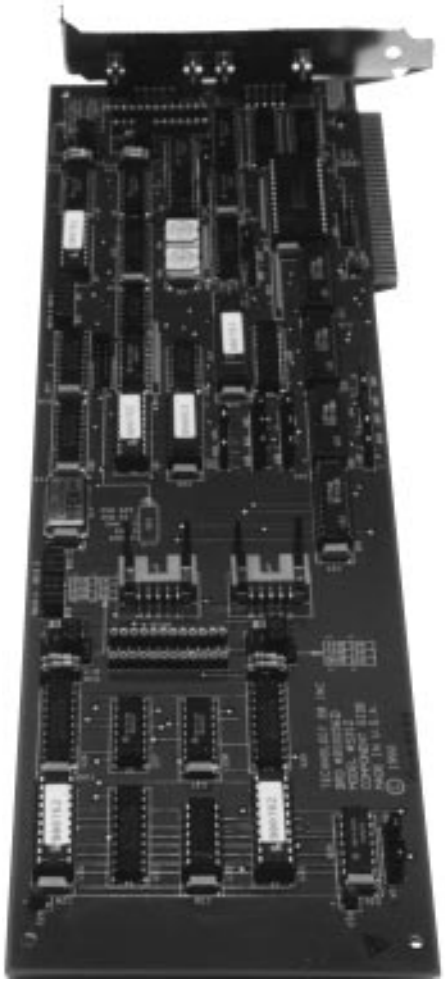
TECH 80

The People in Control of Motion™



Model 5312B 1-4 Axes PC Quadrature Encoder Input

1.2 MHz Maximum Quadrature Input Rate

4.8 MHz Input with Bypassed Sample Filter

Digitally Filtered Inputs with Selectable Sampling Rates

24-Bit Presettable Counters which can be Cascaded to Provide Greater Range

Pulse & Direction and Count Up/Down capability

Interrupts on Index Pulse, Over/Underflow or Count Match

X1, X2, X4 Quadrature Decoding

Software Libraries for C, C++, BASIC, Pascal, Visual Basic, Windows™ DLLs and LabVIEW Drivers Available

The Model 5312B offers an affordable solution for applications needing positional feedback, digital readout and event counting for high input signal occurrences.

Inputs on the 5312B may be single-ended or differential and are conditioned by a four-phase digital filter. Power (+5V) and grounding connections are provided for encoder use. Five jumper-selectable filter clock frequencies, ranging up to 10 MHz, are also available. Noise immunity may be maximized by selecting the lowest frequency that's compatible with the highest input rate expected.

The board applies the signal inputs to a 24-bit decoder/counter with programmable modes. The counter may be used either for quadrature decoding or as a counter for pulse and direction or count up/down inputs. Counters may be cascaded in 24-bit groups. The counters are independent, but may be initialized simultaneously by issuing commands to a single port. When an index pulse occurs, the count may be latched or a new count value may be loaded.

The Model 5312B was created with Tech 80's commitment to open-architecture system design. With its industry-standard language support, programming is far easier than proprietary languages, and throughput isn't slowed by lengthy ASCII transfers. Visual BASIC and Windows drivers are available to work with Windows 3.1 & 95, Visual C++ and Visual BASIC 4.0. Motion-specific function calls enhance standard languages, which enable ease of programming.

Affordable & Precise Encoder Interfacing

Applications

The Model 5312B can be applied in many ways beyond simple encoder feedback. Timer/Velocity and PWM applications are just a few of the complex applications that the 5312B was designed for.

Timer/Velocity Applications

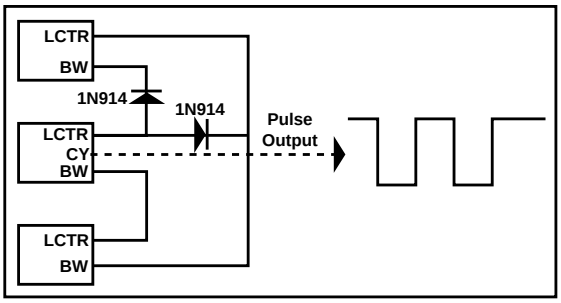
The 5312B's LS7166 counter chip will count quadrature inputs up to 208 ns. or 4.8 MHz edge to edge. However, the limitation of the counting is actually 1.33 MHz quadrature (Up/Down counting) or 10 MHz pulse and direction.

