

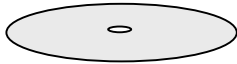


AD5273 One Time Programmable Digital Potentiometer Evaluation Board User Manual

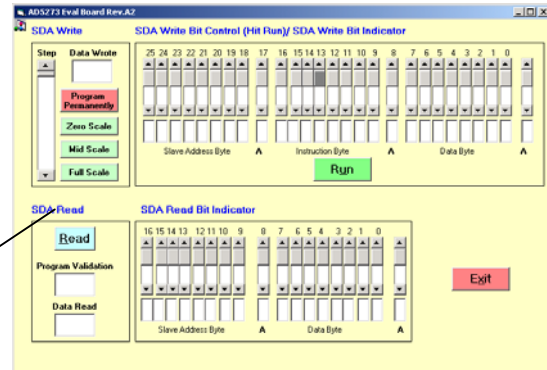
Rev. A 8/20/02

6 STEPS TO SETUP THE EVALUATION BOARD

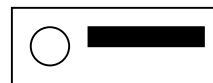
1. Install AD5273 Software
2. Install NTPORT.OCX



3. Connect DB25M-8P8C Adapter to Parallel Port.
Connect 8P8C cable to eval board RJ45 connector

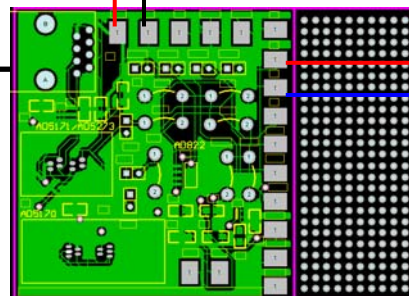


4. Open AD5273 Rev A2.exe and program resistance settings



5. Provide Power Supply

+5V GND



6. Measure Result

Figure 1. Evaluation Kit Setup

No Programming Skill or Programming Language Required!

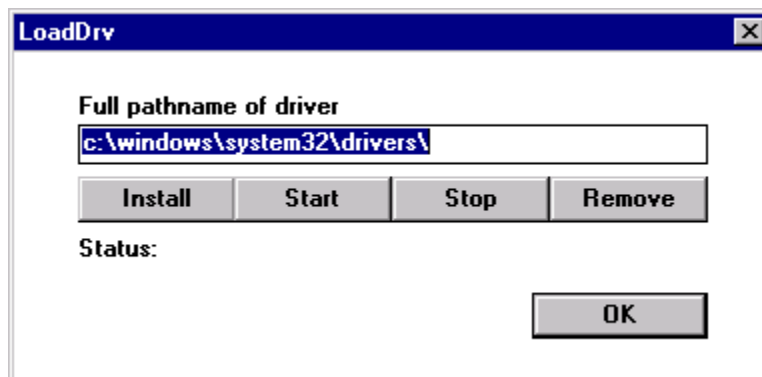
1. Installing AD5273 Rev A Evaluation Software

- a. Run setup.exe under D:\AD5273 Evaluation Board A2\Package
- b. During the installation, hit ignore or yes to bypass error messages if they occur.
(Users may need to install the s/w few times to get successful installation)

2. Steps For Enabling PC Parallel Port Communications

(In addition to installing AD5273 Rev A2, users need to install a 3rd party driver, NTPORT.OCX from UCT, to gain access of the PC parallel port. UCT offers a free trial of such driver)

- a. Unzip ntpor.zip from the CD Rom. If ntpor.zip cannot be found, download it from <http://www.uct.on.ca/>. Click Download NTPORT.OCX, Click NTPORT free trial (user is obligated to pay a nominal license fee after 30 days free trial)
- b. Save ntpor.zip in default or specified directory
- c. unzip and extract all to the specified directory
- d. Run setup.exe
- e. If it prompts file violations during installation, hit Ignore to bypass it.
- f. **The following instructions are for users running Windows® 2000 and XP (For Win NT, skip and jump to step g)**
Users must ensure the file DLPORTIO.SYS is placed in Winnt\system32\drivers or Windows\system32\drivers directory.
 1. Run **LOADDRV.EXE** under c:\program files\project1 or the specified directory. A dialog box will appear as



(Error Message: if windows prompts you some error messages such as ‘Can’t connect to service control manager’, you need to contact the IS department to grant you an authority for further installation)

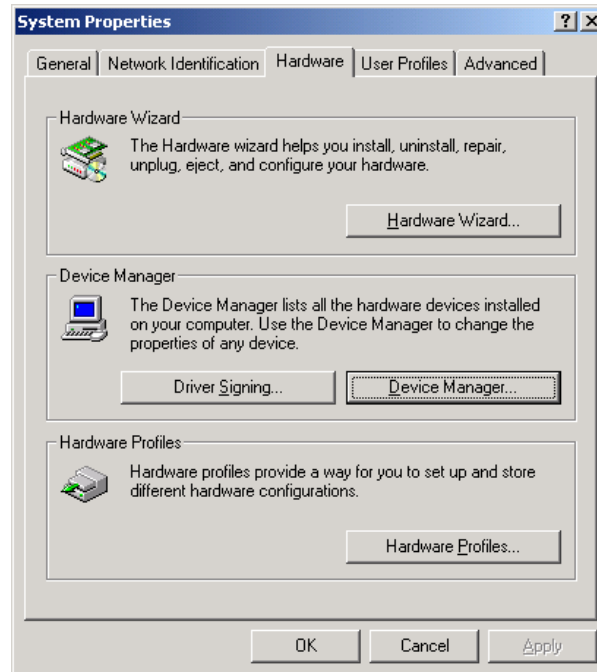
2. Change pathname to

c:\winnt\system32\drivers\dlportio.sys. (For Windows 2000)
c:\windows\system32\drivers\dlportio.sys. (For Windows XP)

3. Hit **Install** button, then **Start** button. If the status message states successful, the driver is installed and operating. Click **OK** button.

