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# DBK12 and DBK13 16-Channel Analog Input Multiplexer Cards

## DBK12 – Low Gain Programmable Card
## DBK13 – High Gain Programmable Card


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**Reference Notes**:

- Chapter 2 includes pinouts for P1, P2, P3, and P4. Refer to pinouts applicable to your system, as needed.
- In regard to calculating system power requirements, refer to *DBK Basics* located near the front of this manual.

## *Overview*

Both the DBK12 and DBK13 provide 16 single-ended, or 16 differential, analog inputs.

### DBK12

The DBK12 ’s amplifier offers ×1, 2, 4, or 8 gain (programmable per channel). These gains can be combined with:

**LogBook:** the standard LogBook gains of 1, 2, 4, 8, 16, 32, and 64 to yield gains of 1, 2, 4, 8, 16, 32, 64, 128, 256, and 512.

**Daq devices:** the standard Daq device gains of 1, 2, 4, or 8 to yield gains of 1, 2, 4, 8, 16, 32, and 64.

### DBK13

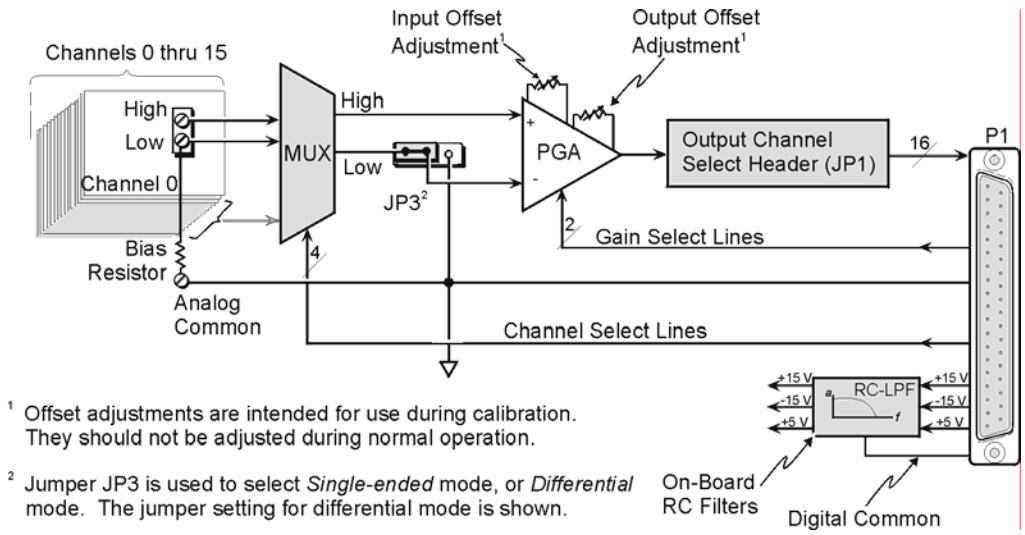
The DBK amplifier offers ×1, 10, 100, or 1000 gain (programmable per channel). These gains can be combined with:

**LogBook:** the standard LogBook gains of 1, 2, 4, 8, 16, 32, and 64 to yield gains of 1, 2, 4, 8, 10, 16, 20, 32, 40, 64, 80, 100, 160, 200, 320, 400, 640, 800, and 1000.

**Daq devices:** the standard Daq device gains of 1, 2, 4, or 8 for net gains of 1, 2, 4, 8, 10, 20, 40, 80, 100, 200, 400, 800, 1000.




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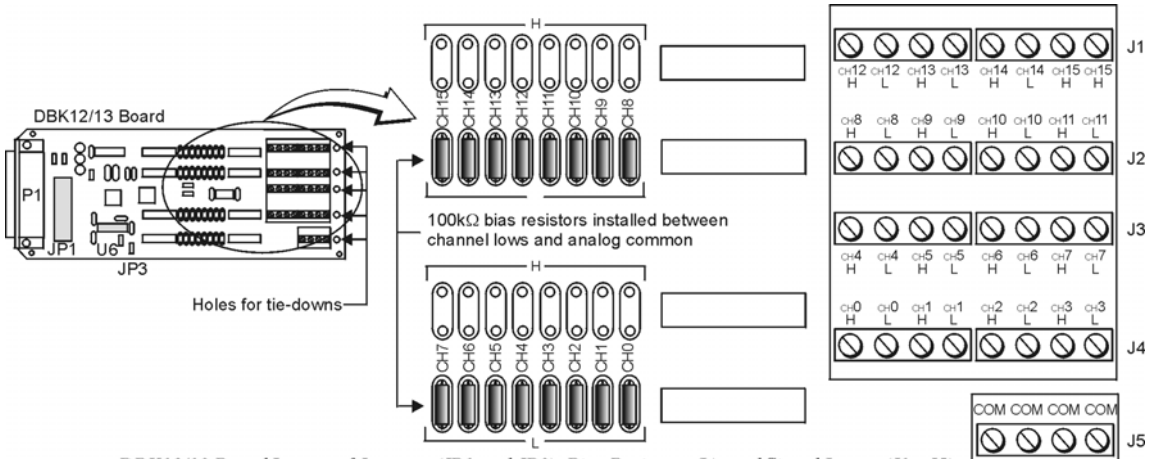

***DBK12 and DBK13 Block Diagram***

Up to 16 such cards can be attached to one of the 16 base channels for 256 single-ended or differential inputs. The scan sequencer can directly program the expansion cards to scan external signals at the same 10 µs/channel rate as on-board channels.

