Fermilab

Particle Physics Division
Mechanical Department Calibration
Standards/Procedures

Number: MD-CALPROC-011 **Date:** 6/26/2009

Manufacturer: Barton

Model: Barton Model 227A – Differential Pressure Indicator

Reviewer(s): James E. Tweed

This Procedure is used for:

Calibration of Barton differential pressure transmitters.

SECTION 4
MAINTENANCE

DPU INSPECTION AND CLEANING

Instructions pertaining to DPU inspection and cleaning are presented in the Appendix.

TOOLS REQUIRED FOR MAINTENANCE

Tools required for removing DPU pressure housing bolts and maintenance of the DPU are listed in the Appendix.

The following tool list is applicable to the indicator:

Tool	Purpose
Pointer puller	Pointer removal
Small screwdriver	Calibration adjustments
Medium screwdriver	Bezel removal
1/8" Open-end wrench	Calibration adjustments
50 lb. Torque wrench	Pressure housing bolts
3/16" Allen socket wrench	Pressure housing bolts
5/16" Allen socket wrench	Pressure housing bolts
Calibration Kit (Item 20, Table 6-1)	

RANGE CHANGES

To change the range of the Model 224 DPU, it is necessary to replace the BUA with a unit of the desired range. Replacement assemblies, range descriptions, and general instructions are presented in the Appendix. Specific instructions as applicable to this instrument are presented in the following paragraph.

BELLOWS UNIT ASSEMBLY

Before attempting to change the Bellows Unit Assembly (BUA) or perform calibration of the instrument, remove the cover glass, scale plate and pointer of the indicator as follows:

1. Loosen three bezel screws located on the front of the bezel.
2. Tilt out the bottom of the bezel and slide the bezel upward.
3. Remove the indicating pointer using the pointer puller.
4. Remove the scale mounting screws and remove the scale plate.

Disassembly to this point provides full access to all indicator movement parts and adjustments.

NOTICE
Do not loosen the two plugs located on the BUA center plate when removing the mounting bracket. If either plug is loosened, the bellows fill fluid will be lost and the DPU will require factory refill.

To replace the DPU BUA, proceed as follows.

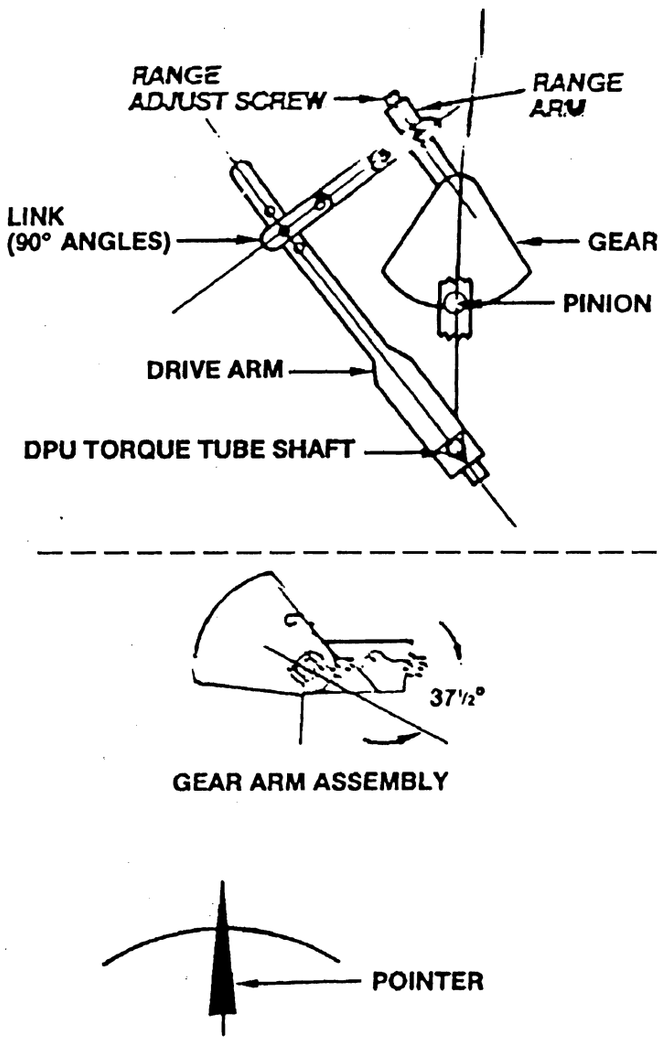
1. Remove the instrument from service.
2. Remove the bezel, cover glass, pointer, scale plate of the indicator.
3. Loosen and remove the drive arm.
4. Remove the indicator movement mounting screws.
5. Remove the four Allen head DPU mounting screws, and separate the DPU from the indicator case.
6. Remove the DPU mounting bracket, pressure housing screws and the pressure housings.
7. Reassemble the DPU using the replacement BUA and following steps 2 through 6 in reverse order.
8. Calibrate the instrument in accordance with #5 and #6.

