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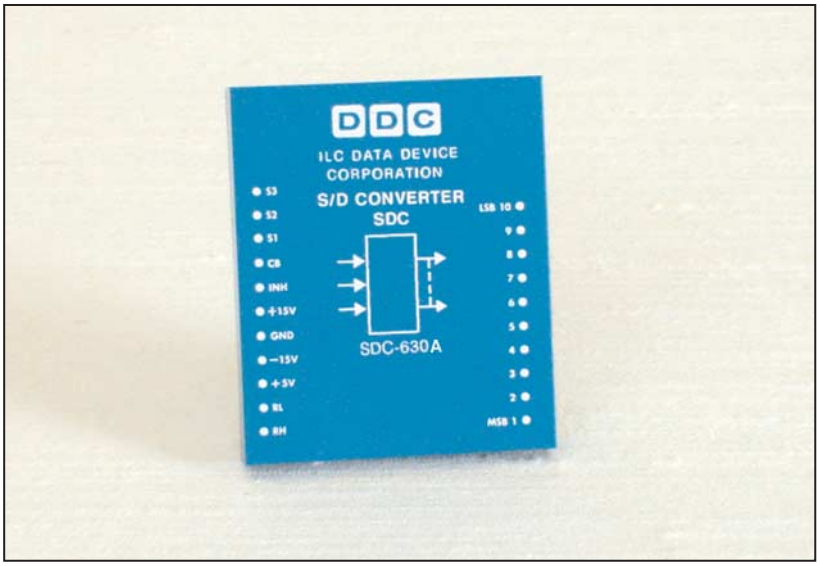
DDC on Board®

SDC-630/632/634* A/ST

10-, 12-, OR 14-BIT SYNCHRO-TO-DIGITAL/ RESOLVER-TO-DIGITAL CONVERTER



FEATURES

- Low Cost Pin-for-Pin Replacement for SDC-630/632/634 Series. For all New Designs.
- Industry Standard Low Profile Modular Converters
- Accuracy:
  - 10 Bit: 21 Minutes
  - 12 Bit: 8.5 Minutes
  - 14 Bit: 4 Minutes, 0.9 LSB or
    2.6 Minutes (High Accuracy)
- Options (Consult Factory):
  - Velocity Input
  - BIT: Built-In-Test
  - 16-Bit Resolution

DESCRIPTION

The SDC-630/632/634 A/ST series are low cost, low profile Synchro-to-Digital (S/D) and Resolver-to-Digital (R/D) tracking converters with standard pin configurations. They use a unique control transformer algorithm that provides inherently higher accuracy and jitter-free output. Utilizing a type II servo loop, these converters have no velocity lag up to the specified tracking rate, and output data is always fresh and continuously available. Each unit is fully trimmed and requires no adjustment or field calibration.

APPLICATIONS

These converters may be used wherever analog angle data from a synchro or resolver must be rapidly and accurately converted to digital form for transmission, storage or analysis. Because these units are extremely rugged and stable, and meet the requirements on MIL-STD-202E, they are suitable for the most severe industrial, commercial and military applications. Military ground support and avionics uses include ordnance control, radar tracking systems, navigation and collision avoidance systems.

