CONTROL UNIT

Instruction manual

Order. No. 9.5033.90.201 9.5033.91.201 9.5033.91.211

NMEA 183 V 2.0

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1. GENERAL INFORMATION

The Control Unit essentially consists of the following components:

The transmitter electronics with

- Power Supply
- CPU with Wind-Interface
- RS 422 Interface for the LED Display
- RS 422 NMEA Data Interface (output)
  for NACOS and CUSTOMER
- RS 422 Data Interface (input) for NMEA HDT message
- RS 422 Data Interface (input) for NMEA VBW or VHW messages
- RS 422 Data Interface (input) for NMEA MWV message

The control Unit connects the different components of the measurement unit with each other over a measurement system and processes the following parameters:

- Wind Speed
- Wind Direction
- Air temperature
- Rel. humidity
- Barometric pressure
- Transverse ground speed, longitudinal ground speed
- Transverse water speed, longitudinal water speed
- Heading (Gyro), water speed (Log)

2. ERROR IDENTIFICATION

The Control Unit can identify hardware and software errors. It can also restart the program (LED "WD" lights up on the CPU) with the help of a RESET-logic (Watchdog) if the program run has malfunctioned. During normal operation, the LED "WD" on the CPU is off (see appendix for the position of the LED).

3. INPUT: SERIAL WIND INTERFACE / RS422 NMEA 0183 V 2.3 DATA INTERFACE WIND DIRECTION AND SPEED

SERIAL SYNCHRONOUS WIND INTERFACE

The digital input wind interface adapts the different data transmitters to the bus system. The digital input values are transmitted to the wind interface card and, from there, are called up once a second by the processor from a buffer storage.

Either a separate data transmitter for wind speed and for wind direction or a combined wind transmitter can be connected to detect ground level, horizontal components of the wind vector in a measuring range between 0.3 and 50 m/s.

When the distance between the wind transmitter and the control electronics is not great, the electronics system supplies the wind transmitter (or wind transmitters) together with its heating system with power. At greater distances (over 50 m) between the wind transmitter and the control electronics, there is a drop in voltage on the lines which leads to a reduced heating power. In this case, a terminal box with a heating transformer should be set up in the vicinity of the wind transmitter.

Wind Speed	:	pulse transmitter	:	0...1052 HZ
		meas. range	:	0,3...50,0 m/s
		resolution	:	0,1 m/s
Wind Direction	:	Code-Transmitter	:	8-bit serial
		meas. range	:	0...360 Degrees
		resolution	:	2,5 Degrees
Transmitter Power Supply	:	+5 V =		
Heater		24 V/ 50 Hz		max. 40 VA
Connecting cable	:	LiYCY 12x 0,75 mm²		
max. Length	:	for heating supply		
		from control unit:		approx. 50 m
		with a separate heating transformer:		
		approx. 500 m		

Type of Leads

21 pole *Siemens* plug connection WIND (Serial synchron or MWV message)

Pin-№	Key	
a1	+5V	Transmitter power supply (wind speed)
a2	GND	signal ground
a3	_⎍_	Wind speed pulse input
a4	Rx+	RS422 / RS485
a5	Rx-	RS422 / RS485
a6	GND	RS422 / RS485
b5	+5V	Transmitter power supply (wind direction)
b6	cl	Clock pulse output
b7	d	Wind direction data input
c1	⌐	Power supply heating
c2	⌙	Power supply heating
c3	⌐	Power supply heating
c4	⌙	Power supply heating
c7	PGND	non-fused earth contact and shield

MWV MESSAGES

- Type of interface
  Simplex, serial, asynchronous (RS422)

- Type of Leads (see SERIAL WIND INTERFACE above)

- Receiving cycle
  The serial input interface scans the received data every second using a timeout of 5 seconds. A maximum input rate of 10 telegrams per second is tested.