**Note**: DBK12 and DBK13 use the same printed circuit board and look quite similar. If the label becomes unreadable, you can distinguish them as follows: the U6 integrated circuit is a PGA203 in DBK12; but a PGA202 in DBK13.

## *Hardware Setup*

To set up the card, you may need to refer to the following board layout. The layout can be used for both DBK12 and DBK13.




*DBK12/13 Board Layout of Jumpers (JP1 and JP3), Bias Resistors (L), and Signal Inputs (J1 - J5)*



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## Card Connection

DBK12 and DBK13 are equipped with screw terminal connectors for easy access to all of the analog inputs, as well as several analog ground access points. Connections are provided for 16 single-ended or 16 differential inputs. On board, there are factory-installed, 100 KΩ bias resistors in the L locations for each channel; these resistors can be removed if desired. (The H locations have no factory-installed resistors).

1. For ***single-ended operation***, connect the signal's high end to the high input of the desired channel and the low end to analog common (J5).
2. For ***differential operation***, connect the signal's high end to the high input and the low end to the low input of the desired channel. When using differential input, ground referencing to analog common is important for accuracy. If necessary, use bias resistors. The two differential measurement configurations (floating and referenced) are discussed in the *Signal Management* chapter.
3. After all connections are in place, secure wires to the card at the captive areas at the end of the card. Nylon tie wraps work well for this purpose.

**A path to analog common must exist, either by direct connection or through bias resistors.**

## Card Configuration

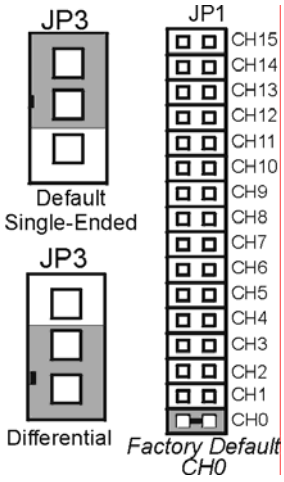
**Factory Default: Input mode – Single-ended**

The two variables of card configuration are input mode to the card and channel output to the LogBook or the Daq device.

1. Using the onboard jumper, JP3, set the signal input mode (see figure). The jumper and its SE (Single-Ended) and DIFF (Differential) positions are clearly identified on the board overlay.
   - For **single-ended** inputs, place the jumper in the **SE** position.
   - For **differential** inputs, place the jumper in the **DIFF** position.
2. To configure the channel, locate the 16×2-pin header (JP1) located near the front of the board. JP1's 16 jumper locations (CH0 through CH15) match corresponding base channels. Place the jumper on the channel you wish to use.

   Only one channel can be selected on a single card; and all cards in a daisy-chain must have unique jumper settings. Up to sixteen DBK12s (or DBK13s) may be connected to your LogBook or to your Daq device. An optional DBK10 enclosure may be used.

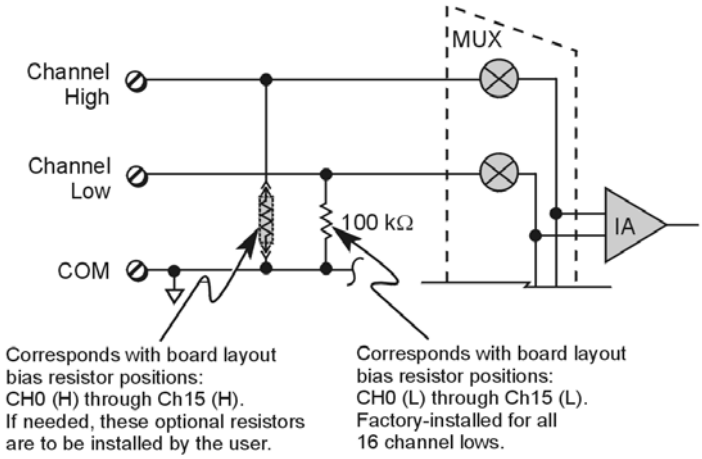
Bias resistors are now factory-installed between the channel lows and analog common. If you have an early version board, you can still install the bias resistors. The use of bias resistors is discussed in the S*ignal Management* chapter.

