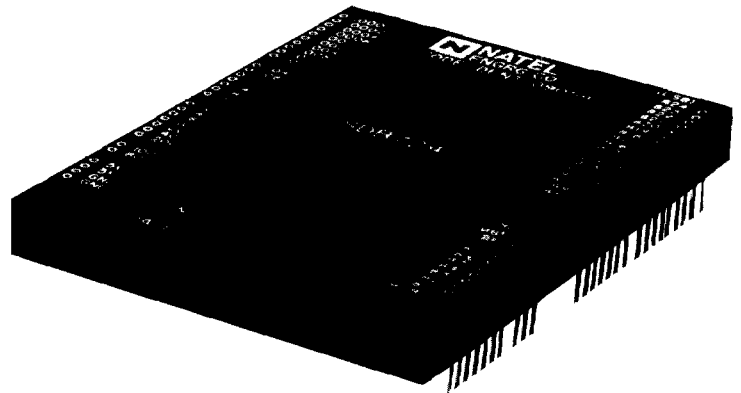


Features

- **Compact size**
(3.0 x 4.0 x 0.4 inch)
- **High resolution**
(0.000022 degree)
- **High accuracy**
(0.0001 degree)
- **3-state output**
(8 and 16-bit data bus compatible)
- **High output drive**
(5 TTL loads)

**Applications**

Code conversion

IEEE 488-based instrumentation (for converting ASCII format instrumentation bus data to natural binary angle)

Interface between thumbwheel switch and high accuracy D/R converters

Description

Model SDB724 converts position information received from ASCII numerical controllers to the form required by digital-to-resolver converters and position control devices. The converter accepts the BCD digital representation of an angle and provides an equivalent natural binary angle (MSB = 180 degrees).

The SDB724 accepts up to 7-digit BCD angles (359.9999 degrees) and converts that into a 24-bit binary output with a resolution of 0.000022 degree (0.08 arc-second). The accuracy of the conversion process is 0.0001 degree. The 3-state binary output is available in 3-bytes of 8-bits each, which facilitates interfacing with an 8-bit data bus. High accuracy of the 724 insures that the command signal is not degraded in digital translation of the data

The BCD-to-binary conversion is purely digital and does not require any timing or control signals for conversion. Conversion speed is limited only by the propagation delays of components used. A mixed blend of CMOS and TTL components is used to obtain a best compromise between speed and power consumption. In addition no input is connected to CMOS devices, therefore, the module does not require any special protection against ESD. The binary data obtained from the conversion circuit is applied to three, independently controlled, 3-state buffers organized as a high byte of 8 MSBs, a middle byte of next 8 bits and a low byte of 8 LSBs. Simultaneous parallel output of all 3-bytes is obtained by applying logic "0" (ground) to the three enable control lines, HBE, MBE and LBE.

Pin Designations

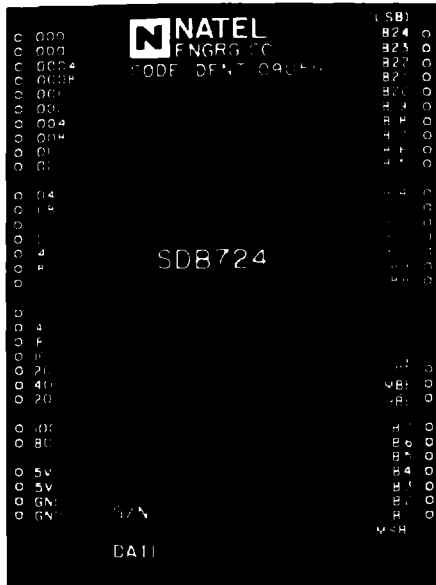


FIGURE 1 SDB724 Pin Assignment

GND	Power supply ground digital ground
5 V	Power supply voltage +5V-dc
$\overline{\text{HBE}}$	High Byte Enable — Output bits B1 through B8 are enabled (low impedance of 3-state output) when $\overline{\text{HBE}}$ is set to a logic "low." When $\overline{\text{HBE}}$ is set to a logic "high," the output bits B1 through B8 are disabled (high impedance state of 3-state output).
$\overline{\text{MBE}}$	Middle Byte Enable — A logic low on $\overline{\text{MBE}}$ enables output bits B9 through B16.
$\overline{\text{LBE}}$	Low Byte Enable — A logic low on $\overline{\text{LBE}}$ enables output bits B17 through B24.

