

Replacing a DPI 510 with the 6270A Modular Pressure Controller/Calibrator

Application Note

The 6270A Modular Pressure Controller/Calibrator is an effective drop-in replacement for the now-obsolete Druck DPI 510 in most applications. In addition to the basic functions required to replace the DPI 510, the 6270A also offers advanced design, performance and features to improve pressure calibration capabilities. This application note summarizes some of the benefits of upgrading to the 6270A as well as detailing the steps for configuring and installing the 6270A as a replacement to the DPI 510.



Benefits of upgrading

There are many benefits to upgrading from the legacy DPI 510 to the 6270A Modular Pressure Controller/Calibrator:

- Workload coverage
- Measurement performance
- Control performance
- Maintainability/serviceability
- Expandability

Workload coverage

The DPI 510 could be configured with up to two measurement ranges. These ranges were completely independent, which allowed flexible coverage since one range could be a high pressure and the second range could be a very low pressure. The drawback is its ability to cover the middle ranges. The 6270A resolves this issue by allowing for more ranges (up to five) to be installed at one time and allowing for easy re-ranging of the unit by replacing modules. You still have the very wide coverage of vacuum to 3000 psi, but now you have coverage at all of the pressures in between.

Measurement performance

Druck DPI 510 utilizes silicon-based pressure sensors for its on-board calibration reference standards. Its headline measurement specification was 0.025% reading for ranges of 7 MPa (1000 psi) and below and 0.04% reading for

ranges above 7 MPa (1000 psi). This specification only includes the combined effects of non-linearity, hysteresis, and repeatability.

The manufacturer-provided specifications for the DPI 510 only provide guidance on its performance immediately following calibration. They provide no guidance on what the user should expect when it is calibrated a year later. The specifications provided for the Fluke Calibration 6270A include one-year measurement stability.

Fluke Calibration 6270A offers two pressure measurement modules class options to replace and improve upon the function of the DPI 510 while balancing cost and performance:

1. The silicon-based cost-effective PM200 module offers 0.02% full scale total one-year measurement uncertainty specification. While the specification for the DPI 510 is percent reading, the PM200 module is a more than adequate replacement, especially when you consider the undefined long term stability drift of the DPI 510.
2. The resonating quartz-based high-performance PM600 module offers 0.01% reading total one-year measurement uncertainty specification from 30% to 100% of the module full scale. Most of the PM600 modules offer gauge, absolute and vacuum measurement standard. In many cases, one PM600 module can effectively replace the function of both ranges and barometric option of the DPI510.

Control performance

The 6270A provides control precision of 0.001% of the active range. The DPI 510 had a specification of 0.004% full scale. The 6270A provides a more stable pressure with a relatively fast time to setpoint.

Maintainability/serviceability

The 6270A is designed with a focus on maintenance and service. The modular design allows for reduced downtime during recalibration. Control functionality is also encapsulated in a module, making troubleshooting and repair of any control performance issues. The focus on serviceability is seen throughout the design. For example, the removable connection manifold allows for easy repair if the port connection threads are damaged due to misuse.

Expandability

Your calibration needs change with time. The 6270A can change with your needs. You can change the pressure range or measurement performance of the instrument by adding pressure measurement modules. This can be done without sending any part of the instrument back to the factory for reconfiguration. Simply install the new pressure measurement modules and start controlling pressure.

The DPI 510 is static in its configuration. Whatever ranges it was configured for originally is what it will be for the rest of its life. Your needs have potentially changed since the DPI 510 was acquired, but the DPI 510 can't be altered to meet them.

Configuring a 6270A

Selecting pressure modules

DPI 510 controllers were configured with one or two ranges and an optional barometric reference sensor to allow operation in absolute pressure mode. The 6270A can accommodate up to five installed pressure modules with 35 module options to choose from, so there are numerous ways to configure a 6270A to replace any configuration of DPI 510.

