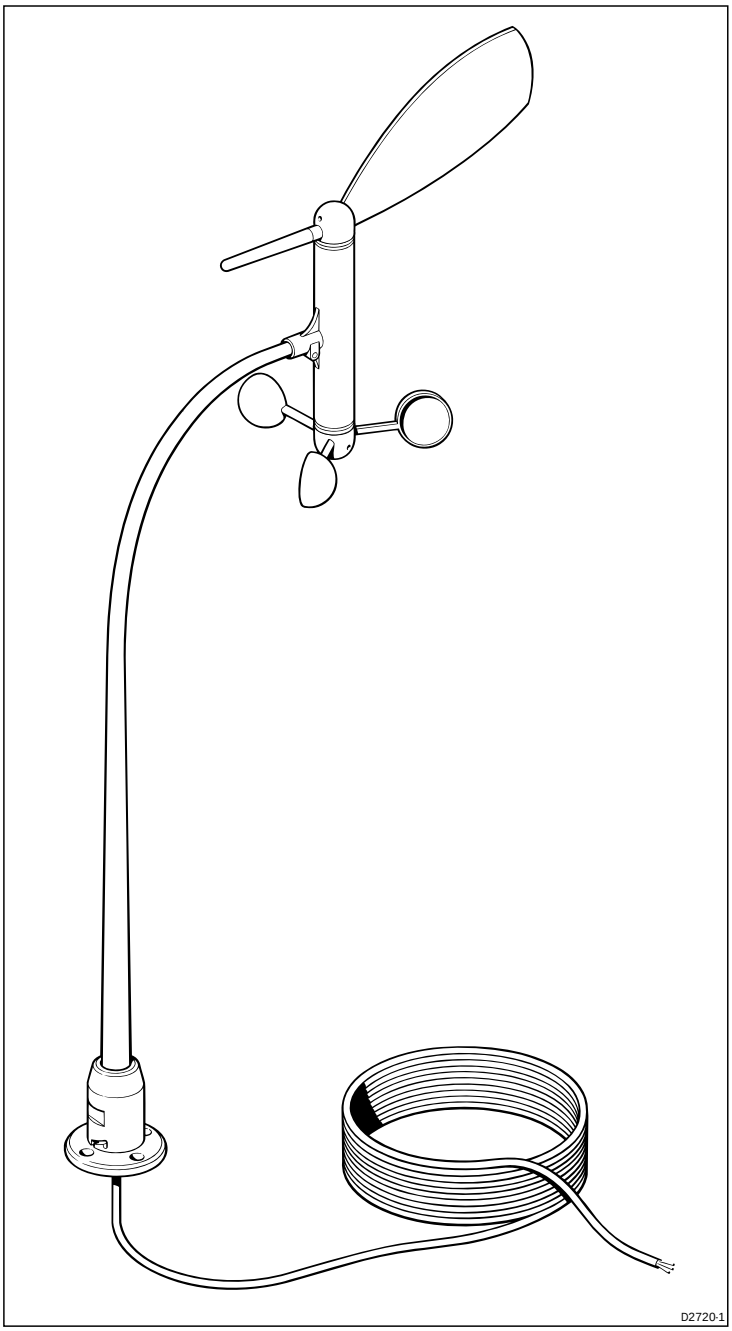


Z219 ST80 Active Wind Transducer Service Procedures

CE MARKING OF EQUIPMENT / REPLACEMENT PARTS

WARNING

If the Autohelm equipment under repair, test, calibration, installation or setting to work carries the European CE mark, only parts and components supplied or approved for such use by Autohelm should be used in order to maintain compliance with the relevant CE requirements.

Incorporation, use or attachment, by any means, of parts or components not supplied for or not approved for such use by Autohelm or, if supplied or approved for use by Autohelm, not properly fitted in accordance with instructions published, provided or recommended by Autohelm, may cause the equipment to malfunction and, in particular, to become unsafe or to no longer meet the relevant CE requirements. In these circumstances, Raytheon Marine Europe Ltd excludes liability to the fullest extent permissible in law for any loss or damage including any liability for its contribution to such loss or damage by its negligent acts or omissions .

Contents

Z219

Illustrations

1. Description

This section of the Maintenance Manual covers the servicing procedures for the ST80 Active Wind Transducer, Product Code Z219.

The transducer measures wind speed and direction using an anemometer cup assembly and a wind vane, each mounted on independent shafts at either end of a pod containing electronic circuitry.

Electronic signals generated by an opto - electric integrated circuit and a mechanical interrupter coupled to a shaft on which a cup assembly rotates. When the cups are driven by the wind the generated signals are converted into data representing wind speed.