It has the ability to get position information at precise time intervals. When the resolution of R counts per dimension, the first three axes will be used to count absolute dimension information. The fourth axis will be used as an interval timer. In this mode, the fourth axis will institute the capture of axis #'s 0, 1 and data counts. It will also generate an interrupt to the host computer. When the interrupt occurs, the host CPU will need to collect the dimension data for RAM storage or other math function requirements (such as velocity calculations).

The timer accuracy can be set in 0.1 µsec. increments. Since the count dimension captures are hardware-triggered, the software only has to respond to the timer interval interrupts. This frees the host CPU for other activities in between interrupt calls.

PWM Operation

This operation requires the use of the three-axis 5312B. Each axis is setup to count in the Divide by N, Countdown and Recycle mode. The counters are set up to count the 10 MHz sample frequency.



By interlocking the counters the Model 5312B can output PWM signals.

Application Example: Automated Print Inspection

Opportunity:

A press manufacturer needed an automated inspection system for a new line of four-color printing presses that saved labor costs and reduced waste. Indexed colors needed to be inspected at various points of the page to regulate ink flow. The system needed to check each piece at speeds up to 20 units per second.

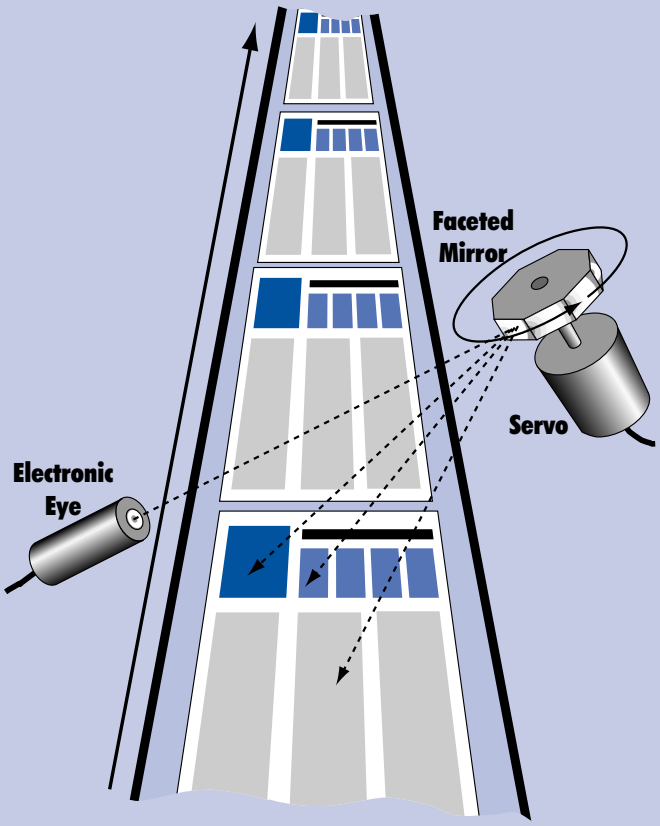
As shown on the right, the customer used an electronic eye with a spinning faceted mirror to monitor index colors. A servo motor was used to spin the mirror at the precise veolcity while two encoders record the mirror and conveyor belt positions. Simultaneously, the customer's servo controller could not process the information generated by the encoders at the speeds required and also trigger the electronic eye at the appropriate moment.

Analysis:

The inspection system requires two axes to collect position information from the encoders and a third axis to act as a timer. By coordinating the first two axes with the third, the electronic eye can be coordinated by both position and time to ensure accurate and efficient data collection.

