DBK5   4-Channel Current Output Card
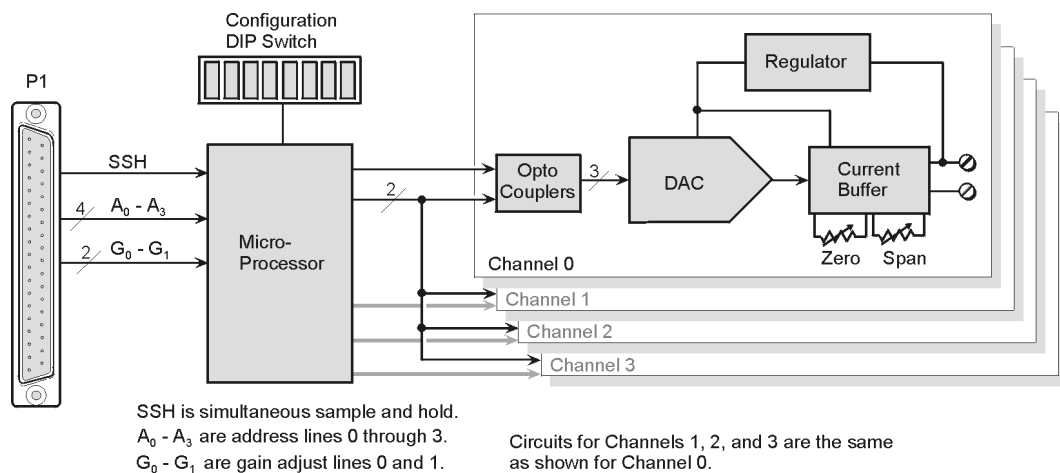
This product is not used for LogBook applications.

Reference Notes:

➢ Refer to the section *Power Requirements* in the document module *DBK Basics*, in regard to calculating system power requirements.

➢ The chapter *System Connections and Pinouts*, includes pinouts for P1, P2, P3, and P4. Refer to the pinouts that are applicable to your system, as needed.

Overview

SSH is simultaneous sample and hold.
A_0 - A_3 are address lines 0 through 3.
G_0 - G_1 are gain adjust lines 0 and 1.

Circuits for Channels 1, 2, and 3 are the same as shown for Channel 0.

DBK5 Block Diagram

The DBK5 can control four 4 to 20 mA current loops. The card connects to the Daq Device's P1 port and uses one of the Daq Device's 16 base channels. Up to four DBK5s can share a single base channel for a maximum of 256 channels. The DBK5 card neither sources nor sinks current; instead, it modulates current in an externally powered loop. In this way, the DBK5 acts as a current-loop transmitter. The DBK5 is compatible with both regulated and unregulated loop supplies, providing these supplies are within the range of 12 to 45 V and have a loop resistance that does not exceed 1.95 kΩ, according to the following relationship:

$$V_{SUPPLY} = V_{TRANSMITTER} + (I_{LOOP} * R_{LOOP})$$

where: $V_{TRANSMITTER}$ = 6 V, and I_{LOOP} = 20 mA max

The DBK5 provides loop-current control through 12-bit digital-to-analog converters (DACs). The 12-bit range of 0 to 4095 corresponds with 0 to 100% of full-span and an output of 4 to 20 mA. As shown in the table, the current output I_{OUT} = 4 mA + (DAC/4095 × 16 mA). Thus, the DAC values for currents between 4 and 20 mA is equal to 255.94 × (I_{OUT} - 4 mA).

DAC	mA
0	4
...	...
1000	7.9
...	...
4095	20

The 4 channels are optically isolated from the Daq Device and from each other. Isolation allows the loop voltages to float beyond the Daq Device's common mode range. An externally powered loop allows the DBK5 to continue to modulate the loop current in the event of a fault or power loss in the Daq Device. If the loop is powered-up before the Daq Device, the DBK5 will maintain the loop current at 4 mA. After a fault, the DBK5 will maintain the loop current at the last level set.

Hardware Setup

Card Configuration

Up to four DBK5 cards can be assigned to a single Daq device channel. With 16 Daq device channels, 4 cards per channel, and 4 inputs per card, up to 256 inputs are possible (16 x 4 x 4).

Each card must appear unique to the Daq device. Micro-switches 1 through 4 (On DIP switch S1) set the **card address** *for the Daq device channel*. A card address can be set to a value in the range of 0 to 15, inclusive. Micro-switches 7 and 8 set the **sub address** to a value of 0, 1, 2, or 3 to distinguish one card from another, for a given Daq device channel.