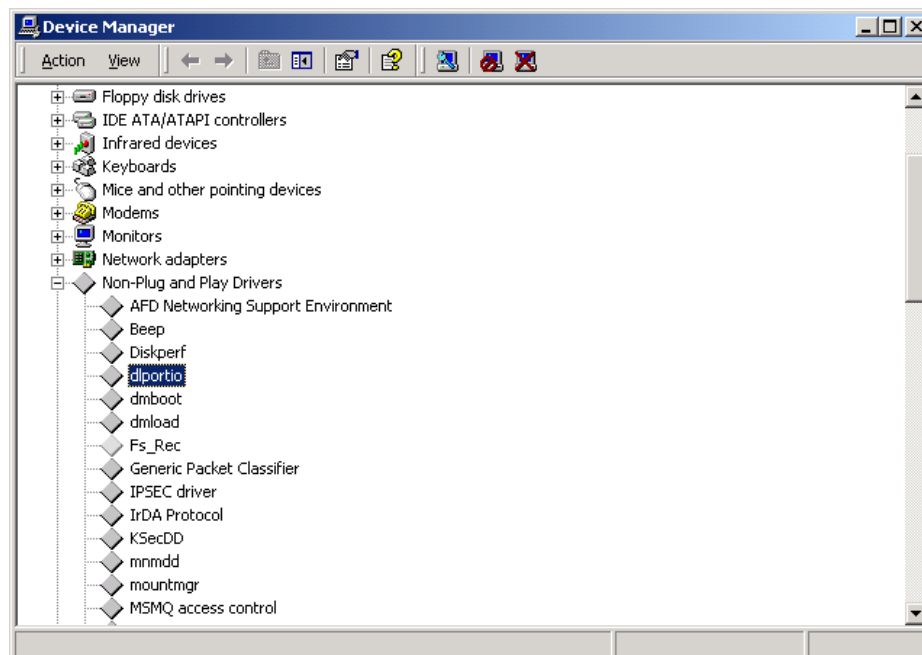
4. Go to Device Manager

(For Windows 2000, go to Control Panel – Systems – Hardware – Device Manager,
For Windows XP, go to System Properties – Hardware – Device Manager)

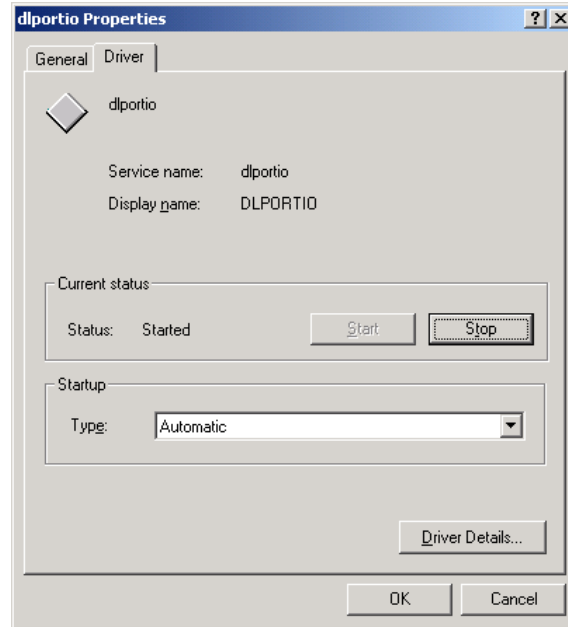


5. The “**Non-Plug and Play Drivers**” entry may not be visible at first. If not, click on the **View** menu item in Device Manager and click on **View Hidden Devices** to make sure that hidden driver files are listed. Then it should be visible.

(Note: If you do not see dlportio, reboot windows or redo LOADDRV.EXE and then reboot windows.)



6. From the non-plug and play drivers list in Device Manager locate the dlportio device and double-click.



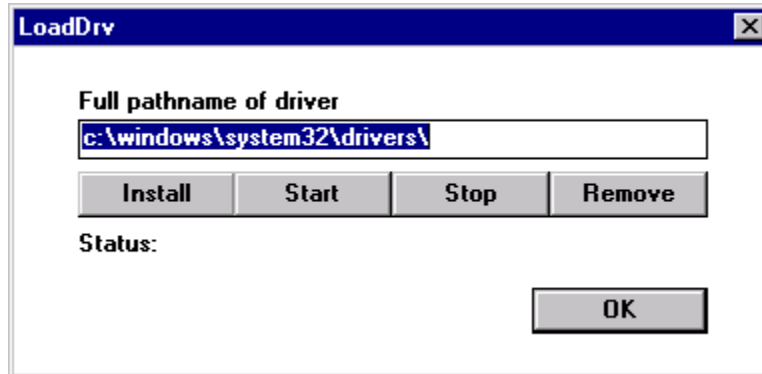
7. The dlportio properties page for the driver will be shown. At Driver tab, select Current Status as **Start** and Startup Type as **AUTOMATIC**.

(Note: If Startup is not active and you cannot change Type, your computer may be administered by your IS department. You may need to consult them to change your PC administrative setting)

- g. The following instructions are for users running Windows NT only
Users must ensure that the file: DLPORTIO.SYS is placed in the Winnt\system32\drivers directory. In order to load the DLPORTIO.SYS driver; use the driver loader program LOADDRV.EXE

1. Open c:\program files\project1\loaddrv.exe

A dialog box will be appear as



(Error Message: if windows prompts you some error messages such as ‘Can’t connect to service control manager’, you need to contact the IS department to grant you an authority for further installation)

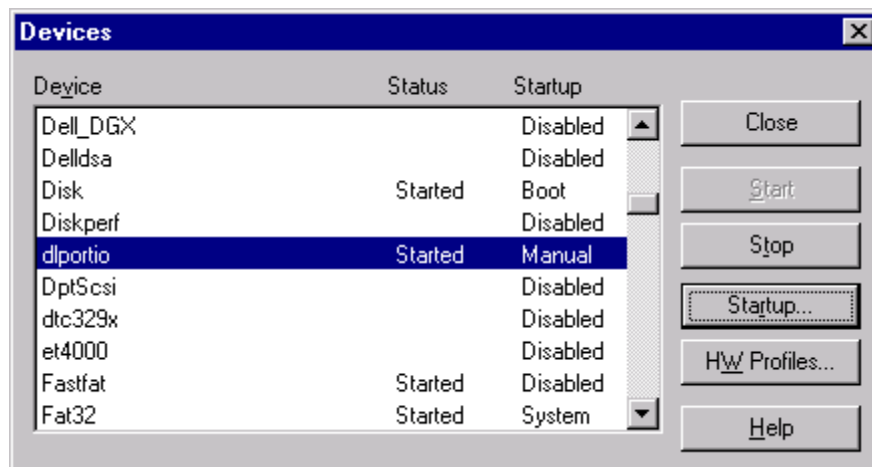
2. The pathname for DLPORTIO.SYS must be changed accordingly to the following operating systems:

c:\winnt\system32\drivers\dlportio.sys

3. Hit **Install** button, then **Start** button. If the status message states successful, the driver is installed and operating. Click **OK** button.