The wind vane rotates on a shaft to which a magnet is attached. Hall effect integrated circuits detect the position of the magnet in two orthagonal axes, and the output signals of the circuits are converted to data representing the position of the wind vane.

Position and speed data are broadcast on the SeaTalk bus at one - second intervals, thus becoming available to other elements of the system.

Parameters defining upper and lower limits of wind speed and angle, both true and apparent, can be entered (through other elements of the system) to cause alarms to be generated when a specified limit is exceeded. Alarms are also broadcast on the SeaTalk bus at intervals of one second while the alarm condition exists.

2. Operation

There are no operational activities required to prepare the Active Wind Transducer for servicing.

3. Disassembly

Refer to Figure 1, Exploded View.

When handling any of the PCBs, linen or other suitable material (*not* nylon) gloves should be worn if an anti - static mat and grounding strap are not used. If gloves are not available, handle the PCB by the edges only.

1. Release the grub screws (12) holding the wind vane (1) and anemometer cup assemblies (11). Back the screws just enough to free the assemblies without allowing the nuts (4) to fall out. Remove the vane and cup assemblies
2. Pull the anemometer head (10) out of the main body (8) and unplug the ribbon cable (5) from PL1. To release the cable, lift the top bar of the connector and slip the cable free (see detail in Figure 1)
3. Pull the wind vane head (2) out of the main body (8) and unplug the ribbon cable (5) from PL1. To release the cable, lift the top bar of the connector and slip the cable free (See detail in Figure 1)
4. Slide the PCB (7) out of the main body through the top (wind vane end)
5. To release the PCB, unsolder the SeaTalk cable (6) from the contact pads (see detail on Figure 1).

4. Assembly

Refer to Figure 1, Exploded View.

When handling any of the PCBs, linen or other suitable material (*not* nylon) gloves should be worn if an anti - static mat and grounding strap are not used. If gloves are not available, handle the PCB by the edges only.

1. Solder the SeaTalk cable (6) to the main PCB (7) contact pads (see detail, Figure 1 for cable colours and connections)
2. Lift the top bars of main PCB connectors PL1 and PL2 and insert the ribbon cables (5). Press the bars down to secure the cables (see detail in Figure 1). For both connectors on the PCB, the coloured side of the cable faces the centre of the PCB
3. Slide the PCB into the main body (8) from the top (wind vane end), threading the lower ribbon cable through as the PCB enters. The PCB is tapered and fits narrow end first
4. Check that the O - rings (3) on the anemometer (10) and wind vane (2) heads are not damaged, distorted or loose and are free of grease and dirt. Replace or clean as necessary
5. Plug the lower ribbon cable (5) into PL1 of the anemometer PCB (9) (see detail in Figure 1), ensuring that the cable is not twisted. The coloured side of the cable faces the outer edge of the board
6. Push the anemometer head (10) into the main body (8), ensuring that the head is fully home and the ribbon cable (5) is not twisted
7. Plug the lower ribbon cable (5) into PL1 of the wind vane PCB (4) (see detail in Figure 1), ensuring that the cable is not twisted. The coloured side of the cable faces the outer edge of the board
8. Push the wind vane head (2) into the main body, ensuring that the head is fully home and the ribbon cable (5) is not twisted
9. Fit the cup assembly (11) to the lower shaft and the wind vane (1) to the upper shaft. Insert and tighten the grub screws (12). Check that the vane and cups rotate freely in both directions.

