PARALLEL OPERATION OF DPS14-SERIES PRESSURE SCANNERS

Technical note

This is an experimental prototype, for measurement purposes only.

This system is not certified for use on aircraft

Contents

Version Control

Version	Date	Summary of changes
1.0	07-2024	New document

1   INTRODUCTION

Multi-unit software executable & development kit

The Surrey Sensors Ltd. DPS14-series pressure scanners are self-contained multichannel pressure measurement instruments with integrated data acquisition hardware, and can communicate with a Windows-based PC over USB.

In many applications, it may be necessary to drive multiple DPS14-series units in parallel, for measurements over more than 64 channels. For these cases, a standalone testing executable and National Instruments LabVIEW software development kit has been provided. These can be used independently, or integrated into existing LabView VI implementations.

2   SOFTWARE AND DRIVERS

The system requires a Windows-based PC with at least one USB connection per pressure scanner in order to function. The pressure scanners may be driven through externally powered USB hubs.

Drivers

There are two external drivers which must be downloaded and installed on the computer in order for the PC to be able to interface with the system, in addition to the specific system driver.

- National Instruments LabVIEW Runtime Engine (LVRTE)
- National Instruments VISA Runime Engine (NIVISA)

These drivers are freely available for download from National Instruments. Ensure that the 64-bit version of the LabVIEW Runtime Engine is selected (note this is not the default option), and restart the computer following each installation. Correct download settings for each driver are shown in Figure 3 and 4 below.

Additionally, the USB driver installation will be required for older versions of Windows (Win7 and earlier).

Figure 1: Download settings for NI LabVIEW Runtime Engine

Figure 2: Download settings for NI VISA Runtime Engine

3   OPERATING INSTRUCTIONS

The executable software package provided for multi-scanner operation will enable the user to access all the functionality of the system, and can be used for data acquisition if required.

Starting procedure

1) Load the program. The software will open in a configuration window (see figure 3).
2) Under 'PRESSURE SCANNERS COM PORTS', select the COM port for each scanner using the drop-down menus. Scanners can be connected and powered on while the configuration window is open: the COM ports may then be identified by refreshing the lists.
3) Press the white arrow near the top left corner of the window to start acquiring data.

The configuration window allows you to set the operating parameters of the unit and provides some data from the on-board sensors.
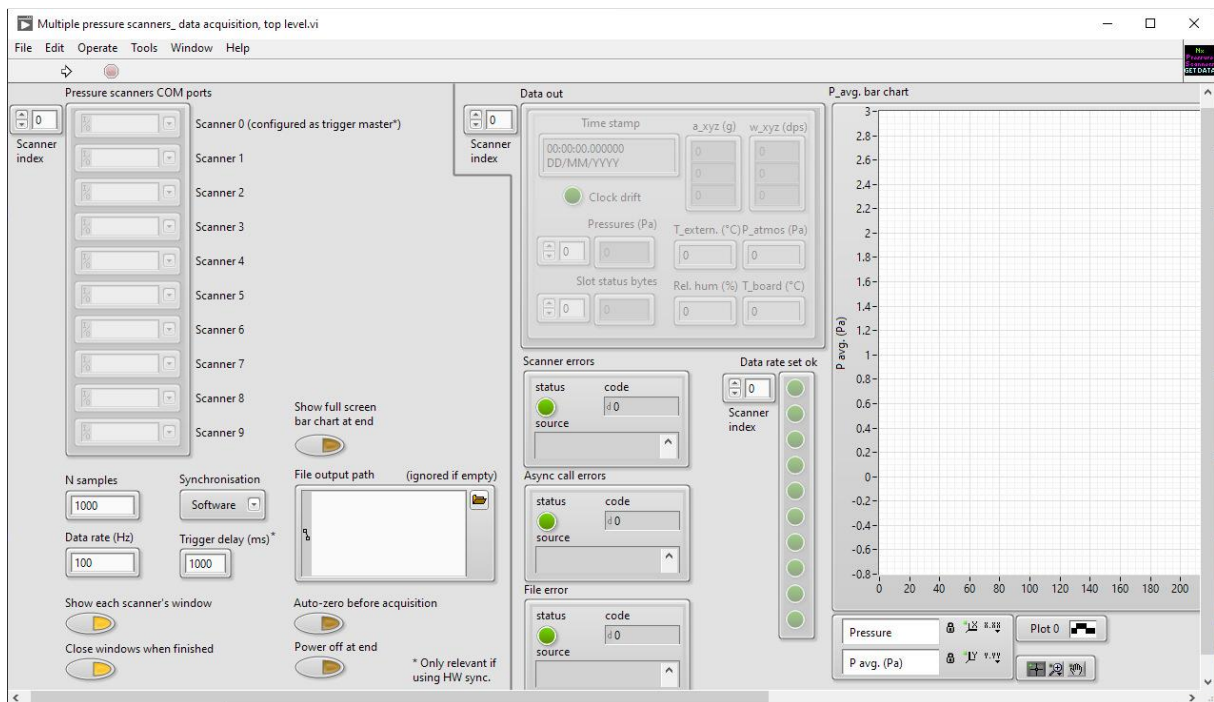

Figure 3: Configuration window

Available commands

Before starting data acquisition, the following parameters may be selected by the user:

- **N Samples:** Set the finite number of samples to acquire.

- **Data rate:** Set the sampling rate for the pressure scanners. This will default to 100 Hz on startup. If data rate changes are registered without error, the green indicators will

illuminate under 'DATA RATE SET OK'. Note that these indicators only illuminate when the data rate is changed.

- **Show each scanner's window:** If enabled, a pop-up window will be generated with each individual scanner's interface, showing its real-time data stream during acquisition. Note that enabling this option will have no effect on synchronisation accuracy, but may slow down the computer because of the extra processing required for graphics.

