DBK208   Relay Carrier Board

For Opto-22 Compatible Solid-State-Relays

Note: The DBK208 provides: (a) two P2 connectors, (b) footprints for sixteen optically-isolated Solid-State-Relay (SSR) Modules, and (c) 16 dual-screw terminal blocks. DBK208 includes a 100-pin P4 connector for use with DaqBook/2000 Series Devices, DaqBoard/2000 Series Boards, and /2000c Series Boards.

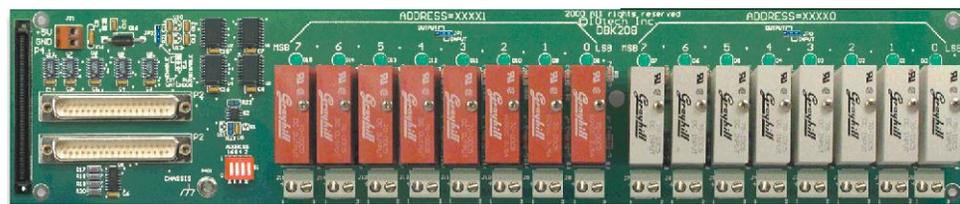**This product is not used with:**
    LogBook
    DaqBook/100 Series devices
    DaqBoard/100 (ISA-type) Series devices

Reference Notes:

◈ In regard to calculating system power requirements refer to the *DBK Basics* section.

◈ Chapter 2 includes pinouts for P1, P2, P3, and P4. Refer to pinouts applicable to your system, as needed.

◈ For a quick comparison of all DBK200 Series boards, refer to the *DBK200 Series Matrix*. The matrix is located just before this DBK200 section.

◈ Refer to the *DaqBoard/2000 Series and cPCI DaqBoard/2000c Series User's Manual* (p/n 1033-0901) or the *DaqBook/2000 Series User's Manual* (p/n 1103-0901) for information pertaining to those products, as needed.

Overview

DBK208 Carrier Board for Opto-22 Compatible Solid-State-Relays

DaqBoard/2000 Series and cPCI DaqBoard/2000c Series boards communicate [external from the host PC] through a 100-pin P4 connector. The P1, P2, and P3 connectors discussed in association with these boards are subset connectors of the 100-pin P4 connector. Chapter *System Connections and Pinouts*, includes pinouts for P1, P2, P3, and P4.

The information included in this section, when combined with that found in the related DBK option cards and modules subsections should enable you to set up your desired configuration.

