ANALOG DEVICES

Evaluation Board
AD420 16-Bit 4-20mA DAC

AD420/EB

GENERAL DESCRIPTION

The AD420-EB is an evaluation board for the AD420 16 bit serial input 4 - 20mA, 0 - 20mA DAC. The evaluation board is configured with two AD420s. Both devices are independently controlled with an IBM PC or compatible, via its parallel printer port. The utility software uses Micrsoft® Visual Basic™ that requires Windows ™. This utility software allows the user to easily exercise the AD420 serial data interface and the operating modes. The software is installed with a standard setup program. A ribbon cable with DB-25 connectors is supplied to interface the PC printer port to the evaluation board.

The SOIC is configured for evaluating the AD420 in the basic current output mode with the minimal number of external components. A precision load resistance is added for ease of verifying the AD420 performance. The PDIP circuit is configured with external components for offset/gain trimming, voltage output operation, and output boost operation. The serial interface for the PDIP is selectable for 3-Wire or Asynchronous mode operation. A prototyping area is provided to interface analog or digital circuitry with the AD420.

All that is required to operate the AD420-EB is a single 12V-36V power supply. Additionally a ± 15V supply is required for the operational amplifier when using the voltage output mode of the PDIP.
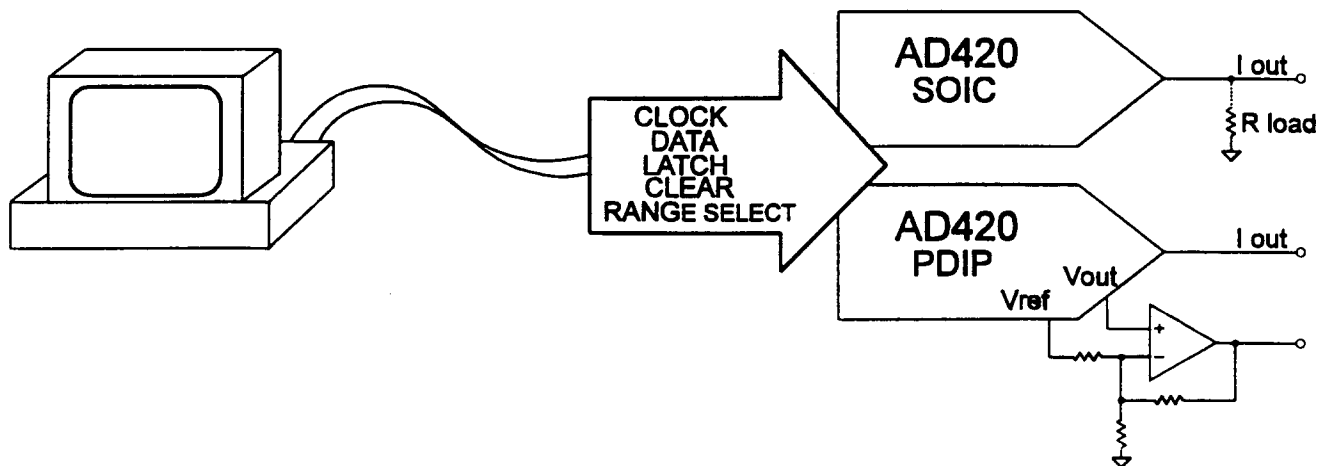

Figure 1. AD420/EB Block Diagram

UTILITY SOFTWARE INSTALLATION

This setup procedure assumes that the Utility Software is being loaded from the A drive onto the C drive. If the installation is from or to another drive substitute the name of that drive in the following procedure.

To install the Utility Software, run Windows and insert the supplied disk in the A: drive. Choose the Run Command from the File Menu in the Windows Program Manager. Type A:\SETUP in the Run dialogue box and click OK or press [ENTER].

