



**COMPUTER
CONVERSIONS
CORPORATION**

www.computerconversions.com

6 Duntun Ct, E Northport, NY 11731 (631) 261-3300 Fax: 261-3308

HSDCK/HRDCK SERIES

**HIGHEST ACCURACY
SYNCHRO & RESOLVER
TO DIGITAL CONVERTERS**

FEATURES

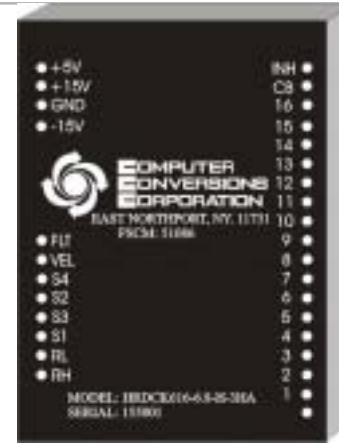
- 16 Bit, 39 Arc Seconds
- "Whole-Converter-Product" no external components required, true field voltage inputs, assured accuracy and dynamics performance.
- 100% Transformer Isolated Reference Inputs.
- Internal Synthesized Reference Input, accomodates Phase Shift to $\pm 60^\circ$.
- True Ratiometric-Type II Tracking Converters.
- Excitation Frequencies: 47 to 10,000Hz.
- Insensitive to Freq or Amplitude Variations.
- Repeatable, Dynamic, Lag-Free Outputs.
- Compact 1.6" x 2.2" Package.
- Commercial & Extended Temp. Grade Models.
- Encapsulated for Safety / Shock / Vibration, Moisture / Flame Retardant Non-Feeding.

DESCRIPTION:

HSDCK and HRDCK series are the highest accuracy, miniature tracking synchro and resolver to digital converters in the marketplace. They are designed specifically for ultra precise requirements in the most demanding industrial and military applications.

Models are available with either low cost differential inputs, or internally transformer isolated inputs for military and the most demanding industrial applications.

No external signal conditioning, critical dynamics, front-end components, or circuitry is required. The HSDCK/HRDCK series accepts direct field voltage synchro or resolver inputs, and converts them into real-time, accurate, natural binary digital data. Provided as a complete plug-in solution, accuracy and performance is assured from the field signals to the digital user. All units are shipped with printed test data.



All the high voltage components and transformers are conformally coated and safely contained in a flame retardant non-feeding encapsulated medium with a durable through hole solder mounting for added containment and resistance to shock and vibration, designed for MIL-STD-202 environmental compliance.

The built-in-self-test provides a continuous report for loss of reference, loss of input signal detect, over-speed, and over-acceleration.

The HSDCK/HRDCK series are value-added whole converter solutions, designed for easy and guaranteed trouble free operation in the most demanding industrial and military applications.

APPLICATIONS

- Military Servo Control Systems
- Artillery Fire Control Systems
- Antenna, Radar & Sonar Systems
- Avionic Systems & Instruments
- Robotics & Manipulators
- Naval Networks & Navigation
- Multi-Axis Motor Controls
- GPS & Navigation Systems
- Fuel Road Positioning Systems
- Vehicular Control Systems
- Semiconductor Water Handling
- Engine Controls & Turbines
- Commercial & Extended Temp. Grade Models
- Encapsulated for Safety/Shock/Vibration, Moisture/Flame Retardent Non-Feeding

THE CONVERTERS:

The HSDCK/HRDCK series are high performance, transformer isolated, tracking, ratiometric; synchro/resolver to digital converters, with internal built-in-test; having internal solid state type two servo loops that track the absolute position displacement, real-time, providing a crisp, virtually dynamic response, very high accuracy, repeatability, and resolution 16 bits wide.

Because the converter employs the use of a type II servo loop, the converter tracks the input angle real-time without velocity lag error, the output data is dynamic, always fresh, and continuously available. Only a minimum recoverable lag may occur with extremely large excessive accelerations, at which point the data is valid with minimum lag and the fault output bit will be cleared to zero = fault (automatically recovers).