NOTE: For simultaneous 24-bit parallel output $\overline{\text{HBE}}$, $\overline{\text{MBE}}$, and $\overline{\text{LBE}}$ should be connected to ground

Specifications

PARAMETER	VALUE
Inputs	
Resolution	Up to 7 decade BCD angle
Logic Levels	DTL/TTL compatible (positive logic)
Loading	1 TTL load
Outputs	
Resolution	24-bit natural binary angle
Accuracy	0.0001 degree (0.36 arc-second)
Logic levels	DTL/TTL compatible (positive logic)
Drive capability	5 TTL loads
Three State Outputs	
Low level OFF state current (I_{LZ})	-100 μA MAX ($V_{OL} = 0.5 \text{ V}$)
High level OFF state current (I_{HZ})	100 μA MAX ($V_{OH} = 2.4 \text{ V}$)
Output short circuit current (I_{OS})	-50 mA typical
ENABLE CONTROLS ($\overline{\text{HBE}}$, $\overline{\text{MBE}}$, $\overline{\text{LBE}}$)	
Logic levels	DTL, TTL compatible
Loading	1 TTL load
Propagation Delay	850 ns typical, 2 μs maximum
Power Supply	
Voltage	5 V-dc $\pm 10\%$
Current	650 mA typical, 850 mA maximum
Physical Characteristics	
Size	3.0 x 4.0 x 0.4 inch (76 x 102 x 10 mm)
Weight	6 oz. (178 grs) maximum

Absolute Maximum Ratings

Supply voltage	-0.5 V-dc to 7.0 V-dc
Input voltage	-1.0 V-dc to 5.5 V-dc
Input current	-10 mA to 5 mA
Output current	-50 mA to 50 mA
Storage temperature	-55°C to +135°C

Input (BCD) (degrees)	Output (Binary) (degrees)	
200	B1 = 180	B13 = 0.0439453
100	B2 = 90	B14 = 0.0219727
80	B3 = 45	B15 = 0.0109863
40	B4 = 22.5	B16 = 0.0054932
20	B5 = 11.25	B17 = 0.0027466
10	B6 = 5.625	B18 = 0.0013733
8	B7 = 2.8125	B19 = 0.0006866
4	B8 = 1.40625	B20 = 0.0003433
2	B9 = 0.703125	B21 = 0.0001717
1	B10 = 0.3515625	B22 = 0.0000858
0.8	B11 = 0.1757813	B23 = 0.0000429
0.4	B12 = 0.0878906	B24 = 0.0000215
0.2		

Input, Output Interface

The BCD inputs of Model 724 are labeled in degrees. For example 200 represents 200 degree input pin and 100 represents 100 degree input. If the input resolution is less than 7 decade, the unused low decade pins must be connected to ground. For example for 6-decade input, pins labeled .0001, .0002, .0004 and .0008, must be connected to ground.

Output data transfer on an 8-bit data-bus is shown in figure 2. The timing diagram for data transfer is shown in figure 3. Access time and recovery time for enable controls is shown in the timing diagram of figure 4. The output data is available 2 μ s after the input data is applied. When a logic low is applied to the enable controls, the corresponding data-bits are loaded on the 8-bit data bus. Enable control LBE transfers 8 LSBs, MBE transfers 8 middle data bits and HBE transfers 8 MSBs on the data bus.

Note that user should avoid having more than one register enabled on the bus at one time since the enabled outputs will deliver short circuit current into other enabled outputs wired together. While physical damage to the converter is unlikely, long-range affects of short circuit currents are unpredictable.