The installation software requires that you enter the drive and directory for the Utility Software. The default is C:\AD420. Five files will be installed in this directory; ad420.exe, portdll.dll, pix.vbx, threed.vbx, and read.me. Additionally, a setup file 420setup.exe is installed into the \windows direc-tory, and two files are loaded into the \windows\system directory, setupkit.dll, and vbrun300.dll.

Once the setup is complete an ANALOG DEVICES program group is created in the Program Manager. The program group will contain the AD420 Evaluation Board icon.

OPERATING PROCEDURE AND FUNCTIONAL DESCRIPTION

Hardware Setup:
Connect the AD420-EB to a PC parallel printer port with the supplied ribbon cable. Connect a 12V-36V power supply to the evaluation board binding posts J1 and J2. If voltage output operation is required, connect a +/-15V power supply to binding posts J5, J6, and J7. Use a multimeter with sufficient resolution to monitor the AD420 output.

Software Setup:
Double click on the AD420 Evaluation Board icon to run the software. When the utility software is initialized, select the parallel port that is connected to the evaluation board and click OK. The Port Selection determines the memory address location the software controls. The control panel can now be used to operate the AD420 evaluation board.

When power is first applied, the AD420 Power-On Reset feature sets the output to the bottom to of the selected range. (All zeros are loaded into the DAC.) The control panel will initialize with the Range Select Bits set to place both AD420s in the 4-20mA mode and to control the PDIP digital interface in the 3-Wire mode.

To check that the correct printer port is selected change the SOIC Output Range from the 4-20 mA mode to the 0-20mA mode. (See the description of the Output Range control below.) If the AD420 output does not respond choose the PARALLEL PORT menu and select a different port connec-tion.

Contol Panel Operation:
The control panel has separate data entry and mode control buttons for the SOIC and PDIP that are used to exercise all the digital interface signals for the AD420-EB. The **Setup Mode** selection box determines the data entry format, mA or Volts, %/FS, or Hex. To select the data entry format click on the button next to the desired format. The **Output Range** selec-tion box controls the logic levels of the Range Select pins, RANGE SELECT 1and RANGE SELECT 2. Select the output range as required; 0-5V, 4-20mA, 0-20mA, or 0-24mA. The **Loading Mode** selection box is used to set either the 3-Wire or Asynchronous digital interface mode for the PDIP. For 3-Wire mode operation the shunt header must be installed on JP4. For Asynchronous mode operation the shunt header must be connected on JP5. The **Setup Output Value** entry box is used to program the AD420 output value. Place the cursor in the text entry box and type the desired programmed output value. Executing [ENTER] from the keyboard will initiate a Load sequence. The input must be entered in the form as required by the Setup Mode. Double clicking in the data entry box will blank the box so that a new value can be entered. Click the **LOAD** button to initiate the sequence for programming the AD420 through its serial interface. The appropriate Clock, Data, and Latch signals are generated to load the AD420. Clicking the CLEAR button sends a pulse to the CLEAR pin. This sets the internal DAC to all zeros which makes the output go to the bottom of the selected range. The LATCH button sends a pulse to the LATCH pin which loads the data in the input shift register into DAC. Depressing the LATCH button subsequent to a CLEAR reloads the AD420 with the previously programmed value. The **Programmed Output Value** repre-sents the theoretical output value in mA or Volts, %/FS, and Hex The display boxes will update as a result of executing the LOAD, CLEAR, or changing the Output Range.

Jumper Description:
JP1 - This is a cut-trace jumper that can be used to isolate the power supplies of the two AD420s. To isolate the SOIC and PDIP power supplies cut the PCB trace under this jumper and remove the shunt header.
JP2 - Connects the SOIC Iout pin to the resitor load R1and R2. Removing the shunt header allows a user-defined load to be connected to binding posts J3 J4.
JP3 - With this jumper installed the Iout BOOST function of the PDIP is disabled. The AD420 output current flows from the Iout pin to the binding post J8. Removing this jumper utilizes the boost function, whereby the output current flows from the BOOST pin into the collector of Q1.
JP4/5- Selects the PDIP digital interface mode, 3-Wire or Asynchronous. The shut header is installed on JP4 for 3-Wire mode operation.

