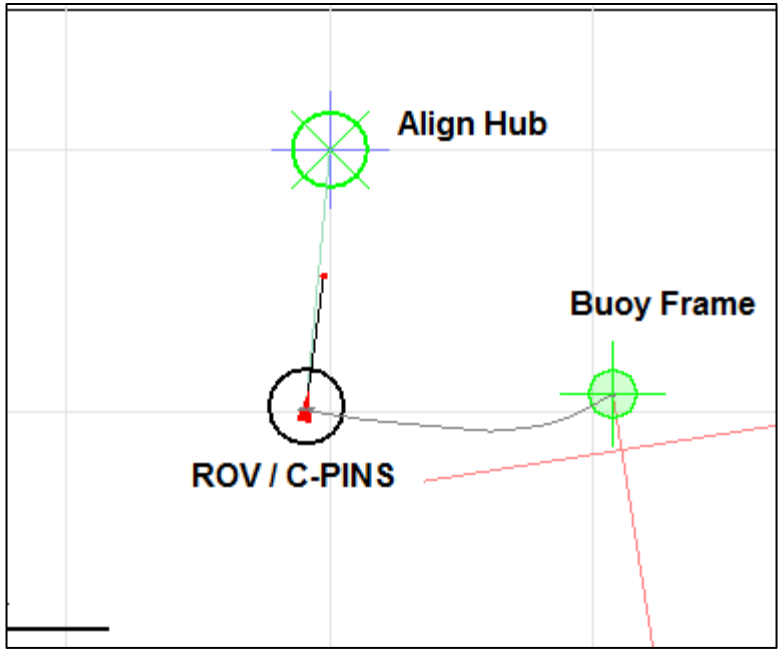
C-PINS METROLOGY WORK

BUOY SET SOLUTIONS



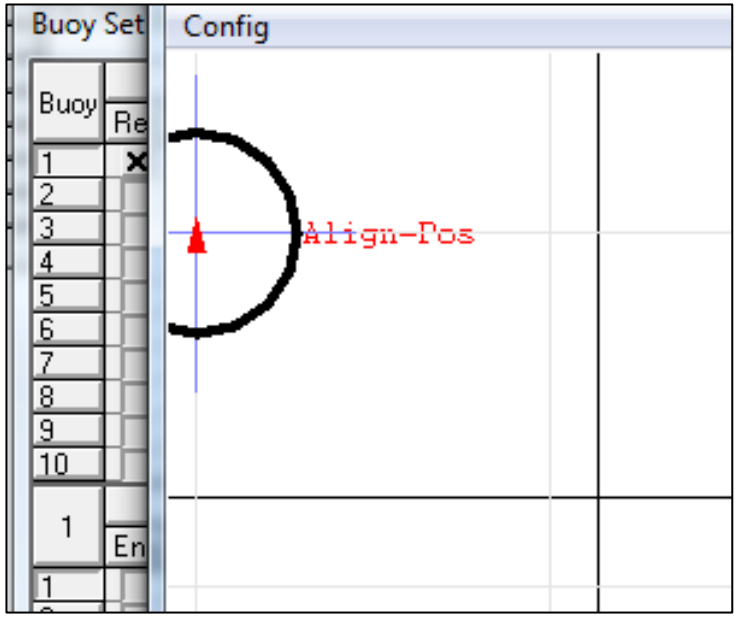
BUOY SET POSITIONING USING INS

- C-PINS aligns to known subsea location (nearby structure)

  (Will require ability to stab into something - receptacle)

- Needs a single point to align to (accuracy unimportant : ~30m)

- All buoys will be placed relative to the alignment position – or manifold/PLET/PLEM slot