To select the right pressure modules for the 6270A, first consider the required pressures and accuracies for your application. There are two classes of pressure measurement modules for the 6270A. The PM200 modules have a one-year specification of 0.02% full scale. For most applications where the performance of the DPI 510 was sufficient, the PM200 modules are a good choice.

The PM600 modules have a one-year specification of 0.01% reading from 30% to 100% span. Depending upon your measurement

needs, it is feasible that both ranges of the DPI 510 can be replaced with a single PM600 module.

Barometric reference pressure

A barometric reference sensor was an option on the DPI 510. Choosing this option allowed the instrument to be used in absolute mode. If gauge mode PM200 modules are used with the 6270A, then a barometric reference option is recommended for operation in absolute mode. There are two modules available that can be used for measuring the barometric reference pressure.

Model	1 Year Specification
PM200-A100K	0.1 % FS
BRM600-BA100K	0.01 % reading

When a barometric reference sensor is used to allow for absolute mode pressure measurements, the performance of the barometer has a greater impact on the overall measurement at lower pressures compared to higher pressures. For many applications, the PM200-A100K is acceptable for pressure ranges of 500 psi or greater. The BRM600-BA100K is a better solution for lower pressure ranges.

The majority of PM600 modules are inherently absolute mode. They are capable of measuring in both gauge and absolute mode without the use of an additional barometer. Adding the barometer can improve the measurement performance in absolute mode. In most situations where the DPI 510 measurement performance was acceptable, the additional improvements provided by the barometer are not necessary.

Test port manifold selection

There are three versions of the 6270A main chassis. The difference between the versions is the connection types on the back of the instrument. The connection types can be changed by removing and replacing the rear connection manifold. Removal of the manifold is done by removing the four screws and sliding the manifold out the back of the instrument.

Model	Supply, Exhaust, Test, and Reference Connections	Vent Connection
6270A-NPT	¼ NPT	1/8 NPT
6270A-BSP	¼ BSP (parallel)	1/8 BSP (parallel)
6270A-7/16	7/16-20 SAE	5/16-24 SAE

Installation and setup

Rackmount installation

An optional rackmount kit is available for the 6270A. This kit allows for installing the 6270A in a standard 19-inch rack, just like the optional rackmount kit that was available for the DPI 510. The DPI 510 was 4U high where the 6270A is 3U high. Thus, the 6270A will fit into the same vertical space in the cabinet as the DPI 510, with an additional 45 millimeters (1.75 inches) left over.

Single range physical connections

Replacing a single range DPI 510 is straightforward. Simply connect the device under test to the 6270A test port instead of the DPI 510 outlet. Connect the supply pressure (previously connected to the DPI 510 supply+ port) to the supply port on the 6270A. If there was a vacuum pump connected to the DPI 510 supply- port, connect it to the 6270A exhaust port. For ranges above 100 psi, the supply pressure requirements for the DPI 510 and the 6270A are the same (10% above the full scale range). For ranges below 100 psi, increase the 6270A supply pressure to equal the full scale plus 15 psi (100 kPa).

Dual range physical connections

The DPI 510 was available in dual range configurations. This configuration requires two test ports (outlet) and two supply pressures. The 6270A allows for a more simplified setup, where there is only one test port and one supply pressure.

If the low range on the DPI 510 is no less than 10% of the high range (for example 3000 psi and 300 psi), then simply connect the higher supply pressure to the 6270A supply port. The low range supply pressure regulator is no longer required. If the low range is less than 10% of the high range, then the low range supply regulator still needs to be used. A simple way to set up a manual system for doing this is to use a five-way switching valve to switch the supply port on the 6270A to either the low or high pressure supply (see figure below). An example five-way switching valve is Swagelok part number SS-43ZF2 (note: this valve has a full scale working pressure of 2500 psi). A five-way switching valve is used instead of a three-way valve in order to insure that the pressure is automatically vented when switching between supply sources.