Test Point	Description
TP1	Vcc
TP2	Ground
TP3	+15V
TP4	Ground
TP5	-15V
AD420 PDIP:	
TP6	V$_{LL}$
TP7	FAULT DETECT
TP8	RANGE SELECT 2
TP9	RANGE SELECT 1
TP10	CLEAR
TP11	LATCH
TP12	CLOCK
TP13	DATA IN
TP14	DATA OUT
TP15	VOUT

Table 1. Test Point Designations

Pin #	Description
1	SOIC-LATCH
2	SOIC-RANGE SELECT 2
3	SOIC-RANGE SELECT 1
4	SOIC-CLEAR
5	SOIC-DATA IN
6	PDIP-RANGE SELECT 2
7	PDIP-RANGE SELECT 1
8	PDIP-CLEAR
9	PDIP-DATA IN
10-13, 15	No Connection
14	SOIC-CLOCK
16	PDIP-CLOCK
17	PDIP-LATCH
18-25	Ground

Table 2. P1 Pin Designations

Reference Designator	Description
U1	AD420AR
U2	AD420AN
U3	AD707KN
R1, R2	1KΩ 0.01% 0.3W
R3, R13	1.3KΩ 5% 1/4 W RCR07
R4, R5	20KΩ 0.1% 1/4 W RN55C
R6	10KΩ .1% 1/4 W RN55C
R7	500 Ω Trimpot
R8	10KΩ Trimpot
R9	4.99KΩ 1% 1/4W RN55C
R10	1KΩ 5% 1/4 W RCR07
R11	10KΩ 5% 1/4 W RCR07
R12	100K Ω 5% 1/4 W RCR07
C1, C2, C6, C7	0.01μF NPO/COG ChipCap
C3, C8	0.003μF NPO/COG ChipCap
C4, C5	0.1μF XR7 Ceramic Chip Cap
C9-12	0.1μF XR7 Ceramic
C13, C1	4.7μF Tantalum 25V
Q1	NPN Transistor 2N3053
D1, D2	LED (Red)
TP1, TP3, TP5	Test Point Red
TP2, TP4	Test Point Black
TP6-15	Test Point White
JP1-5	Jumper Header
JP1-4	Jumper Shunt
J1 - J10	Binding Post
P1	DB-25 DPL Plug Connector

