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WBK40

14-Channel Thermocouple Input Module

Features

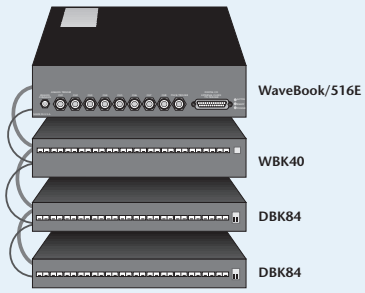
- **Add from 14 to 224 thermocouple inputs to the WaveBook/516E**
- **Provides linearized and cold-junction compensated readings for all thermocouple types**
- **1.0 ˚C or better accuracy for most ranges and TC types**
- **Consumes no measurement bandwidth from the WaveBook/516E**
- **Open TC detection per channel**
- **Each TC channel can also be used to measure ±100 mV**



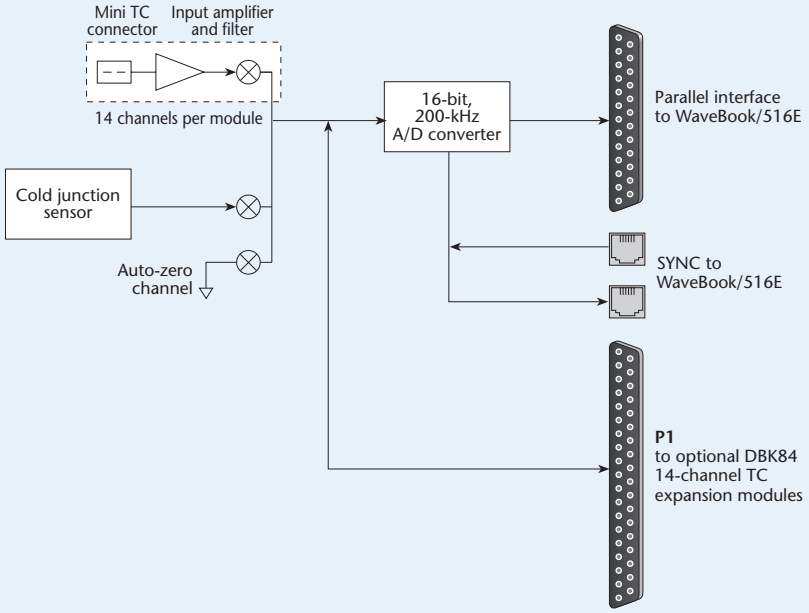
The WBK40 provides 14 to 224 TC inputs for WaveBook systems

The WBK40 attaches to any of the three parallel expansion ports on the WaveBook/516E, and provides 14 thermocouple input channels. Because the WBK40 has a built-in 16-bit, 200 kHz A/D converter, thermocouple measurements on the WBK40 do not consume valuable sampling time from the WaveBook's 1 MHz A/D converter. As a result, there are no speed implications to WaveBook or other WBK measurements when the WBK40 is attached.

WBK40 System Example



WBK40 Thermocouple Input Module Block Diagram



The 14 built-in TC channels on the WBK40 can accept any type of thermocouple, including types J, K, S, T, E, B, R, M, and N mini-TC connections on the front of the WBK40 make it quick and easy to attach thermocouples. The WBK40 can be expanded in 14-channel increments using the DBK84 TC expansion module. A total of 15 DBK84s can be attached to one WBK40, for a total TC channel capacity of 224 channels.

Built into the WBK40 is a 16-bit, 200 kHz A/D converter that samples all of the TC inputs, including inputs attached to the DBK84 expansion modules. The SYNC connection between the WBK40 and WaveBook/516E insure that thermocouple measurements on the WBK40 are synchronized with higher-speed measurements on the WaveBook. WaveBook software automatically accomodates for the difference in sampling rates between the WaveBook and WBK40, insuring that there is exact time correlation between readings from both devices.

The WBK40 automatically performs thermocouple linearization and cold-junction compensation, providing accurate and stable temperature readings in either ˚C, ˚F, or ˚K. Typical TC accuracy is better than 1.0 ˚C, with channel-to-channel variation and noise typically better than 0.2 ˚C.

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WBK40

Specifications & Ordering Information

In synchronous master/slave systems or when using a WBK40 module, it is possible to run the slave units at a slower clock rate than that of the master device in the system. This configuration may be necessary when it is desirable to have a systems which has signals that need to be sampled at widely varying rates while remaining time synchronous to the master unit.

When such a configuration exists the master unit is connected to the slave or WBK40 via the SYNC ports. The SYNC ports allow the master unit to pass its trigger and acquisition clock signals to the slave devices. When the slave devices receive the clock they can divide the master clock by 1 to 65,535 to determine their own acquisition clock rate. Each slave can be programmed to a clock divider independent of other slave units in the system. For example, suppose that a high speed system is configured with 8 accelerometers on the master WaveBook system but we also need to scan 8 much slower moving temperature using a WBK40. In this example, suppose the 8 accelerometer channels are scanned at 100 kHz each while we need to only scan the WBK40 temperature channels at 10 kHz. Here, since we wish to scan the temperature channels 10 times slower than the accelerometer channels, the WBK40 clock divider would be set to 10. This configuration results in the 8 accelerometer channels to be scanned every 10 µs while the temperature channels on the WBK40 will be scanned every 100 µs.

