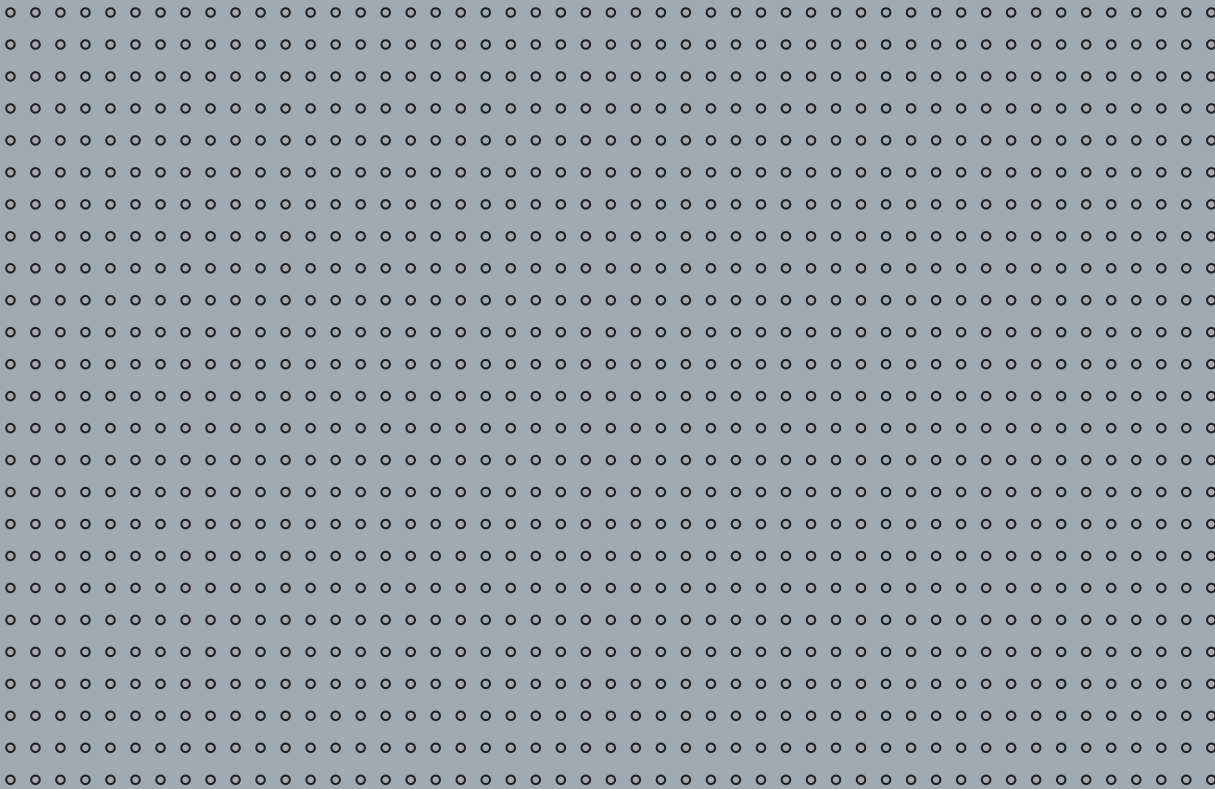




Master the Elements

Instruction manual

Simrad DR76, AR78, AR80,
AR81 and AR83
Digital, Analog and Bearing Repeaters
English



***Instruction manual
DR76 Digital repeater,
AR78 / AR80 Analog repeaters
and
AR81 / AR83 Bearing repeaters***

This manual is used for installing and operating Simrad's
Digital -, Analog- and Bearing Repeaters.

Document revisions

Rev	Date	Written by	Checked by	Approved by
A	11.11.03			
B	02.09.04			

Document history

Rev. A	First issue
Rev. B	Updated to include AR81 and AR83 Bearing repeaters.

About this manual

This manual provides installation instructions, operation and simple fault finding procedures for Simrad's repeaters.

The manual must be used in conjunction with the instructions and drawings designed for the specific vessel, and should remain with the vessel on completion of the installation to serve as an additional reference during maintenance of the system.

Important text that requires special attention from the reader is emphasized as follows:

Note *Used to draw the reader's attention to a comment or some important information.*

Caution *Used for warning the reader that a risk of damage to the equipment exists if care is not exercised.*

WARNING **Used for warning the reader that a risk of damage to the equipment exists if care is not exercised.**

To assist us in making improvements to this manual, we would welcome comments and constructive criticism. Please send all such - in writing to:

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Table of contents

1	INTRODUCTION	1
2	DR76 DIGITAL REPEATER	2
2.1	Technical specifications	2
2.2	Installation	3
	Panel mounting.....	3
	Optional bracket mounting	4
2.3	Cable connection	5
2.4	Operation	6
2.5	Commissioning.....	8
2.6	Fault finding	8
3	AR78 / 80 ANALOG REPEATERS	9
3.1	Technical specifications	9
3.2	Installation	10
	Panel mounting.....	10
	Optional bracket mounting	10
3.3	Cable connection	11
3.4	Operation	12
	Turning the repeater ON.....	12
	Adjusting display illumination	12
3.5	Commissioning.....	13
3.6	Fault finding	13
4	AR81 / 83 BEARING REPEATERS.....	14
4.1	Technical specifications	14
4.2	Installation	15
4.3	Cable connection and DIP switch settings	15
	Dip settings in AR81/83 repeater	15
	Connecting an AR81/83 repeater to a GC80/85 Compact gyro system	17
	Connecting an AR81/83 repeater to a GC80/85 Expanded/Dual gyro system	19
4.4	Operation	23
	Turning the repeater ON.....	23
	Adjusting display illumination	23
4.5	Commissioning.....	23
4.6	Fault finding	24

5 SPARE PART LIST.....25

6 DRAWINGS27

1 INTRODUCTION

The DR76 Digital Repeater, the AR78/AR80 Analog repeaters, and AR81/AR83 Bearing repeaters have been designed to accept a variety of digital inputs that are sensed when first switching on the repeater.

The repeaters accept serial data (RS422). The D-type connector has pins allocated for power and serial data.

The serial input is configured to recognize NMEA 0183 HDT, HDG and HDM sentence structures in priority order.

All repeaters may be delivered with an optional mounting bracket.

The repeaters should be mounted where it is most convenient for the user, with regard to the unit's environmental protection, temperature range and cable length. The unit should not be installed in area exposed to heavy vibrations.

Avoid mounting the repeater where it is easily exposed to sunlight, as this will shorten the lifetime of the display.

2 DR76 DIGITAL REPEATER

2.1 Technical specifications

Dimensions	Refer page 28
Weight (nominal):.....	1.2 kg
Mounting options:.....	Panel or bracket (Option)
Finish:	Light Weather-work Grey (BS3816-676)
Construction:.....	Aluminum splash proof
Compass safe distance	2 m
Protection:.....	IP33
Temperature:.....	-5°C to 50°C
Humidity:	0% to 95% at 40°C
Vibration:	1-12.5 Hz ±1.6 mm 12.5 – 25 Hz ±0.38 mm 25HZ – 50 Hz ±0.1 mm
Magnetic Permeability:.....	Cat. A (Acceptable for embarkation within volumetric allowances)
Power supply:	24V DC, 0.75A
Data input:	RS422 NMEA 0183, 4800 baud, no priority, 1 stop bit HDT HDG HDM

2.2 Installation

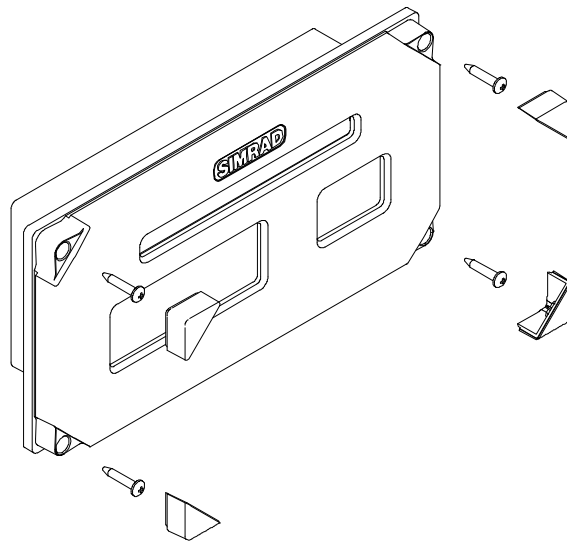
Panel mounting

- 1 Drill 4 mounting holes and make a panel cut-out according to supplied drilling template
- 2 Use the supplied screws to fasten the control unit to the panel

Note

Do not over- tighten the mounting screws!