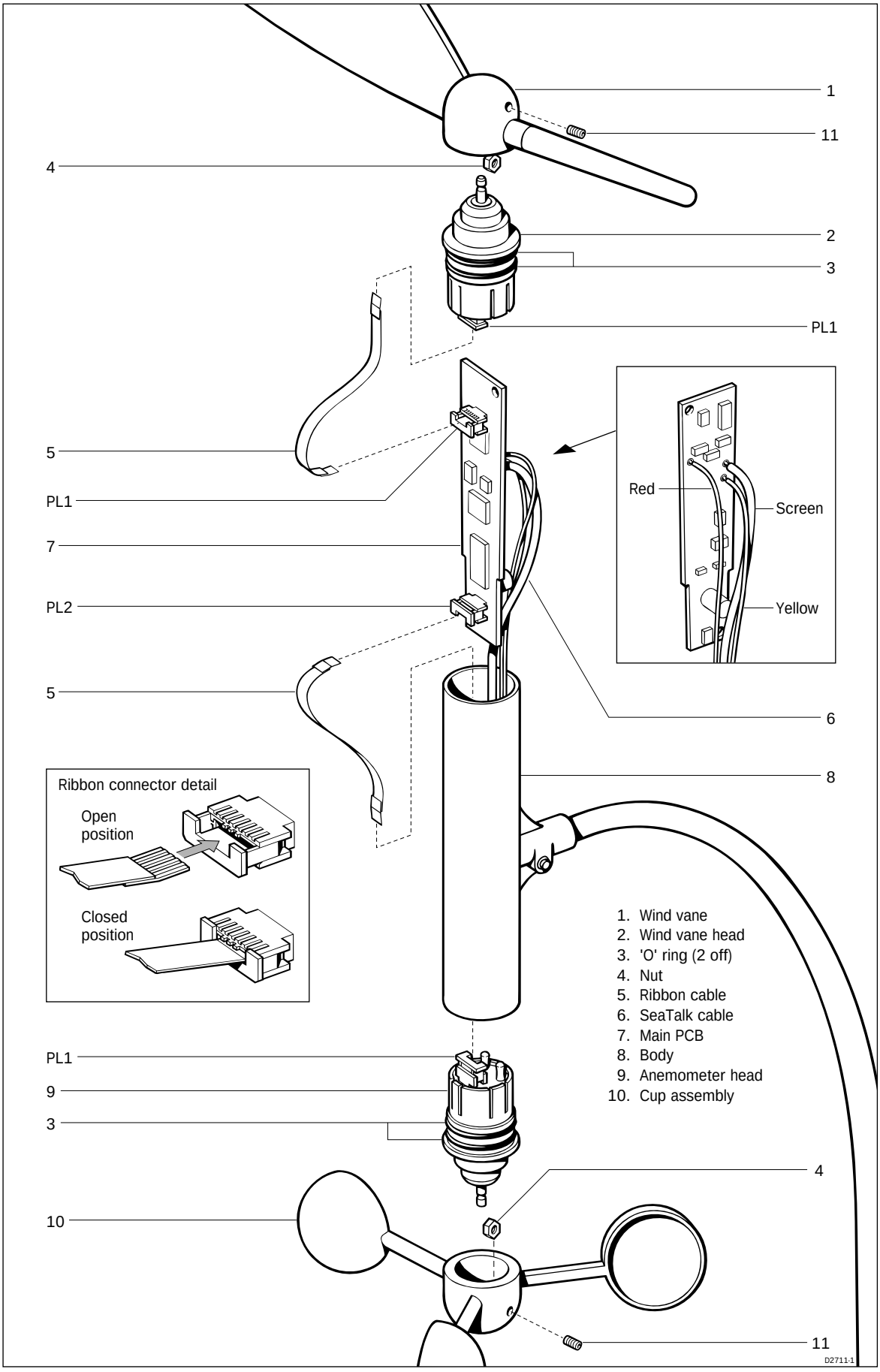


Figure 1 Exploded View

5. Functional Test

5.1 Preliminary Inspection

Before testing, inspect the equipment for physical damage (cracked or broken case, bent/corroded/burnt connector pins, etc.). Clean off any grease, dirt or deposits in or on the equipment.

Check for signs of water ingress. Check for damage to the pod PCB, in particular, overheating on the power supply input pins and PCB tracks.