This type II servo essentially closes its loop on the tangent expressed as the ratio of the sin/cos of the input angle, making this ratiometric conversion technique inherently insensitive to absolute amplitude and frequency variations, additionally; because the complex windings in the field mounted sensors themselves expand and contract together, though their absolute voltages may vary; the ratio of the sensor outputs preserve the ratiometric accuracy, thereby this ratio-conversion technique inherently provides the converter with automatic temperature compensation on the field mounted synchro/resolver sensor itself.

A small <1LSB hysteresis is injected into the loop to assure that the data outputs are crisp, stable and jitter-free, and to assure true 1 bit monotonicity (every single bit state must be successively discernible, no jumping of bits).

Data made available to the outputs is continuously updated (tracking) without interruption; output data is stable, accurate, and always fresh up to the maximum tracking rate of the converter.

ISOLATED REFERENCE INPUT:

The high impedance isolated reference input is self-saturating to accommodate large reference variance without damage, is MIL-T-27 compliant, meets the isolation and power mandates of MIL-STD-1399, compliance for MIL-S-20708 referenced systems and provides a full 500 VDC minimum breakdown voltage (high-pot).

The unique micro-transformer design maintains a very high impedance on the reference inputs regardless of any potential mode of failure. This prevents the synchro-

resolver signals and reference (often feeding other users) from being adversely loaded even in the unlikely event of failure.

The use of internal Isolation Transformers on the reference inputs provides phasing flexibility, immunity from ground loops or ground reference induced noise, and are an effective barrier to prevent any electrical noise on the reference source input from effecting the users digital control system and DC supply rails.

Because the AC Reference source is commonly shared or tied to many different destinations (other hardware) in a typical system; isolation on the reference inputs protects not only the user circuitry of the converter, but also every user tied to the reference source in the system. When integrated on applications as add-on hardware; the isolation assures the user that the add-on hardware is non-obtrusive, and causes no conflict with any existing apparatus.

SYNTHESIZED REFERENCE:

Synthesized reference input to accommodate phase shift of up to $\pm 60^\circ$ between the reference input source and the signal inputs without degradation. This synthesized reference allows these converters to achieve the very high 39 arc seconds accuracy while accommodating very long cables and the large phase shifts typically found in high accuracy synchros and resolvers.

TIMING AND INTERFACE:

The output data changes respective of realized displacement on the input angle and in proportion to speed. The output data is monotonic, whereby the every 1 least significant bit of change is realized on the output with no missing counts. A 0.5 to 1.5 microsecond "Converter Busy" (C/B) pulse is generated the instant the data output is being incremented/decremented, and stabilized within 1.5 microseconds respective of the C/B's leading edge.

Interface considerations range from monitoring the C/B, to using the "Inhibit" (INH) signal input to latch the data on command. A low level inhibit occurring during a C/B will be ignored until the new data is set on the outputs.

DATA TRANSFER ON DEMAND-LATCH INPUT:

When the /INH. (Inhibit) input is cleared to zero; within 1.5 Usec. all data bits are latched, and data is valid to be read. Release the Inhibit line within 5 Usec. or sooner to prevent stalling the converter.

The INH line may also be used to capture real-time position



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SALIENT SPECIFICATIONS

MODELS: HSDCK & HRDCK

	616	416	2516
Frequency:	60 Hz.	400 Hz.	2500 Hz.
Frequency Range:	47 to 440 Hz.	360 to 1200 Hz.	2000 to 4800 Hz.
Resolution:	16 Bits	16 Bits	16 Bits
Accuracy: <i>-HA Models</i>	±1 Arc Minute, +1 LSB Nominal @ Rated Frequency ±40 Arc Seconds Nominal @ Rated Frequency		
Tracking Rate(RPS):	0.625	4	8
Acceleration: <i>for a 1 LSB lag:</i> <i>Constant (Ka):</i>	10.843 1973	271.077 49348	0/sec./sec. 0/sec./sec.
Step Response (for 180° step):	700 msec.	320msec.	
Digital Output:	Parallel Positive Logic TTL/DTL Compatible, 16 Bits Binary Angle Data. 5 Std TTL Load Fan-Out		
Inhibit:	Logic "1" or "Open" = Data Update Logic "0" or "Gnd" = Data Freeze		
Converter Busy:	(C/B) Positive Pulse, .5 to 1.5 Usec Duration During Output, Logic "1" = C/B, 2 Std. TTL Load Fan-Out		
Bite Output (Built-In-Test):	Logic "1" = Normal Converter Tracking Logic "0" = Converter Fault Condition TTL Logic, .5 TTL Load Fan-Out Fault Indicates Loss of Reference, Signal, Overspeed, Over-Accel and Tracking Loss		
Reference Inputs:	115 VRMS into 360K Ohms Min. L-L 40 VRMS into 200K Ohms Min. L-L 26 VRMS into 100K Ohms Min. L-L		
Signal Inputs:	6.8V. L-L into 70K Ohms Min. L-L Balanced 11.8V. L-L into 100K Ohms Min. L-L Balanced 115V. L-L into 200K Ohms Min. L-L Balanced		
Breakdown Voltage Highpot:	To 500 VDC Min. Highpot on Reference Input (Isolated)		
Phase Shift:	±60° Reference to Signal Inputs		
Power Supplies:	± 15 VDC Powered Models: +5 VDC @ 40ma. +15 VDC @ 10ma. -15 VDC @ 40ma. ± 12 VDC Powered Models: +12 VDC @ 11.25ma. -15 VDC @ 50ma.		
Temperature:	(operating): 0°C to +70°C -1 units, 40°C to +85°C -3 units (Storage): -55°C to +125°C		