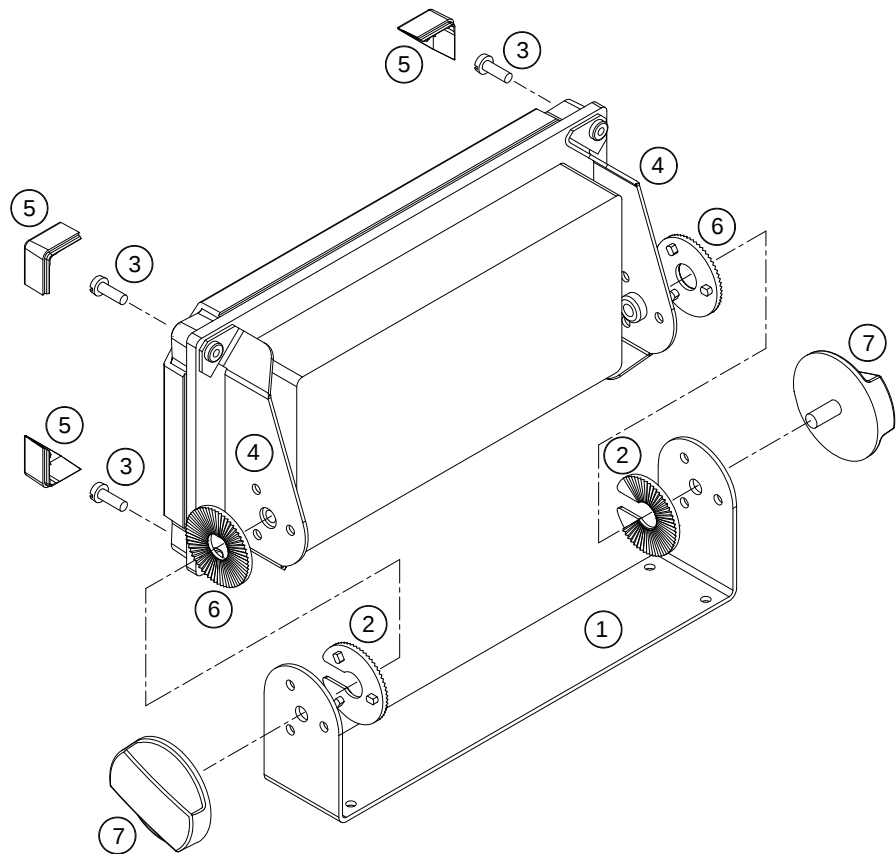
- 3 Apply the front panel corners



Optional bracket mounting

Numbers in brackets refer to the drawing below.

- 1 Locate the cradle (1) on the mounting site and mark 4 holes for the fixing screws on the mounting surface
- 2 Drill the 4 mounting holes and screw the cradle to the mounting surface
- 3 Insert the 2 open ratchet disks (2) into the cradle
- 4 Use the 4 supplied screws (3) to fasten the DR76 to the left and right brackets (4)
- 5 Apply the front panel corners (5)
- 6 Insert the 2 closed ratchet disks (6) into the left and right brackets
- 7 Use the locking knobs (7) to assemble the cradle with the left and right brackets
- 8 Adjust the repeater to best viewing angle



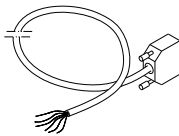
2.3 Cable connection

Caution

Any voltage supplies other than those specified in the product specification, page 2, may cause damage to the repeater.

The repeaters have no power switch, and the repeater will be automatically started when the cable is connected to the unit. It is therefore recommended to connect the cable via an external power switch.

The repeaters are designed to run on 24VDC, and accept a digital RS422 data signal.

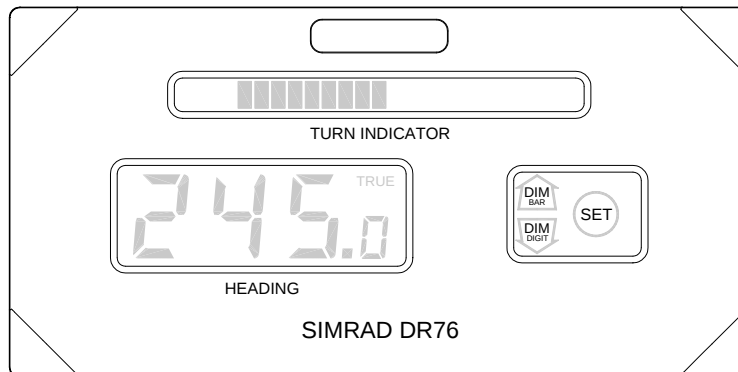


The repeater is supplied with a 2.5 meters cable with a 15 pins female D-type connector.

The following table indicates the function of cores and their identification.

Function	D-type connector pin	Wire color (as supplied)	Ships cable (to be filled out for reference by installer)
24V DC	1	Red	
DC Return	9	Black	
Data positive (TDA)	3	Green	
Data negative (TDB)	11	Blue	
Screen	8	Green/Yellow	

2.4 Operation



The DR76 front panel includes the following elements:



TURN INDICATOR

- Horizontal Turn indicator
 - used either as a rate of turn indicator, or as a steering indicator to indicate the difference between actual and set course



HEADING

- Heading display
 - showing the input heading received from the transmitting device, e.g. the Gyro compass



- Dimmer buttons
 - used for adjusting the illumination on the turn indicator or the back light intensity for the heading display



- SET button
 - used for setting a course to steer, and for setting the display mode for the turn indicator

Turning the DR76 ON

DR76 has no separate power button, and the unit is automatically turned on when the cable is connected to the unit.

The repeater has been designed to accept a variety of NMEA input sentences. When the cable is connected to the repeater, it will automatically sense which sentence that is present. The following priority is used when defining the signal:

- True heading (HDT)
- Heading & Variation format (HDG)
- Old Heading format (HDM)

If the signal is invalid or missing after 1 second, this will be indicated with flashing heading display.

When the defined input signal is lost, power must be switched off and on again. If the cable not is connected via an external switch, the cable must be disconnecting and reconnected again to define a new input signal.

Adjusting display illumination

The display illumination on both displays may be adjusted by using the dimmer buttons.



DIM BAR button is used for adjusting the illumination on the Turn indicator.

DIM DIGIT button is used for adjusting the back lighting on the Heading display.