5.2 Test Equipment

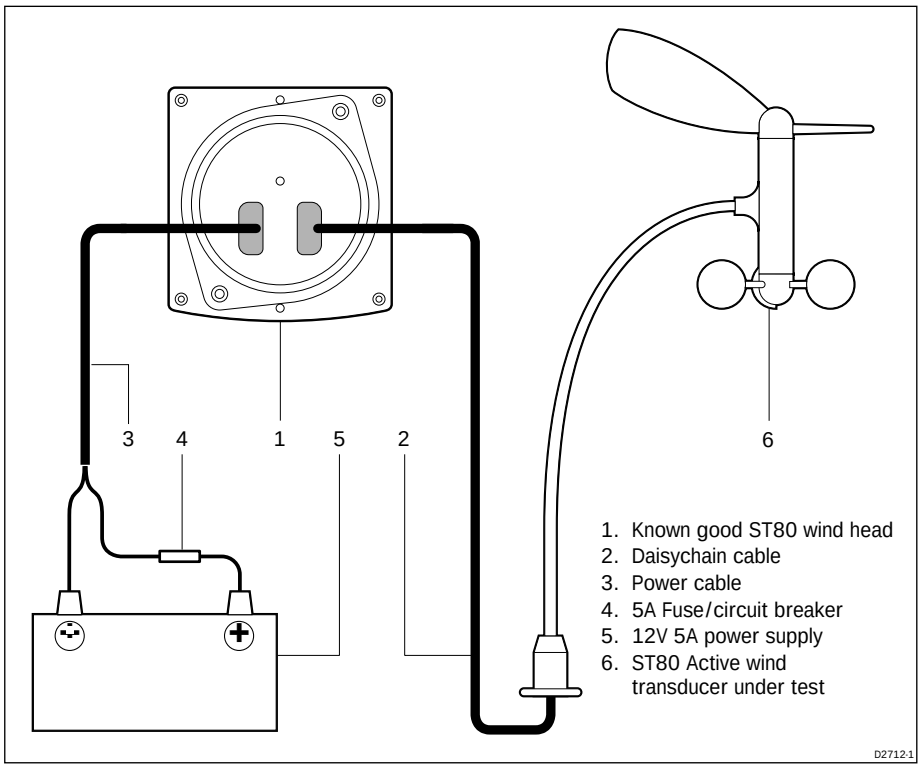
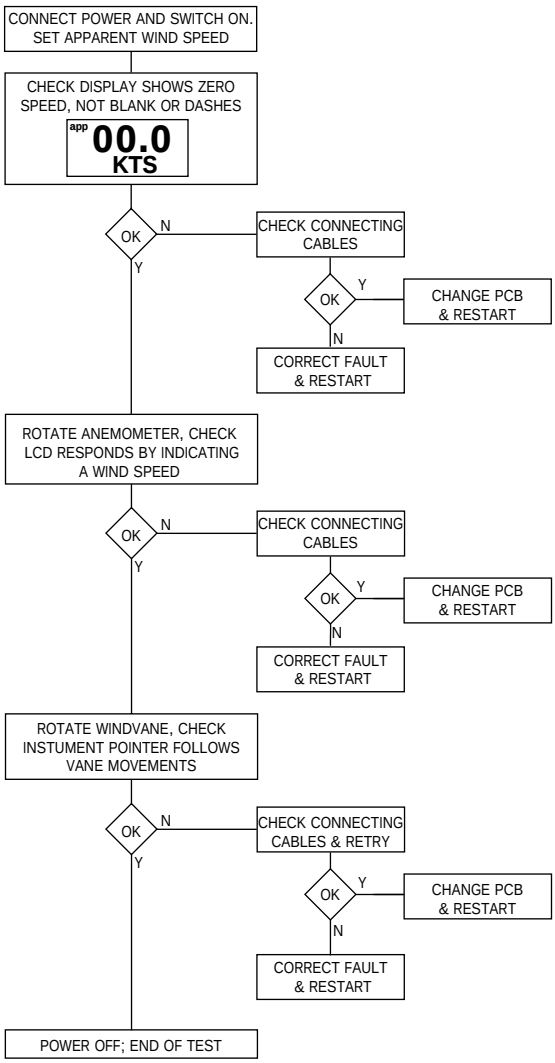


Figure 2 Test Equipment Connection

5.3 Functional Test Flowchart



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6. Spares Numbers

Item	Cat. No.	Part No.	Comments
30m Extension Cable	D252		
50m Extension Cable	D253		
Anemometer Pod Sub-Assembly	Q140	9	
Vane Pod Sub-Assembly	Q141	2	
PCB Sub-Assembly	Q142	7	
Anemometer	W062	10	
Vane	W063	1	
Arm Sub-Assembly	W064	8	

7. Circuit Description

Refer to Figure 3, Block Diagram and Figure 5, Circuit Diagram.

Two sensor PCBs (round boards) feed the main PCB. Interconnection and elements on the round boards are shown in the bottom right corner of the block diagram.

One sensor (anemometer) detects rotation of the wind cups and produces a pulse train which is used to calculate the wind speed. The other sensor (wind vane) detects the rotation of a magnet attached to the wind vane shaft from which the wind angle is calculated.

The main PCB processes signals from the sensors and interprets messages from other system elements. SeaTalk sentences containing wind speed, wind angle and alarm conditions are generated for transmission on the SeaTalk bus.

7.1 Power Supplies

A nominal 12V supply enters the unit via the red lead of the SeaTalk cable. Varistor V1 placed across the supply and 0V (black lead of the SeaTalk cable) provides protection against power surges and voltage spikes.

Diode D1, similarly placed across the supply and 0V, provides limited protection against lightning strikes.

The input supply is routed as follows:

1. Through reverse protection diode D4 to IC1, a regulator which provides +5V (Vcc) to the circuitry on the PCB. The output of diode D4 (nominally 12V) is sent through diode D6 to ASIC IC5, as signal VHELD
2. Through diode D3 as signal 12V to regulator IC2 (or alternative fit 8V regulator IC9).

Regulator IC2 (or alternative fit 8V regulator IC9) provide an 8V supply to digital - to - analogue convertor IC8. The sensor PCBs (wind vane and anemometer) are supplied with 8V through PL1 and PL2.