- **Close windows when finished:** If enabled, the pop-up windows generated by [SHOW EACH SCANNER'S WINDOW] will be automatically closed when acquisition is complete.

- **Synchronisation:** The system may operate with either software or hardware synchronisation.

  If [SOFTWARE] is selected, the system will trigger the scanners in parallel using a USB command. This will result in some system-dependent uncertainty in the triggering times, but these uncertainties are normally less than 10 ms and will be insignificant if only mean pressures are required, if tubes of lengths > 1m are used to connect the scanners to the pressure sources being measured, or if the number of PC cores is greater than or equal to the number of scanners and the background activity is low.

  If [HARDWARE] is selected, the system will provide interrupt-based, sub-microsecond synchronisation suitable for maximum bandwidth unsteady measurements. For hardware triggering, the scanner I/O terminals must be connected together as illustrated below
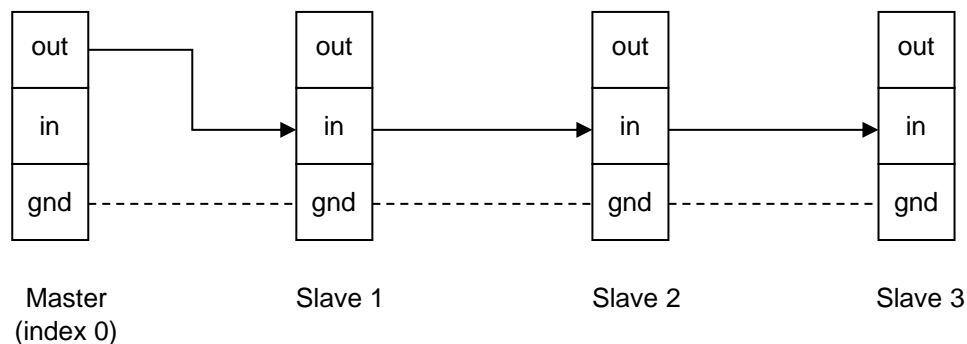
  The system will use the scanner on the COM port assigned index '0' as a trigger source, and will slave all other scanners to it. It is also best practice to connect all the ground [GND] terminals together.

- **Trigger delay:** If hardware triggering is used, this option allows the user to set an arbitrary delay between the command to start acquisition and the generation of the master unit trigger pulse. Since the computer must first send configuration commands to all the scanners, some delay is necessary- and the length of the required delay will depend on the capabilities of the computer and USB hub loading. The default value of 1000 ms is well above the requirement for most modern computers, but the user may experiment with lower values to improve efficiency (if desired).

- **Show full screen bar chart at end:** If enabled, a pop-up window will be generated at the end of the acquisition, showing a manometer-style bar-chart of mean pressures acquired, in Pa (see figure 2).
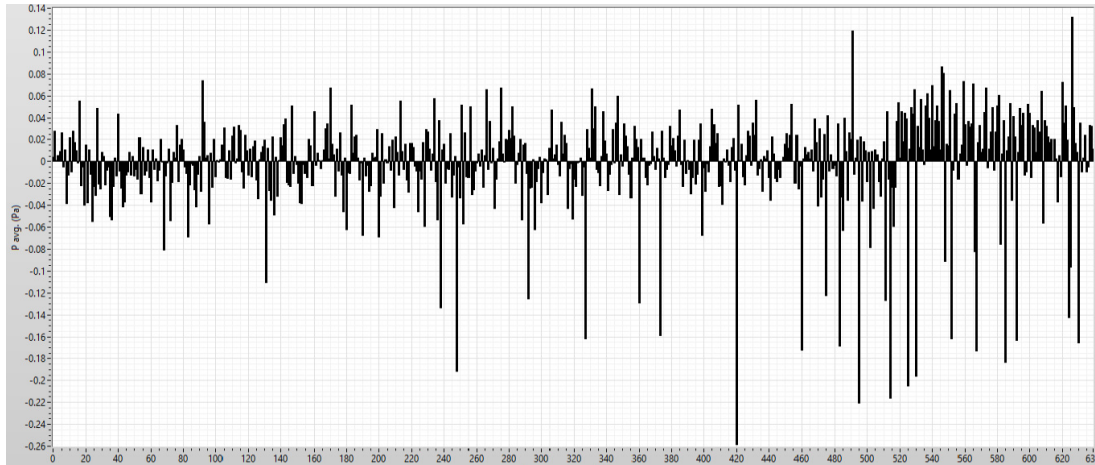

Figure 4: Example of full screen bar chart

- **File output path:** If an ASCII data file is desired, enter the full file path in this field; to avoid conflicts, the filename should include the extension '.TXT'. If the field is left blank, data will be displayed on screen but not be written to disk. In the data file, the first column will be the time from start of acquisition (in s); next will follow columns of pressures (in Pa) from all the scanner channels, and then columns from the ancillary, external temperature and environmental sensors from the 'master' unit only (in SI units). the final column contains sensor bank status values. All columns are headed with labels and units.

- **Auto-zero before acquisition:** If enabled, the array will collect mean pressures on all channels, store these values temporarily in memory and subtract them from all subsequent measurements. The values will be lost when the scanners are powered down.

- **Power off at end:** This function will power down all the scanner sensor arrays at the end of the measurements, in order to save power. The sensor arrays will automatically power on again when the executable is re-run.

  Note that the options selected will only be transmitted to the scanners once the acquisition is started.

4   TECHNICAL SUPPORT

Full technical support is available for this product and its associated software.

If you experience any difficulty in installation or use, or if you need additional support in the operation of the system, please contact your Surrey Sensors Ltd. account manager or technical representative.