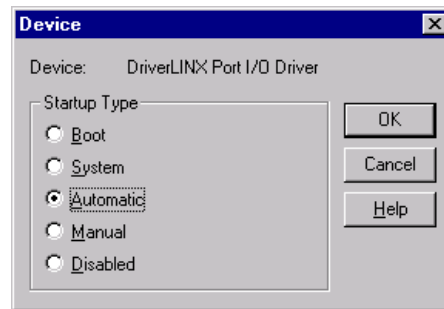
4. Automatic Driver Loading Under Windows NT

Once the DLPORTIO.SYS driver has been installed and run on an NT system it can be made to start automatically every time NT is started. To place the driver into this mode select the **DEVICES** icon from the Windows NT **Control Panel**. From “Devices” dialog box that will appear select **dlportio** and click on the **Startup...** button





5. The device **Startup Type** dialog box will be shown as illustrated below. From the option buttons select **Automatic**. The driver will now automatically start each time that Windows NT is restarted.



Note

Due to the large variations in computer platforms and configurations, Analog Devices, Inc. cannot guarantee this software to work across all systems. Should you encounter problem, you may consult www.analogdigitalpotentiometers@analog.com or call 1-408-382-3082 for application support.

Uninstall

To uninstall AD5273 and NTPORT, use Add/Remove Programs in Control Panel



3. Connect DB25M-8P8C Adapter to PC Parallel Port, Connect 8P8C Network Cable from Adapter to Eval Board
4. Apply +5V between VDD and AGND
5. Open AD5273 Rev A2 program from Windows Start – Program. Move scroll bar to program resistance settings. The operation are self-explanatory.

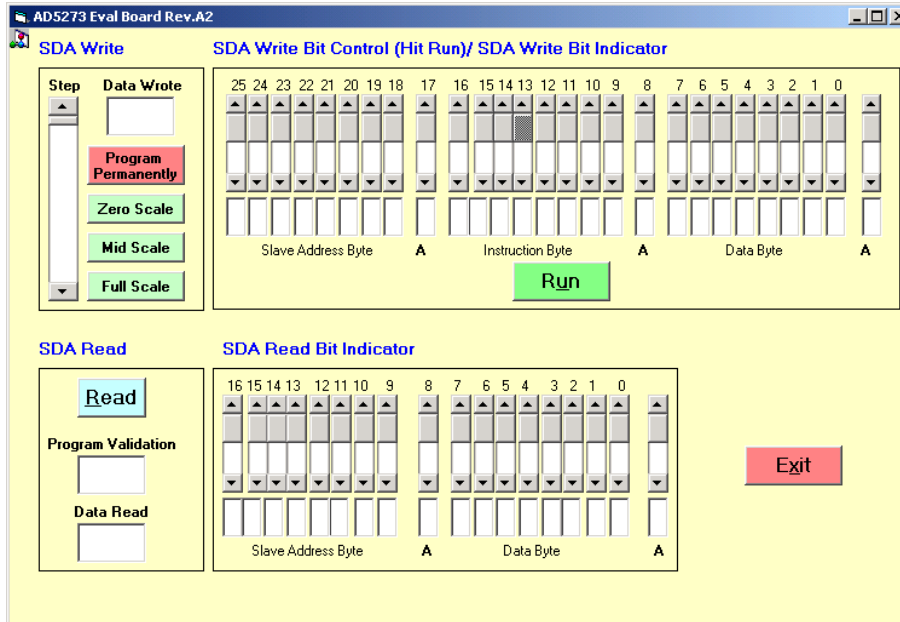


Figure 2. AD5273 Software Graphic Interface

6. Measure resistance across W-B or W-A

(Dual opamp AD822 U3 and 2.5V reference ADR03 U4 are provided to facilitate further evaluations. U3A can be configured with AD5273 in various building block configurations, see appendix. To use U3, either connect JP3 and JP4 to make V+ and V- equal to VDD and AGND respectively or connect JP5 and JP6 to apply V+ and V- to no more than +/-15V for higher voltage applications. AD5273 is low power device, but VDD is connected to the voltage reference U4 such that the total supply current is about 0.65mA).