Reverse diode D5 ensures a floating 0V for the circuitry by isolating the incoming 0V.

7.2 External Signals

SeaTalk

SeaTalk signals carried by the yellow lead of the SeaTalk cable are routed directly to the Autohelm ASIC IC5.

Diode D2 placed across the data line and 0V provides limited protection against lightning strikes.

Incoming signals are converted by the ASIC from SeaTalk duplex line format to SeaTalk DATA IN format for the microprocessor.

Outgoing signals from the microprocessor are converted from SeaTalk DATA OUT format at CMOS voltage levels to SeaTalk format at 12V level by the ASIC.

Anemometer

Pulses are generated by opto - electric integrated circuit IC3, at a rate dependent on wind speed, by the action of an opto - interrupter on the cup mounting shaft at the lower end of the assembly.

The output of IC3 is fed via PL1 (round board) and PL2 (main PCB) to comparator IC3a which uses the reference voltage produced by resistors R8 and R9 to provide a clean input to microprocessor IC7.

Wind Vane

Hall effect sensors IC1 and IC2 on the round board at the top end of the assembly detect the position of a magnet mounted on the wind vane shaft.

The resulting analogue voltages (sine and cosine, representing orthagonal two - axis sensing) are fed via PL1 (round board) and PL1 (main PCB) to comparators IC3b and IC3d.

The microprocessor sets up bits 1 to 10 on the input of digital - to - analogue convertor IC8, which produces a reference voltage at the output (VREF). VREF is fed via IC4a to comparators IC3c (cosine), IC3b (sine) and IC3d (VTEST).

When the reference voltage and the inputs from the Hall Effect sensors are matched, the outputs of the comparators change state and, as the microprocessor knows the digit pattern set up to cause this change, the position of the magnet in relation to the sensors can be calculated.

A test signal (VTEST) is produced by comparator IC3d.

7. Circuit Description

Refer to Figure 3, Block Diagram and Figure 5, Circuit Diagram.

Two sensor PCBs (round boards) feed the main PCB. Interconnection and elements on the round boards are shown in the bottom right corner of the block diagram.

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The input supply is routed as follows:

1. Through reverse protection diode D4 to IC1, a regulator which provides +5V (Vcc) to the circuitry on the PCB. The output of diode D4 (nominally 12V) is sent through diode D6 to ASIC IC5, as signal VHELD
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Outgoing signals from the microprocessor are converted from SeaTalk DATA OUT format at CMOS voltage levels to SeaTalk format at 12V level by the ASIC.

Anemometer

Pulses are generated by opto - electric integrated circuit IC3, at a rate dependent on wind speed, by the action of an opto - interrupter on the cup mounting shaft at the lower end of the assembly.

The output of IC3 is fed via PL1 (round board) and PL2 (main PCB) to comparator IC3a which uses the reference voltage produced by resistors R8 and R9 to provide a clean input to microprocessor IC7.

Wind Vane

Hall effect sensors IC1 and IC2 on the round board at the top end of the assembly detect the position of a magnet mounted on the wind vane shaft.

The resulting analogue voltages (sine and cosine, representing orthagonal two - axis sensing) are fed via PL1 (round board) and PL1 (main PCB) to comparators IC3b and IC3d.

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A test signal (VTEST) is produced by comparator IC3d.