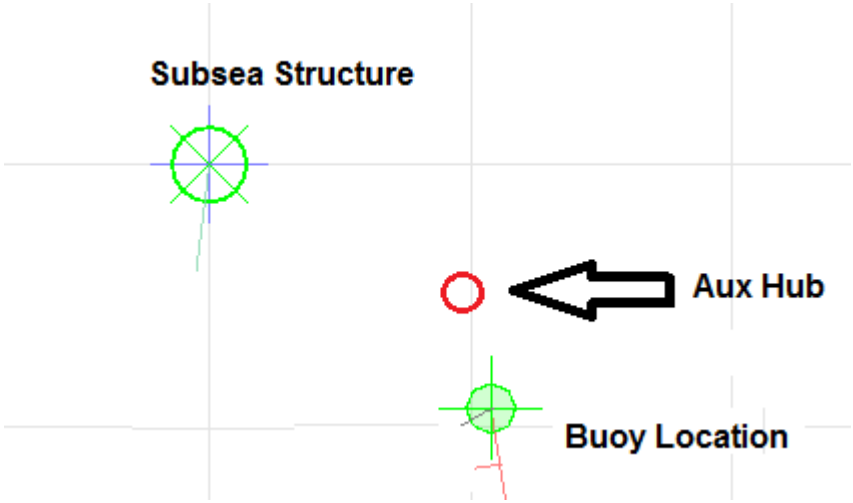
BUOY SET POSITIONING USING INS

If the nearby structure with receptacle is over ~50 meters away Zupt will deploy an auxiliary hub closer to buoy locations

Auxiliary Hub (Aux Hub) is a receptacle on a parking frame

The Aux Hub will be tied into the known coordinates of the subsea structure nearby. The Aux Hub will be used to reference buoy placement and keep C-PINS drift minimal.

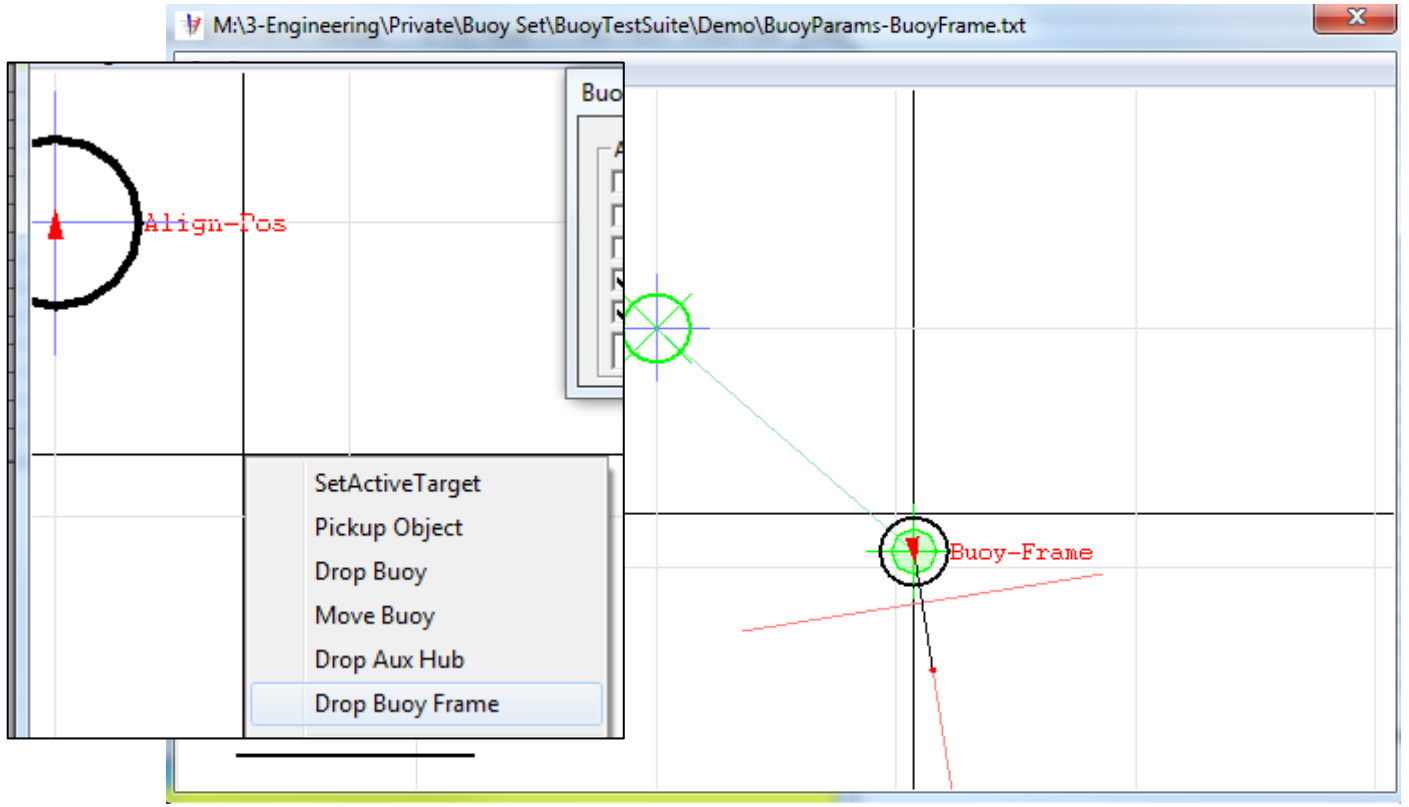
Two loops to Aux Hubs gives us <20cm relative (20 mins)