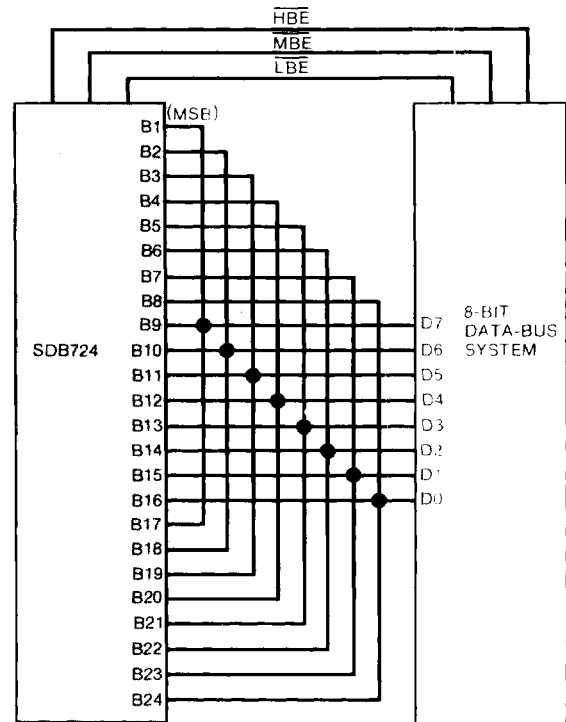


FIGURE 2 Output Connections for 8-Bit Data Bus

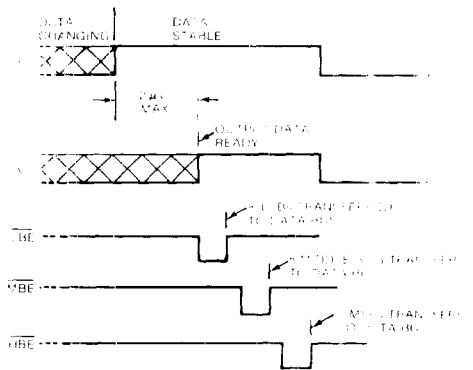


FIGURE 3 Data Transfer Timing Diagram

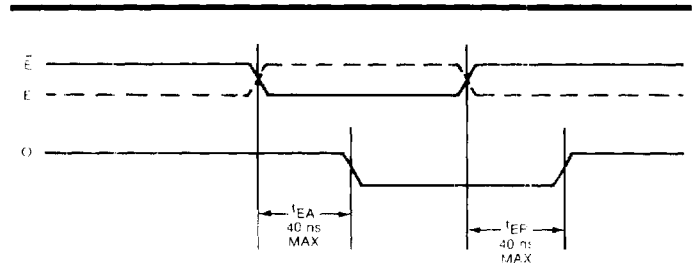
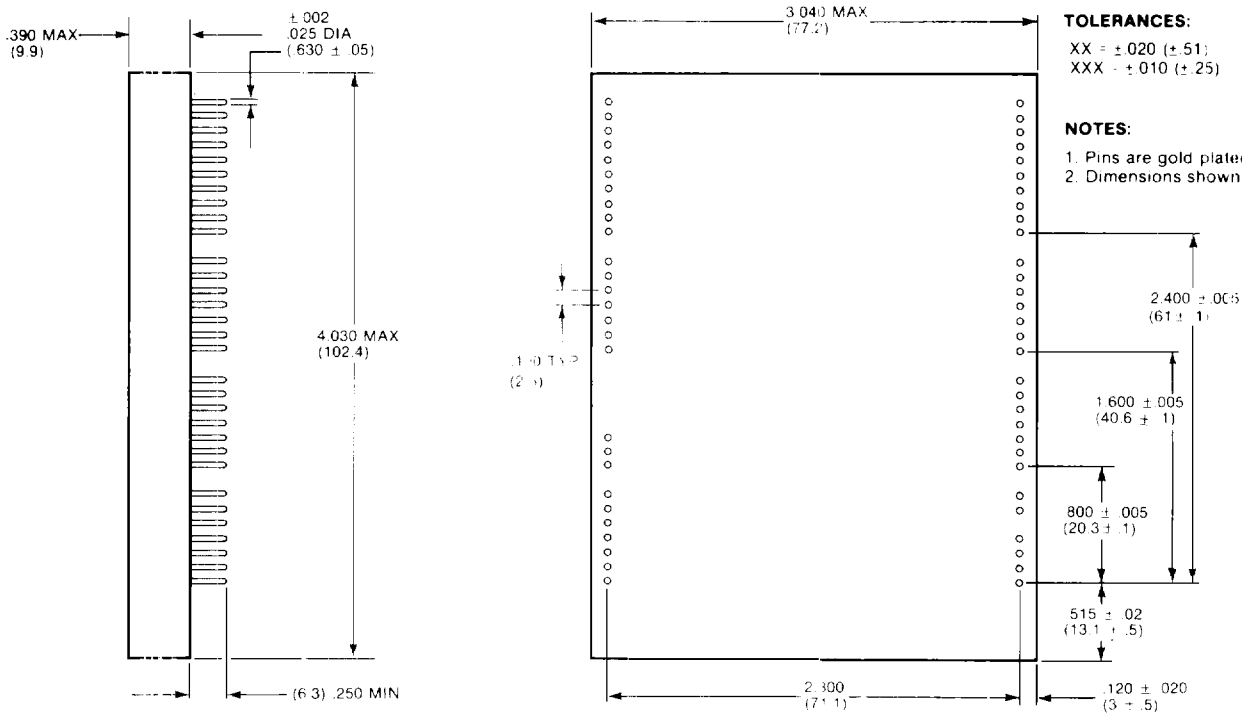