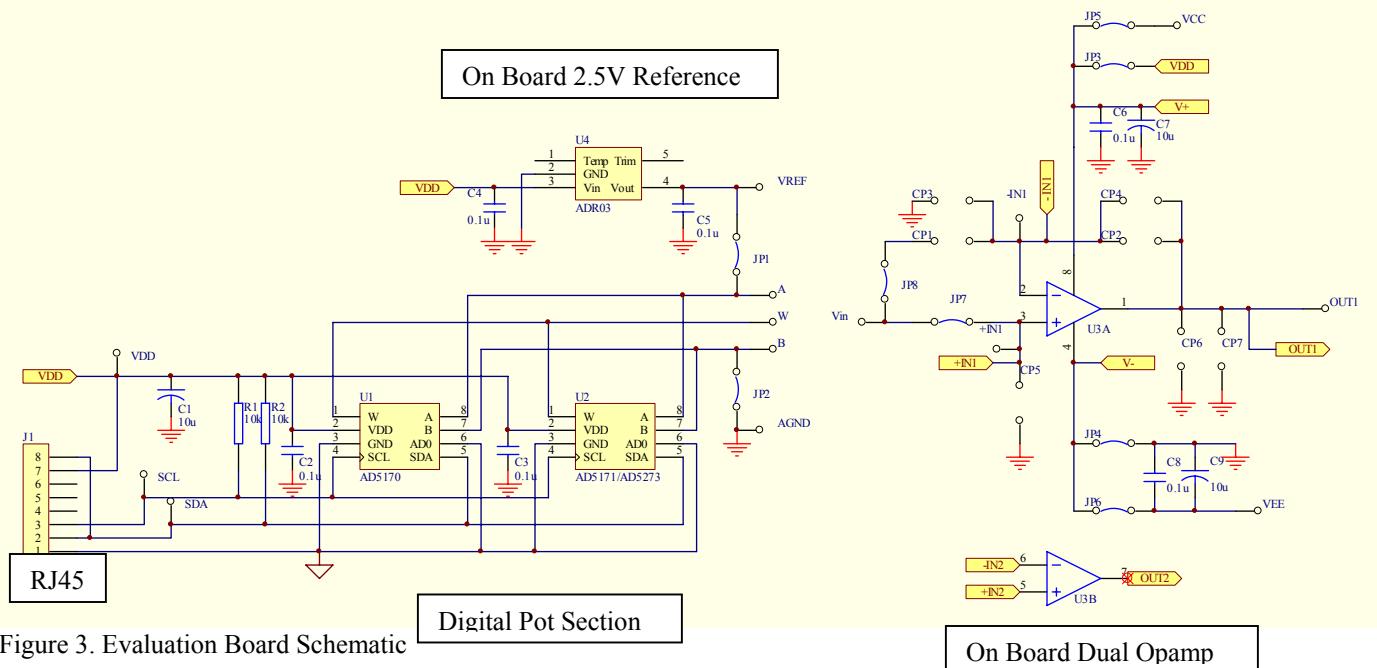
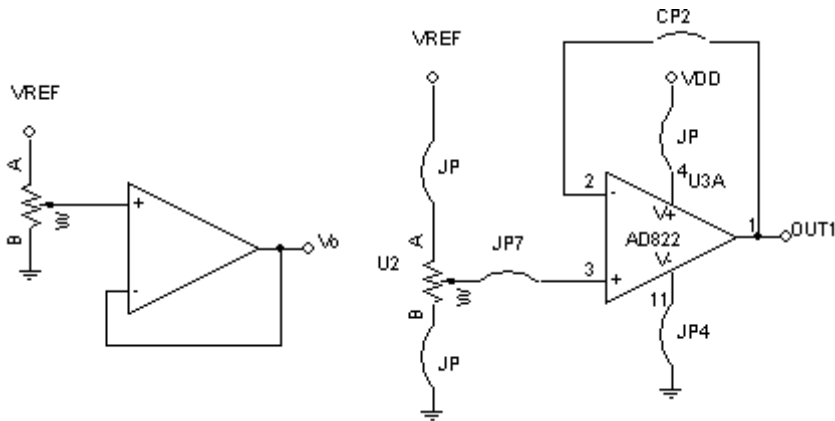


Figure 3. Evaluation Board Schematic

APPENDIX

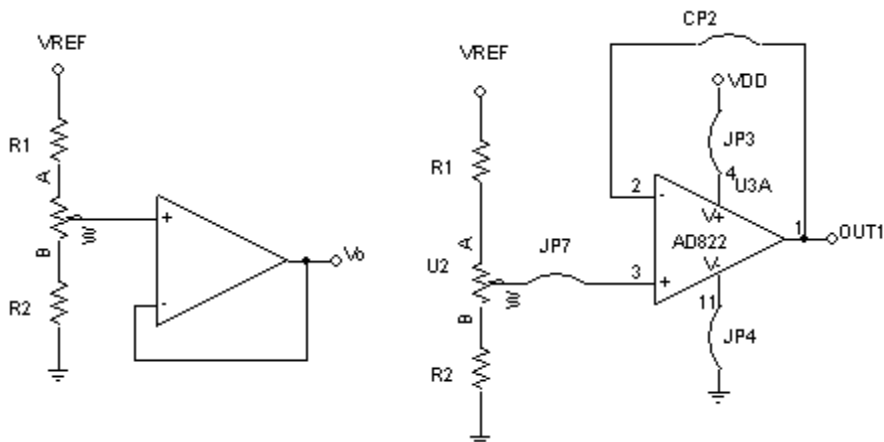
Applications

The AD5273 evaluation board comes with dual opamp AD822 and 2.5V reference ADR03. Users can configure the various building blocks circuits with minimum components. In the schematics, JP and CP stand for jumper and connection point respectively. The black color arcs are on-board jumpers and red color arcs require hard wiring.



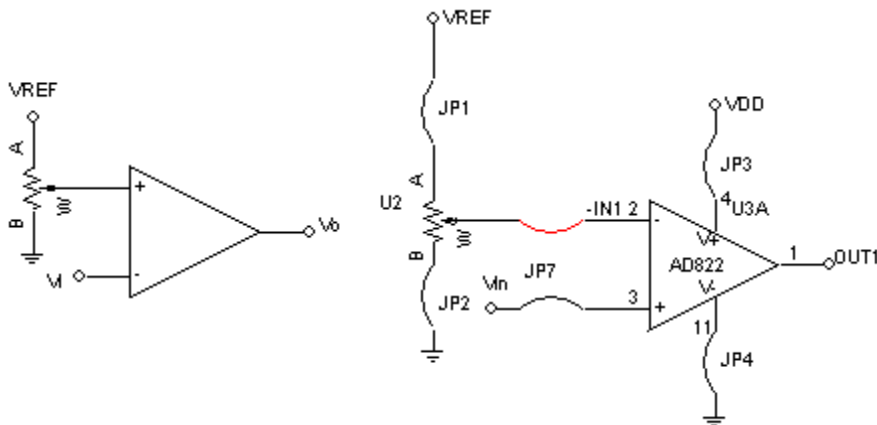
$$V_o = 2.5V \cdot \frac{D}{64}$$

Figure A1. Programmable-Voltage Output.