BUOY SET POSITIONING USING INS

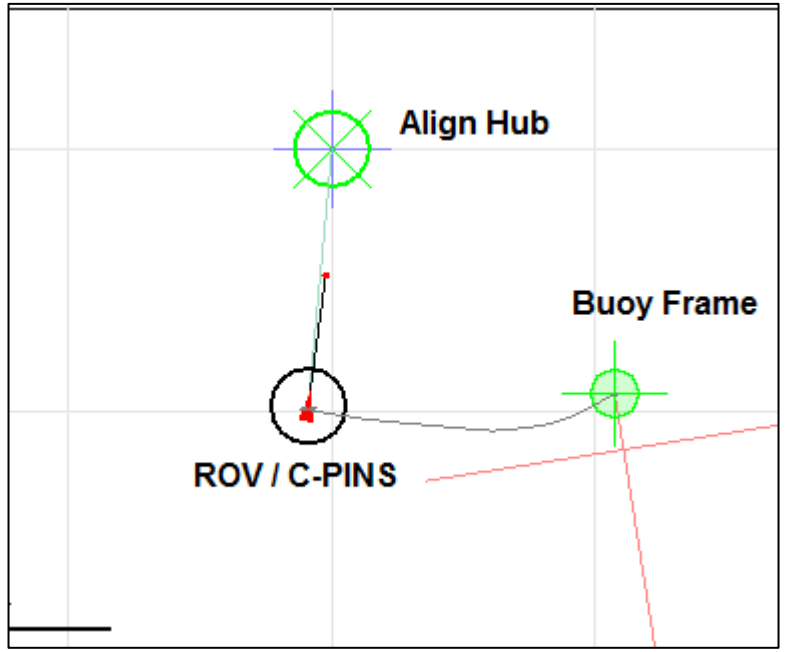
Aligned C-PINS can navigate to place a buoy frame

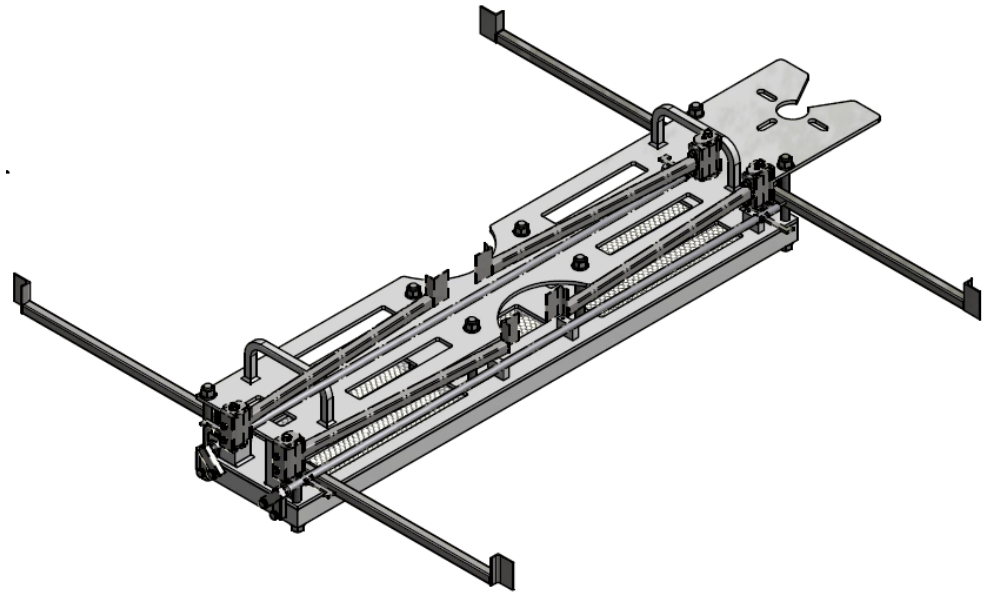
Alternatively buoys can be placed one by one