DBK208 is a two-bank carrier board for optically-isolated Solid-State-Relay (SSR) modules. Each bank supports up to eight digital I/O modules. The banks can be independently set as "input" or "output" via jumpers (JP0 for Bank 0, and JP1 for Bank 1). The I/O modules are industry standard Opto-22 compatible, 5-volt logic level modules.
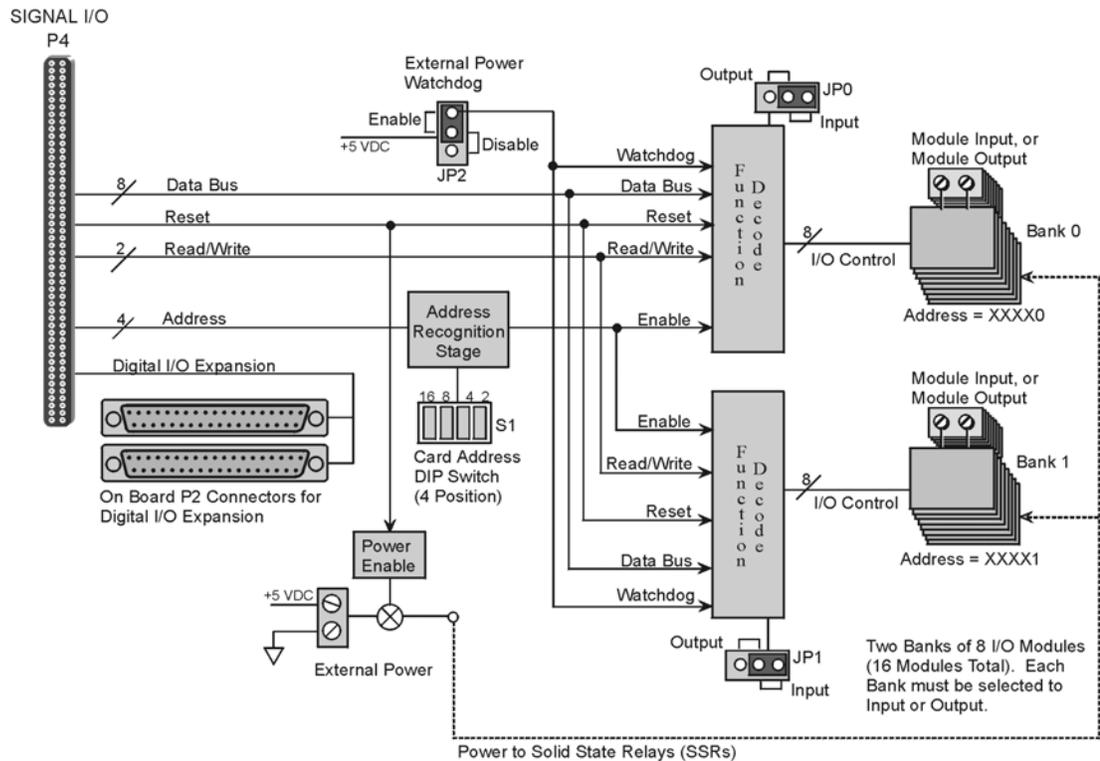
WARNING
Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads.   Do not operate such switch-loads unless emergency over-ride circuitry is present.

Note 1: DBK208 is not used with DaqBoard/2003.

Note 2: DBK208 can be used with DaqBook/200 and Daqboard/200 (ISA-type) series devices; but should not be used with DaqBook/100 or DaqBoard/100 (ISA-type) series devices.

DBK208 Block Diagram

DBK208 boards are typically installed in NEMA-type panels; however, they may alternatively be installed on DIN rails. Separate mounting instructions are included with Rack Mount Kit (part no. Rack-DBK-3) and with DIN-rail Mount Kit (part no. DIN-DBK-1).

DBK208 is controlled digitally from the Daq device (DaqBook or DaqBoard) through one of two connectors, as follows:

DaqBook/200 Series Devices – control is through the 37-pin P2 digital port of the DaqBook and one of two DBK208 P2 connectors.
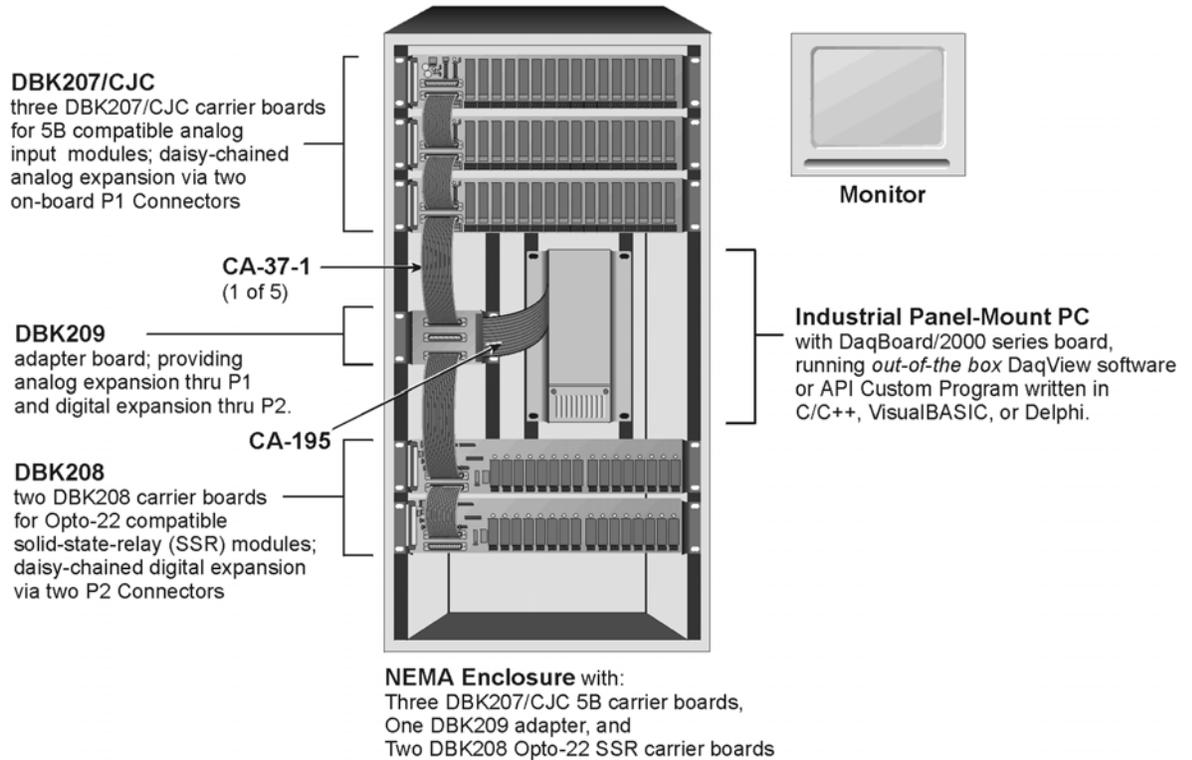
DaqBoard/200 Series boards [ISA-type] - control is through the 37-pin P2 digital port of the DaqBoard and one of the DBK208 P2 connectors.

