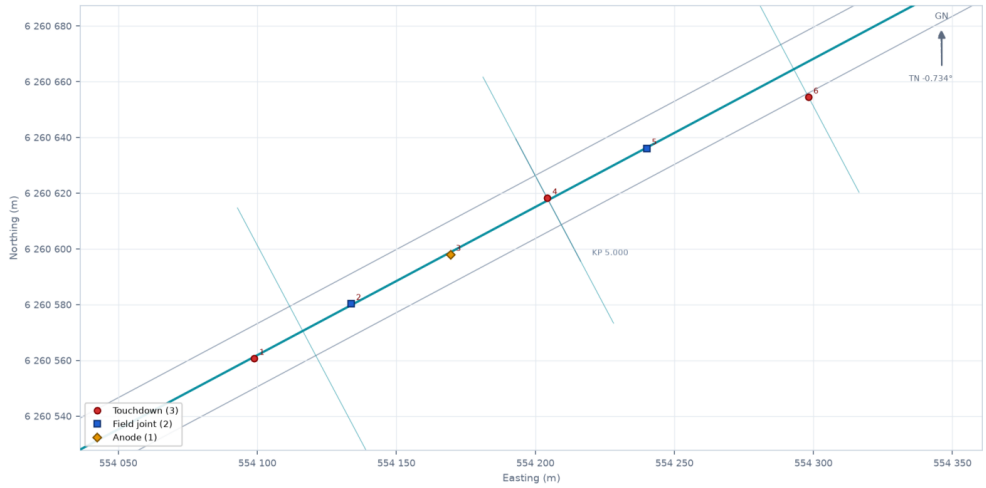
The front page of the PDF report.

TOUCHDOWN REPORT Touchdown demo · Rev A

Touchdown points



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The plan of the fixes: touchdowns, field joints and anodes.

TOUCHDOWN REPORT Touchdown demo · Rev A

Fixes

No.	Type	Time (UTC)	Waypoint	Easting	Northing	Latitude	Longitude	KP	DCC	Seabed	Alt.	Layback	Runline	SD	Comment
1	Touchdown	2026-10-22 07:02:32	TD001 KP4.880 DCC0.6S	554098.95	6260560.64	56° 29' 10.98" N	2° 07' 17.41" W	4.880	+0.59 S	86.47	1.19	181.3	Pipeline 15km	0.18	
2	Field joint	2026-10-22 07:02:40	FJ001 KP4.920 DCC0.5P	554133.74	6260580.32	56° 29' 11.60" N	2° 07' 15.37" W	4.920	-0.46 P	86.53	1.23	182.6	Pipeline 15km	0.13	
3	Anode	2026-10-22 07:02:48	AN001 KP4.960 DCC0.8S	554169.65	6260597.96	56° 29' 12.16" N	2° 07' 13.25" W	4.960	+0.83 S	86.45	1.19	183.9	Pipeline 15km	0.07	
4	Touchdown	2026-10-22 07:02:55	TD002 KP5.000 DCC0.8P	554204.34	6260618.22	56° 29' 12.80" N	2° 07' 11.21" W	5.000	-0.77 P	86.59	1.24	184.9	Pipeline 15km	0.13	
5	Field joint	2026-10-22 07:03:03	FJ002 KP5.040 DCC0.2S	554240.07	6260636.08	56° 29' 13.36" N	2° 07' 09.11" W	5.040	+0.23 S	86.50	1.21	186.0	Pipeline 15km	0.13	
6	Touchdown	2026-10-22 07:03:18	TD003 KP5.100 DCC11.3S	554298.21	6260654.40	56° 29' 13.93" N	2° 07' 05.70" W	5.100	+11.35 S	86.51	1.21	188.1	Pipeline 15km	0.13	Outside the ±10 m corridor (1.3 m over)

Field joints are shaded blue and anodes amber.

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The table of fixes, with the field joints and the anode shaded and the fix outside the corridor commented.