BUOY SET POSITIONING USING INS

Real time visual map of buoy set targets / frames / ROV

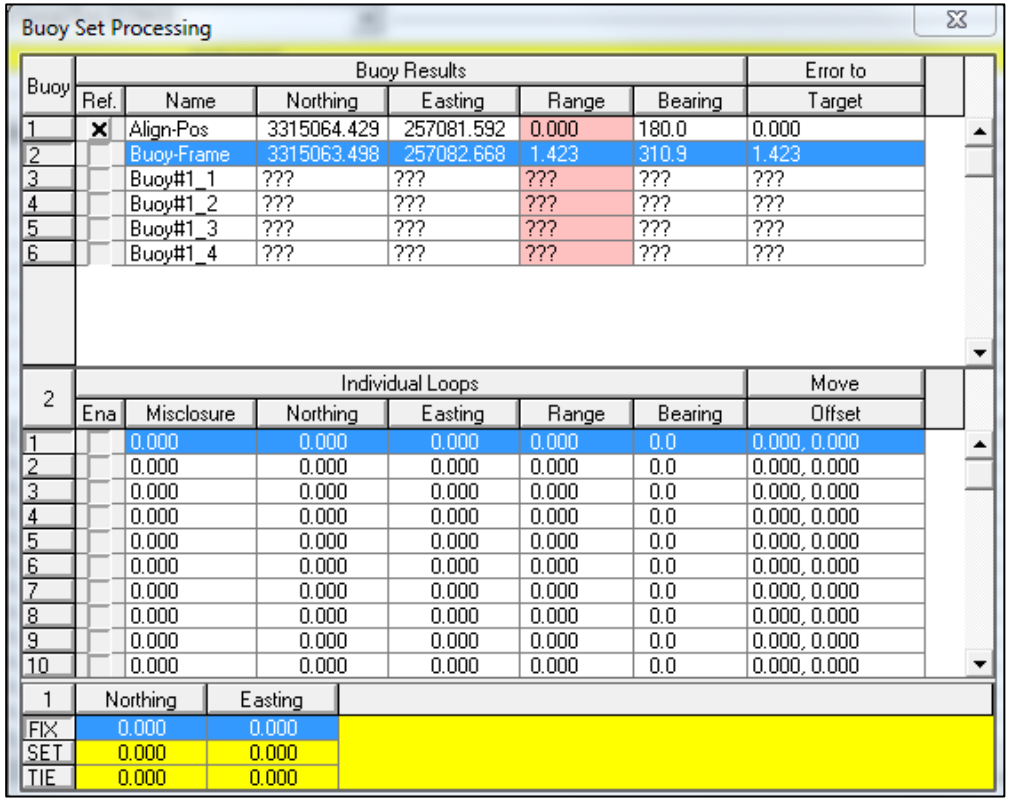




BUOY SET POSITIONING USING INS

Data QC

Buoy location accuracy in real time



TIMES FOR INERTIAL BUOY SET

Align	**45 mins**
Aux Hub placement – if needed	**<30mins**
Frame Placement (if buoy pattern needed)	**40 mins**
Buoy Placement to Frame	**60 mins**

Total time for well buoy set **<4 hours**

Buoy relative accuracy to known point <20cm. Buoy to buoy relative accuracy - <5cm.

No array needed, no transponder frames, no array calibration and add on.