AC-DC SYNCHRO TO DIGITAL INTERFACE

SDC910

INTRODUCTION

The interface converts synchro transmission to NMEA 0183 or IEC 61162 data. Applications include voyage data recorders, and ECDIS.

- **Rudder Sensor Angle**
- **Rudder demand**
- **Engine telegraphs**
- **Trusters**
- **Wind speed and direction**
- **Log speed**

The interface can convert rudder sensor ratios such as 4:1, selected by DIP switch. The option table shows more than 30 useful functions.

The AC/DC input voltage range is from 2 volts upwards. The input voltage is handled by plugging in the right value of resistors. They are standard 4-resistor networks easily available world-wide.

The AC-DC **SDC910** is an interface designed to complement the high precision, high speed tracking version KW910-M. They are the same size and pin compatible.

SPECIFICATION

INPUT 1: Synchro DC to 65 Hz. Reference 4 to 220v.
Phase voltage +/- 2 to 90 volts.
Input scaling resistors nominally, DC, 3.5K per volt per phase. AC, 5K per volt per phase.
Reference current 2mA, 500 ohms per volt.
The phases have a common connection at centre of the three phase scaling resistors to the isolated ground plane. Reference input and power is isolated.
Conversion is to an accuracy of +/- 1 degree at 1 per second.
Resistor selection and testing results requires a technician with the ability to read the data output.
Terminals: R1+, R2-, S1, S2, S3, ground plane.

INPUT 2: NMEA 0183 port. 4800 baud.
Pass-through option allows series connection (daisy chain) of interfaces
Rudder Sensor Angle option allows the input of a 2nd rudder angle or rudder demand
Wind option allows the input of wind speed.
Wind direction option allows this port to be used for wind speed anemometer pulses
XDR option: A second transducer value can be input via this port.
Message $PAMIT allows 3 external inputs to be combined in one sentence of 4 fields.

OUTPUT: 5v CMOS 5 mA via 47 ohms. NMEA 0183, RS422, RS232 compatible.
Data is 4800 baud NMEA 0183 format, per second. Refer to option list.

Gyro option: $HEHDT 1:1 synchro. The accuracy is 1 degree.

Rudder sensor angle: RSA does not necessarily = actual rudder angle. Interface outputs $ERRSA synchro transducer angle sentence with two values, first the interface's own angle, the second field taken from the first field entered via the NMEA input port. (Allows 2 rudders or rudder demand.)

Wind option: $WIMWV. The interface outputs wind speed OR direction. The speed field can be filled by input from the NMEA input port. (Including anemometer pulses.)

XDR option: XDR is the NMEA transducer sentence which may be used with an undefined sensor. Many XDR identities are available switch selectable. Outputs a $ERXDR synchro transducer angle sentence with two values, first the interface's own angle, the second field taken from XDR via the NMEA input port

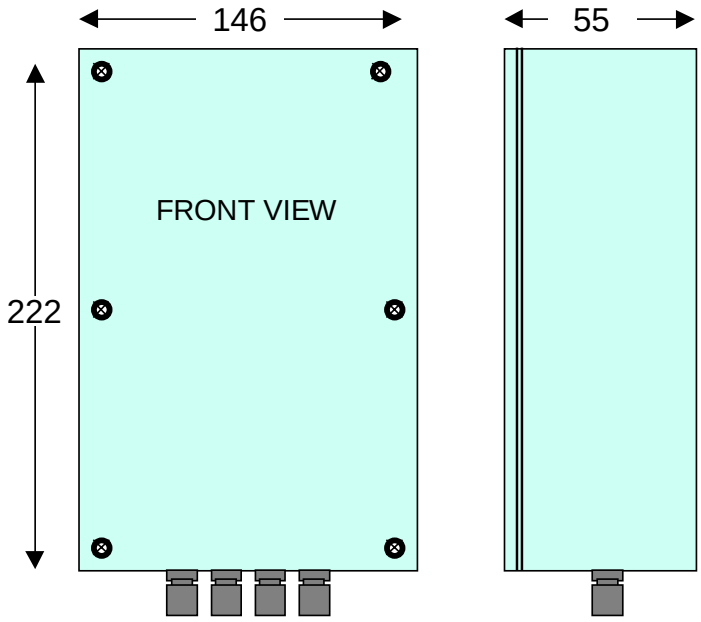
$PAMIT option: Thruster, dual telegraph. **$PAMIV option:** 3 voltages, or angle as a percentage.

POWER: 20 to 32 v DC at 0.1 amps.

ENCLOSURE: **Black texture powder coated** diecast box 222 x 155 x 55 mm for indoor bulkhead mounting.

CABLE ENTRY: Glands for 7 mm diameter cables.

FEATURES: LEDs on data in and out plus bicolour status led. Connections are plug-in terminal blocks.



13mm CABLE GLANDS

RATIOS, SCALE OFFSET AND ALIGNMENT:
Synchro is assumed 1:1 with a synchro natural zero = 0 degrees, midships etc. The SDC910 may be adjusted for an offset angle by inserting a correction in the EPROM.

The rudder sensor ratio can be changed to make the interface output actual angle, by using a table of 360 values in the EPROM.
More details are given in the option table and manual but this work can only be done by engineers familiar with binary, BCD, hexadecimal and EPROM programming.

SPECIAL INTERFACING:
The 3-wire DC telegraph transmission found on MV Serenade (maker still unknown) is specially catered for. The $PAMI,TEL,xx, sentence gives 12 values centred on 15 degree intervals.

Thomas Walker wind instruments with a “Desyn DC-synchro” transmission may be interfaced, theoretically, for we have not tried it yet. The Walker anemometer pulses are also convertible to speed. There are known to be other wind instruments using synchro and pulses which may now be interfaced.