DaqBook/2000 Series Devices, DaqBoard/2000 Series boards, and cPCI DaqBoard/2000c Series boards – control originates in the board's 100-pin P4 connector. Connection of these boards to DBK208 can be made directly or indirectly as follows:

- Direct connection can be made from the 2000 series board's 100-pin P4 connector to a DBK208's P4 connector via a CA-195 cable.

- Indirect connection can be made using one of the DBK200 Series P4-adapters that includes a 37-pin P2 connector (DBK201, DBK202, DBK203, DBK204, DBK206, DBK209, or another DBK208). CA-37 cables are used to connect from P2 to P2.

Note that a single Daq-based data acquisition system can support up to 16 DBK208 boards, providing a total of 256 channels. DBK208 boards contain two DB37 P2 connectors for the purpose of daisy-chaining to other DBK208s or to other P2-supported devices.

The following illustration is an example of a Data Acquisition System that includes two DBK208 boards for digital I/O. The two DBK208 boards are daisy-chained to a DBK209 P2 connector. The DBK209 is connected to a DaqBoard/2000 Series board via a CA-195 cable.

DBK207/CJC
three DBK207/CJC carrier boards for 5B compatible analog input modules; daisy-chained analog expansion via two on-board P1 Connectors

CA-37-1
(1 of 5)

DBK209
adapter board; providing analog expansion thru P1 and digital expansion thru P2.

CA-195

DBK208
two DBK208 carrier boards for Opto-22 compatible solid-state-relay (SSR) modules; daisy-chained digital expansion via two P2 Connectors

Monitor

Industrial Panel-Mount PC
with DaqBoard/2000 series board, running *out-of-the box* DaqView software or API Custom Program written in C/C++, VisualBASIC, or Delphi.

NEMA Enclosure with:
Three DBK207/CJC 5B carrier boards,
One DBK209 adapter, and
Two DBK208 Opto-22 SSR carrier boards

Warnings, Cautions, and Tips

WARNING
Ensure that hard-wire emergency over-ride circuitry exists for all applications that make use of dangerous switch-loads. Do not operate such switch-loads unless emergency over-ride circuitry is present.

