Action - Procedure	√	**Initial**
Prep tube. Wear latex gloves at all times. Using lint-free wipes and IPA, wipe down all outer tube surfaces, ball joint and front flange, including inside surfaces where feasible.		
Stage o-rings. Wipe down with lint-free wipe and IPA. Qty 2, 218x7 (loader door and collar). THT. Qty 1, 85x3 (ball joint). THT. Qty 2, 10x1 (paddle TC sheath). THT. Qty 1, 18x3 (tube port/paddle TC). THT. Qty 1, 10x1 (paddle TC outer seal). Viton.		
Inspect tube heater sleeve for contaminants, damage. Clean out any loose material using a cleanroom vacuum cleaner. Make sure both front and rear insulation ceramic spacers are in place. Position both halves (inboard and outboard) of the front loader compression collar about 2" away from each other to facilitate insertion of the tube. (The outboard collar is stationary; the inboard collar can be moved). Wipe down all compression collar surfaces with lint-free wipes and IPA.		
Position the tube for insertion into the heater sleeve. This operation begins at the rear of the furnace. For the top tube position (nitride), TWO people carefully lift up the tube and hand the flange end off to a THIRD person, who is standing on a ladder, next to the heater sleeve. This person then carefully slides the tube into the sleeve straight and true. Do not bias sideways! Insert about ½ the length of the tube past the rear ceramic spacer, and then STOP. Make sure the weight of the tube is balanced on the rear ceramic spacer and do not let the tube touch the heater coils or any other interior surface.		
One person then gowns up and stands at the front of the furnace loader door. A second person stands at the front access panel, chase side (which has been removed) so they can guide the tube carefully past the INBOARD compression collar. The person at the loader door will reach into the heater sleeve to grasp the front of the tube flange while the person at the rear continues to slide the tube forward.		
The person standing at the access panel needs to assist the tube insertion so that the tube flange extends about 1 inch past the INBOARD compression collar but does not contact the OUTBOARD collar. Also, make sure that the front ceramic spacer remains firmly seated in its nest (the tube insertion may displace the spacer).		
The person at the loader door takes one of the 218x7 THT o-rings and carefully rolls it onto the OD of the tube. **DO NOT USE VACUUM GREASE ON THIS O-RING!**		

The o-ring should be positioned about ½ inch past the tube flange.		
The tube can now complete its insertion step. The person at the rear continues to apply forward force to gently fit the tube into the OUTBOARD compression collar, as the other two persons guide it from the front and side. Once the tube is fitted into the OUTBOARD compression collar, the INBOARD compression collar can be moved forward to make contact with the other collar, securing the o-ring in the V-groove created by the two collar halves.		
Take the 6 HEX SHCS fasteners and thread them into the OUTBOARD compression collar, and into the INBOARD collar. DO NOT tighten at this time.		
Using a small quantity of KRYTOX™ grease, lubricate an 85x3 THT o-ring and install into the o-ring relief on the tube ball joint. Wipe away any excess grease with a lint free wipe and IPA.		
Thoroughly clean the ball joint connector vessel and cold trap. Rough-position the vessel to line up with both the ball joint and the 90° tube exhaust flange (NW63). Loosen all fasteners but leave them installed. **CAREFULLY** fit the connector vessel against the ball joint, DO NOT pinch the o-ring.		
Inspect alignments for all rear tube connections. They must line up without any radial bias whatsoever. Once there is confidence that the alignments are true, the vessel can be soft-mounted, centering rings and ISO clamps, to fix the assembly into the correct position. Again, DO NOT tighten anything yet.		
Assemble the **paddle TC quartz sheath** using the following o-rings. 2, 10x1 (paddle TC sheath). THT. 1, 18x3 (tube port/paddle TC). THT. 1, 10x1 (paddle TC outer seal). Viton. Apply a very small amount of KRYTOX™ grease to each of the THT o-rings. Slide assembled **paddle TC quartz sheath** carefully into the TC port at the bottom of the furnace tube, under the ball joint. Position the sheath with the Delrin positioning block such that the sheath protrudes out past the port (TBD) inches. Hand-tighten the Cajun™ screw compression fitting. Do not apply sideways force while tightening, or you may break the sheath! Do not over tighten. Fit the TC electrical connections to the cable per the numbers (1, 2, 3). Check the TSC computer to make sure the DTC acknowledges the connection.		
Fit 4 ISO clamps to the exhaust plenum at the cold trap. Make snug. Do not finish-tighten. Fit the ball joint retainer to the trap/ball joint interface.		
At the loader open end, seat all six SHCS fasteners and hand-tighten the knurled setscrews. Inspect for alignment.		
Back at the colt trap, using an opposing star pattern, tighten the ISO clamps		

until seated. Maintain alignment while performing this step. Tighten the trap/ball joint clamp using the knurled setscrews. This takes a bit of finesse. Fit the cold trap water-cooled coil into the end of the trap and cam-over each of the 4 locking mechanisms. Attach the cooling water connections, making sure they "click" into place. Turn on the cooling water valves.		
Back at the loader, tighten the 6 SHCS fasteners in THREE stages (snug, medium, tight, no torque spec), again, using an opposing star pattern. Keep an eye on the tube seal o-ring (not the loader door) while performing this step. Make sure the o-ring is compressed evenly in the v-groove, against the tube OD. Fit the two 4mm nuts to the screw studs on the back of the inboard compression collar.		
At this point, the tube installation is complete and is ready for pump down and leak-check.		