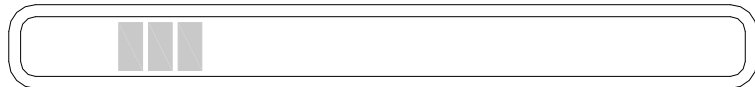
When a dimmer buttons is pressed, the illumination will be increased/decreased until the button is released.

Display modes for Turn indicator

DR76's Turn indicator may be set to 3 different display modes, defined as Mode 0, 1 and 2.

Mode 0:

Rate of turn indicator with fine resolution. For each $1/10^\circ$ the vessel's bow turns, three bargraphs will move to left or right on the indicator.



TURN INDICATOR

Mode 1:

As for Mode 0, but with the bargraphs indicating each 1° turn.

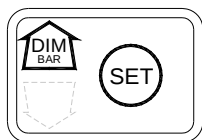
Mode 2:

In this mode the Turn indicator acts as a set steering display. When the vessel's heading is identical to set course, all LEDs are unlit. For each degree steered off-course, one LED will be lit.

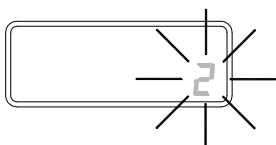


TURN INDICATOR

Setting the Display mode



Active mode is selected by pressing the **SET** button and the **DIM BAR** button simultaneously.



The last digit in the heading display will now cycle between the three display modes. Then selected mode is indicated, this mode is activated by releasing both buttons.

2.5 Commissioning

Perform the following tests when commissioning the repeater:

- 1 Ensure that the mechanical installation and cable connection has been completed according to the description on previous pages
- 2 Connect the cable to the repeater. The repeater will automatically sense which digital signal that is present
 - The repeater will align itself to zero and then to the transmitted gyro heading
- 3 Ensure that the lighting is set to a suitable level. Adjust if necessary with the dimmer button

2.6 Fault finding

The DR76 is a sealed unit, and breakage of the security seal will invalidate the warranty.

If trouble is encountered, make preliminary checks as described below. If the problems remain unsolved, contact your nearest Simrad dealer for assistance.

Symptom	Probable fault	Remedy
The repeater does not operate.	No power or incorrect power connection.	Check incoming power supply.
The repeater aligns itself to zero and does not respond to heading input.	The digital signal to the repeater is either not present, or the sentence being sent is incorrect or has wrong polarity.	Switch the unit off and on again.
Lighting not visible	Damage to internal LED, or damage to internal PCB.	Return to Simrad dealer for service.

3 AR78 / 80 ANALOG REPEATERS

3.1 Technical specifications

Dimensions: Refer page 29 and 30

Weight (nominal):

AR78: 2.9 kg

AR80 1.9 kg

Mounting: Panel or bracket (Option)

Finish: Satin black (RAL 9005)

Construction: Aluminum enclosure

Connections: 1x6 way screened cable (15 way D-type fitted)

Compass safe distance: 2 m

Cable: 2.5 m tailed with D-Type connector

Protection: IP54

Temperature: -5°C to +50°C

Performance:

AR78: $\pm 0.5^\circ$

AR80: $\pm 0.1^\circ$

Follow up rate: 12°/s

Dial Resolution:

AR78: Marked to 1°

AR80:

Outer dial: Marked to 1°

Inner dial: Marked to 0.1°

Power supply: 24V DC, 0.75A

Data input: RS422

NMEA 0183, 4800 baud, no priority, 1 stop bit

HDT

HDG

HDM

3.2 Installation

Panel mounting

- 1 Drill the mounting holes and make a panel cut-out according to supplied drilling template
- 2 Use the supplied screws to fasten the control unit to the panel

Note

Do not over- tighten the mounting screws!

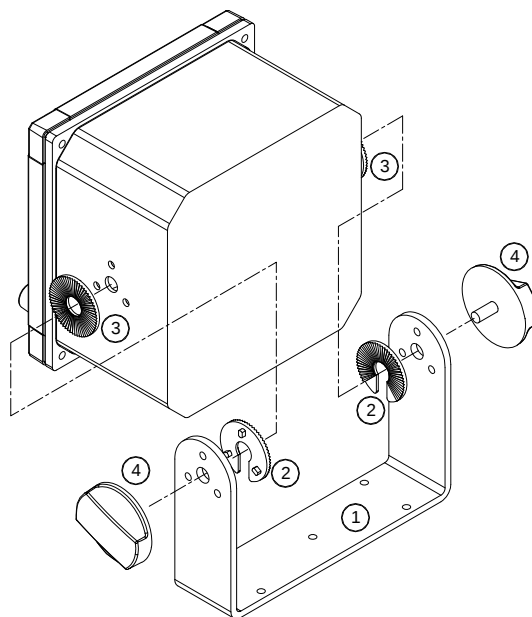
- 3 Apply the front panel corners

Refer the drawing on page 3 showing the panel mounting for DR76.

Optional bracket mounting

Numbers in brackets refer to the drawing below.