* Patented

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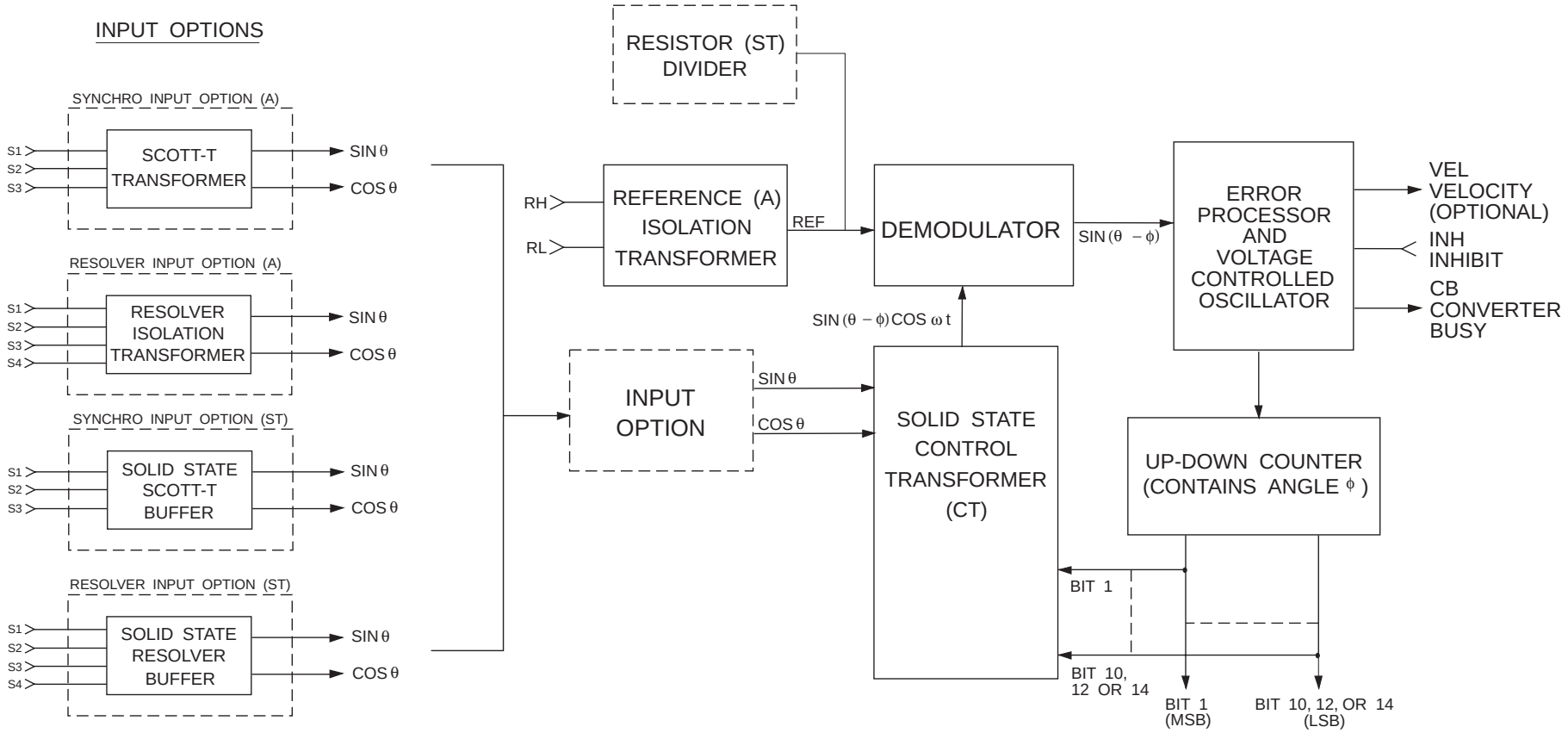


FIGURE 1. SDC-630/632/634 A/ST BLOCK DIAGRAM

TABLE 1. SDC-630/632/634 A/ST SPECIFICATIONS

PARAMETER	VALUE		
	SDC-630	SDC-632	SDC-634
RESOLUTION	10 bits	12 bits	14 bits
ACCURACY			
Standard Units	±21 min	±8.5 min	±5.3 min
High Accuracy Option	—	—	±2.6 min
SIGNAL AND REFERENCE INPUT	Signal Frequency Range	Signal Input Impedance (L-L Balanced, Resistive)	
		A*	ST
Synchro Input			
90V L-L, 400 Hz (Option H)	350-1000 Hz	148 kΩ min	123 kΩ
90V L-L, 60 Hz (Option I)	47-1000 Hz	148 kΩ min	123 kΩ
11.8V L-L, 400 Hz (Option L)	350-1000 Hz	19 kΩ min	52 kΩ
Resolver Input			
90V L-L, 400 Hz (Option H)	350-1000 Hz	148 kΩ min	—
26V L-L, 60 Hz (Option M)	350-1000 Hz	42 kΩ min	—
11.8V L-L, 400 Hz (Option L)	350-1000 Hz	19 kΩ min	70 kΩ
REFERENCE INPUT	Reference Voltage Range	Reference Input Impedance (Resistive)	
Options H, I	40-150 Vrms	300 kΩ min	270 kΩ
Options M, L	10-50 Vrms	80 kΩ min	60 kΩ
*Transformer Isolated. Other voltages and frequencies available on special order.			
DIGITAL INPUT/OUTPUTS			
Logic Type	TTL/CMOS Compatible		
Inhibit Input (INH)	Logic "0" inhibits Does not interrupt converter tracking.		
Outputs			
Type	TTL/CMOS		
10, 12, 14, (For 16 Consult Factory) Parallel Data Bits	Natural Binary Angle; Positive logic		
Converter Busy (CB)	0.5 to 1.5 µsec positive pulse. Data changes on leading edge.		
Drive Capability	1 Std. TTL load		
Built-In-Test (BIT) (Special Order, Consult Factory)			
VELOCITY OUTPUT (SPECIAL ORDER)			
Polarity	Positive Output for increasing angle		
Std. Voltage Range (Full Scale)	±4 Min (Other ranges available; Consult Factory)		
Scaling			
Option H, L	0.6 V per RPS (nominal) 10 V = 15 RPS		
Option I	3.3 V per RPS (nominal) 10 V = 2.7 RPS		