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data synchronized to a time stamp, camera strobe, or to capture several axis of data simultaneously on coordinated axis' control schemes.

ASYNCHRONOUS DATA TRANSFER -BUSY OUTPUT:

Alternatively, the C/B (converter Busy) output may be used; it will occur as fast as the max. specified tracking rate for the resolution selected (up to every 5.1 Usec. at it's fastest rate depending on the speed of the inputs changing).Data is available to be read on the trailing edge.

For simple Display type devices, the converters will be free running and use of the inhibit or C/B line may not be required.

PACKAGE:

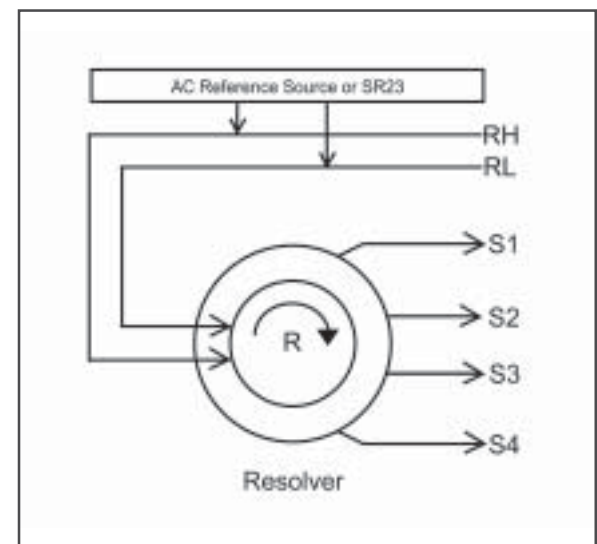
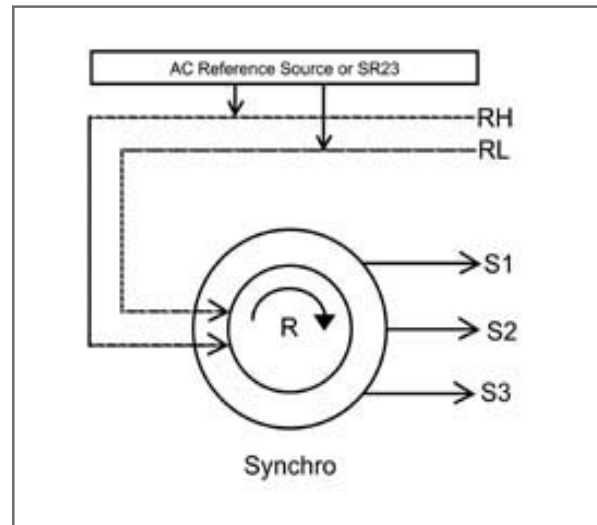
The complete converter including internal transformers, and requiring no external components, w/std. .020 dia. pins, on .100" centers, with a low 0.5" H. profile.