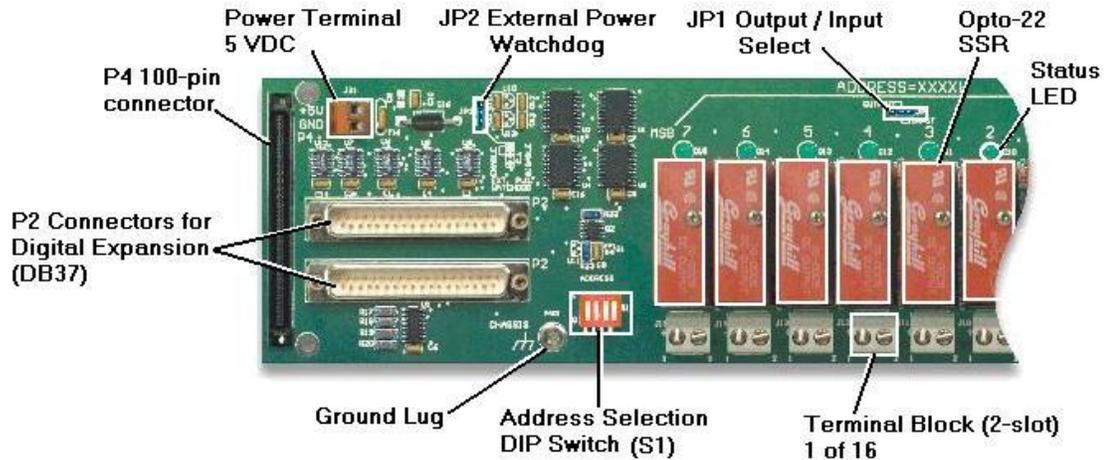| CAUTION |
|---|
| **Turn off power to the host PC and externally connected equipment prior to connecting cables or signal lines to the DBK. Electric shock or damage to equipment can result even under low-voltage conditions.** |
| **Take ESD precautions (packaging, proper handling, grounded wrist strap, etc.)** **Use care to avoid touching board surfaces and onboard components. Only handle boards by their edges (or ORBs, if applicable). Ensure boards do not come into contact with foreign elements such as oils, water, and industrial particulate.** |
| **Do not confuse connectors. Ensure that you only connect P1 I/Os to P1, P2 I/Os to P2, and P3 I/Os to P3. Improper connection may result in equipment damage.** |

1. Provide raceways (protective wiring routes) for all external I/O wiring.

2. Keep external I/O wiring away from ribbon cables.

3. Keep external I/O wiring away from low-voltage signal wiring.

4. Provide appropriate strain-relief and physical restraint to ensure that the wiring is held securely in the intended position, and without strain.

5. Ensure that all wiring with >50V potential is identified by the appropriate color codes and that warning labels are clearly visible.

6. Provide physical protection for the I/O interface board. The level of protection is dependent upon the board's operating environment.
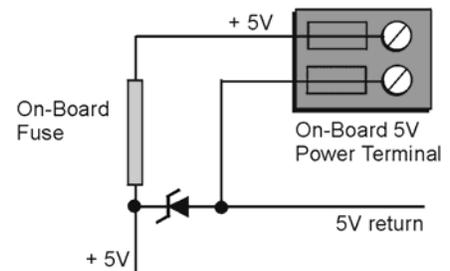

Partial DBK208

Power

The DBK208 requires an external isolated 5 volt DC supply with at least 0.25 amp current capacity. External power attaches to the DBK208 via on-board screw terminal connections. The board contains capacitors to filter input noise from the power supply.

Over-current protection is provided by an on-board 0.5 amp reset fuse in series with the 5 volt supply. Protection from over-voltage and reverse polarity power conditions is provided by a 6.8V zener diode.

External Power Watchdog

The External Power Watchdog is governed by the setting of the JP2 jumper. This jumper allows the user to determine the behavior of the digital output latches in the event of a loss and recovery of the external power supply.

With the jumper in the ENABLE position, the loss of external power will cause the output latches to be reset into a high-impedance condition. Even with a recovery of the external power, all output modules will be disabled until a write is done to the data bus. This setting is useful in an application that requires a serial enabling of output loads.