TABLE 1. SDC-630/632/634 A/ST SPECIFICATIONS (CONTD)

PARAMETER	VALUE		
POWER SUPPLIES	+15 V Supply	-15 V Supply	+5 V Supply
Nominal Voltage			
Range	+11 to +16.5 V	-11 to -16.5 V	+4.5 to +5.5 V
Maximum Voltage			
Without Damage	+18 V	-18 V	+7 V
Current (All)	20 mA	25 mA	10 mA
TEMPERATURE RANGES			
Operating			
-1 Option	-55°C to +105°C		
-3 Option	0°C to +70°C		
Storage	-55°C to +125°C		
PHYSICAL CHARACTERISTICS			
Size (Encapsulated Module)	3.125 x 2.625 x 0.43 inches (7.94 x 6.67 x 1.07 cm)		
Weight	4 oz (113 gm.)		

NOTE: These specifications apply over temperature range, power supply range, reference frequency and amplitude range, ±10% signal amplitude variation, and up to ±10% harmonic distortion in reference input.

POWER SUPPLIES

The main power supplies can vary over the specified ranges with no change in converter specifications, except for a proportional change in maximum tracking rates.

When testing or evaluating the converters, it is advisable to limit the current in each of the supplies. Set each current limit 50% greater than the maximum current listed for that supply as listed in TABLE 1.

TIMING

FIGURE 2 shows the converter timing waveforms. Whenever an input angle change occurs, the converter changes the digital angle in 1 LSB steps, and generates a Converter Busy (CB) pulse. The CB is a positive pulse 0.5 to 1.5 µsec long. Data changes on the leading edge of the CB pulse, and data can be transferred 0.5 µsec after the leading edge.

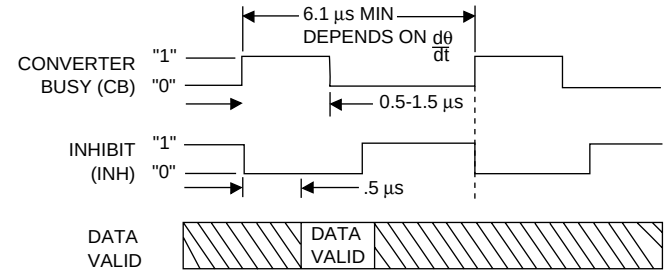


FIGURE 2. SDC-630/632/634 A/ST TIMING DIAGRAM

TABLE 2. SDC-630/632/634 A/ST DYNAMIC CHARACTERISTICS									
Bandwidth (non F carrier)	60 HZ				400 HZ				UNITS
Carrier Frequency Range	47 - 1,000				360 - 1,000 (ST to 5,000)				Hz
Bandwidth (Closed Loop)	15				100				Hz
Ka	1,100				48,000				1/s
A1	0.1				1				1/s
A2	7,600				48,000				1/s
A	33				220				1/s
B	16.3				110				1/s
RESOLUTION	**10**	**12**	**14**	**16**	**10**	**12**	**14**	**16**	**UNITS**
Tracking Rate (rps)									
Typical	28.5	7.1	1.8	0.45	192	48	12	3	rps
Minimum	24	6	1.5	0.37	160	40	10	2.5	rps
Acceleration (1 LSB lag)	370	93	23	5.8	17,000	4,220	1,050	260	$°/s^2$
Settling Time (179° step, max)	500	600	900	2,200	90	100	140	320	msec