CALIBRATION CHECK

Normally all that is required to adjust the indicator to the factory-set calibration tolerances is to perform the following calibration check.

1. Connect the instrument to a standard pressure source as shown in Appendix 1.
2. Remove the plug from the low pressure housing.
3. Apply approximately 150% of the differential pressure range to the high pressure housings. Release pressure. Repeat 3 or 4 times.
4. Apply 0%, 50% and 100% of full scale pressure (see Figure 4-1). If indication is within the specified limits, no further adjustments are necessary. If the zero indication is incorrect, remove the bezel and glass assembly, and adjust the pointer by turning the pointer by the hub.
5. Replace the bezel and glass assembly.

Figure 4-1. Linkage Assembly at 50% Differential Pressure



COMPLETE CALIBRATION

A complete calibration of the instrument is required whenever the DPU assembly is replaced. Refer to Figures 2-1 and 5-1, and the Appendix while performing the calibration procedure.

1. Connect the instrument to a standard pressure source as shown in the Instrument Calibration Setup illustration in the Appendix.

2. Attach linkage between drive arm and movement. (The following illustration shows alignment at 50% differential pressure.)

Inspect parts for straightness and pivot-fit without binding.

NOTE
If replacing the pointer it may be necessary to ream the hub to obtain the required 75 to 90% hub engagement.

3. Set the pointer at zero on the scale by slipping the pointer on the hub. Hold the pointer tip and turn the hub with a wrench.

4. Apply 100% differential pressure. If pointer exceeds 100% on the scale, lengthen the range arm. Remove pressure.

5. Set zero and span using the hub for the zero adjustment and the range adjust screw on the movement for span adjustments.

6. Apply 50% differential pressure. If linearity adjustment is required, loosen the drive arm and move the arm to shift the pointer in the direction of the error (approximately 10:1). Re-tighten drive arm.

7. Reset zero and check span. If the gear in the movement reaches its limit of travel due to the linearity adjustment, slop the gear approximately 5° from the 37.5° angle to approximately 43°. Retest at 50% and 100% differential pressure and adjust linkage until pointer readings are acceptable.

8. Apply 0%, 25%, 50%, 75%, and 100%, 75%, 50%, 25%, and 0% differential pressure to the indicator without over-shoot. Lightly tap the indicator to overcome the effects of friction.

9. Test repeatability at 0%, 50%, 0% 50%.

10. Set stops to prevent pointer from striking snubbers on the scale.

11. Tighten all screws. Test by moving the pointer (by finger) from zero to 50% and return. An off-set in zero reading indicates pointer slippage.

TROUBLESHOOTING

If operation problems are encountered, refer to the Troubleshooting Chart, Table 4-1.

Table 4-1. Troubleshooting Chart

Trouble	**Possible Sources**	**Probable Cause**	**Corective Action**
Low or No Indication	DPU	See Troubleshooting Chart— Appendix	
	Indicator	Loose Movement.	Tighten or replace.
		Out of calibration.	Calibrate.
		Pointer loose.	Tighten pointer
		Dirt in mechanism.	Clean mechanism.
	Piping or Primary Source	See Troubleshooting Chart — Appendix	
High Indication	Piping or Primary Source	See Troubleshooting Chart — Appendix	
	DPU	See Troubleshooting Chart — Appendix	
	Indicator	Loose arms or mechanism.	Tighten mechanism.
		Out of calibration.	Calibrate.
Erratic Indication	Primary Element	See Troubleshooting Chart — Appendix	
	Piping	See Troubleshooting Chart — Appendix	
	DPU	See Troubleshooting Chart — Appendix	
	Indicator	Movement dragging or dirty.	Adjust or clean movement.
		Pointer dragging on scale plate.	Adjust pointer position.