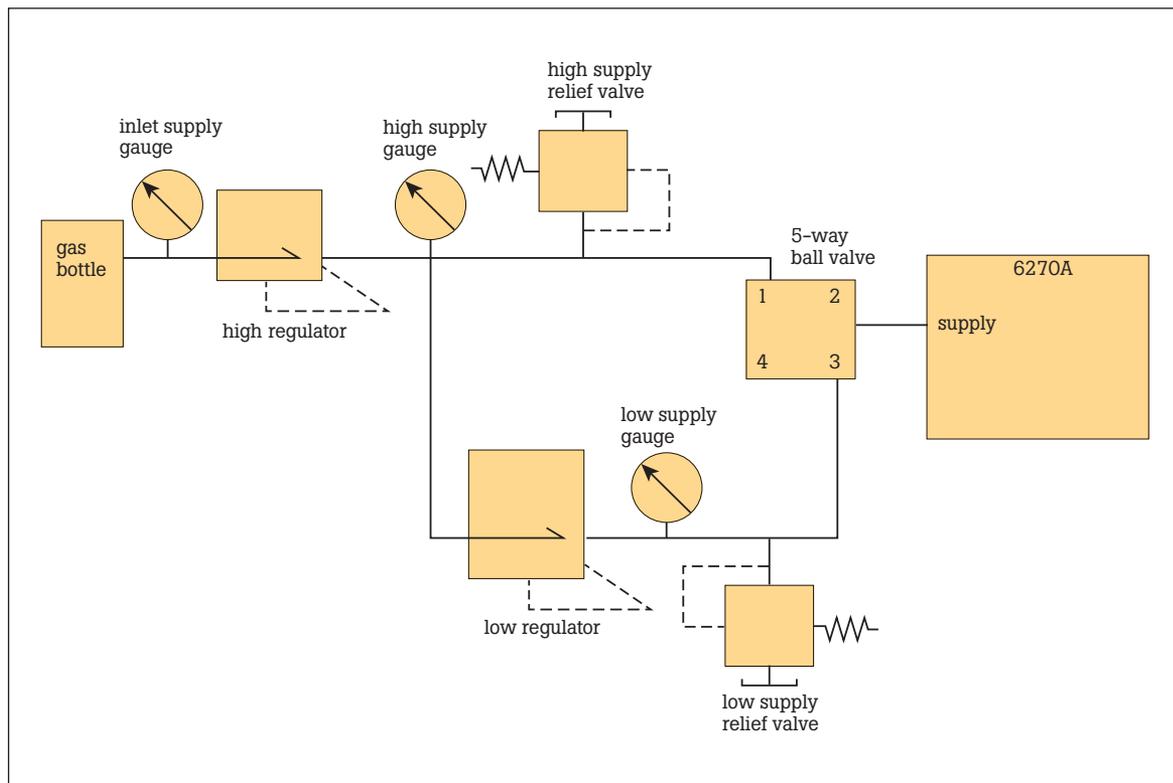


Figure 1. Using a five-way switching valve to switch the supply port on the 6270A to either the low or high pressure supply

Connect the 6270A supply port to the common port on the valve. Connect the supply pressures to two of the four other ports. The two ports should be opposite each other. By doing this, when switching from the high to the low pressure supply, the pressure line to the controller is vented so that the low pressure regulator won't be back-fed with high pressure.

Emulating remote communication

The 6270A can be placed in DPI 510 remote emulation mode. To set remote emulation mode from the front panel, press SETUP. In the main setup menu, select INSTRUMENT SETUP and then REMOTE PORT. Pressing EMULATION MODE allows you to select DPI 510. For a complete listing of all supported commands, see the 6270A Programmers Reference Guide.

Conclusion

With the DPI 510 well past the end of its serviceable life, the flexible Fluke Calibration 6270A modular design can offer a basic direct drop-in replacement that is also a true step above in performance. With the 6270A you get the service and support of Fluke Calibration, the industry leaders in pressure calibration.

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