The simplest method of interfacing with a computer is to transfer data at a fixed time interval after the Inhibit is applied. The converter will ignore an Inhibit during the "busy" interval until that interval is over. Timing is as follows: (a) apply the Inhibit, (b) wait 0.5 µsec, (c) transfer the data, (d) release the Inhibit. The Inhibit line has no effect on converter tracking.

SIGNAL INPUTS

To prevent damage to the inputs, the maximum steady-state voltage should not exceed the specified input voltage by more than 30%.

ACCOMMODATING NON-STANDARD INPUT VOLTAGES (A ONLY)

The signal and reference input levels can be resistively scaled to accommodate non-standard voltages, see FIGURE 3. Select a converter that is the next lower standard voltage, and the voltage is then scaled up by using resistors in series with the synchro and/or reference inputs.

For a synchro input (SDC), a resistor R_{SIG} is added in series with S1, S2 and S3 which is determined as follows:

R_{SIG} = 1.1k (New L-L Voltage – Standard Unit L-L Voltage)

That is, 1.1k for each volt above the design voltage level of the standard unit.

Example: An SDC-634A-L (11.8 V) is to be used at 50 V L-L.

R_{SIG} = 1.1k (50 – 11.8) = 42.2k

The closest available high grade resistor with a low temperature coefficient of resistance should be used, and the three resistors should be as closely matched to each other as possible. In general, a 0.1% difference will introduce 1.7 arc minutes of additional error due to the effect on SIN/COS ratio relationship.

The ABSOLUTE value of the resistor is not critical.

In the case of the RESOLVER version (RDC), the equation is:

R_{SIG} = 2.2k (New L-L Voltage – Standard Unit L-L Voltage)

The calculated resistors are connected in series with S1 and S2 respectively. Note only two resistors are required. The required resistance matching and its effect on accuracy, is the same as for a synchro input, see FIGURE 3. The Reference Voltage is treated in the same manner, but the value is not critical.

R_{REF} = 2.8k (New Reference – Standard Reference)

For this use a 10% tolerance resistor is adequate.