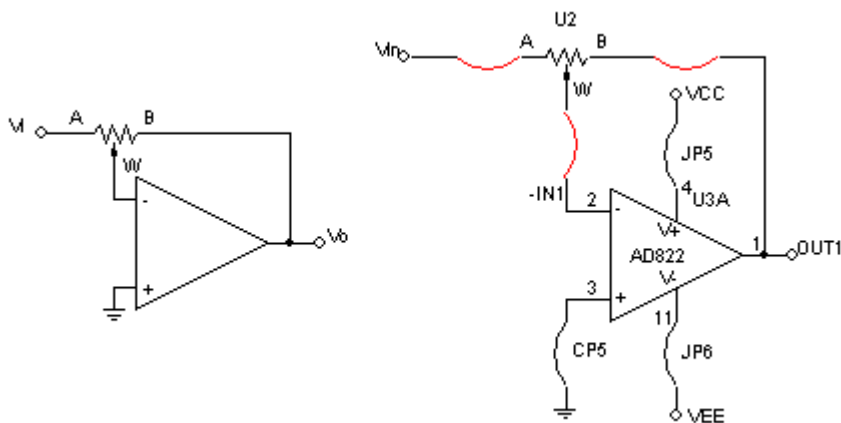
$$V_o = \frac{R_{WB} + R_2}{R_1 + R_2 + R_{AB}} 2.5V$$

Figure A2. Fine-Voltage Adjustment.



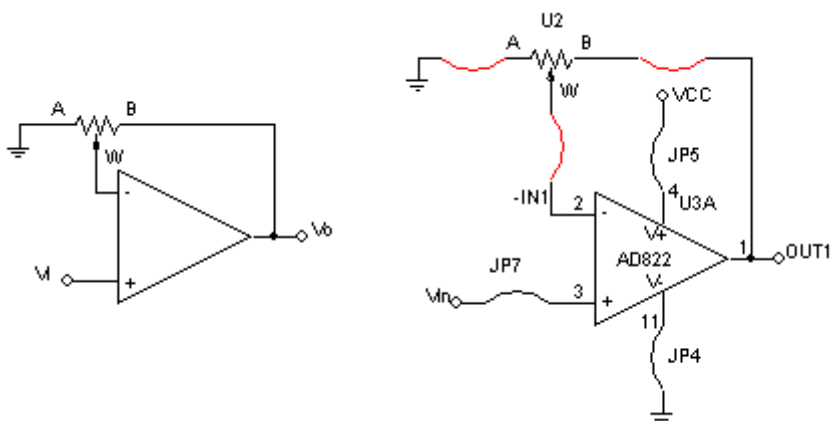
If $V_{in} > V_w$, $V_o = V_{DD}$, 0
Otherwise

$$V_w = 2.5V \cdot \frac{D}{64}$$



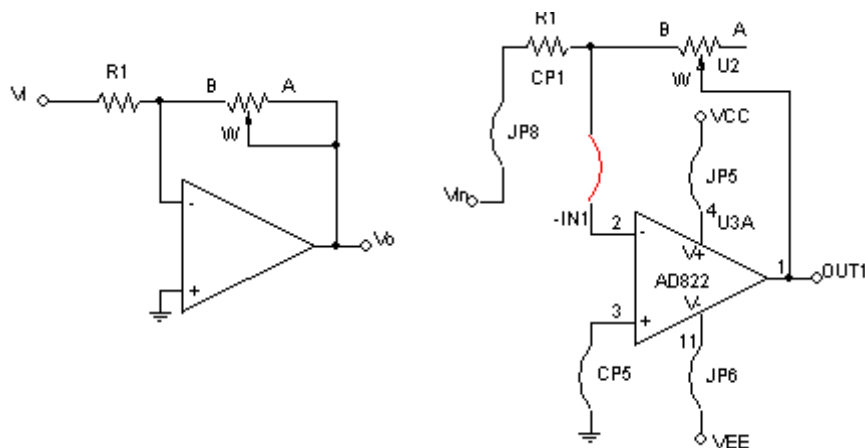
$$V_o = -\frac{D}{63}V_i$$

Figure A4. Pseudo Log Inverting Gain and Attenuator



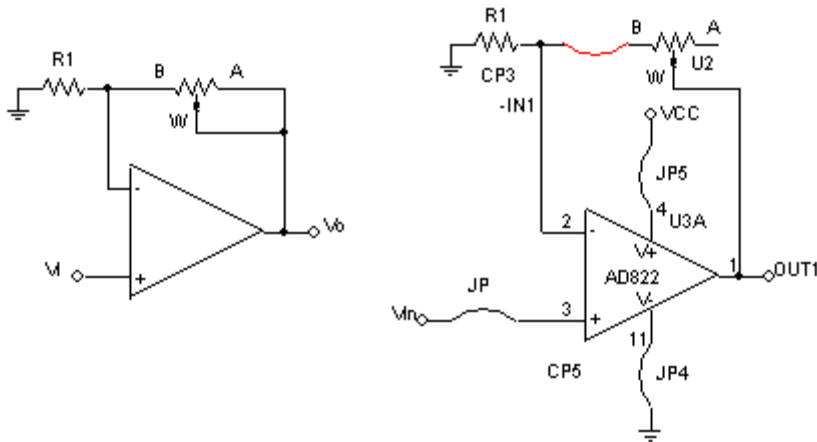
$$V_o = (1 + \frac{D}{64 - D})V_i$$

Figure A5. Pseudo Log Non-inverting Gain.



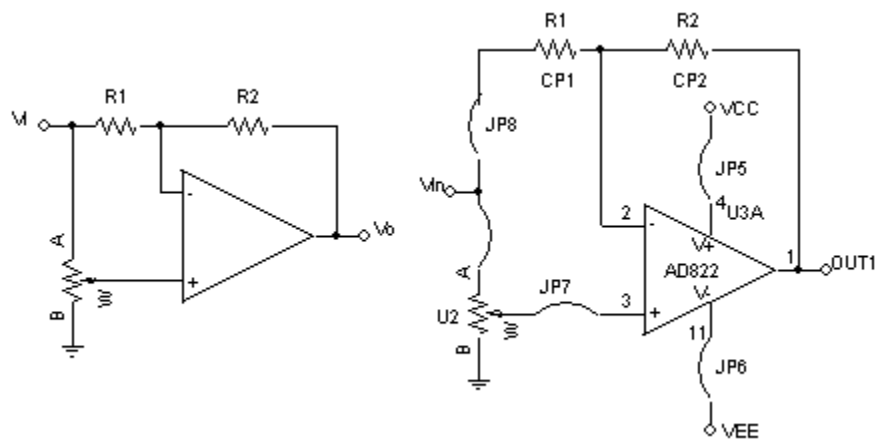
$$V_o = -(\frac{D \cdot R_{AB}}{64 \cdot R_1})V_i$$