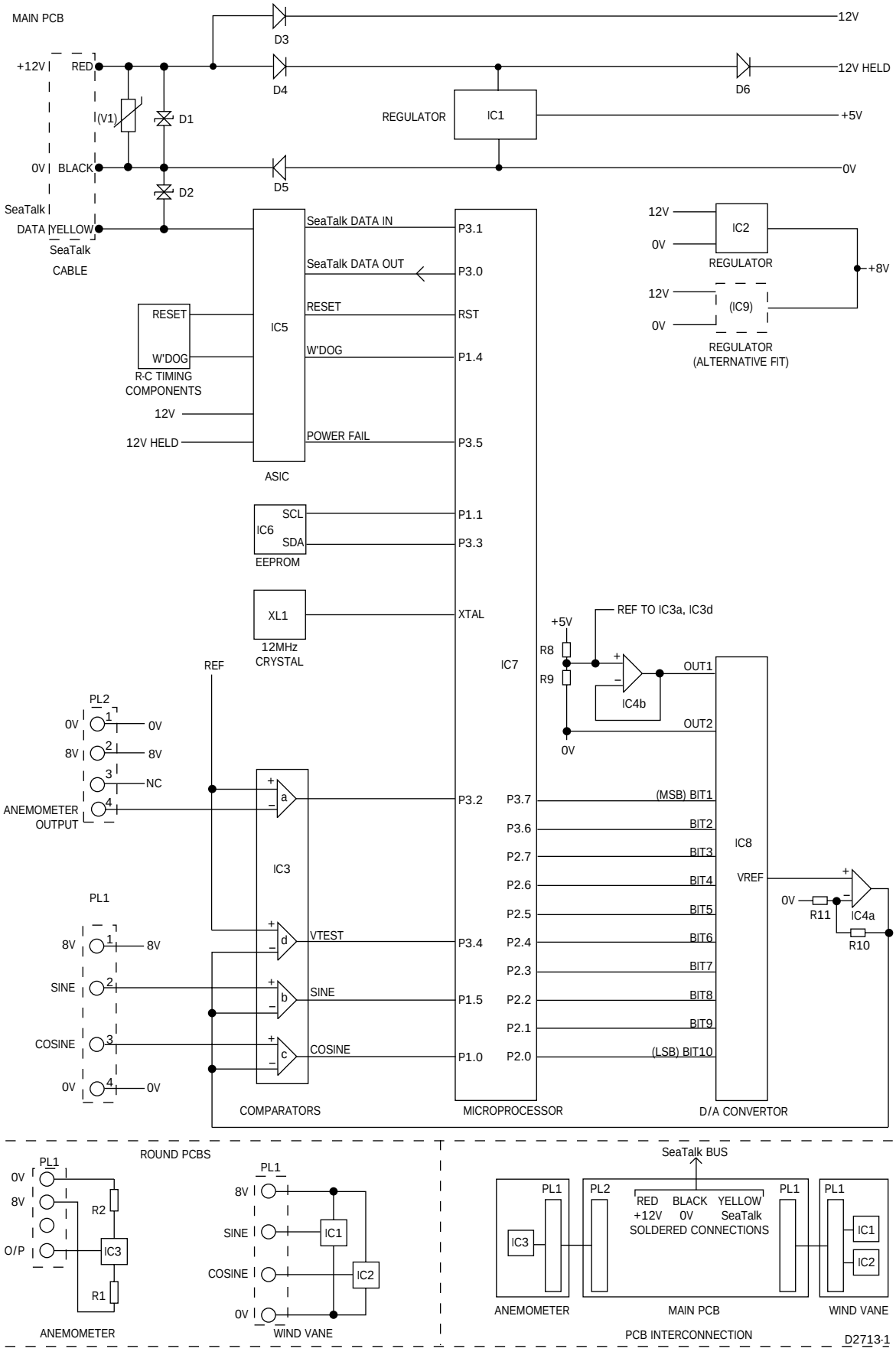

Figure 3 Block Diagram
Signal flow is left to right except where indicated

8. PCB Details

8.1 PCB Layout

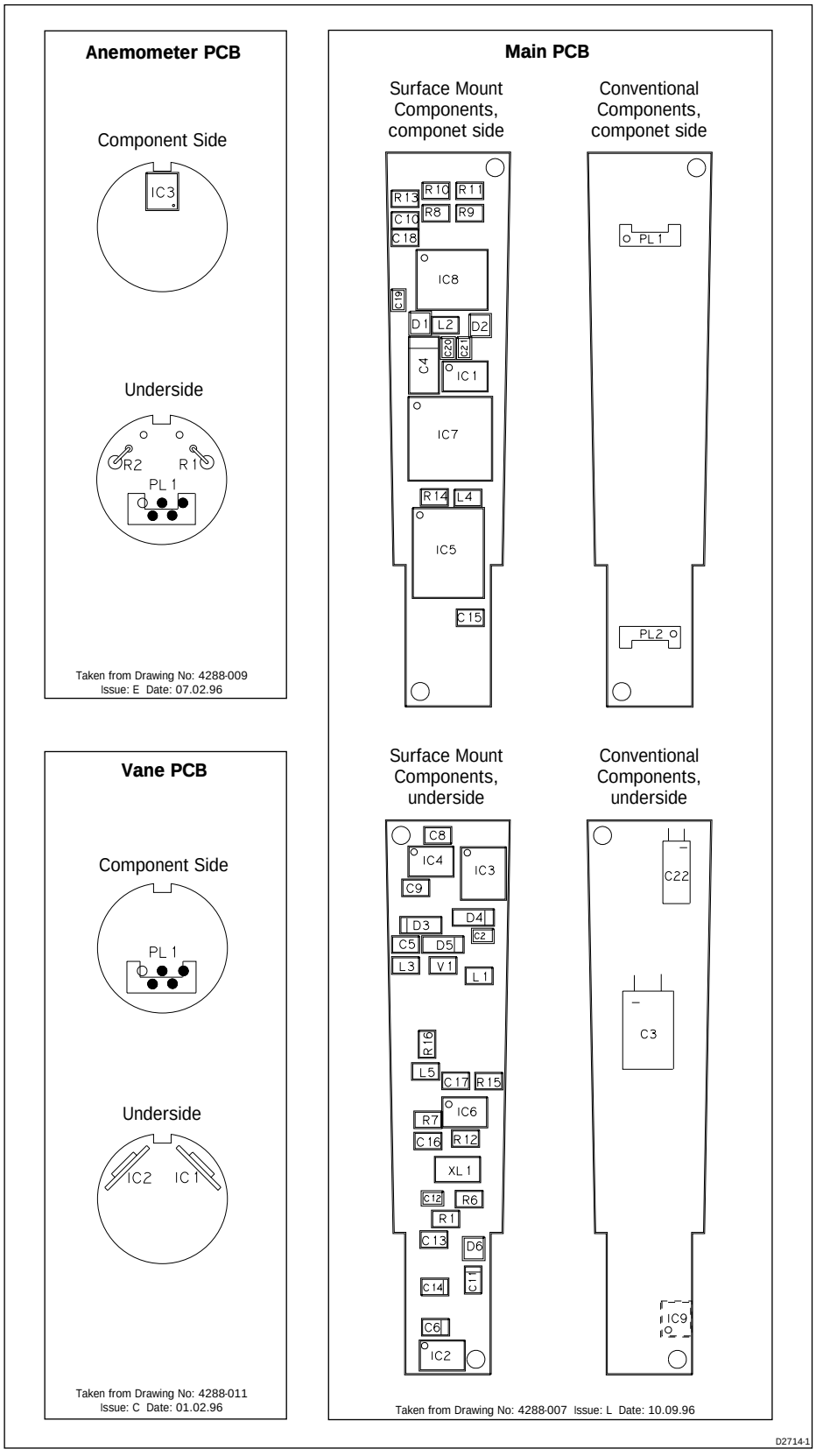

Figure 4 Component Layout

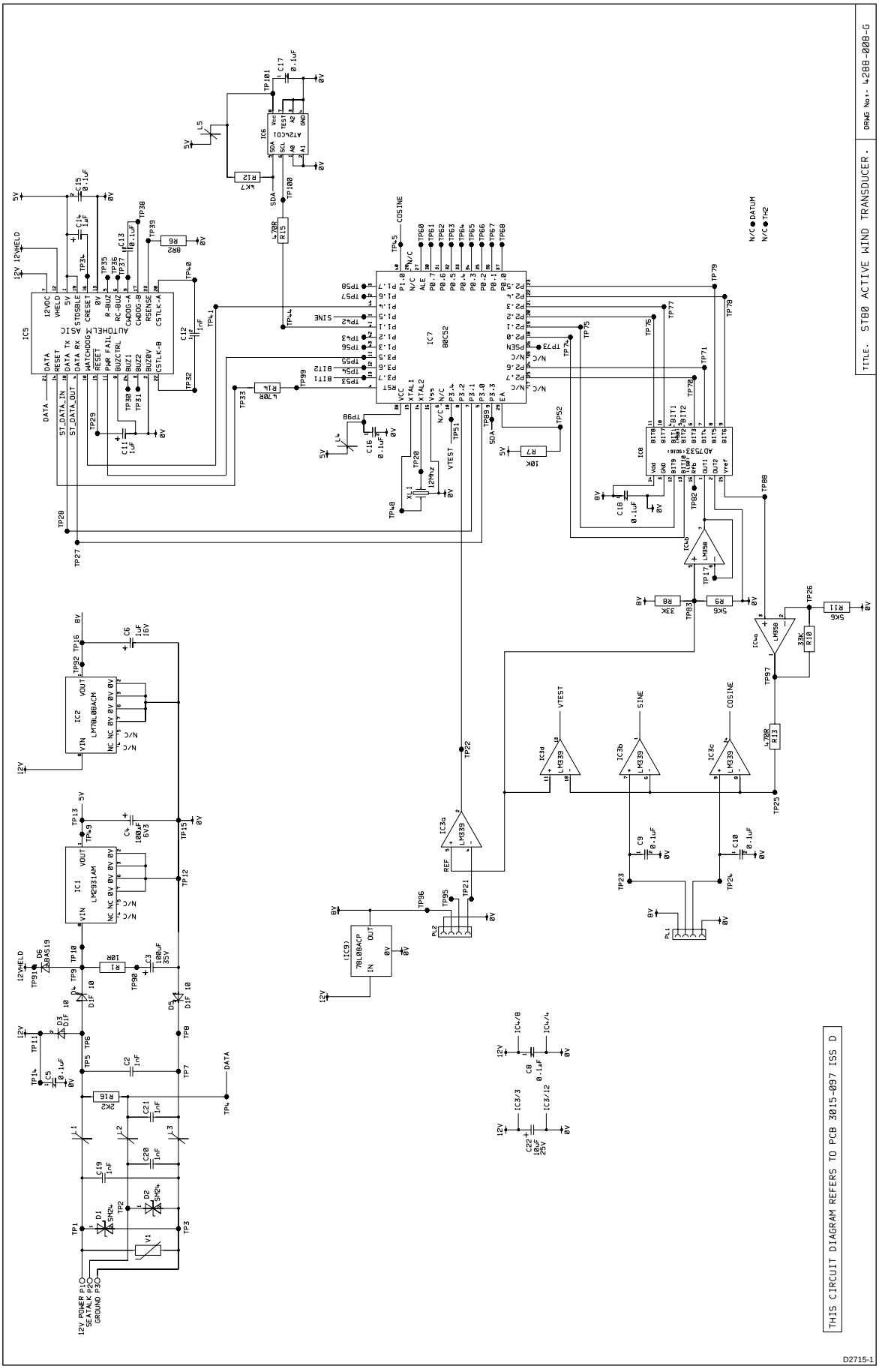

Figure 5 Circuit Diagram

8.2 PCB Component Lists

Anemometer PCB, Components

CONNECTOR 4 WAY	PL1
RESISTOR CF 56K 0.25W 5%	R2
RESISTOR CF 330R 0.5W 5%	R1
IC OPTO PAN040PT	IC3
PCB ST80 ACTIVE WIND (ROUND)	3015-098

Taken from Drawing No: 4288-009 Issue: E Date:07.02.96 D3955-1

Vane PCB, Components

CONNECTOR 4 WAY	PL1
IC HALL EFFECT SENSOR SS94A1	IC1,2
PCB ST80 ACTIVE WIND (ROUND)	3015-098

Taken from Drawing No: 4288-011 Issue: C Date:07.02.96 D3956-1

Main PCB, Surface Mount Components, component side