FIGURE 4 Enable Access Time and Recovery Time

Other Synchro Conversion products available from NATEL

- Hybrid (36-pin DDIP size) synchro (resolver)-to-digital converters with 10 to 16-bit resolutions (1000 series).
- Hybrid (36-pin DDIP size) digital-to-synchro (resolver) converters with 14 and 16-bit resolutions (2000 series)
- Transformer-Isolated, 16-bit synchro (resolver)-to-digital converter with 3-state output and 1.3 arc-minute accuracy (Model 1106, a 32-pin triple DIP hybrid)
- 1.5-VA output 16-bit microprocessor-compatible digital-to-resolver converter with double buffered inputs and 1 arc-minute accuracy (Model 2106, a 32-pin triple DIP hybrid)
- Solid State Control Transformer, 16-bit microprocessor-compatible, can be used in existing designs, (pin-compatible) offers high accuracy and improved performance (Model 3006, a 36-pin DDIP hybrid)
- Low profile (1.42"), transformer isolated, 1.3-VA output drive, 16-bit microprocessor-compatible digital-to-synchro (resolver) converter (Model 5001).
- 1 arc-minute accuracy, transformer isolated, 16-bit microprocessor compatible, 3-VA drive, digital-to-synchro (resolver) converter in (3.1x2.6x0.8 inch) size (Model 5101).
- Digital Trigonometric (Vector) Generator, 16-bit high accuracy four-quadrant multiplying sin/cos DAC (Model 5126).
- Low cost 14 and 16-bit digital-to-synchro (resolver) converters (Models 5114/5116).
- Synchro/resolver-to-digital converter with many pin-programmable features for testing D/S and D/R converters (Model 546).
- Two-speed synchro (resolver)-to-digital converters with 16 and 20-bit resolutions in a single package (Models 2SD402/2SD412).

BOTTOM VIEW



TOLERANCES:
 XX = ±.020 (±.51)
 XXX = ±.010 (±.25)

NOTES:
 1. Pins are gold plated (50 μinch min)
 2. Dimensions shown in inches and (mm)

MECHANICAL OUTLINE

Ordering Information

SDB724 - T M

Temperature Range
 1 = 0°C to +70°C
 3 = -55°C to +105°C

MIL - Specification
 S = Standard
 B = MIL-STD-883B

A wide range of other SYNCHRO CONVERSION products and application assistance is available from Natel. Application Notes can be requested when available and Natel's applications engineers are at your disposal for specific problems.

Other High Accuracy Synchro Products from NATEL

- 22-bit binary-to-7 decade BCD converter with 3-state output (SBD227)
- 20-bit digital-to-resolver converter with 3 arc-second accuracy (DSC5020)
- 22-bit synchro/resolver-to-digital converter with 6-arc second accuracy (SD/RD522)
- Two-speed logic combiner with 20-bit, 3-state output in a 1.3 x 2.6 x .35 inch size (TSL1X36)
- Dynamic Angle Simulator with IEEE interface, high accuracy and various programmable features (DAS200) — 5/84
- Angle Position Indicator with IEEE interface, high accuracy and various programmable features (API100) — 6/84

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