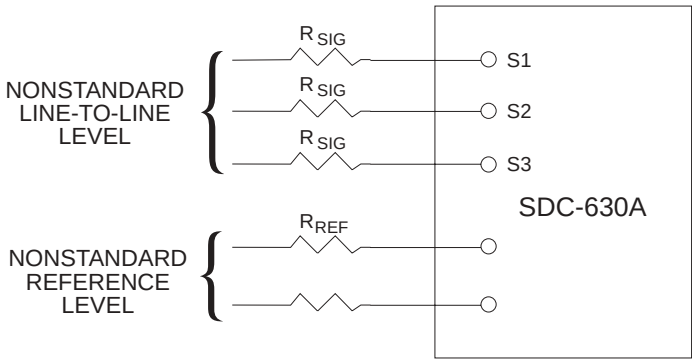
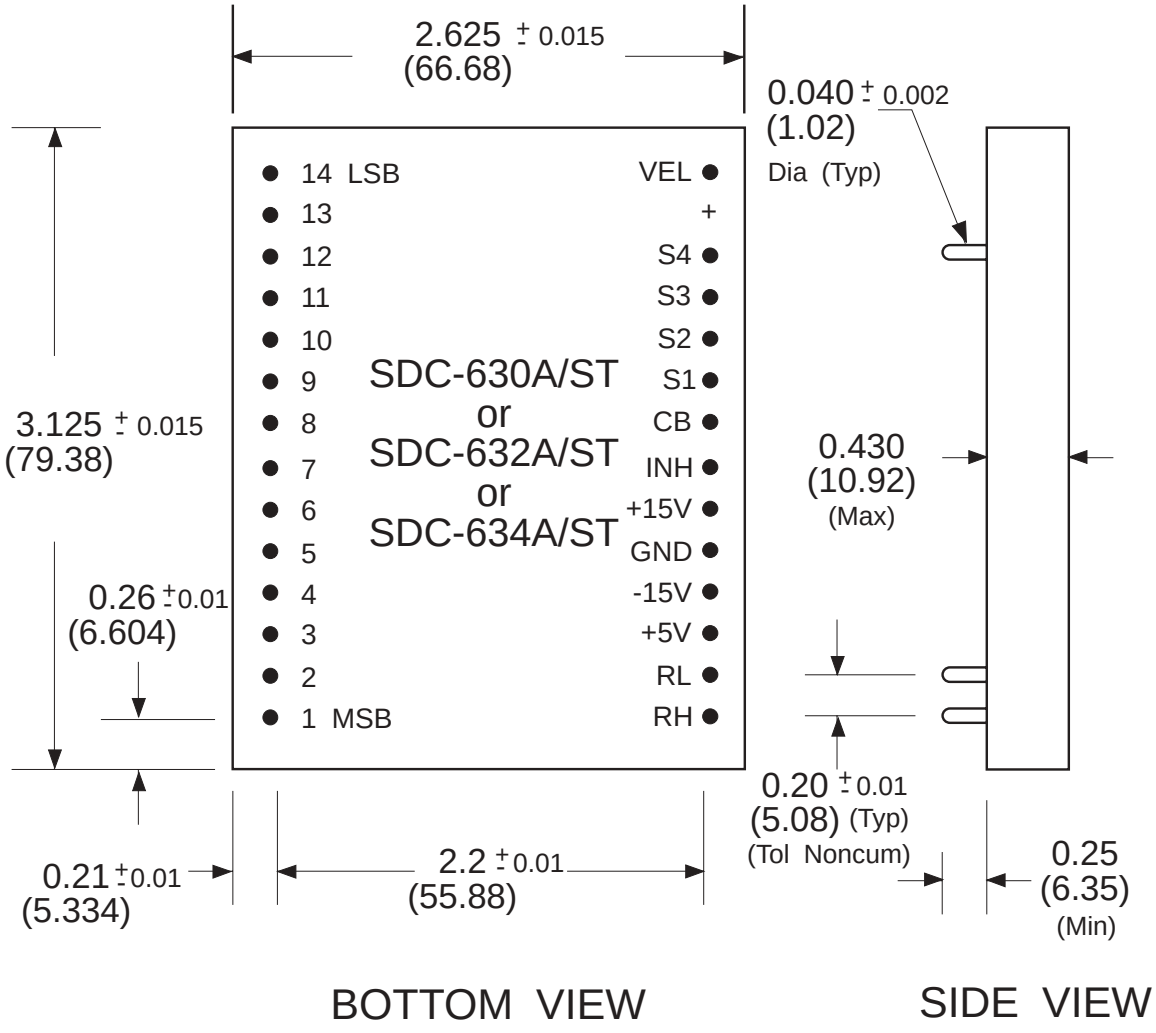


FIGURE 3. SDC-630/632/634 A/ST NON-STANDARD INPUT LEVEL SCALING

Dimensions are in inches (mm).



Note: VEL is not present on the standard product.
For VEL output contact factory.

FIGURE 4. SDC-630/632/634 A/ST MECHANICAL OUTLINE

ORDERING INFORMATION

XXX-XXX-X-X-X-X-X

Reliability Grade:
R = Enhanced Reliability *

Accuracy:
a = High Accuracy Version, ±2.6 Minutes (SDC-634 Only)

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

Signal Input Voltage and Frequency:
H = 90 V_{L-L}, 400 Hz (Synchro or Resolver)
I = 90 V_{L-L}, 60 Hz (Synchro Only)
L = 11.8 V_{L-L}, 400 Hz (Synchro or Resolver)

Transformer Type:
A = Internal Transformer
ST = Solid State

Resolution:
636 = 16 bits, Consult Factory
634 = 14 bits
632 = 12 bits
630 = 10 bits

Input Type:
SDC = Synchro
RDC = Resolver

Notes: * R version only available in -55°C to 105°C temperature range (Option 1)
For versions with Velocity or Built-In-Test, Please Consult Factory.

NOTES

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