Ludwieg Tube Checklist Ae104b Experiments

Preliminary setup

- Ensure test section-dump tank junction is closed
- \bigcirc Visually inspect test section and tunnel
- \bigcirc Set wedge angle

Positioning the diaphragm

- Cut circular diaphragm in polycarbonate sheet.
- \bigcirc Check pressure in both sections, should be atmospheric. If not, follow steps for venting
- O Push tunnel from dump tank side all the way to the west side of the laboratory
- \bigcirc Undo 10 nuts on driver-nozzle junction bolts
- Separate driver tube and nozzle
- $\bigcirc\,$ Remove and dispose of old diaphragm
- Peel off protective coverings from new diaphragm
- \bigcirc Put a very small amount of vacuum grease on the top of new diaphragm
- Insert new diaphragm into the driver-nozzle junction
- \bigcirc Push tunnel from dump tank side all the way to the west side of the laboratory
- $\bigcirc~$ Ensure sections mated correctly and secure with 10 nuts

Evacuation of tunnel

- \bigcirc Open driver vacuum valve V1
- $\bigcirc~$ Open dump tank valve V2
- $\bigcirc~$ Open dump tank vacuum gauge valve V3 to tank
- \bigcirc Close atmospheric vent valve A1
- $\bigcirc~$ Open vacuum pump valve V4
- \bigcirc Ensure V6 on control panel is closed
- O Put earphones on
- Close door and hang "Do not enter" sign

- $\bigcirc~$ Turn on vacuum pump
- $\bigcirc~$ Wait 20 minutes for vacuum. Vacuum pressure should be ≈ 1.5 Torr. While waiting, see following two sections
- \bigcirc Close driver fill valve V1
- $\bigcirc~$ Close dump tank valve V2
- $\bigcirc~$ Isolate dump tank vacuum gauge valve V3
- \bigcirc Close V4
- $\bigcirc~$ Turn off vacuum pump
- \bigcirc Open A1 to relieve pressure in line
- $\bigcirc~$ Cycle vacuum pump valve V4 open and closed

Preparation of optical setup (can be done while tunnel is pumping down)

- Turn on camera
- $\bigcirc~$ Start Phantom software on computer, go to Acquisition \rightarrow Setup & recording
- \bigcirc Turn on light source fan
- \bigcirc Turn on light source power supply
- $\bigcirc~$ Remove lens cap from camera, adjust camera settings as needed
- Adjust schlieren cutoff to desired sensitivity

Preparation of data acquisition (can be done while tunnel is pumping down)

- Start MATLAB 32-bit
- Open "MATLAB/Ludwieg Tube/NI_DAS_6133_Ludwieg_Legacy.m"
- \bigcirc Ensure shot number is correct
- Run script to arm
- Arm camera by clicking "Capture" on Phantom software
- $\bigcirc~$ Trigger, ensure both programs function properly
- $\bigcirc~$ Open "Shot Log.xlsx", create entry for current shot

Fill driver and fire

- $\bigcirc~$ Arm camera and MATLAB DAS script
- Turn on driver digital pressure gauge
- O Open 4 active air bottles and regulator valves
- \bigcirc Open fill line ball valve V5
- Fill driver with needle valve V6 until diaphragm bursts, slowing when pressure approaches expected burst pressure
- \bigcirc When tunnel fires, close V6
- $\bigcirc~$ Close V5 and active bottles and regulator valves gently
- \bigcirc Replace lens cap on camera
- \bigcirc Turn off light source
- \bigcirc Turn off light source fan
- $\bigcirc~$ Open dump tank valve V2 to vent tunnel, open V6 during venting to relieve pressure
- $\bigcirc~$ Save .cine file on Phantom software