- 1 Locate the bracket (1) on the mounting site and mark 5 holes for the fixing screws on the mounting surface
- 2 Drill the 5 mounting holes and screw the bracket to the mounting surface
- 3 Insert the 2 open ratchet disks (2) into the bracket
- 4 Insert the 2 closed ratchet disks (3) into the repeater
- 5 Use the locking knobs (4) to assemble the brackets and the repeater
- 6 Adjust the repeater to the best viewing angle



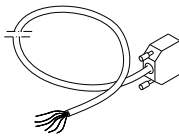
3.3 Cable connection

Caution

Any voltage supplies other than those specified in the product specification, page 9, may cause damage to the repeater.

The repeaters have no power switch, and the repeater will be automatically started when the cable is connected to the unit. It is therefore recommended to connect the cable via an external power switch.

The repeaters are designed to run on 24VDC, and accept a digital RS422 data signal.

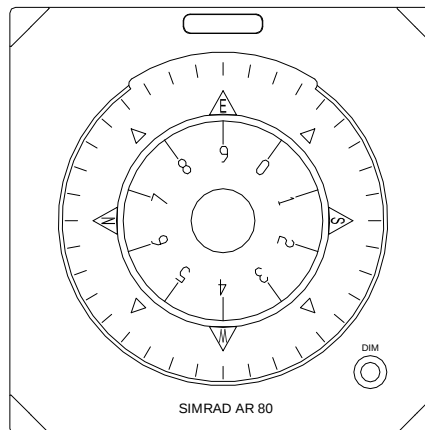


The repeater is supplied with a 2.5 meters cable with a 15 pins female D-type connector.

The following table indicates the function of cores and their identification.

Function	D-type connector pin	Wire color (as supplied)	Ships cable (to be filled out for reference by installer)
24V DC	1	Red	
DC Return	9	Black	
Data positive (TDA)	3	Green	
Data negative (TDB)	11	Blue	
Screen	8	Green/Yellow	

3.4 Operation



The analog repeaters include a rotating dial and a dimmer button.

Turning the repeater ON

The repeaters have no separate power button, and the unit is automatically turned on when the cable is connected to the unit.

The repeaters have been designed to accept a variety of NMEA input sentences. When the cable is connected to the repeater, it will automatically sense which sentence that is present. The following priority is used when defining the signal:

- True heading (HDT)
- Heading & Variation format (HDG)
- Old Heading format (HDM)

If the signal is invalid or missing after 1 second, the repeater will indicate this by flashing illumination and by rotating the dial back and forth $\pm 35^\circ$ around the last known heading.

When the defined input signal is lost, the power must be switched off and on again. If the cable not is connected via an external switch, the cable must be disconnecting and reconnected again to define a new input signal.

Adjusting display illumination

The rotary button is used for adjusting the background illumination on AR78 and AR80. Rotating the button in a clockwise direction will increase the light intensity, while the light intensity will be decreased when the button is turned counter-clockwise.

3.5 Commissioning

Perform the following tests when commissioning the repeater:

- 7 Ensure that the mechanical installation and cable connection has been completed according to the description on previous pages
- 8 Connect the cable to the repeater. The repeater will automatically sense which digital signal that is present
 - The repeater will align itself to zero and then to the transmitted gyro heading
- 9 Ensure that the lighting is set to a suitable level. Adjust if necessary with the dimmer button

3.6 Fault finding

The AR68/AR77 are sealed units, and breakage of the security seal will invalidate the warranty.

If trouble is encountered, make preliminary checks as described below. If the problems remain unsolved, contact your nearest Simrad dealer for assistance.

Symptom	Probable fault	Remedy
The repeater does not operate.	No power or incorrect power connection.	Check incoming power supply.
The repeater aligns itself to zero and does not respond to heading input. The dial rotates +/- 35°.	The digital signal to the repeater is either not present, or the sentence being sent is incorrect or has wrong polarity.	Switch the unit off and on again.
Lighting not visible	Damage to internal LED, or damage to internal PCB.	Return to Simrad dealer for service.

4 AR81 / 83 BEARING REPEATERS

4.1 Technical specifications

Dimensions:	Refer page 31
Weight (nominal):.....	4.5 kg
Mounting:	Dedicated holders or stand
Connections:	Via holder or stand
Compass safe distance:	0.5 m
Cable:	1.8 m
Protection:.....	IP66
Temperature:.....	-20°C to +60°C
Performance:.....	±0.3°
Follow up rate:	40°/s maximum
Dial Resolution:	
AR81:	Marked to 1°
AR83:	
Outer dial.....	Marked to 1°
Inner dial.....	Marked to 0.5°
Power supply:	24V DC
Data input:	\$ - - HDT

4.2 Installation

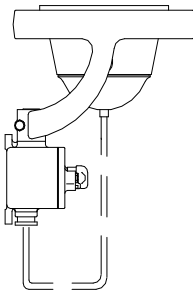
The AR81/AR83 bearing repeaters have to be mounted by using one of the repeater holders or in the repeater stand. Refer **SPARE PART LIST**, page 25.

Refer dimensional drawings for repeater holders and repeater stand, page 32 onwards.

4.3 Cable connection and DIP switch settings

Caution

Any voltage supplies other than those specified in the product specification, page 14, may cause damage to the repeater.