With the jumper in the DISABLE position, the loss of external power will have no effect on the state or continued control of the output latches. That is, data that is written to the output modules will continue to be latches as normal. A recovery of the external power would then cause the output modules to reflect the current state of the output latches. This setting is useful in the case where the operator halts the transfer of data and turns off the external power on purpose and then wants the system to assume the same state upon recovery of the external power.
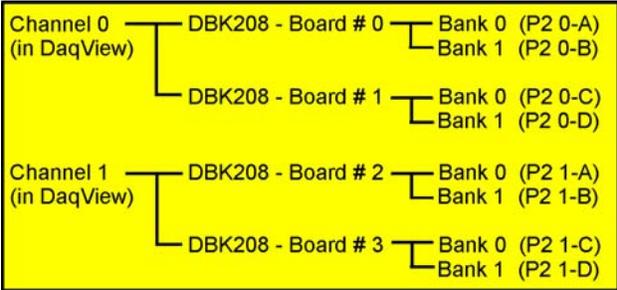
The setting of the JP2 jumper has no effect on input modules with regards to external power. While a loss of external power will result in corruption of the data being read, the data bus will be valid again immediately upon the recovery of the external power. The default setting of the JP2 jumper is the ENABLE position.

Operation

The DBK208 P2 expansion protocol makes use of a 4-bit dip switch (S1) to configure the board's addresses. Addresses are seen as XXXX + 0 for Bank 0's set of eight modules and as XXXX + 1 for Bank 1's set of eight modules, where the four Xs represent the DIP switch settings of 16 8 4 and 2. With all four S1 micro-switches OFF (open), the first system board (designate as "0") has Bank 0 registered as 0 and Bank 1 registered as 1. With S1's micro-switch "2" closed, we would see Bank 0 registered as 2 and Bank 1 registered as 3. The following table portrays the addressing scheme and includes DaqView designations.

The following breakdown is provided to indicate the relationship of DaqView channels to DBK208 boards and banks. More detailed information follows.

Simplified Channel-to-DBK208 Relationship

DBK208 Board #	Switch S1 Configurations				Address		Designation in DaqView (see notes 2 & 3)		
	16	8	4	2	Bank 0	Bank 1	Expanded Digital I/O in Async Digital I/O window		Channel
0	OFF	OFF	OFF	OFF	0	1	P2 0-A	P2 0-B	0
1	OFF	OFF	OFF	ON	2	3	P2 0-C	P2 0-D	
2	OFF	OFF	ON	OFF	4	5	P2 1-A	P2 1-B	1
3	OFF	OFF	ON	ON	6	7	P2 1-C	P2 1-D	
4	OFF	ON	OFF	OFF	8	9	P2 2-A	P2 2-B	2
5	OFF	ON	OFF	ON	10	11	P2 2-C	P2 2-D	
6	OFF	ON	ON	OFF	12	13	P2 3-A	P2 3-B	3
7	OFF	ON	ON	ON	14	15	P2 3-C	P2 3-D	
8	ON	OFF	OFF	OFF	16	17	P2 4-A	P2 4-B	4
9	ON	OFF	OFF	ON	18	19	P2 4-C	P2 4-D	
10	ON	OFF	ON	OFF	20	21	P2 5-A	P2 5-B	5
11	ON	OFF	ON	ON	22	23	P2 5-C	P2 5-D	
12	ON	ON	OFF	OFF	24	25	P2 6-A	P2 6-B	6
13	ON	ON	OFF	ON	26	27	P2 6-C	P2 6-D	
14	ON	ON	ON	OFF	28	29	P2 7-A	P2 7-B	7
15	ON	ON	ON	ON	30	31	P2 7-C	P2 7-D	

Notes:
(1) Switch S1 settings are made physically on the DBK208 boards and are checked in DaqView (see the following screen capture). The software aspect is detailed on the following page.

(2) The *Digital Option Cards External Connection* section of DaqView's *Configure System Hardware* window lists 8 channels (0 through 7) as shown in the following screen image.

(3) Each of the 8 channels can represent 2 DBK208 boards. For example, as seen in the table, System Board 0 and System Board 1 would both show up in DaqView's channel 0.