Table 3. Components List

Fhgure 2. AD420/EB Schematic
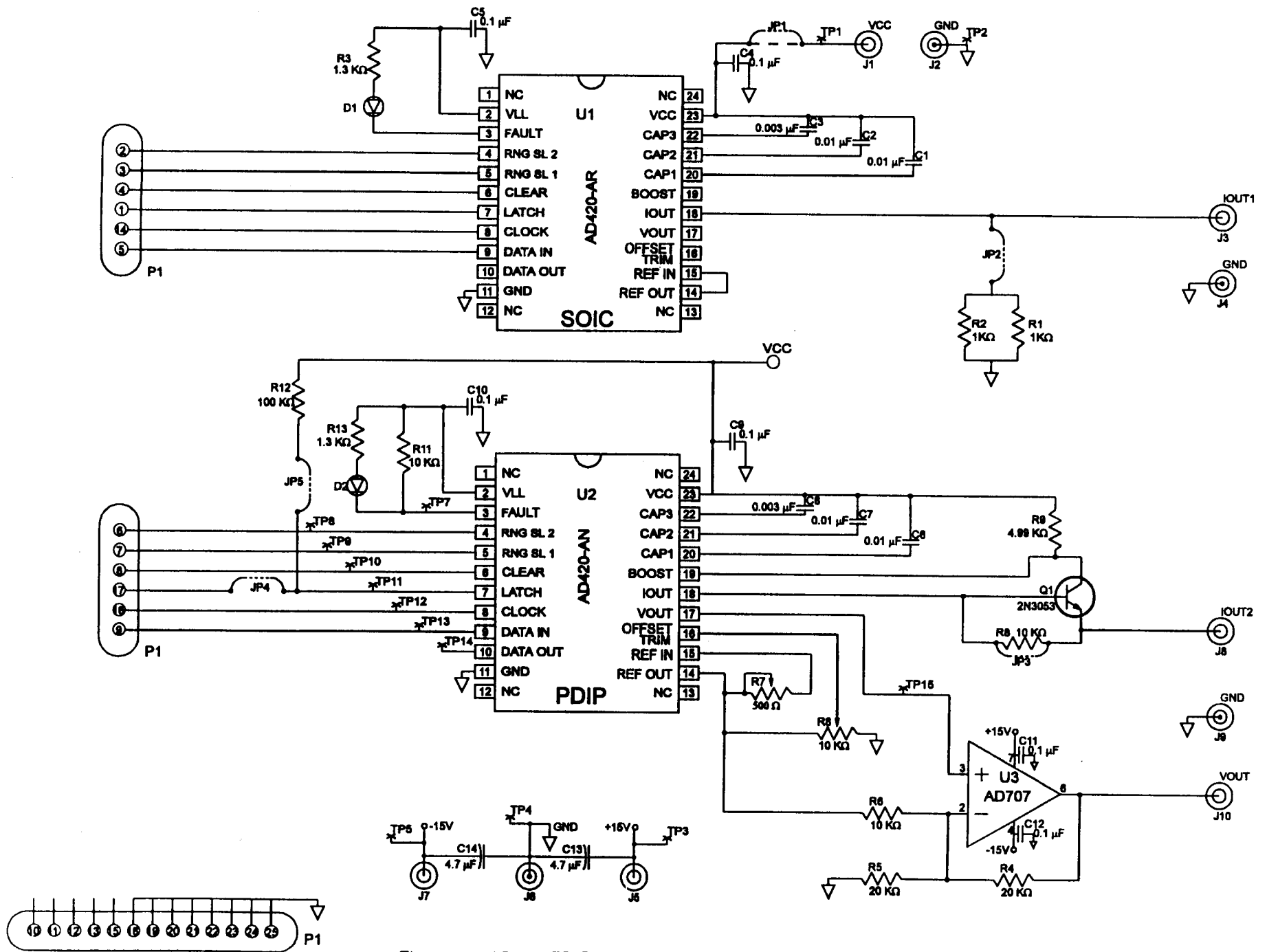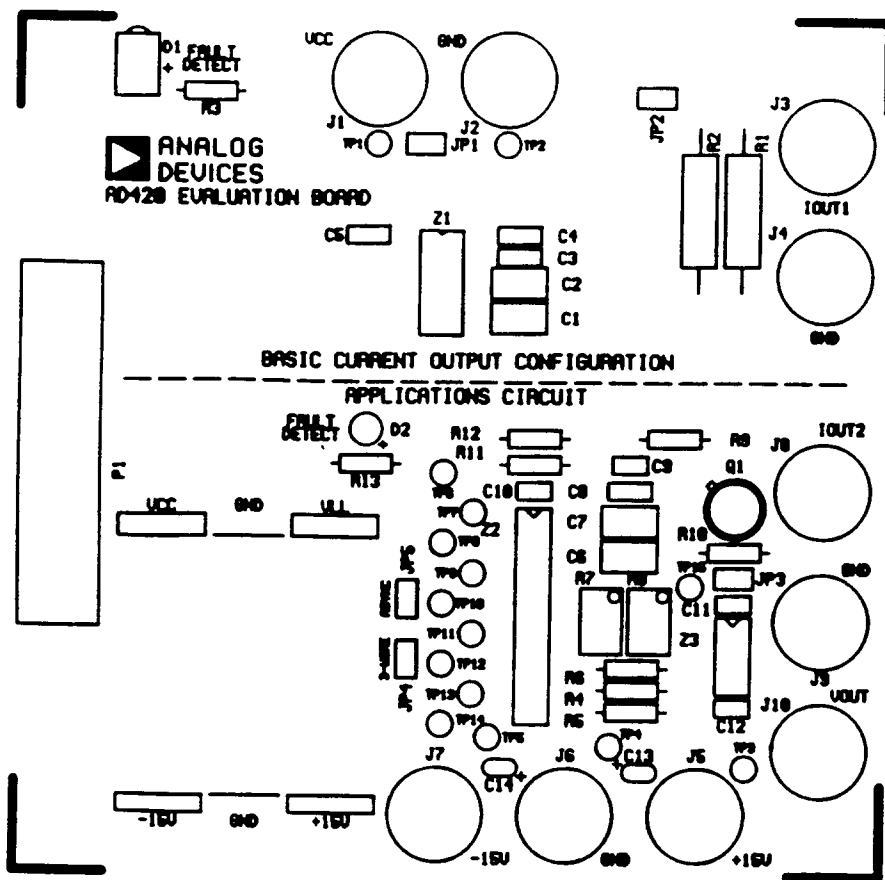