The AR81/AR83 repeaters are supplied with a 1.8 m cable.

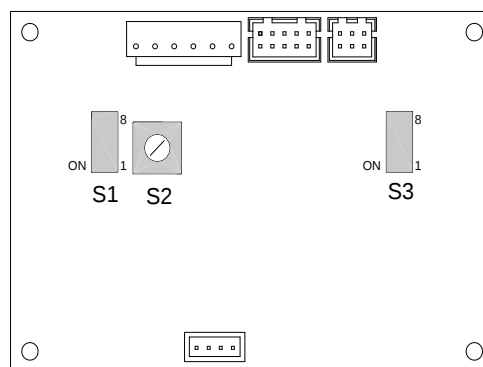
The repeater is connected to the gyro compass via the connection box on the repeater holder or on the repeater stand.

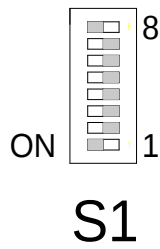
Refer the following paragraphs for how to connect the repeater and how to set necessary jumpers in repeater and in the gyro's control unit.

Dip settings in AR81 / 83 repeater

DIP switch settings in the AR81/83 repeaters are factory set for connection to a GC80/85 gyro compass.

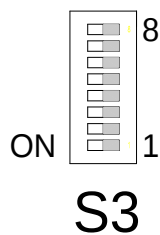
If the repeaters are to be used by any other gyro system, it could be necessary to set the DIP switches in S1 according to the description following here.





SWITCH	DEFAULT	FUNCTION	DESCRIPTION	
S1-1	ON	Setup for receive format	1-1 OFF	20 msec (IEC-2)
			1-2 OFF	
			1-3 OFF	
			1-1 ON	100 msec (IEC-1)
			1-2 OFF	
S1-2	OFF		1-3 OFF	
			1-1 OFF	200 msec (IEC-1)
			1-2 ON	
S1-3	OFF		1-3 OFF	
			1-1 ON	
			1-2 ON	
S1-3	OFF		1-3 OFF	TK format
			1-1 OFF	
			1-2 OFF	
S1-3	OFF		1-3 ON	
S1-4	OFF	Not used		
S1-5	OFF	Not used		
S1-6	OFF	Repeater type	OFF = Standard	
			ON = Steering repeater	
S1-7	-	Polarity for offset	OFF = +	Value input with S2
			ON = -	
S1-8	ON	Software update	OFF = Software update	
			ON = Normal operation	

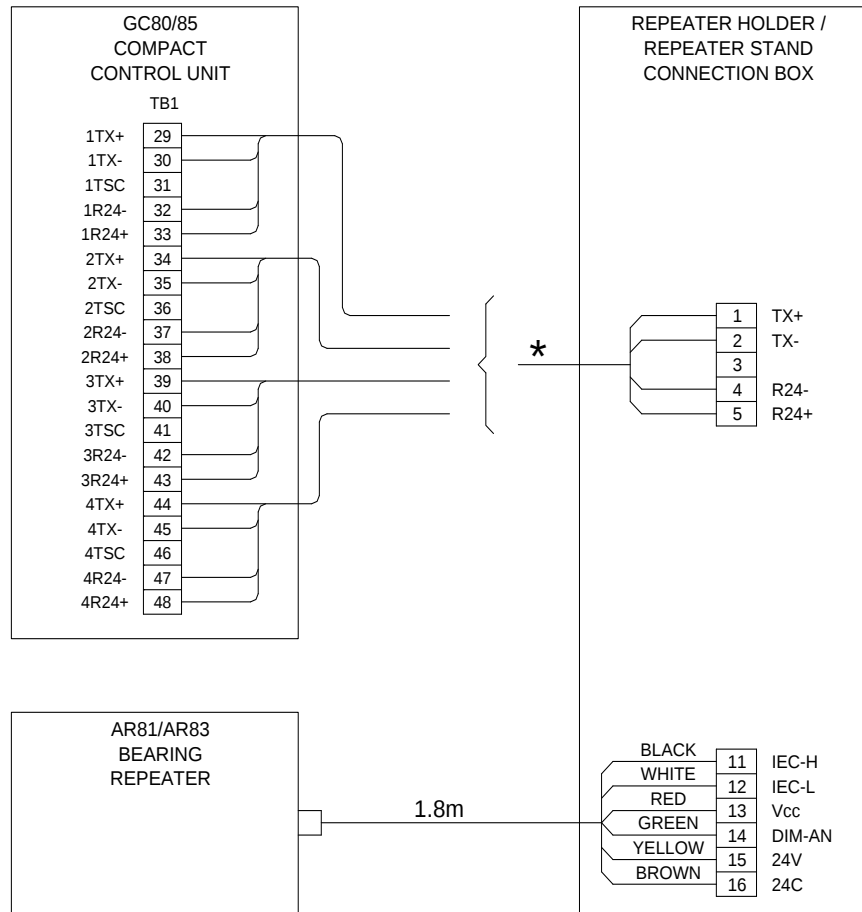
SWITCH	DEFAULT	FUNCTION	DESCRIPTION
S2	-	Offset value	