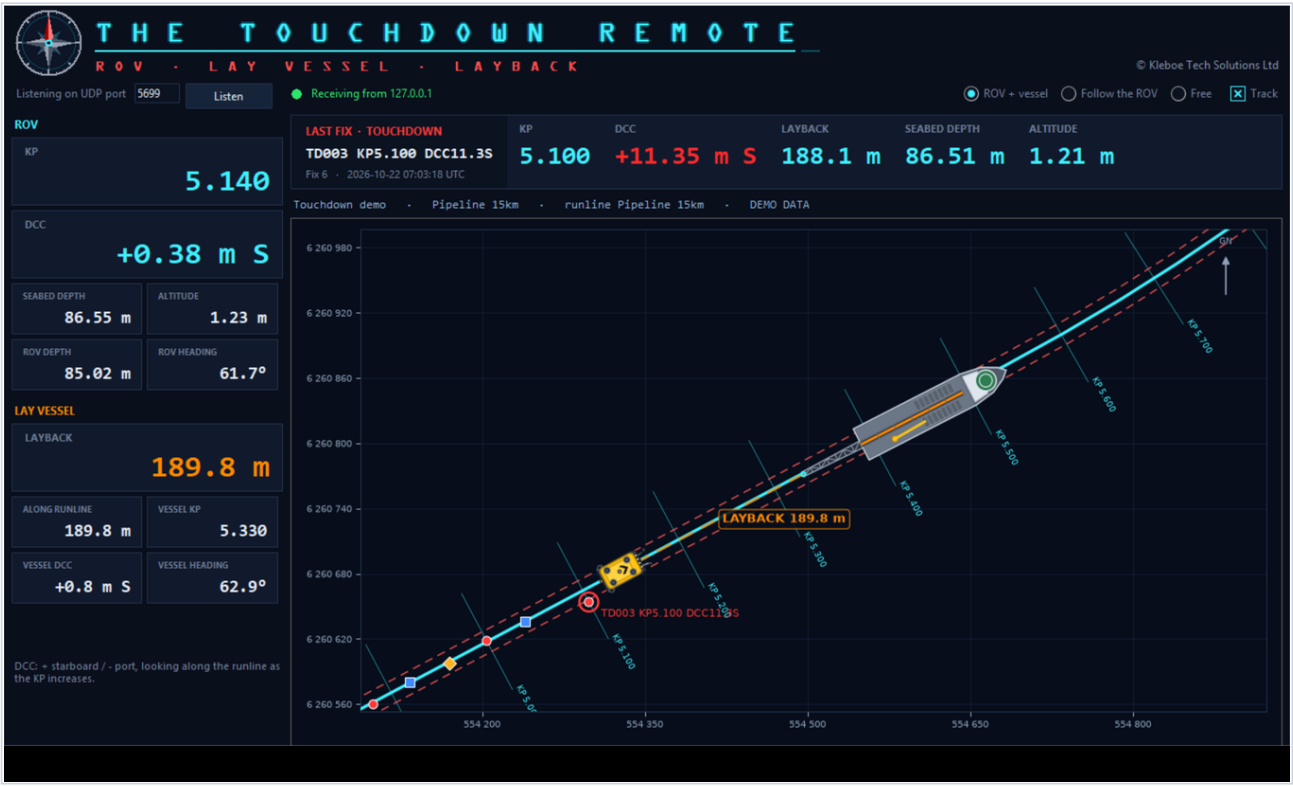
14 The plan

To	Do this
Follow the ROV	Tick **Follow the ROV**: the plan keeps the ROV in view.
Zoom	Roll the mouse wheel, or click **Zoom to ROV**.
See the ROV and the vessel	Click **ROV + vessel**.
Move the plan	Drag it with the mouse (this turns Follow the ROV off).
See everything	Click **Fit all**.
Show or hide	Tick **KP lines**, **Labels**, **Background** and **Track** (the recent tracks of the ROV and the vessel).

The ROV and the vessel are drawn at their true size and turned to their headings, and are drawn bigger when zoomed out so they can always be seen. The pipe is drawn dashed from the stinger tip to the touchdown, with the layback. The readout above the plan gives the Easting, Northing, latitude, longitude, KP, DCC and the distance from the ROV of the point under the mouse.

15 The Touchdown Remote

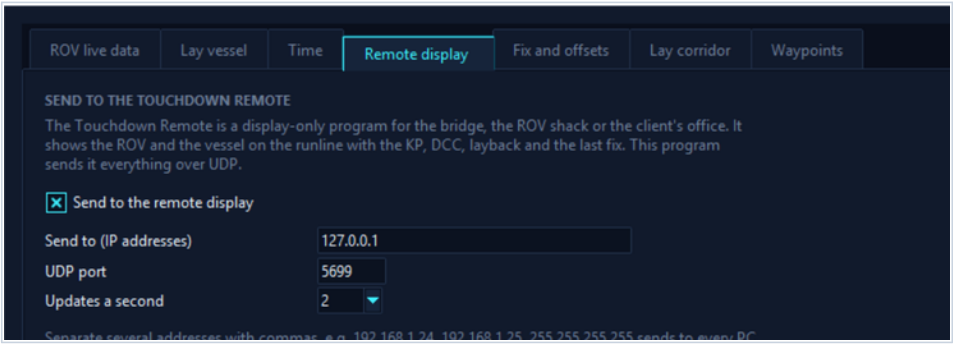
The Touchdown Remote (TouchdownRemote.exe) is a display-only program for the bridge, the ROV shack or the client's office. It shows what The Touchdown Monitor sends it: the ROV and the lay vessel on the runline, the KP, DCC, layback, seabed depth and altitude, the fixes, the last fix in large figures and the corridor alarm. Nothing can be changed from it: fixes are only taken on The Touchdown Monitor.



The Touchdown Remote on the bridge.

15.1 Setting it up

On The Touchdown Monitor, open **Setup…** → **Remote display**:



The remote display settings.