Figure A6. Inverting Linear Gain.



$$V_o = \left(1 + \frac{D \cdot R_{AB}}{64 \cdot R_1}\right) V_i$$

Figure A7. Non-inverting Linear Gain.



$$-\frac{R_2}{R_1} < \frac{V_o}{V_i} < +1$$

Figure A8. Bipolar Linear Gain

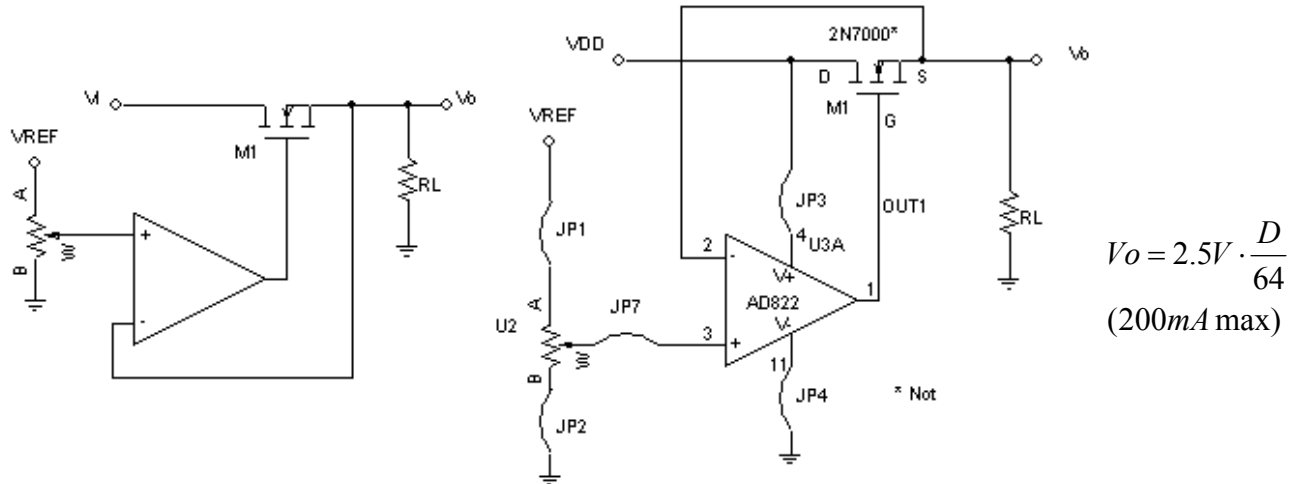


Figure A9. Programmable 2.5V Power Supply.