(4) In the *Async Digital I/O* window, each active channel (representing 2 boards) has divisions of A, B, C, and D. A represents Bank 0 of the first board. B represents Bank 1 of the first board.

C represents Bank 0 of the second board. D represents Bank 1 of the second board.

(5) Banks are selected to be "Input" or "Output" via jumpers. Jumper JP0 applies to Bank 0, JP1 applies to Bank 1.

Logic outputs provide signals for clocking data to registers for the Opto-22 SSR type modules. On-board jumpers (JP0 and JP1) are used to set the banks for "input" or "output." The banks can be set independently, however, all modules within a bank will have the same setting. For example, JP0 could be set to "Input," configuring all 8 modules of Bank 0 to Input; and JP1 could be set to "Output," configuring all Bank 1 modules to "Output."

Each Opto-22 module has a 2-connector terminal block for signal connections.

Software Setup

Note: DBK208 is not applicable to LogBook or LogView.

To use DBK208 from within DaqView, you must first configure the DaqView software to match the hardware setup.

1. From DaqView's main window, select the **Device** pull-down menu.

2. Select **Configure Hardware Settings**.

   The *Digital Option Cards External Connection* section of DaqView's *Configure System Hardware* window lists 8 channels (0 through 7) as shown in the following screen image.
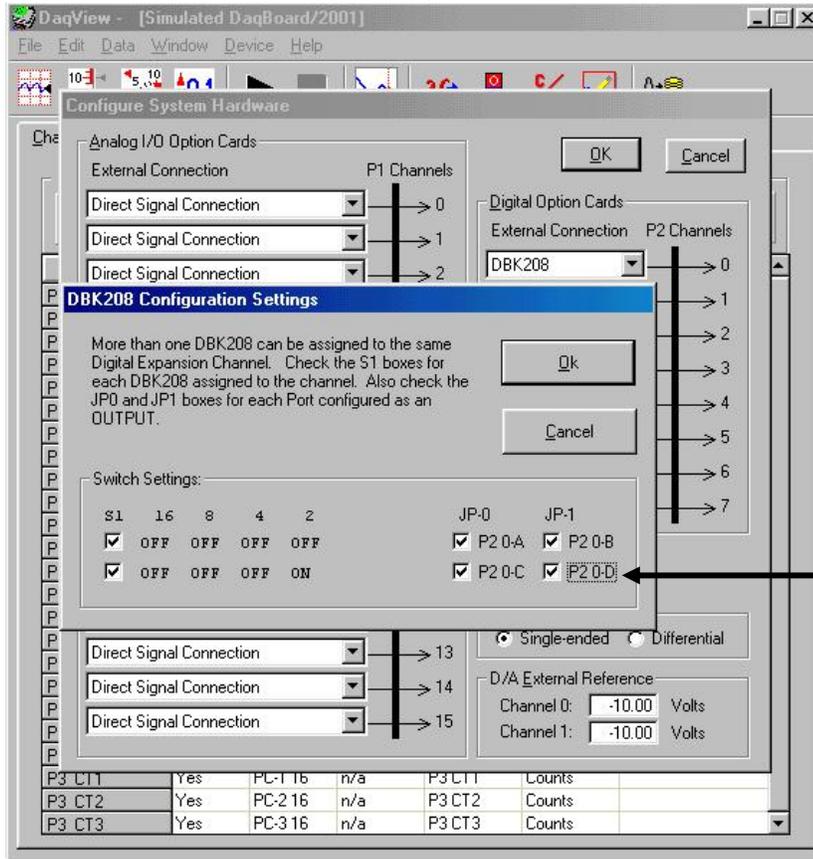
3. Under Digital Option cards (on right side of screen), select **DBK208**. A DBK208 Configuration Settings window will appear. The window includes a "Switch Settings" section (see following figure).

4. Select the S1 switch settings that apply to your configuration. In the above screen example DaqView's Digital Channel 0 consists of two boards. Note that no more than two DBK208 boards are permitted per DaqView Channel. Both S1 check boxes are selected when two boards are used in a channel.