Setting	What it does
Send to the remote display	Switches the sending on.
Send to (IP addresses)	The IP address of the PC running The Touchdown Remote. Separate several with commas, e.g. 192.168.1.24, 192.168.1.25. 255.255.255.255 sends to every PC on the network (one subnet). 127.0.0.1 is this PC.
UDP port	The port the remote listens on (5600 by default).
Updates a second	How often the picture is sent (normally 2). A new fix is sent at once.

On the bridge PC, start **The Touchdown Remote**, type the same UDP port in **Listening on UDP port** and click **Listen**. The light turns green and says where the data is coming from.

> **Tip**
> The port number must be the same on both PCs, and the bridge PC's firewall must let The Touchdown Remote receive UDP on it.

15.2 Using it

To	Do this
Choose the view	**ROV + vessel** keeps both in view, **Follow the ROV** keeps the ROV in the middle at the zoom you choose, **Free** leaves the plan where you put it.
Zoom and move	Roll the mouse wheel; drag the plan (this changes to Free).
Full screen	Press **F11**; **Esc** to leave it.
Show the tracks	Tick **Track**.

If nothing arrives for 5 seconds, the light turns red, it says how long it has been, and the figures turn grey so old values can't be mistaken for live ones. The DCC turns amber or red with the corridor alarm, and the bar shows above the last fix.

16 Files

File	What it is
.touchdown	A Touchdown Monitor project: the job details, geodesy, runlines, backgrounds, settings and every fix. Double-click it to open it (after the program has been run once).
.rlx / .runlines	Runlines to import.
.dxf / .dwg / .csv	Background drawings and points.
.wp2	The waypoint files written for the fixes.
Touchdown_fixes.csv	The backup table of fixes in the waypoint folder.
.pdf / .docx / .csv	The reports.
Touchdown_demo.touchdown	The demo project: a 15 km pipeline with the mock route drawing and a 10 m corridor.

The program remembers the last project and opens it when it starts.

17 Trial and licence

The program runs as a free 48-hour trial with everything working. After that it needs a Survey Software Utilities licence key: click **Enter licence key…** at the top of the window, paste the key from the email and click **Activate**. One key unlocks every Survey Software Utilities program on the PC, on up to 4 PCs. The licence is checked online now and then and works for up to 30 days at a time without internet. The Touchdown Remote needs no licence of its own.

18 Troubleshooting

Problem	What to check
The POSITION light is red	Look at Setup… → ROV live data: the message under the RECEIVED box says what's wrong (section 5.3).
Nothing arrives on a UDP port	The data must be sent to this PC's IP address and that port. Check the Windows firewall, and that no other program on the PC is using the port.
A serial port won't open	Another program may have it open. Check the COM port number in Device Manager and the baud rate.
The position is hundreds of metres out	Check the geodesy (section 3), and for a text string that the Easting and Northing columns aren't swapped.
The KP or DCC is blank	Import the runline (section 4). There is no KP or DCC when the ROV is past the ends of the runline.
The DCC is on the wrong side	Starboard is to the right looking along the runline as the KP increases. Check the direction of the runline and the DCC sign (section 8.3).
No layback	Tick Show the pipelay vessel (section 7) and check the VESSEL POSITION light. The layback needs both the ROV and the vessel positions.
The layback is out by a lot	Is the position sent the stinger tip or the CRP? For the CRP, enter the offsets to the stinger tip; for the stinger tip, set them to 0 (section 7.2).
The layback is out by a few metres	Check the offsets from the CRP to the stinger tip, their signs (Y is negative aft), and the vessel heading (section 7.2).
The altitude or seabed depth is blank	Check the ROV ALTIMETER section of Setup… → ROV live data and the ALT light (section 5.4).
The time on the toolbar line is amber	The time isn't synchronised: look at Setup… → Time. PC clock (no ZDA) means no ZDA is arriving (section 6.3).

Problem	What to check
PPS pulses: 0	Check the pin and the PPS port, and that the GNSS receiver's PPS output is switched on. The pulse must be at least 5 ms long.
The PC clock isn't synchronised	If the program is on the acquisition PC, ask for the acquisition software to control the Windows clock (section 6.1), or use ZDA + PPS.
The corridor alarm doesn't go off	Tick Watch the lay corridor and check the width (section 9). The alarm needs a fresh position and a KP / DCC.
The alarm goes off all the time	Check the corridor width is metres each side, not the total width, and that the right runline is active.
The Touchdown Remote shows nothing	Tick Send to the remote display, and use the same UDP port on both PCs; try the bridge PC's own IP address instead of 255.255.255.255 (section 15).
The waypoint doesn't appear	Check the folder in Setup… → Waypoints, that the navigation software reads the same file, and the status line after the fix.
Take fix says the offsets need the heading	Set up the heading, or set X and Y to 0.
The depth is wrong by the offset	Z is + up: a fix point below the position being sent is a negative Z.
The report won't save	Close it in the PDF viewer, Word or Excel, or save with another name.