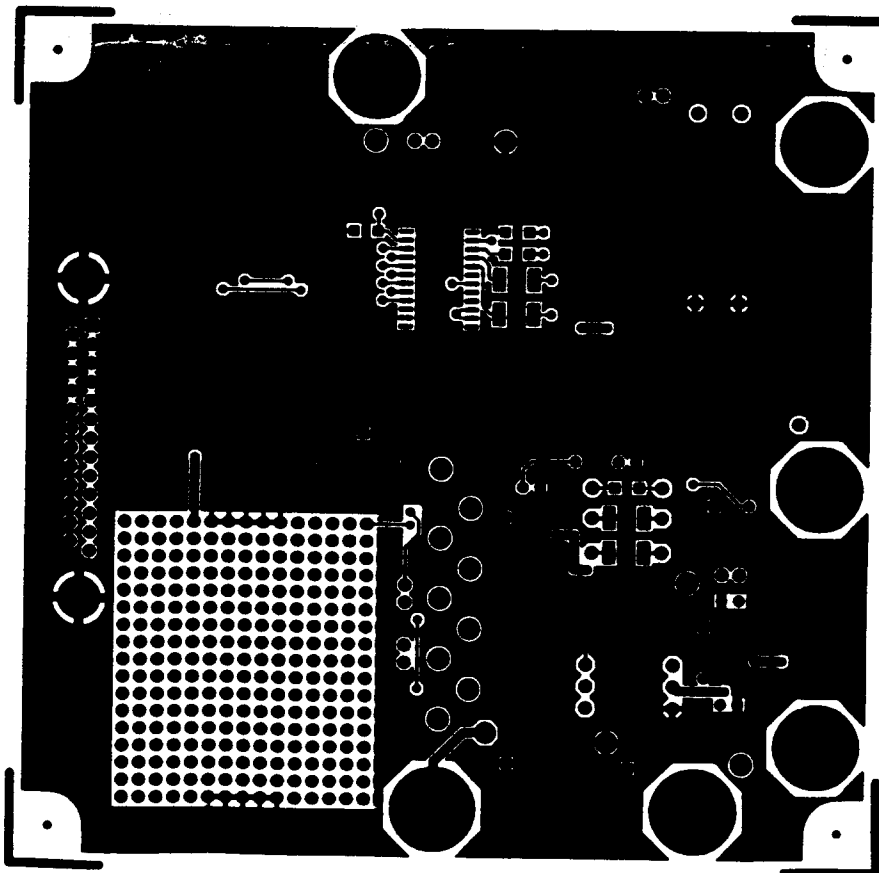
Figure 3.   AD420/EB Layout- Silkscreen Layer

Figure 4.   AD420/EB Layout- Component Side