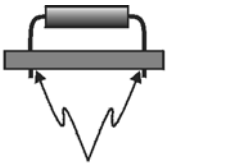



***DBK12, DBK13 Configurations***



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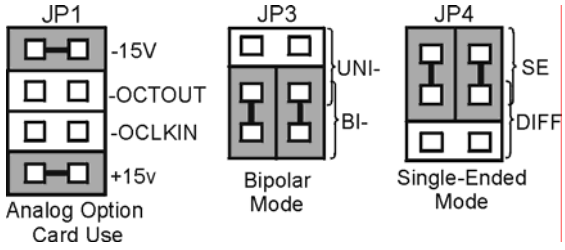



## DaqBook/100 Series & /200 Series and DaqBoard [ISA type] Configuration

Use of DBK12 or DBK13 requires the following setup steps for DaqBook/100 Series & /200 Series devices and DaqBoard [ISA type] applications.

1. If not using auxiliary power, place the JP1 jumper in the expanded analog mode.




***Default Configuration Settings for DBK12 and DBK13***

**Note**: These jumpers are located in the DaqBook/100 Series & /200 Series devices and DaqBoard [ISA-Type] units.

The JP1 default position, indicated in the above figure, is necessary to power the interface circuitry of the DBK12 or DBK13 via the internal ±15 VDC power supply. If using auxiliary power (e.g. a DBK32A or DBK33), you must remove both JP1 jumpers. Refer to *Power Requirements* in the *DBK Basics* section and to the DBK32A and DBK33 sections as applicable.

2. For DaqBook/100, DaqBook /112, and DaqBook /120 *only*, place the JP3 jumper in either the *unipolar* or *bipolar* mode as needed (bipolar shown).
3. For DaqBook/100, DaqBook /112, and DaqBook /120 *only*, place the JP4 jumper in the DaqBook/DaqBoard in *single-ended* mode.

**Note**: Analog expansion cards convert all input signals to *single-ended* voltages referenced to analog common.

## DaqBook/2000 Series and DaqBoard/2000 Series Configuration

No jumper configurations are required for these 2000 series devices.

# *Software Setup*



**Reference Notes**:

- **DaqView users** - Refer to chapter 3, *DBK Setup in DaqView*.
- **LogView users** - Refer to chapter 4, *DBK Setup in LogView*.



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## DBK12 – Specifications

**Name/Function: Analog Multiplexing Card (Low Gain)**

**Output Connector:** DB37 male, mates with P1

**Input Connector:** Screw terminals

**Gain Ranges:** ×1, ×2, ×4, ×8

**Inputs:** 16 differential or single-ended
(switch selectable as a group)

**Voltage Range:** 0 to ±5 VDC bipolar; 0 to 10 V unipolar

**Input Impedance:** 100 MΩ (in parallel with switched 150 pF)

**Gain Accuracy:** ±0.05% typ, ±0.25% max

**Maximum Input Voltage:** ±35 VDC

**Slew Rate:** 20 V/µs typ, 10 V/µs min

**Settling Time:** 2 µs to 0.01%

**CMRR:** 80 dB min

**Non-Linearity:** 0.002% typ, 0.015% max

**Bias Current:** 150 pA, 0.2 µA max

**Offset Voltage:** ±(0.5 + 5/G) mV typ; ±(2.0 + 24/G) mV max

**Offset Drift:** ±(3 + 50/G) µV/°C typ; ±(2.0 + 24/G) µV/°C max

## DBK13 – Specifications

**Name/Function: Analog Multiplexing Card (High Gain)**

**Output Connector:** DB37 male, mates with P1

**Input Connector:** Screw terminals

**Gain Ranges:** ×1, ×10, ×100, ×1000

**Inputs:** 16 differential or single-ended (switch selectable as a group)

**Voltage Range:** 0 to ±5 VDC bipolar; 0 to 10 V unipolar

**Input Impedance:** 100 MΩ (in parallel with switched 150 pF)

**Gain Accuracy:** ±0.05% typ @ G < 1000
±0.25% max @ G < 1000
±0.10% typ @ G = 1000
±100% max @ G = 1000

**Maximum Input Voltage:** ±35 VDC

**Slew Rate:** 20V/µs typ, 10V/µs min

**Settling Time:** 2 µs to 0.01% @ G < 1000
10 µs to 0.01% @ G = 1000

**CMRR:** 80 dB @ G=1 min
86 dB @ G=10 min
92 dB @ G=100 min
94 dB @ G=1000 min

**Non-Linearity:** 0.002% typ @ G < 1000
0.015% max @ G < 1000
0.02% typ @ G = 1000
0.06% max @ G = 1000

**Bias Current:** 150 pA typ; 0.2 µA @ 25ºC max

**Offset Voltage:** ±(0.5 + 5/G) mV @ 25ºC typ;
±(2.0 + 24/G) mV @ 25ºC max

**Offset Drift:** ±(3 + 50/G) µV/ºC typ; ±(12 + 240/G) µV/ºC max






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