Because it is so simple to do the interface can be used in as a 3-channel DC voltage input device, with a common line. (Example, DC potentiometer on three telegraphs using option 20.) Otherwise, it could be a floating differential sensor connected to two channels. This gives AMI the capability of interfacing practically any voltage sensor/transducer.

Wiring of multiple interfaces is eased because of the HE14 daisy-chain capability.

Any feedback or special requests, please contact us.
21/05/2006

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SDC910 option table for program SDC4 and later. 21/05/2006

Option	Switch	Data out	Data	
00	00 0000	$PADI,	S1, S2, S3, angle	Used for checking correct resistor selection
01	00 0001	$ERXDR	S1 %	Use for DC +/- input
02	00 0010	$ERXDR	S1, S2 %	"
03	00 0011	$ERXDR	S1, S2, S3 %	"
04	00 0100	$PADI	Test message	Used for development & to report abnormalities
05	00 0101	$HEHDT	Heading	1:1 ratio synchro
06	00 0110	$PAMI,TEL,xx,	12 values centred at 15 deg	For DC 3-wire telegraph transmission
07	00 0111	$PAMIT,xx,_1,_2 ,_3,	%	"xx" = local synchro as +/- %. Other fields from external input fields 1, 2, 3.
08	00 1000	$PAMIT,_1,xx,_2,_3,	%	"
09	00 1001	$PAMIT,_1,_2,xx,_3,	%	"
0A	00 1010	$PAMIT,_1,_2,_3,xx,	%	"
0B	00 1011	$ERRSA	Rudder sensor angle	1:1 ratio
0C	00 1100	$ERRSA	Rudder angle	4:1 rudder sensor. Translate table 0
0D	00 1101	$ERRSA	Rudder angle	3:1 rudder sensor. Translate table 1
0E	00 1110	$ERRSA	Rudder angle	2:1 rudder sensor. Translate table 2
0F	00 1111	$ERRSA	Rudder angle	Translate table 3 available for on-board use.
10	01 0000	$ERXDR	Transducer angle	Identity is as set on the switch
11	01 0001	$ERXDR	Transducer angle	"
12	01 0010	$ERXDR	Transducer angle	"
13	01 0011	$ERXDR	Transducer angle	"
14	01 0100	$ERXDR	Transducer angle	"
15	01 0101	$ERXDR	Transducer angle	"
16	01 0110	$ERXDR	Transducer angle	"
17	01 0111	$ERXDR	Transducer angle	"
18	01 1000	$ERXDR	Transducer angle	"
19	01 1001	$ERXDR	Transducer angle	"
1A	01 1010	$ERXDR	Transducer angle	
1B	01 1011	$WIMWV	Wind direction & speed	Wind direction. Speed by pulses into NMEA port.
1C	01 1100	$WIMWV	Wind speed	100 knots for 1 synchro rev. Wind direction by NMEA 0183 input.
1D	01 1101	$WIMWV	Wind direction	Wind Direction. Wind speed by NMEA 0183 input.
1E	01 1110	$VMVBW	Longitudinal Water speed	100 knots = 1 synchro rev 3rd quadrant is astern
1F	01 1111	$VMVBW	Longitudinal Water speed	48 knots = 1 synchro rev Volts input to NMEA port = astern
20 - 27		$PAMIV,ID,xx,xx,xx,	Three percentage values S1, S2, S3 to common.	
28 – 3F		$PAMIV,ID,xx,	Synchro angle as %	

- An offset angle may be applied to all options using location 5B 5C packed BCD in 10ths of a degree.

- 01, 02, 03. The ID number for these XDR messages are defined in locations 68H, 69H, 6AH. Default is "1, 2 and 3."

- 07 to 0A $PAMIT,xx,xx,xx,xx is used as AMI's thruster and telegraph sentence. Angle is translated to +/- 100 %.

- 0B. Rudder **sensor** angle does not always equal actual rudder angle.
- 0C. You can use an offset angle to correct for synchro angle, then use the translate table. Translate table is 360 values described in detail in the technical manual.
- 0B – 0F is dual rudder sensor angle. Input the second angle via NMEA input port.
- 1E. Loc 5F = low binary scaling for multiplier. 250 dec= 100 for a full revolution.
- 0F. Change pointer to translate table at hi-lo 5D 5E

- 10 – 1A. A second XDR sentence from a may be input, to be output added to the end of the $ERXDR output. The format is restricted so it can not combine all XDR messages.
- Location 64 is packed BCD base for XDR ID.
- Location 65 66 is the talker ID in ASCII.

- 1B. Wind speed pulses into the NMEA port are counted over a time period. For example, Thomas Walker's equipment give 1024 pulses per knot per minute, which works out to "speed = number of pulses in 590 milliseconds." The time period, in steps of 10 mS, is set in location 6DH. 59 = 3B hex. Time period range from 10 mS to 2.55 seconds. Max pulse rate 1KHz.
- 1D. Accepts wind speed via the NMEA 0183 input, to be combined in the WIMWV sentence.
- 1C. By look up table. Scale 0 to 100 but made zero for speeds greater than 94 knots to allow for synchro going "below" zero.

- 1E, 1F. Unused speed fields are sent as null fields.
- 1E. The speed may be considered as percentage of max rotation. The 3rd quadrant is astern. Speed goes from zero knots to 50 at the 180 degree synchro position, rising to 74.9. Astern speed is –25 to –0.1.

- Options 20 to 3F use switch as ID, added to the base ID set in location 64.

J2	0 (off) = receive and use NMEA data input.	1(on) = pass-through any NMEA 0183 data