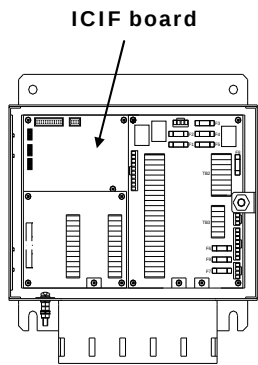
SWITCH	DEFAULT	FUNCTION	DESCRIPTION
S3-1	OFF	Not used	
S3-2	OFF		
S3-3	OFF		
S3-4	OFF		
S3-5	OFF		
S3-6	OFF		
S3-7	OFF		
S3-8	OFF		

Connecting an AR81 / 83 repeater to a GC80 / 85 Compact gyro system

The AR81/83 should be connected to one of the four TX ports in the Compact control unit as shown on the figure below:

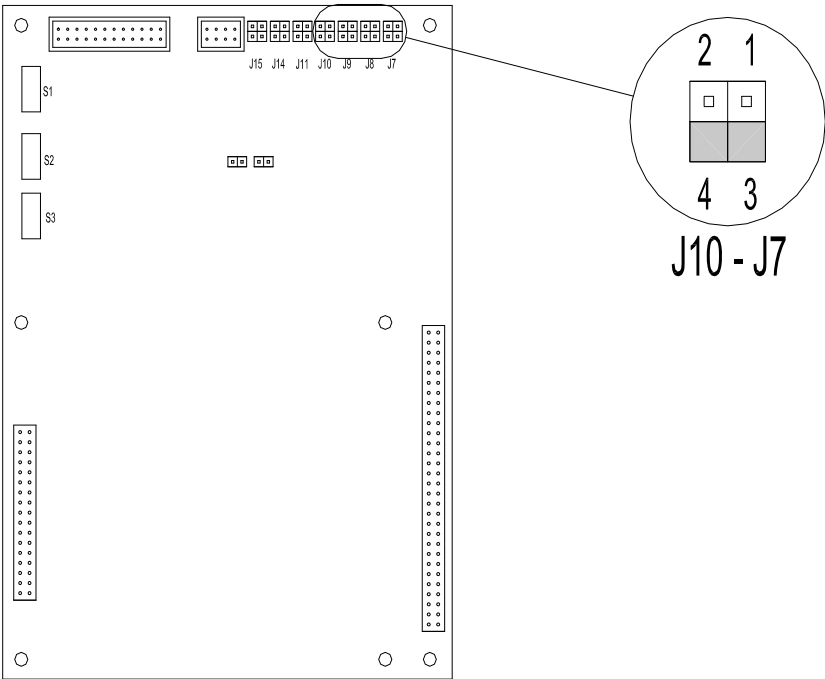


* Cable not supplied by Simrad



When an AR81/83 is connected to a GC80/85 Compact gyro system, the serial output signal from the gyro has to be set to IEC-61162-1 ed.2. This is done by setting a jumper on the **ICIF** board in the GC80/85 Compact Control unit. Depending on which TX port that is used for connecting the repeater, pin 1-2 has to be shorted on the following jumpers on the ICIF board:

