Subject: Automatic Pressure Calibration System, Solicitation No. NNC09ZCH019Q

1) Please explain further the statement, "There shall be easy access to all pressure heads from outside cabinet for purpose of calibration. All heads shall be isolated for the purpose of calibration". Each pressure sensor in the system will be calibrated with respect to a reference plane that will be stated on the calibration report. Is this sufficient? This means that the pressure controller(s) shall have the ability to be valved off, where necessary, and accessible for calibration without removal of the controllers from the rack. In the case where the controller, or any other hardware, needs replaced or removed, the equipment shall be able to be extracted without major disassembly. Inability to disassemble to send instruments out for service will not be acceptable.

2) Please verify that the differential transducers will be calibrated at atmospheric line pressure. True. It is also required to provide line testing with both reference port and the test port at the same pressure (elevated to the line pressure spec of the UUT's). This test should be selectable or deselectable by the operating technician at the time of the calibration setup.

3) Please provide size and capacity of vacuum pumps that will be provided by NASA. NASA will use a Leybold Trivac D16 Vacuum Pump if all of the supplied pressure controllers use an internal absolute reference (eliminating the needs for vacuum reference). If the controller(s) are gage or differential, then two Leybold D4A's will be used – one for maintaining the 100mTorr at the reference port and the other will be used to provide a sub-atmospheric pressure for the test port.

4) Please verify if system is to include manifold for 10 transducers or is NASA providing this? If vendor is supplying as part of the system, are isolation valves required between each port? Is each port to be AN4 fitting? NASA does not require manifolds to be provided for multiple transducer calibrations. NASA currently uses its own manifolds for this application.

5) The Statement of Work specifies that "the system shall control the vacuum level at 100 mTorr...". The user's current Ruska 6000 series based system performs absolute mode measurements by pulling a vacuum on the reference port. It is possible that the new system will do the same. Is the statement above regarding the control of the vacuum level referring to the control of the vacuum on the reference port or is it referring to the vacuum level that needs to be controlled on the test port? The proposed system should have two ports – a reference port (low side) and a test port (high side). The ref port is used at atmospheric when the pressure controllers are of "absolute-type". If the controller(s) are gage or differential, then, the ref port of the controller would need to be sucked down to 100mTorr and held there through the cal. The 100mTorr uncertainty shall be measured equal to or better than the Basically, the 100mTorr ref. should be stable and accurate to the same, or better, uncertainties using, for example, the **Granville Phillips 275 Convectron Gauge Vacuum Pressure Measurement Sensor, 1/8 MNPT 275071**. We use a variable leak to set the ref pressure at 100mTorr. The test port should be able to span the range of the UUT for the calibration. The ref side should be isolated from the test port side.

6) The uncertainty requirements give the impression that for pressures below 1 psi, the uncertainty must be 0.02% reading. Normally, pressure measurement specifications will give a baseline number where below that number the specification changes to % Full Scale. What is the baseline number for this

requirement? Range: to cover pressure calibration for pressure transducers with ranges between 1 PSI to 3000 PSI
System Measurement Uncertainty: equal to or better than 0.015% of pressure setting from 1 psi to 2000 psi; 0.02% of pressure setting above 2000 psi and below 1 psi for a calibration cycle of 1 year.

See note for the accuracy explanation.

The Scope of Work states that:

"All types of pressure transducers (differential, guage, absolute, or bidirectional gauges) need to be calibrated with the system."

"The system shall have two (2) pressure ports used for all testing. One port shall be the low or reference side and the other shall be the high side."

"The reference for the absolute pressure could be chosen by technician to be 100 mTorr or 200 mTorr, and it should be controlled to the chosen value."

"The provided system shall control the vacuum level at 100 mTorr or 200 mTorr or any other entry in mTorr. ... The default vacuum reference shall be 200 mTorr."

My questions are:

1. What is the pressure range and accuracy requirements for each of the two pressure ports, including vacuum? See text above and in the RFQ. Basically, the 100mTorr ref. should be stable and accurate to the same, or better, uncertainties using the **Granville Phillips 275 Convectron Gauge Vacuum Pressure Measurement Sensor, 1/8 MNPT 275071, for the vacuum reference**

2. Am I correct to assume that the two pressure ports will attach to a test fixture that already exists or is being provided outside of the scope of this solicitation? Yes, you are correct in that assumption. NASA has fixtures to port pressure to UUT transducers for multiple (up to 10) transducers, concurrently
In other words, the offerer is not responsible for any test fixtures downstream of the two pressure ports. true