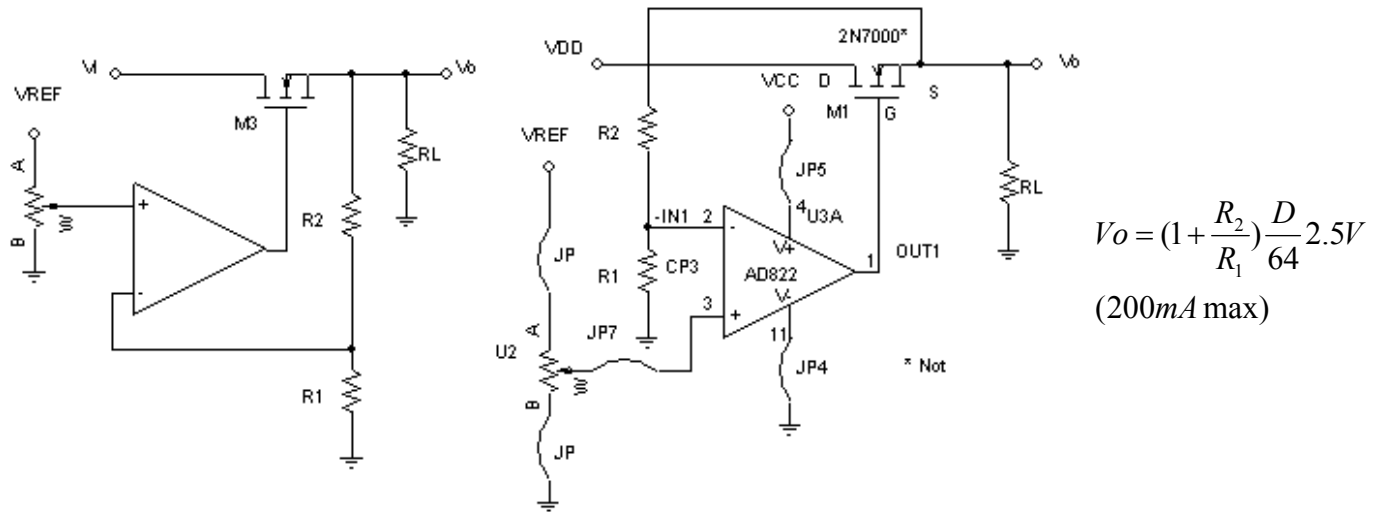


Figure A10. Programmable Power Supply

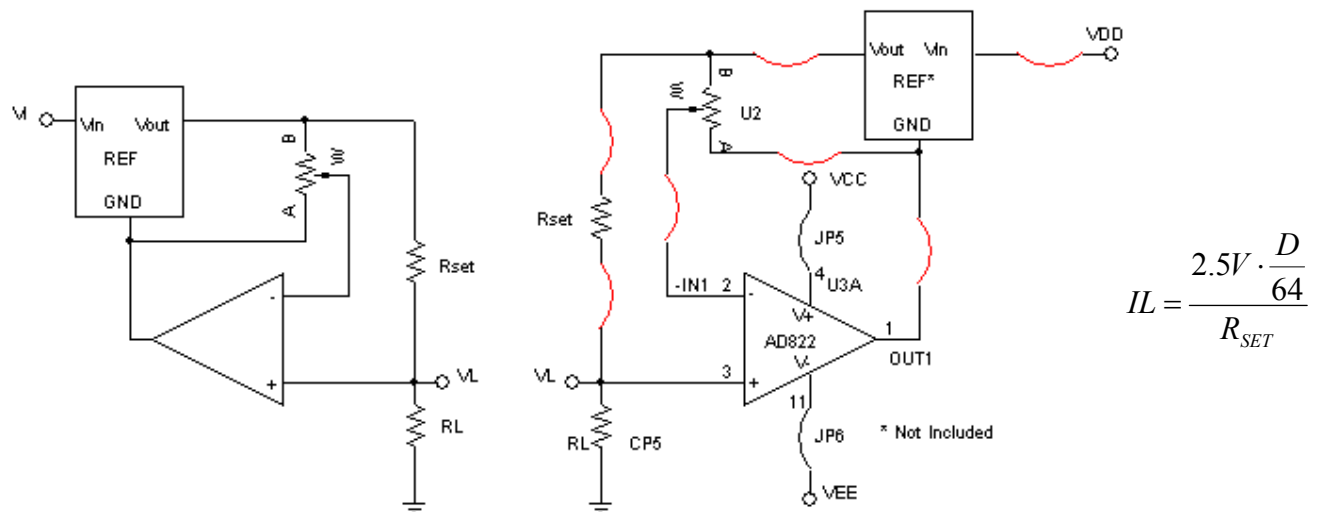
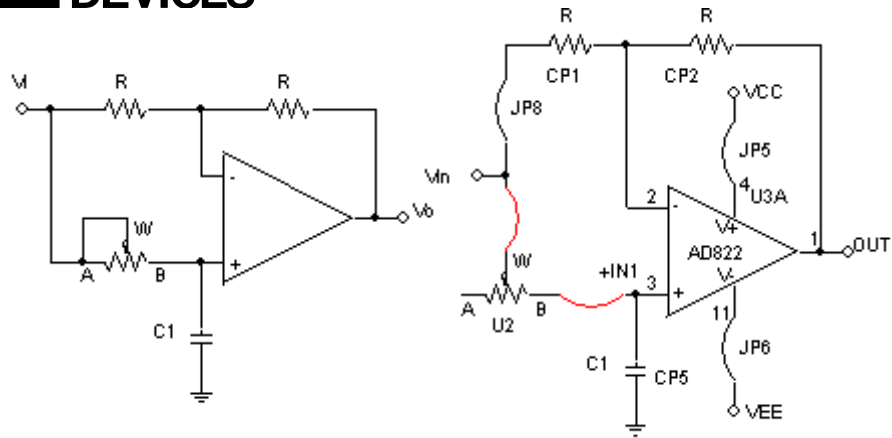
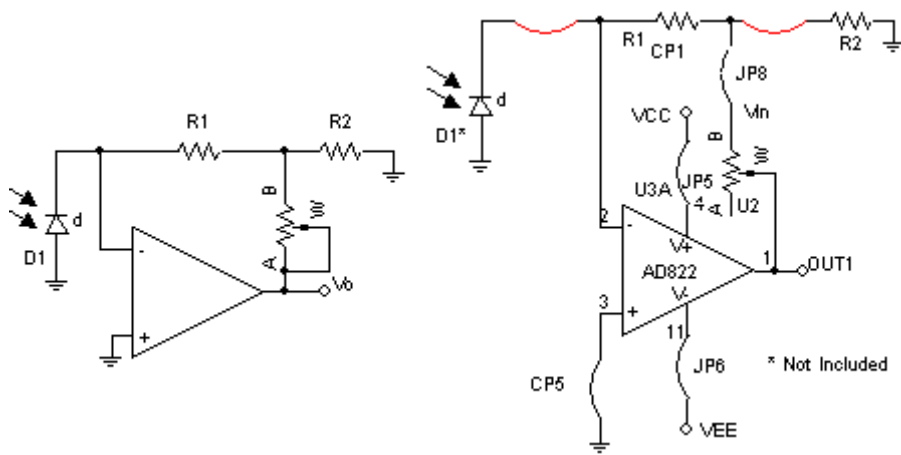


Figure A11. Programmable-Current Source.



$$G = 180^\circ - 2 \tan^{-1}(\omega \cdot R_{WB} \cdot C_1)$$

Figure A12. Phase Shifter.



$$V_o = -k \cdot R_1 \cdot I_D$$

$$k = 1 + \frac{R_{WB}}{R_2} + \frac{R_{WB}}{R_1}$$

Figure A13. High Sensitivity Photodiode Detector

PCB LAYOUT, GROUNDING, and POWER SUPPLY BYPASSING CONSIDERATION

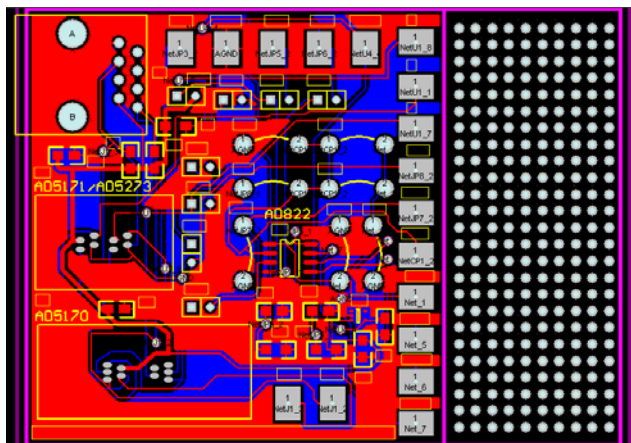


Figure A14. Evaluation Board.