SOLID CHIP INDUCTOR	L2,4
IC AD7533 10 BIT D/A CONVERTER	IC8
IC RAYTHEON ASIC VERSION 1	IC5
IC MICROPROCESSOR AT89C52	IC7
IC REGULATOR LM2931AM	IC1
CAPACITOR 1nF 0805	C19-21
CAPACITOR CER 0.1uF 20% 50V 1206	C10, 15, 18
CAPACITOR TANT 100uF 20% 7V TANTE	C4
DIODE SM24	D1,2
RESISTOR WCR 1206 470R 5% 0.125W	R13, 14
RESISTOR WCR 1206 33K 1% 0.125W	R8, 10
RESISTOR WCR 1206 5K6 1% 0.125W	R9, 11

Taken from Drawing No: 4288-007 Issue: L Date:10.09.96 D3957-1

Main PCB, Conventional Components, component side

MOLEX 4WAY FFC CONNECTOR	PL1,2

Taken from Drawing No: 4288-007 Issue: L Date:10.09.96 D3958-1

Main PCB, Surface Mount Components, underside

RESONATOR 12MHz	XL1
VARISTOR VC180400	V1
SOLID CHIP INDUCTOR	L1,3,5
IC DUAL OPAMP LM358	IC4
IC QUAD OPAMP LM339	IC3