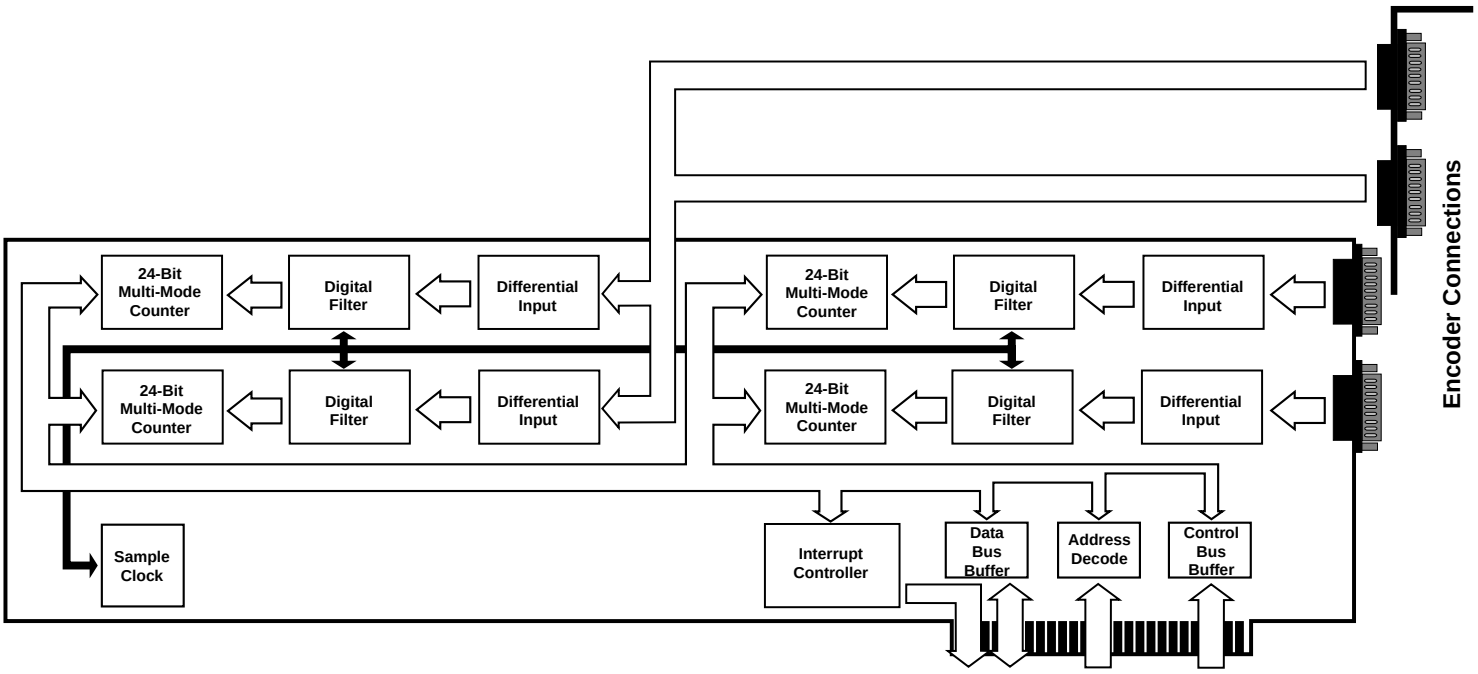
Solution:

We recommended a three-axes configuration of the Model 5312B Encoder Input. With its 1.2 MHz maximum quadrature input rate, the 5312B could easily accommodate the data acquisition demands. It can latch the first two axes to the third and fire the electronic eye's A/D controller at the appropriate moments.



By latching the encoder inputs from the conveyor belt and mirror to a timer, the Model 5312B accurately fires the electronic eye's A/D controller in high-speed, high-precision application.

Board Layout



I/O Map

Axis	Address	When Written	When Read
1	00	Write to present register (PR) & increment register address counter (IRAC)	Read output latch (OL) & incremental register address counter (IRAC)
	01	Write to command register	Read output status register (OSR)
2	02	Write to PR & IRAC	Read OL & IRAC
	03	Write to command register	Read OSR
3	04	Write to PR & IRAC	Read OL & IRAC
	05	Write to command register	Read OSR
4	06	Write to PR & IRAC	Read OL & IRAC
	07	Write to command register	Read OSR
Global	08	Global write to all four PR's	Invalid
	09	Global write to all four command registers	Invalid
PIC	0A	Low port	Low port
	0B	High port	Hight port

J1-J4 Connector PIN Assignments

Pin #	Single-Ended	Differential
1	Ground	/Phase A*
2	+5V	+5V
3	Ground	/Phase B*
4	+5V	+5V
5	Ground	/Index*
6	Phase A	Phase A
7	Phase B	Phase B
8	Ground	Ground
9	Index	Index