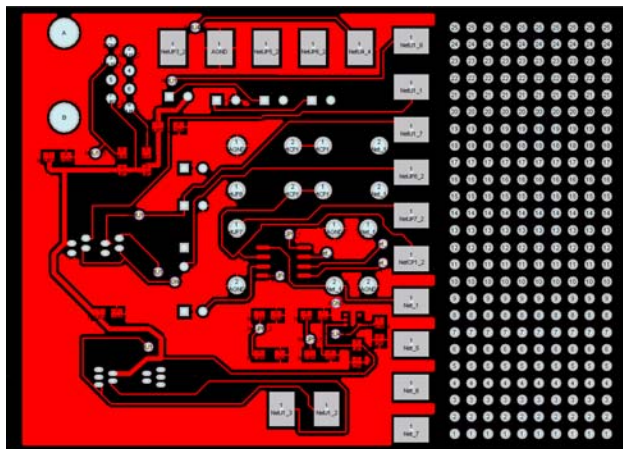


Figure A15. Top Layer

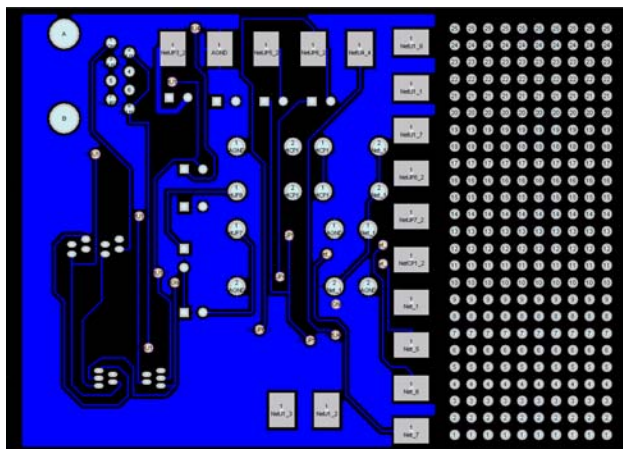


Figure A16. Bottom Layer

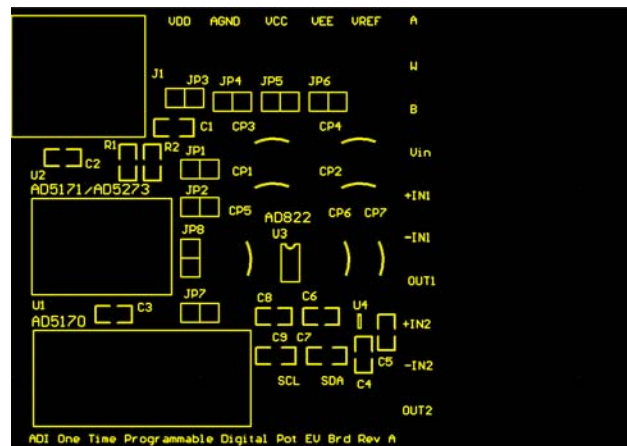


Figure A17. Top Overlay.

It is a good practice to bypass the power supplies with quality capacitors for optimum stability. Supply leads to the device should be bypassed with 0.01uF-0.1uF disc or chip ceramics capacitors. Low-ESR 1uF to 10 uF tantalum or electrolytic capacitors should also be applied at all supplies to minimize any transient disturbance and filter low frequency ripple, Figure A18.

Similarly, it is also a good practice to employ compact, minimum-lead length layout design. The leads to the input should be as direct as possible with a minimum conductor length. Ground paths should have low resistance and low inductance. Separate ground plane for multi-layers board is ideal or maximize ground plane as much as possible in two layers board, Figures A15 and A16.

The ground pin of the AD5273 device is digital ground reference. To minimize the digital ground bounce, the AD5273 ground terminal should be joined remotely to the analog ground at a single point, Figure A18.

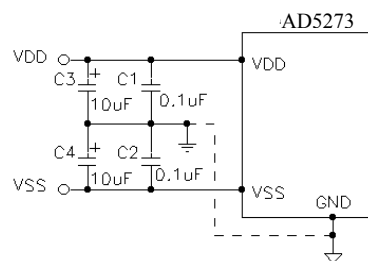
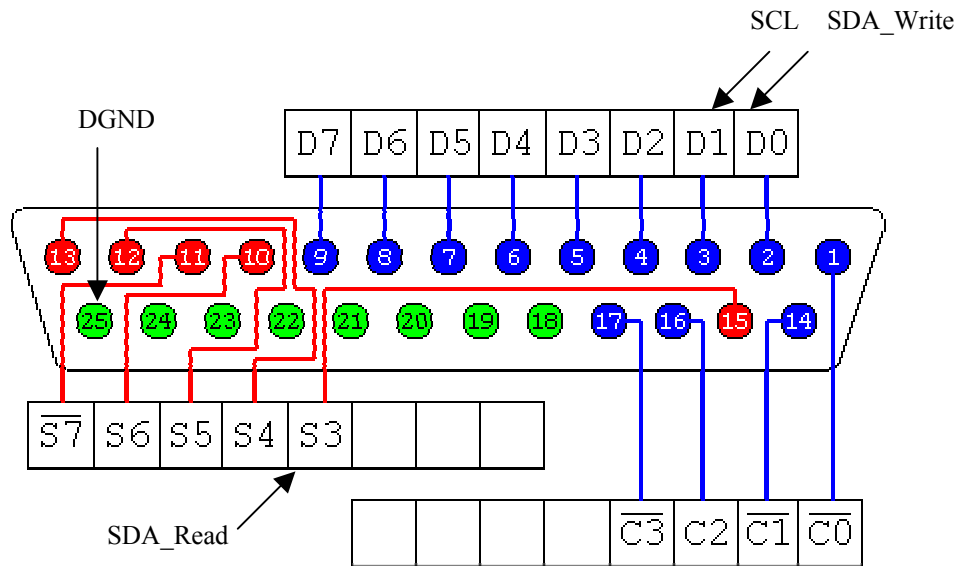


Figure A18. Power Supply Bypassing. Digital Ground and AGND connection.

AD5273 Parallel Port Connection (Information for Visual Basic Program Developers Only)



<http://www.doc.ic.ac.uk/~ih/doc/par/>

8 output pins accessed via the **DATA Port** (NTPORT1.Address = 888)
 5 input pins (one inverted) accessed via the **STATUS Port** (NTPORT1.Address = 889)
 4 output pins (three inverted) accessed via the **CONTROL Port** (NTPORT1.Address = 890)
 The remaining 8 pins are grounded

TIMING DEFINATION IN VISUAL BASIC SOURCE CODE cmdRUN (Information for Visual Basic Program Developers Only)