- Interface parameters
  The interface parameters can be set individually for each interface.
  Baudrate: 150 to 19200 Baud Default: 4800
  Transmission: 8N1, 7E1 Default: 8N1
  See: "Position of the DIP switch on the Multicom Assembly and
  Table 1 "Parameters to set the serial interface"

The data telegram has the following NMEA format:

MWV Wind direction and speed

Character	Key
$	Start of sentence
MI	Talker identifier: This information is not evaluated
MWV	Sentence identifier: Wind direction and speed
,	Separator (comma, Hex 2C)
xx.x	Decimal value of the wind direction in degrees
,	Separator (comma, Hex 2C)
R	Status: R = Relative wind
,	Separator (comma, Hex 2C)
xx.x	Decimal value of the wind speed in m/s
,	Separator (comma, Hex 2C)
M	Status: M values in m/s
,	Separator (comma, Hex 2C)
A	Status: A = data valid, every other character = not valid
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

- All characters are evaluated as ASCII codes
- The "frame" of the above listed characters in each telegram is obliging. The length of the included decimal values is variable and there may be included some more characters just before the checksum identifier, but the maximum number of characters must not exceed 100 (VBW, VHW) respectively 50 (HDT). Maximal 4 successive characters in the decimal value will be evaluated.
- The checksum is calculated by XOR-operation with all characters between the $ and the * (each exclusively). If the XOR-operation with all these characters (for example) results in the hexadecimal value 7E, then the ASCII characters for the checksum should be "7" (Hex 37) as high byte and "E" (Hex 45) as low byte.
- A decimal value is assumed to be valid, if
  - the inspection of the "frame" and the checksum is successful,
  - the conversion of the appropriate characters to a decimal value is successful,
  - and the related status byte (if there is any) is an "A".

4. SERIAL OUTPUT: RS 422 LED-DISPLAY

The data telegram of the acquired data is available at the serial output of the electronics for wind speed and wind direction in ASCII format for transmission to the LED display. The telegram contains two NMEA MWV-messages with both the relative, and the true wind. If an external switch is connected, you can toggle the display between relative and true wind.
The setting of the interface is programmed and can not be changed by the user:

The following parameters are set:

serial, asynchronous
simplex

Baud rate	:	4800	bit/s
Data length	:	8	bit
Parity	:	none	
Start-Bit	:	1	bit
Stop-Bit:	:	1	bit

4-pole Tuchel plug connection

Pin-No.	
1	Tx+
2	TX-
3	GND
4	shield (protective conductor)

Serial output telegrams for LED-Display

The data telegrams have the following NMEA formats:
MWV True wind LED

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MWV	Sentence identifier: Wind direction and speed
,	Separator (comma, Hex 2C)
ddd.d	Decimal value of the true wind direction in degrees
,	Separator (comma, Hex 2C)
T	True wind
,	Separator (comma, Hex 2C)
ss.s	Decimal value of the true wind speed in m/s
,	Separator (comma, Hex 2C)
M	Unit: meter / second
,	Separator (comma, Hex 2C)
A (a,V)	Status: A = data valid, a = data valid and display, V = not valid
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

MWV Relative wind LED

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MWV	Sentence identifier: Wind direction and speed
,	Separator (comma, Hex 2C)
ddd.d	Decimal value of the relative wind direction in degrees
,	Separator (comma, Hex 2C)
R	Relative wind
,	Separator (comma, Hex 2C)
ss.s	Decimal value of the relative wind speed in m/s
,	Separator (comma, Hex 2C)
M	Unit: meter / second
,	Separator (comma, Hex 2C)
A (a,V)	Status: A = data valid, a = data valid and display, V = not valid
*	Checksum identifier (Hex 2A)

Character	Key
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

- All characters are transmitted in ASCII codes
- Leading zeros are transmitted
- The decimal value of the true wind direction is referenced to the vessel (ship) unless the S3 code-switch on the CPU-board is set to “True wind referenced to earth” (open).
- The checksum is calculated by XOR-operation with all characters between the $ and the * (each exclusively). If the XOR-operation with all these characters (for example) results in the hexadecimal value 7E, then the ASCII characters "7" (Hex 37) as high byte and "E" (Hex 45) as low byte will be sent out.
- If the status of a decimal value is not valid, no decimal values are sent. In this case two separators (“,”) follow one after the other.
- Different from a normal NMEA sentence, the status can be set to “a” (lower case letter instead of an upper case letter). This character is used to control the LED-Display when the external switch true/relative wind is used.
- The two telegrams are transmitted once a second. First the relative wind and with a delay of 50 ms after the end of the first telegram the true wind is transmitted.

5. SERIAL OUTPUT: RS 422 NMEA 0183 V 2.0 DATA INTERFACE

NACOS and CUSTOMER INTERFACE

- Type of Interface
  simplex, serial, asynchronous (RS 422)

- Type of Leads
  5 pole Tuchel plug connection NACOS
  7 pole Tuchel plug connection CUSTOMER

Pin-No		
1	TX+	
2	TX-	
3	UND	signal ground
4	PGND	non-fused earth contact shield

- Transmitting cycle
  The transmitter electronics outputs a data telegram once a second.

- Transmission Parameters
  The transmission parameters can be set individually for each channel of the interface. To do this, unplug the instrument from the supply voltage and pull the multicom interface out of the transmission electronics.

  The parameters are 8 N1 or 7E1

  150…19200 Baud

  Baud rates are adjustable and have been set at the factory to 4800 bit/s.

DATA TELEGRAM NMEA 0183 V2.0

For Interface ATLAS-ELECTRONICS Thies-Vers 2.0 19.07.2001

Interface 1: NACOS
Interface 2: CUSTOMER

Five data telegrams are transmitted over each interface once a second. The time delay between each of the five data telegrams is 50 ms.

Serial output telegrams for NACOS and CUSTOMER interface

The data telegrams have the following NMEA formats:

MHU Humidity [1]

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MHU	Sentence identifier: Humidity
,	Separator (comma, Hex 2C)
hhh.h	Decimal value of the relative Humidity in %
,	Separator (comma, Hex 2C)
aaa.a	Decimal value of the absolute humidity in g/m³
,	Separator (comma, Hex 2C)
ddd.d	Decimal value of the dewpoint temperature in °C
,	Separator (comma, Hex 2C)
C	Unit: degrees Celsius °C
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

MMB Barometric pressure [1]

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MMB	Sentence identifier: Barometric pressure
,	Separator (comma, Hex 2C)
ii.ii	Decimal value of the barometric pressure in inches of mercury
,	Separator (comma, Hex 2C)
I	Unit: Inches of mercury
,	Separator (comma, Hex 2C)
b.bbb	Decimal value of the barometric pressure in bars
,	Separator (comma, Hex 2C)
B	Unit: bar
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

[1] Not in all versions of the Control Unit. See Combination Circuit Diagram 5764

MTA Temperature [1]

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MTA	Sentence identifier: Temperature
,	Separator (comma, Hex 2C)
ttt.t	Decimal value of the temperature in °C
,	Separator (comma, Hex 2C)
C	Unit: degrees Celsius °C
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

MWV Relative wind [1]

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MWV	Sentence identifier: Wind direction and speed
,	Separator (comma, Hex 2C)
ddd.d	Decimal value of the relative wind direction in degrees
,	Separator (comma, Hex 2C)
R	Relative wind
,	Separator (comma, Hex 2C)
ss.s	Decimal value of the relative wind speed in m/s
,	Separator (comma, Hex 2C)
M	Unit: meter / second
,	Separator (comma, Hex 2C)
A (V)	Status: A = data valid, V = not valid
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

[1] Not in all versions of the Control Unit. See Combination Circuit Diagram 5764

MWD True wind [1]

Character	Key
$	Start of sentence
WI	Talker identifier: Weather instrumentation
MWD	Sentence identifier: Wind direction and velocity, surface
,	Separator (comma, Hex 2C)
Character	Key
ddd.d	Decimal value of the true wind direction in degrees
,	Separator (comma, Hex 2C)
T	True wind
,	Separator (comma, Hex 2C)
,	Separator (comma, Hex 2C)
M	Mag.
,	Separator (comma, Hex 2C)
,	Separator (comma, Hex 2C)
N	Unit: knots
,	Separator (comma, Hex 2C)
sss.s	Decimal value of the true wind speed in m/s
,	Separator (comma, Hex 2C)
M	Unit: m/s
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

- All characters are transmitted in ASCII codes
- Leading zeros are transmitted
- The decimal value of the true wind direction is referenced to the vessel (ship) unless the S1 (NACOS) or S2 (CUSTOMER) code-switch on the CPU-board is set to “True wind referenced to earth” (open).
- The checksum is calculated by XOR-operation with all characters between the $ and the * (each exclusively). If the XOR-operation with all these characters (for example) results in the hexadecimal value 7E, then the ASCII characters "7" (Hex 37) as high byte and "E" (Hex 45) as low byte will be sent out.
- If the status of a decimal value is not valid, no decimal values are sent. In this case two separators (“,”) follow one after the other.
- The 5 telegrams are transmitted once a second on each interface (NACOS, CUSTOMER) in the above given order. After a delay of 50 ms after the end of the preceding telegram the next telegram is transmitted.

Position of the DIP Switch on the Multicom Assembly

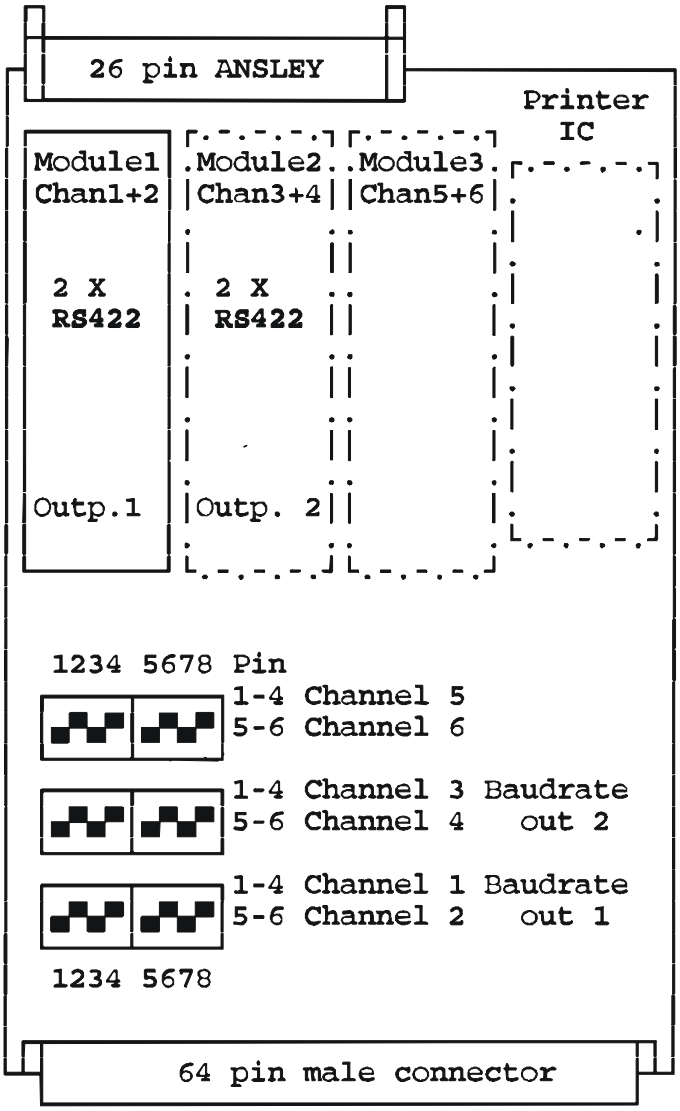
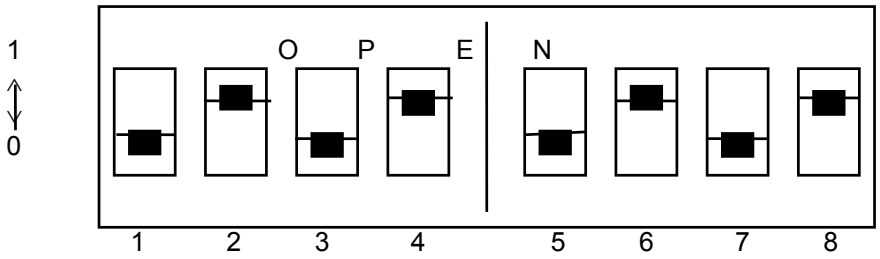


Table 1: Parameters to set the Serial Interface

Position of the DIP switch on the multicom interface
Switch in Pos. OPEN = 1
Switch in Pos. CLOSED = 0



		Channel 1				Channel 2			
Baudrate		Baudrate			Par.	Baudrate			Par.
19200 Bit/s		0	0	0	X	0	0	0	X
9600 Bit/s		1	0	0	X	1	0	0	X
4800 Bit/s	*	0	1	0	X	0	1	0	X
2400 Bit/s		1	1	0	X	1	1	0	X
1200 Bit/s		0	0	1	X	0	0	1	X
600 Bit/s		1	0	1	X	1	0	1	X
300 Bit/s		0	1	1	X	0	1	1	X
150 Bit/s		1	1	1	X	1	1	1	X
Switch		1	2	3	4	5	6	7	8

Parameters: X = 1 8 bit word, no parity, 1 stopbit (8N1)
X = 0 7 bit word, even parity, 1 stopbit (7E1)

* Default: 4800 8N1

6. SERIAL INPUT: RS422 NMEA 0183 V 2.3 DATA INTERFACE

VBW, VHW and HDT MESSAGES

- Type of interface
  Simplex, serial, asynchronous (RS422)

- Type of Leads
  6 pole *Tuchel* plug connection GYRO (HDT message)
  8 pole *Tuchel* plug connection LOG (VBW, VHW messages)

Pin-№	Key
1	RXD+
2	RXD-
3	GND signal ground
4	PGND non-fused earth contact shield
5-6 (8)	Not connected

- Receiving cycle
  The serial input interface scans the received data every second using a timeout of 5 seconds. A maximum input rate of 5 telegrams per second is tested.

- Interface parameters
  The interface parameters can be set individually for each interface.
  Baudrate: 150 to 19200 Baud Default: 4800
  Transmission: 8N1, 7E1 Default: 8N1
  See: "Position of the DIP switch on the Multicom Assembly and
  Table 1 "Parameters to set the serial interface"

The data telegrams have the following NMEA formats:

VBW Velocity bottom water

Character	Key	
$	Start of sentence	
VD	Talker identifier: This information is <u>not</u> evaluated	
VBW	Sentence identifier: Velocity bottom water	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the longitudinal water speed in knots	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the transversal water speed in knots	
,	Separator (comma, Hex 2C)	
A	Status: A = data valid, every other character = not valid	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the longitudinal ground speed in knots	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the transversal ground speed in knots	
,	Separator (comma, Hex 2C)	
A	Status: A = data valid, every other character = not valid	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the Stern transverse water speed	Not evaluated
,	Separator (comma, Hex 2C)	
A	Status: stern water speed	

Character	Key	
,	Separator (comma, Hex 2C)	
xx.x	Decimal value of the Stern transverse ground speed	Not evaluated
,	Separator (comma, Hex 2C)	
A	Status: Stern ground speed	
*	Checksum identifier (Hex 2A)	
H	Checksum high byte	
L	Checksum low byte	
<CR>	Carriage return (Hex 0D)	
<LF>	Line Feed (Hex 0A)	

VHW Heading and water speed

Character	Key
$	Start of sentence
VH	Talker identifier: This information is not evaluated
VHW	Sentence identifier: Heading and water speed
,	Separator (comma, Hex 2C)
xx.x	Decimal value of the heading relative to true north in degrees
,	Separator (comma, Hex 2C)
T	T = heading is relative to true north
,	Separator (comma, Hex 2C)
,	Separator (comma, Hex 2C)
M	M = Mag.
,	Separator (comma, Hex 2C)
xx.x	Decimal value of the water speed
,	Separator (comma, Hex 2C)
N	Unit: knots
,	Separator (comma, Hex 2C)
,	Separator (comma, Hex 2C)
K	Unit: km/h
*	Checksum identifier (Hex 2A)
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

HDT Heading

Character	Key
$	Start of sentence
HE	Talker identifier: This information is not evaluated
HDT	Sentence identifier: Heading and water speed
,	Separator (comma, Hex 2C)
xx.x	Decimal value of the heading relative to true north in degrees
,	Separator (comma, Hex 2C)
T	T = heading is relative to true north
*	Checksum identifier (Hex 2A)

Character	Key
H	Checksum high byte
L	Checksum low byte
<CR>	Carriage return (Hex 0D)
<LF>	Line Feed (Hex 0A)

- All characters are evaluated as ASCII codes
- The “frame” of the above listed characters in each telegram is obliging. The length of the included decimal values is variable and there may be included some more characters just before the checksum identifier, but the maximum number of characters must not exceed 100 (VBW, VHW) respectively 50 (HDT). Maximal 4 successive characters in the decimal value will be evaluated.
- The checksum is calculated by XOR-operation with all characters between the $ and the * (each exclusively). If the XOR-operation with all these characters (for example) results in the hexadecimal value 7E, then the ASCII characters for the checksum should be "7" (Hex 37) as high byte and "E" (Hex 45) as low byte.
- A decimal value is assumed to be valid, if
    - the inspection of the “frame” and the checksum is successful,
    - the conversion of the appropriate characters to a decimal value is successful,
    - and the related status byte (if there is any) is an “A”.

7. Calculation of the TRUE WIND

Definitions

- *Reference to earth*
  The earth's directional reference frame has true north corresponding to zero degrees with angles increasing in a clockwise direction.
- *Reference to ship*
  The ship's directional reference frame has zero degrees at the bow of the vessel with angles increasing in a clockwise direction.
- *Course over ground COG)*
  Direction (relative to true north) the vessel actually moves over the fixed earth.
- *Speed over ground (SOG)*
  The speed at which the vessel actually moves in the direction of COG.
- *Heading*
  Direction to which the bow is pointing relative to true north.
- *Speed over water (SOW)*
  The water-relative motion of a ship is a vector with components along (longitudinal) and perpendicular (transversal) to the axis of the ship.
- *Water motion (WM)*
  The motion of the water referenced to the fixed earth.
- *Log*
  Speed over water of the vessel in the direction of heading.
- *Relative wind*
  The platform-relative wind vector measured relative to the ship.
- *Wind direction*
  The direction *from* which the wind is blowing.
- *True wind*
  A wind vector with a speed referenced to the fixed earth and a direction referenced to either the fixed earth or to the bow of the ship.

Calculations

The vector *relative wind speed* ($\overrightarrow{RWS}$) is composed of the two vectors *speed over ground* ($\overrightarrow{SOG}$) *and true wind speed* ($\overrightarrow{TWS}$):

$$\overrightarrow{RWS} = \overrightarrow{SOG} + \overrightarrow{TWS} .$$

Here the RWS is measured with an Anemometer and a wind vane on the ship, the SOG is transmitted with the serial interfaces and the TWS has to be calculated:

$$\overrightarrow{TWS} = \overrightarrow{RWS} - \overrightarrow{SOG} .$$

This subtraction of vectors is done in an orthogonal coordinate system fixed to the ship.

The steps of the calculation are:
- Resolve the vectors (if necessary) into orthogonal components,
- Subtract the related components,
- Convert into polar coordinates.

The result of the calculation is the *norm of the true wind speed* and the *true wind direction referenced to the ship* (TWDS). The *true wind direction referenced to the earth* (TWDE) is calculated by adding the *heading* (HDG):

$$TWDE = TWDS + HDG .$$

Approximations

The vector of *speed over ground* ($\overrightarrow{SOG}$) is composed of the two vectors *speed over water* ($\overrightarrow{SOW}$) and *water motion* ($\overrightarrow{WM}$):

$$\overrightarrow{SOG} = \overrightarrow{SOW} + \overrightarrow{WM}$$

The complete vector of SOG is given in the telegram VBW with the components longitudinal and transversal ground speed.

- If the vector SOG is not valid (or missing), the true wind is approximated by substituting SOG with SOW. This procedure is allowed, if the water motion WM is negligible regarding the speed over water SOW. But of course, the condition can not be checked.

The complete vector of SOW is given in the telegram VBW with the components longitudinal and transversal water speed.

- If the complete vector SOW is not valid (or missing), the true wind is approximated by substituting SOG with SOW and neglecting the transversal component of SOW. This procedure is allowed, if the water motion WM is negligible regarding the speed over water SOW and the transversal component is negligible regarding the longitudinal component of the water speed. But of course, the condition can not be checked.

The longitudinal component of the vector SOW is given in the telegram VHV with the longitudinal water speed (Log).

ERRORS

Both components (speed and direction) of the true wind vector are not valid if:
- One component (speed or direction) of the relative wind is not valid, or
- One component (Longitudinal or Transversal) of the speed over ground or its approximation is not valid

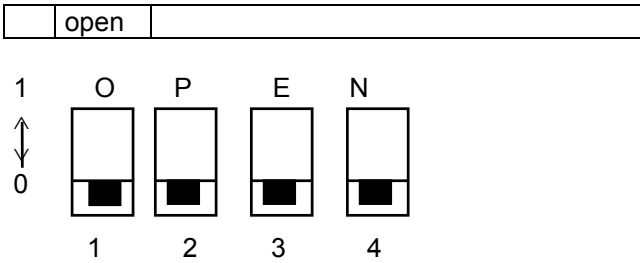
Additionally both components (speed and direction) of the true wind vector referenced to earth are not valid if:
- The heading messages in both the HDT and VHW telegrams are not valid.

The true wind vector referenced to ship does not need a heading message.
If both telegrams (HDT and VHW) give the heading message, the calculation is done with the heading from the HDT telegram.

SELECTIONS

The reference (ship/earth) of the true wind direction is selected individual for all the three serial outputs (LED, NACOS, CUSTOMER) by setting a DIP switch on the CPU board. See the position of the DIP switch in the figure “CPU Card (Mounting Side)” in the appendix.

switch		key	affected interface
S1	closed	True wind referenced to ship (default)	NACOS
	open	True wind referenced to earth	
S2	closed	True wind referenced to ship (default)	CUSTOMER
	open	True wind referenced to earth	
S3	closed	True wind referenced to ship (default)	LED
	open	True wind referenced to earth	
S4	closed	No external switch “true/relative” (default)	LED



Default setting of the DIP switch on the CPU-board

8. APPENDIX

POSITION OF THE PRINTED CIRCUIT BOARDS: transmitter electronics
* see on the motherboard from right to left*

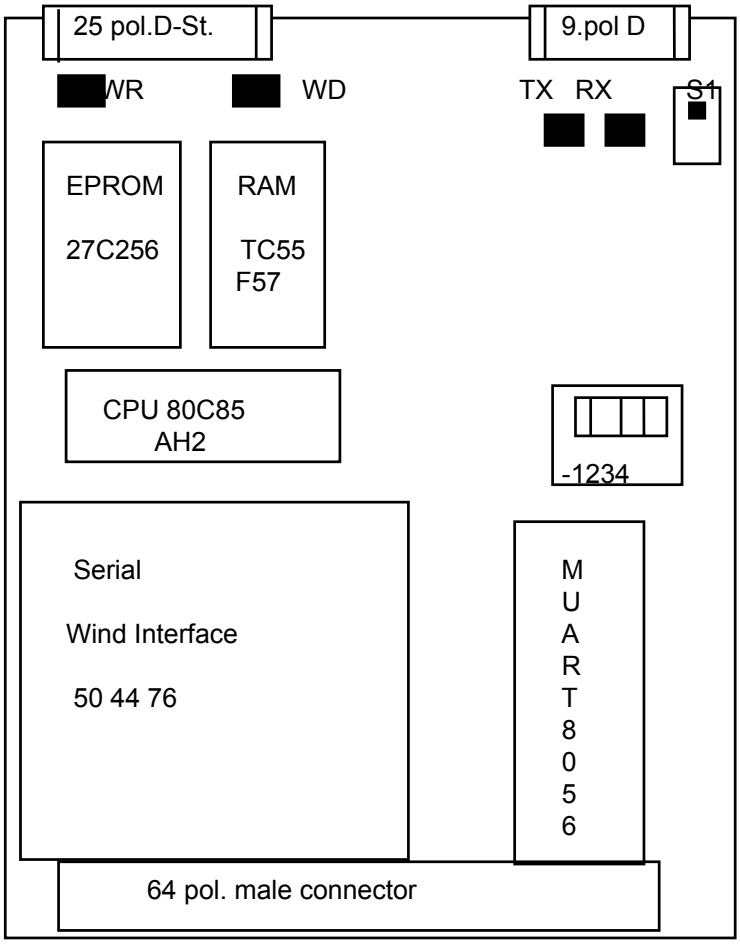
BOARD ASSIGNMENT			
BOARD	TYPE/FUNCTION	ADDRES.	CHANNEL
1	Power Supply Board +5, ±15 V=		
2	CPU-board EPROM 1 RAM 1 8000 Wind-Interface 0020	0000	 2
3	Universal-Analogue-Interface	E000	3
4	Multicom-Interface	E200	4
7	Baro transmitter	-	-

Supplementary Information

Inputs: Wind interface

APPENDIX

CPU Card (Mounting Side)



LED WD* = Watchdog red LED TX = Transmitt red
LED PWR = Power on green LED RX = Receive red

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