Specifications

General

Supply Voltage Range: 10 to 30 VDC
Power Available for DBK84 Expansion Options: ±15V @ 500 mA, +5V @ 1000 mA; up to eight DBK84 options can be powered from the WBK40; for applications with 9 to 15 options, a DBK32A must be added to the system
Operating Temperature: 0 to +50 °C
Storage Temperature: -40 to +80 °C
Relative Humidity: 0 to 95%, non-condensing
Vibration: MIL STD 810E
System Connector: DB37 male for P1
TC/mV Connector: Mini-TC connectors
Dimensions: 285 mm W x 220 mm D x 70 mm H (11" x 8.5" x 2.70")
Weight: 1.6 kg (3.5 lbs)

TC Accuracy at Measurement Temperature in °C (±°C)											
Type	Min	Max	-100	0	100	300	500	700	900	1100	1400
J	-200	760	0.8	0.7	0.7	0.8	0.9	0.9	—	—	—
K	-200	1200	0.9	0.8	0.8	0.9	1.1	1.1	1.2	1.3	—
T	-200	400	0.9	0.8	0.8	0.8	—	—	—	—	—
E	-270	650	0.8	0.7	0.7	0.7	0.8	—	—	—	—
S	-50	1768	—	3.1	2.4	2.0	2.0	1.9	2.0	2.1	2.1
R	-50	1768	—	3.1	2.1	2.0	1.9	1.9	1.7	1.9	2.0
B	50	1780	—	—	—	4.9	3.2	2.8	2.4	2.3	2.0
N28	-270	400	1.2	0.9	0.9	0.9	—	—	—	—	—
N14	0	1300	—	0.9	0.9	0.9	1.1	1.1	1.2	1.3	—

A/D Specifications

Type: Successive approximation
Resolution: 16 bit
Conversion Time: 5 µs
Maximum Sample Rate: 200 kHz
Nonlinearity (Integral): ±1 LSB
Nonlinearity (Differential): No missing codes

Thermocouple Inputs

Functions: TC types J, K, S, T, E, B, R, N; x100 (voltage)
Inputs: 14 differential TC/mV inputs
Input Voltage Range: ±100 mV
Input Impedance: 40M Ohm (differential)
Input Bandwidth: 4 Hz
Input Bias Current: 10 nA typ
CMRR: 100dB typ
Maximum Working Voltage (signal + common mode): ±10V
Over-Voltage Protection: ±40V
Voltage Accuracy: ±(0.2% of rdg +50 µV)
TC Accuracy: Valid for one year, 18 to 28 °C, see table above
Minimum Resolution: 0.1 °C for all TC types

Input Sequencer

Scan Clock Sources: 2
1. Internal, programmable from 5 µs to 5.96 hours in 5 µs steps*
2. External, TTL level input up to 200 kHz max

Depth: 512 locations
Channel-to-Channel Scan Rate: 5 µs per channel, programmable
Data Buffer: 64 Ksample FIFO

External Acquisition Scan Clock Input

Maximum Rate: 200 kHz
Clock Signal Range: 0V to +5V
Minimum Pulse Width: 50 ns high, 50 ns low
External SYNC Port: Available on rear panel, allows WBK40 to be synchronized with a WaveBook/516E

Note: The WBK40 and WBK41 are not currently supported in WaveView. We recommend using DASYLab® when using these modules, which includes full support for the WBK40/41. The WBK40/41 are also supported in LabVIEW®, and DaqCOM. If it is necessary to use these modules in conjunction with a WaveView application, then it is necessary that a second, concurrent application be launched to acquire data from the WBK40/41 into separate data files.

Ordering Information

Description	Part No.
14-channel thermocouple input module for the WaveBook/516E	WBK40
14-channel expansion module for the WBK40	DBK84
56-channel thermocouple input module	DBK90

Accessories & Cables

Rack mount kit	RackDBK4
Expansion cable for connecting DBK84 options; specify number of DBK84 options (x) to be connected	CA-37-x
Expansion cable for connecting to DBK expansion products,	
2.5 in expansion cable	CA-37-1T
4.5 in expansion cable	CA-37-3T
5.5 in expansion cable	CA-37-4T
11.5 in expansion cable	CA-37-8T
SYNC cable for multiunit synchronization; 1 ft.	CA-74-1
5-pin male DIN to 5-pin male DIN provides convenient connection between WBK40 power input connectors and battery packs	CA-115
5-pin DIN to automobile cigarette lighter power cable, 8 ft.	CA-116

Male Connectors for Subminiature TC Jacks

Type J male connector	CN-144-JM
Type K male connector	CN-144-KM
Type T male connector	CN-144-TM

Product Compatibility

✔ WaveBook

* Clock does not apply when SYNC'd to a WaveBook

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