Both addresses are determined by binary-weighted values of the micro-switches. In the following figure the DIP switch is set for a card address of 15 since micro-switches 1 through 4 are in the "1" position. This means the binary weights add up to fifteen (8 + 4 + 2 + 1). In the same figure the sub address is 3, since micro-switches 7 and 8 are in the "1" position giving us 2 + 1. Note that micro-switches 5 and 6 are not used. Since addresses start at "0" instead of "1," a card's 15 / 3 address would mean that it is assigned to the sixteenth Daq device channel and that it is the fourth card.
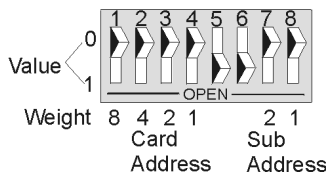
Configuration DIP Switch

Shown with a Card Address of 15 and a Sub Address of 3.

| Switch Settings & Resulting Addresses								
Switch 1-4 Settings				Resulting Card Address	Switch 7-8 Settings				Resulting Sub Address
1	**2**	**3**	**4**		*	*	**7**	**8**	
0	0	0	0	**0**			0	0	**0**
0	1	0	1	**5**			0	1	**1**
1	1	0	0	**12**			1	0	**2**
1	1	1	1	**15**			1	1	**3**
8	**4**	**2**	**1**	**--**			**2**	**1**	**--**
Weights associated with switches when set to "1"									

*Micro-switches 5 and 6 are not used.

Card Connection

Current-loop connections are provided via dual screw terminal connections. The + and - loop connections are shown in the figure. Once all connections are in place, secure wires to the board at captive areas at the end of the board. Nylon tie wraps (not included) work well for this purpose.

(1) An external *loop-voltage supply* must be provided.

(2) To meet CE safety specifications, an edge guard (kit p/n 232-0806) must be attached to the DBK5 card before insertion into a DBK41 expansion chassis. This guard helps prevent accidental access to high-voltage circuits.
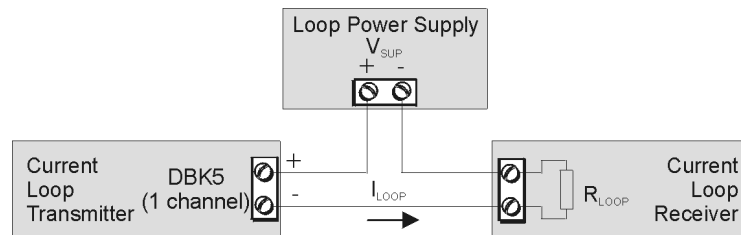
DBK5 Current Loop Configuration

CE Compliance

Reference Notes:
Should your data acquisition system need to comply with CE standards, refer to the *CE Compliance* section of the Signal Management chapter.

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

Use of the DBK5 requires setting jumpers in DaqBooks/100 Series & /200 Series devices and DaqBoards [ISA type].

1. *If not using auxiliary power*, place the **JP1** jumper in the expanded analog (Analog Option Card Use) mode. In this mode JP1 jumpers are positioned in the −15 V and +15 V positions.
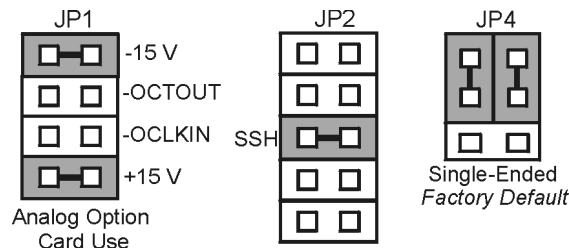
Jumper Configurations in DaqBooks/100 Series & /200 Series devices and DaqBoards [ISA-Type]

Note: The JP1 default position, indicated above, is necessary to power the interface circuitry of the DBK5 via the internal ±15 VDC power supply. If using auxiliary power cards 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 of this manual.

<table>
<tr><td>⚠</td><td>CAUTION

When using the SSH output, do not use an external voltage reference for DAC1.
Applying an external voltage reference for DAC1, when using the SSH output, will result in equipment damage due to a conflict on P1, pin #26.</td></tr>
</table>

2. Place the **JP2** jumper in the *SSH* position (see above CAUTION).

3. **For DaqBook/100, DaqBook/112 and DaqBook/120** *only*, place the JP4 jumper in *single-ended mode*.

DaqBook/2000 Series & DaqBoard/2000 Series

No jumper configurations are required for these /2000 series devices.

Software Setup

Reference Notes:

➢ *DaqView* **users** - Refer to the *DBK Setup* section in the *DaqView* document.

➢ *LogView* **users** - Not Applicable.

DBK5 – Specifications

Name/Function: **4-Channel 4-20 mA Current Output Card**

Connectors: DB37 male, mates with P1. Screw terminals for signal output.

Accuracy/Linearity: 0.1% FS

Resolution: 4 µA / LSB, monotonic

Hysteresis: 0.02% FS

Regulation: 0.05% FS

Compliance: $R_{LOOP} = (V_{SUPPLY} - 6) / 0.020$ max

Isolation: 500 V