5. Check (or uncheck) JP-0 and JP-1 to match your hardware. A checked jumper indicates that the associated bank is digital Input. An unchecked jumper indicates Output. The first board in the channel has its banks designated as P2 0-A and P2 0-B. The second board's banks are designated as P2 0-C and P2 0-D.

6. After S1, JP-0, and JP-1 settings are complete, click the OK button.

7. Select the Digital I/O icon from DaqView's main window toolbar. The *Async Digital I/O window* will appear.

   With the P2 Digital I/O tab selected in the *Async Digital I/O* window, each active channel (representing 2 boards) has divisions of A, B, C, and D.

   - "**A**" represents the 8-bit **Bank 0** of the first board.

   - "**B**" represents the 8-bit **Bank 1** of the first board.

   - "**C**" represents the 8-bit **Bank 0** of the second board.

   - "**D**" represents the 8-bit **Bank 1** of the second board.

Configure System Hardware and DBK208 Configuration Settings Windows

Switch Settings

The switch settings must agree with those on the actual DBK208 board. Refer to pages 5 and 6 of this section for configuration details.
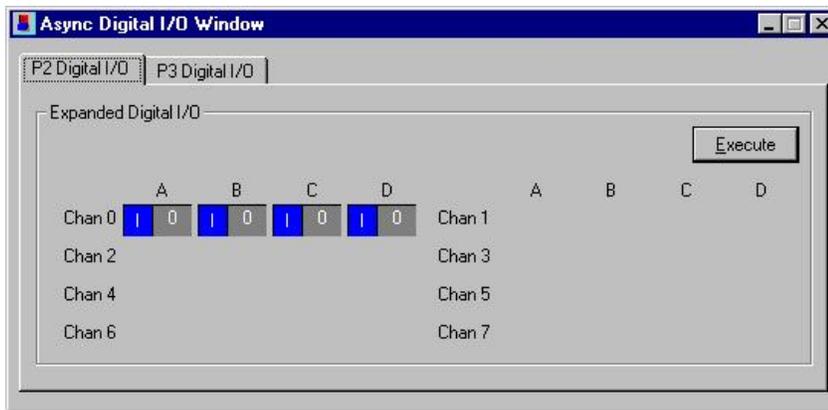
For Digital Output

Ensure the JP0 and JP1 boxes are checked for each port configured as Digital Output.

For Digital Input

Ensure the JP0 and JP1 boxes are not checked for each port configured as Digital Input.

Async Digital I/O Window – P2 Digital I/O Tab Selected

In the above screen shot of the Digital I/O Window, channel 0 represents two DBK208 boards. The first board consists of banks A and B, the second board consists of banks C and D. In this example all four banks are seen as Input. The input determination was made by the physical positions of hardware jumpers (JP0 and JP1) and software selections for JP-0 and JP-1, i.e., that for Digital Input they were not checked.

Note: When Output is selected, hexadecimal values must be entered in the "O" block for the applicable bank.

8. Upon completion of the configuration click the **Execute** button.

DBK208 – Specifications

Name/Function: Carrier Board for Opto-22 Compatible Solid-State-Relays

Module Capacity: 16, Opto-22 Solid-State-Relays

Cable (optional): CA-37-x

DC Input Fuse: 0.5A, re-set type

Power Requirement: 5 VDC, regulated. 0.25 amp minimum.

Operating Environment:
    Temperature: 0°C to 70°C
    Relative Humidity: 95% RH, non-condensing

Connectors:
    P4 – 100-pin connector provides for connection to a DaqBook/2000 Series device's,
        DaqBoard/2000 Series board's or cPCI DaqBoard/2000c Series board's
        P4 connector via a CA-195 cable.
    P2 – Two P2 (DB37) connectors provide for digital expansion via CA-37-x cable.
    Screw Terminals – 16 sets of 2-connector blocks for I/O signals.

Isolation:
    Channel-to-System: 500 V
    Channel-to-Channel: 500 V

Notes