IC AT24C01A	IC6
IC REGULATOR LM78L08ACM	IC2
CAPACITOR 1nF 0805	C12
CAPACITOR 1nF 0805	C2
CAPACITOR TANT 1uF 10% 16V TANTA	C6, 11, 14
CAPACITOR CER 0.1uF 20% 50V 1206	C5, 8, 9, 13, 16, 17
DIODE BAS19	D6
DIODE RECTIFIER DIF10 1A 100V	D3, 4, 5
RESISTOR WCR 1206 2K2 5% 0.125W	R16
RESISTOR WCR 1206 470R 5% 0.125W	R15
RESISTOR WCR 1206 4K7 5% 0.125W	R12
RESISTOR WCR 1206 8R2 5% 0.125W	R6
RESISTOR WCR 1206 10K 5% 0.1W	R7
RESISTOR WCR 1206 10R 1% 0.1W	R1
PCB ST80 ACTIVE WIND (MAIN)	3015-097

Taken from Drawing No: 4288-007 Issue: L Date:10.09.96 D3959-1

Z219

Main PCB, Conventional Components, underside

CAPACITOR ELEC 10uF 25V	C22
CAPACITOR ELEC 330uF 16V	C3
IC REGULATOR ML78L08AC 8V	(IC9)

Taken from Drawing No: 4288-007 Issue: L Date:10.09.96

D3960-1