SAFETY AND CONSTRUCT:

All modules are encapsulated in an inert polymer that is self-extinguishing, flame retardant to U.L. 94VO, and will not feed or combust. Printed Circuit card material is flame retardant FR4, assemblies are conformal-coated for moisture resistance. Transformers are manufactured to MIL-T-27 and capable of withstanding high-pot to 500VDC. Case is flame resistant glass filled Diallyl Phthalate per MIL-M-14. Because all the high voltage circuitry is encapsulated within the self-extinguishing and flame retardant potting material: added protection is provided with

respect to the potential for component failure, shock and vibration. Military applications.

MIL-STD-202 ENVIRONMENTALS		
ENVIRONMENT	METHOD	CONDITION
Shock: 100g, 11ms	213	A
Vibration: 10G, 2k Hz	204	C
Thermal Shock	107	A
Moisture	106*	-
Salt Spray	101	B
Altitude	105	B



MIL-STD-202 ENVIRONMENTALS & OUTPUT PHASING DETAILS

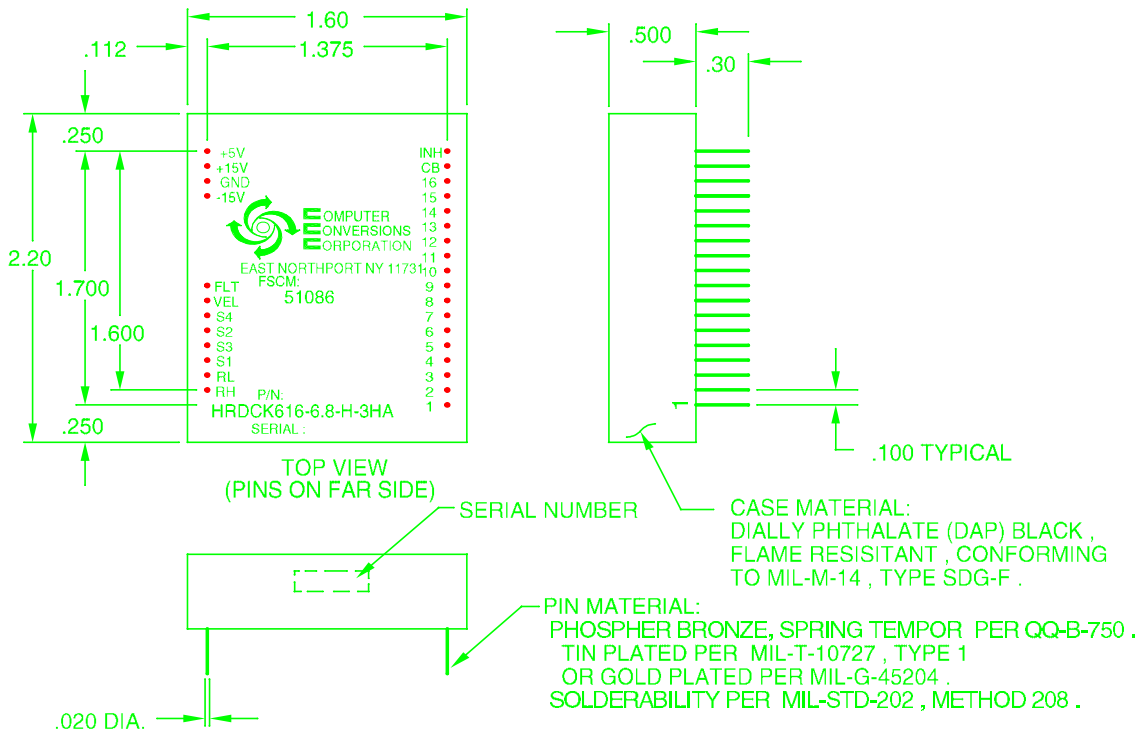
Notes:

- 1) Environmentals applies to and -3 suffix temp. variants.
- 2) *When conformally coated on PCB.
- 3) Guaranteed to meet these environmental test criteria.

MIL-STD-1399 & MIL-S-20708

Designed for compliance with MIL-STD-1399 DOD Interface Standard for Shipboard Systems, Electric Power, AC Reference and Signal, Power and Isolation Mandates, and those of MIL-S-20708 for Synchro's.

Mechanical Outline:



NOTES :

1. EXAMPLE PART NUMBER SHOWN .
2. PIN "S4" USED ON RESOLVER UNITS (HRDCK) ONLY .

Model Selection Guide:

