

DOCUMENTATION

TRANSMITTER ELECTRONICS

9.5030.90.201

Dok.-Nr. 720.0 St 19 03/97

NMEA 183 V 2.0

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1. GENERAL INFORMATION

The transmitter electronics 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 for NACOS and CUSTOMER
- Log /Gyro Interface

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

- Wind Speed
- Wind Direction
- Log/Gyro

2. SERIAL 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.

3. **ERROR IDENTIFICATION**

The 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.

The output signals of the wind speed transmitter are raised by the switching voltage of one diode (approx. 0.7 V) against reference point ground (life zero); this makes it possible to detect defects in the transmitter or in the cable. The corresponding error message appears on the outputs and displays.

Malfunctions in the program run are detected with the aid of a triggerable RESET logic (Watchdog). The CPU is reset and all registers and memories are re-initialized.

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 setting of the interface is programmed and cannot be changed by the user:

The following parameters are set:

serial, asynchronous
simplex

Baud rate	:	1200	bit/s
Data length	:	7	bit
Parity	:	even	
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)

Depending on the selector switch in the front panel the following data will be indicated on the LED-Display:

log/gyro	inst. value
true wind	2 min. mean value
true wind	inst. value
relative wind	inst. value
special wind	2 min mean value
special wind	inst. value

Attention:

After having connected the supply voltage, first the actual course is to be set with the 4-decade-switch and is then to be confirmed by pressing the set button.

SERIAL OUTPUT TELEGRAM FOR LED-DISPLAY

The data telegram has the following format:

No.	Character	Key
1	\$	Startcharacter
2 - 5	XX.X	Wind speed, (instan).unit of meas. m/s
6		Separator (Space)
7...9	xxx	Winddirection (instan.) unit of meas. Grad
10	*	Checksum follows
11	H	Checksum High-Byte
12	L	Checksum Low-Byte
13	CR	Carriage Return
14	LF	Line Feed

- All characters are displayed in ASCII code.
- Leading zeros in the measured values are replaced by spaces (20 HEX).
- Carriage return and line feed are carried out separately with CR (0D hex) and LF (0A hex).
- Every data telegram starts with STX (02 hex)
- Positive signs are replaced by spaces (20 hex).
- Erroneous measured values are masked with F's.
- Signs for erroneous measured values are replaced by spaces (20 hex).
- The individual measured values are separated by a space (20 hex).
- The checksum is the XOR function from byte 2 to byte 9 inclusive.

5. 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 Tucher plug connection NACOS
7 pole Tucher 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 number of transmitted data bits is set to 8.

Parity can now be selected, either "Even Parity" or "No Parity".

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. 1.1 15.03.1997

Interface 1: NACOS
Interface 2: CUSTOMER

One data telegram is transmitted over each interface. The time interval between the individual data telegrams is 1 second, whereby both interfaces must be set to the same baud rates.

Data Telegram Wind

No.	Character	Key
1	\$	Start of Text
2 - 6	WIMWV	Weather Instrument. Wind Speed and Angle
7	,	Separator
8 - 12	xxx.x	Winddirection unit of meas. Degree
13	,	Separator
14	R	Relative Winddirection
15	,	Separator
16 - 19	xx.x	Windvelocity unit of meas. m/s
20	,	Separator
21	M	m/s
22	,	Separator
23	A	Status V= not valid / A = valid
24	*	Checksum follows
25	H	Checksum High
26	L	Checksum Low
27	CR	Carriage Return
28	LF	Line Feed

All characters are transmitted in ASCII code.

Leading zeros are transmitted.

The formation of the checksum is the XOR function of byte 2 to the character "*" exclusively.

Erroneous values are replaced by zero fields.

The plus sign is omitted for positive values; it is replaced by a leading zero.

No software and no hardware handshake is possible.

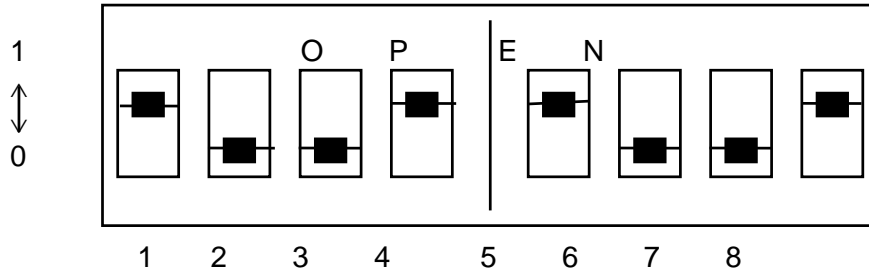
Position of the DIP Switch on the Multicom Assembly

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

	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		

Parity: x = 1 no parity
x = 0 even parity

6. LOG-GYRO INTERFACE

The combined wind transmitter detects the relative wind velocity and wind direction on a ship. The ship's course and speed are determined from a compass signal and a log signal. The electronic unit calculates true wind from the vector of the relative wind and the vector of the ship's course and ship's speed. The selector switch on the control unit can be set to the wind values desired for display on the displays.

The log signal is a frequency of rectangular pulses (200 pulses/mile) which is proportional to the speed of the ship. The pulses are integrated and evaluated over a period of 100 seconds. Consequently, the data concerning ship speed can only change in a 100 second time interval.

The gyro signal is a 3-phase "stepper signal". As this signal only transmits changes in the ship's course, it will be necessary to read the ship's course on the compass system and to reset it on the electronic system everytime the wind measurement system (or the compass system) is put into operation. This is done with the code switches and the "set" key on the upper part of the electronic unit case.

The Log/Gyro interface is conceived for an input voltage of 15 V to 120 V. Three input voltage ranges can be set on S1, S2, and S3 by means of programming bridges (see Appendix). True wind is calculated in the electronic unit from the log and the gyro signals.

The electronic unit reads all data once a second. Then the data are linearized and scaled so that they are available as instantaneous values for further processing. From these instantaneous values, the 2 min gliding mean values are determined for wind velocity and wind direction and, moreover, the 2 min gliding min Å max values are calculated.

CALCULATING TRUE WIND

First the relation of the measured relative wind direction to the course of the ship is determined and the absolute wind (in polar coordinates) is formed:

abs. wind direction = relative wind direction + course of the ship modulo 360
abs. wind velocity = relative wind velocity.

Then true wind is calculated vectorially in Cartesian coordinates as the difference from the vector of the absolute wind and the vector of the ship's movement (log and gyro). Then, the Cartesian coordinates are recalculated into Polar coordinates and a relation to the ship's coordinate system reestablished.

LOG INPUT

Path Constant: 200 pulses/mile
Integration Time : 100 sec

Measuring Range : 0 ... 100 kn
Input Voltage : Contact closure

GYRO INPUT

Signal Form : 3 phase stepper 30 ... 50 V
Measuring Range : 0 ... 360 degrees
Input Voltage : ± 15 V ... ± 120 V
Resolution : 0...166 degree per step

There are three ranges for the input voltage which can be set with jumpers S1, S2 and S3 for the gyro signals and with the jumper - - for the log signal.

S1-S3

± 15 ... 45 V	A	A	
± 46 ... 80 V	B	B	Set at delivery!
± 81 ... 120 V	C	C	

Please note: Check the input voltages in accordance with the jumper positions before starting operation.

- LOG input is provided for contact closure
- Terminal strip J3 terminal 5/6
- The - - jumper is in position A!

Take care that the system is switched off before setting. Then you can remove the appropriate circuit boards and set them as desired.

7. 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	Multicom-Interface	0200	2
4	GYRO-LOG-Interface	F000	4

CPU-BOARD: Data Processing

Supplementary Information

Inputs: Windinterface

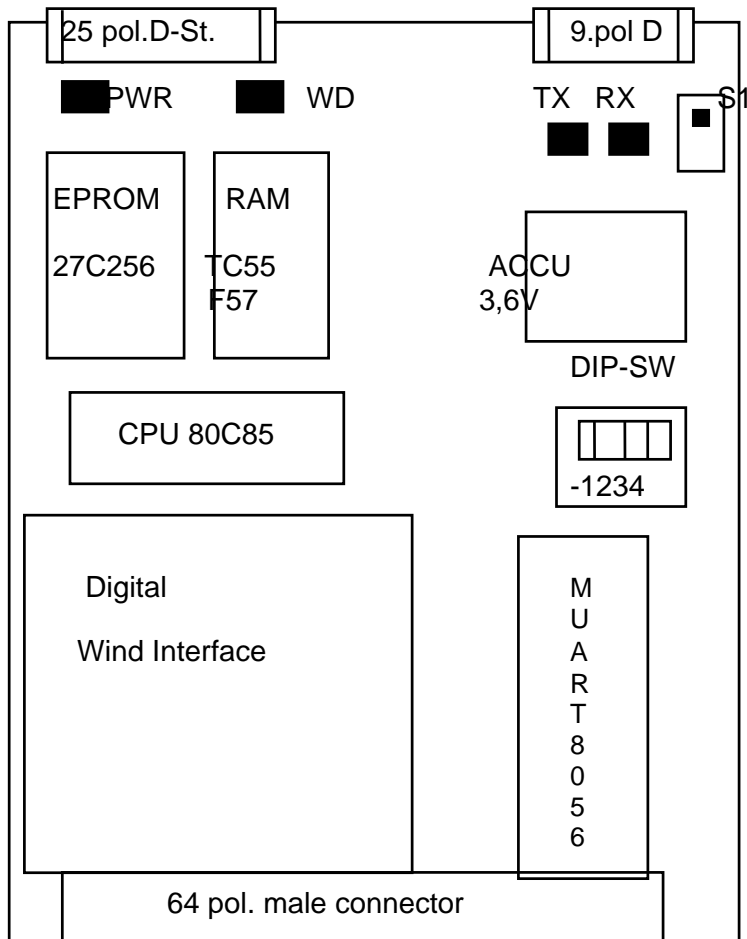
Wind Speed	:	pulse transmitter	:	0...1052 HZ
		meas. range	:	0,3...50,0 m/s
		resolution	:	0,1 m/s
Wind Direction	:	Code-Transmitter	:	8-bit seriell
		meas. range	:	0...360 Degrees
		resolution	:	2,5 Degrees
Transmitter Power Supply Heater	:	+5 V = 24 V/ 50 Hz	max. 40 VA	
Connecting cablel max. Length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

The station has its own transformer which supplies power to heat the transmitter. However, if the transmitter is more than 50 m away from the transmission electronics, then an external heating transformer must be used.

APPENDIX: TECHNICAL DATA

Appendix A:

CPU Card (Mounting Side)



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

Temperature range : 0 ... +45 °C

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