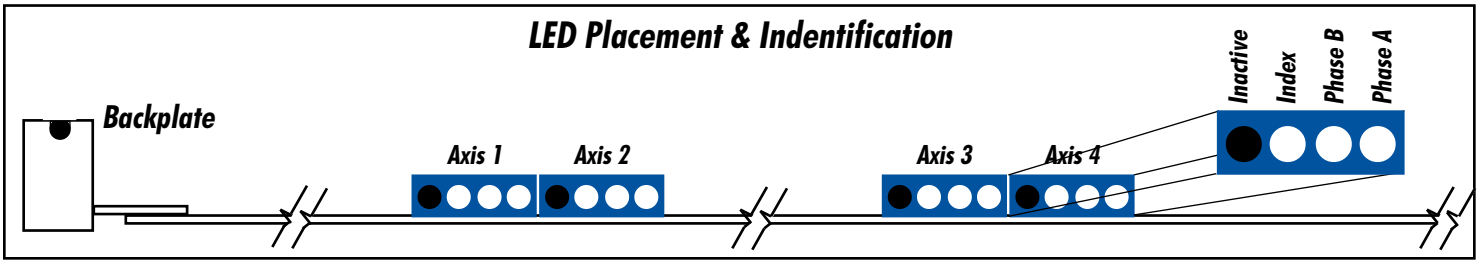
** Denotes an active LOW signal.*

Sample Clock Frequency Jumper Settings

Sample Clock Frequency (MHz.)	W23
0.625	(9 - 10)*
1.250	(7 - 8)
2.500	(5 - 6)
5.000	(3 - 4)
10.000	(1 - 2)

** Default jumper settings*

LED Placement & Indentification



SPECIFICATIONS

Host Interface:

- PC/XT/AT Compatible
- I/O Mapped Switch-Selectable Address
- 8-Bit Data transfers
- Programmable Interrupts
- High-Speed Binary Communications

Card Dimensions:

13.3 x 4.2 x 0.5 inches
33.8 x 10.7 x 1.3 cm

Recommended Operating Environment:

- 0 - 70 ° C
- 20 - 95% Relative Humidity, Noncondensing

Mating Connectors:

- 9-Pin D-Sub
- Ansley 609-9P
- Amphenol 841-14-DEFR-BO9P

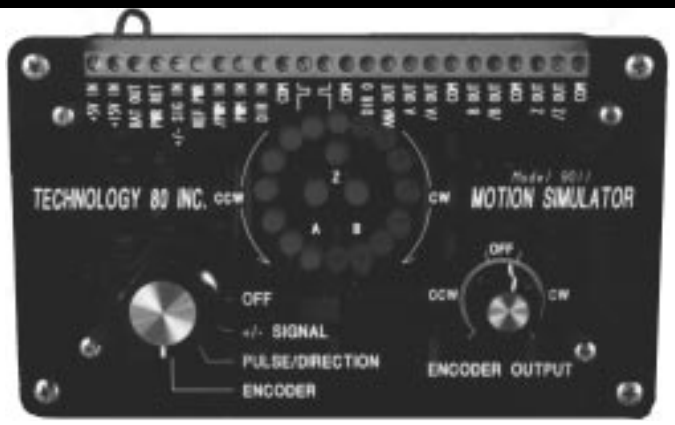
Interrupts (Per Axis):

- Controller Ready
- Time/Position Breakpoints
- Trajectory Complete
- Excess Following Error
- Index/Home Capture

Power Requirements:

- +5.0 VDC: ± 5% 1.1 Amp (with 4 quadrature encoders attached)
- +12 VDC: ± 10 mA
- -12 VDC: ± 10 mA

Peripheral Tool for the Model 5312B: Tech 80's Motion Simulator (Model 9011)



The Model 9011 Motion Simulator is a powerful tool to help you to develop, debug and troubleshoot your motion control systems and the Model 5312B. Using a circular LED array, it simulates amplifiers, encoders and motors.

The Motion Simulator allows you to test software off line, preventing expensive hardware mishaps due to undetected software bugs. You can troubleshoot your software even before the motors, slides and other hardware arrives.

After only one use, Tech 80's Motion Simulator will become an integral tool for your motion control systems.

Ordering Information

5312B-1	Quadrature Encoder Interface, 1 Axis
5312B-2	2 Axes Configuration
5312B-3	3 Axes Configuration
5312B-4	4 Axes Configuration
5312 LAB	LabVIEW VI's
5312 DEV	Development Kit
5312 MAN	Hardware & Software Manuals*
5312 SOFT	Demo & Driver Software*

* Included in the Development Kit along with Motor Sizing Software, *Designing with Motion Handbook*, and discount on 9011 Motion Simulator

Warranty

This product is warranted according to the Terms and Conditions of Sale and is effective for *TWO YEARS AFTER SHIPMENT* from Technology 80 Inc. For further warranty information, please consult the hardware manual.

The People in Control of Motion is a trademark of Technology 80 Inc. Windows is a trademark of the Microsoft Corporation.

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