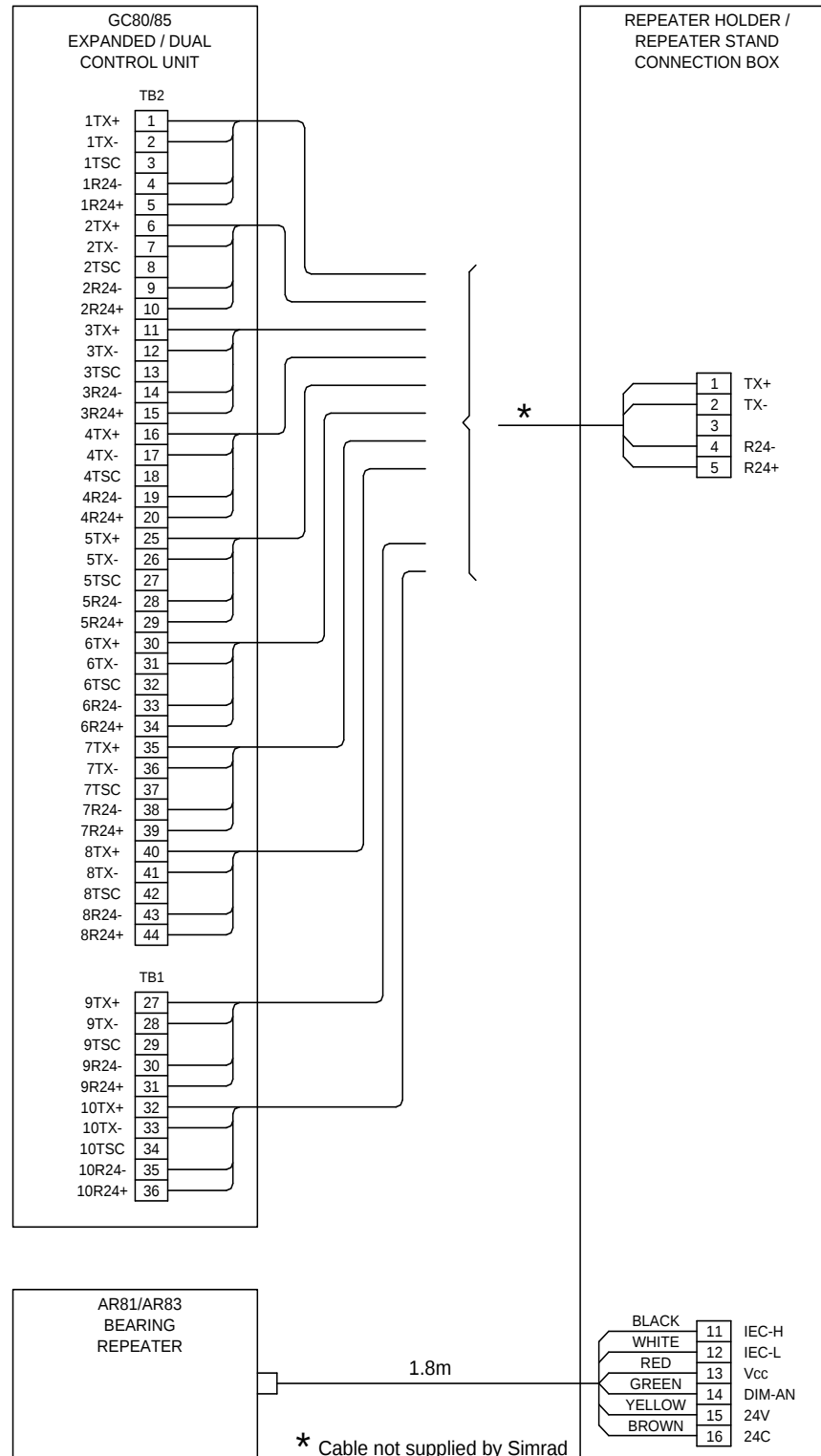
TX PORT	JUMPER
1TX	J7, 3-4 short
2TX	J8, 3-4 short
3TX	J9, 3-4 short
4TX	J10, 3-4 short



Refer to the manual for your gyro system for more detailed information about the different jumper settings.

Connecting an AR81/83 repeater to a GC80/85 Expanded/Dual gyro system

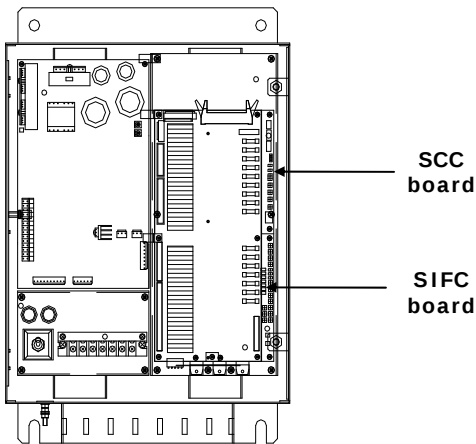
10 TX channels are available when connecting the AR81/83 repeater to a GC80/85 Expanded or Dual gyro system. The repeater should be connected to the control unit as shown on the figure below:



When an AR81/83 is connected to a GC80/85 Expanded or Dual gyro system, the serial output signal from the gyro has to be set to IEC-61162-1 ed.2. This is done by setting a jumper on the **SCC** or **SIFC** board in the GC80/85 Expanded, or on the **SCC** or **SCOIF** board in the Dual control unit.

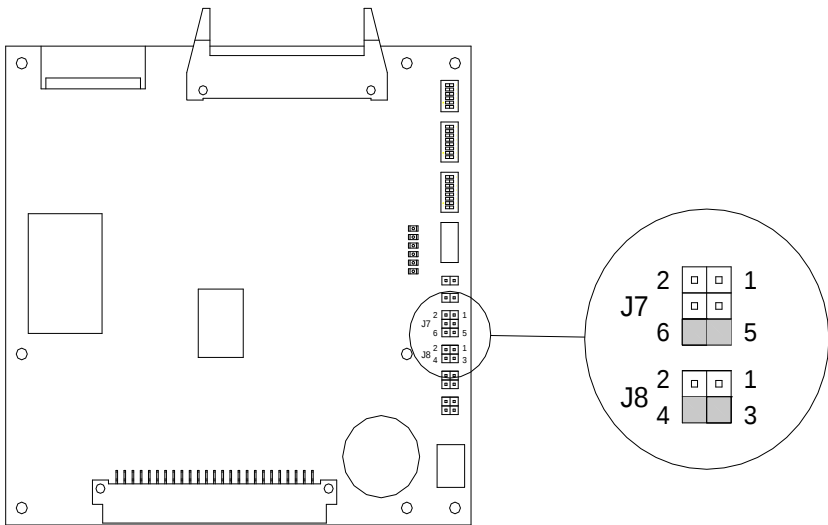
Depending on which TX port that is used for connecting the repeater, the jumpers have to be set as described in the following pages.

GC80 / 85 Expanded gyro system

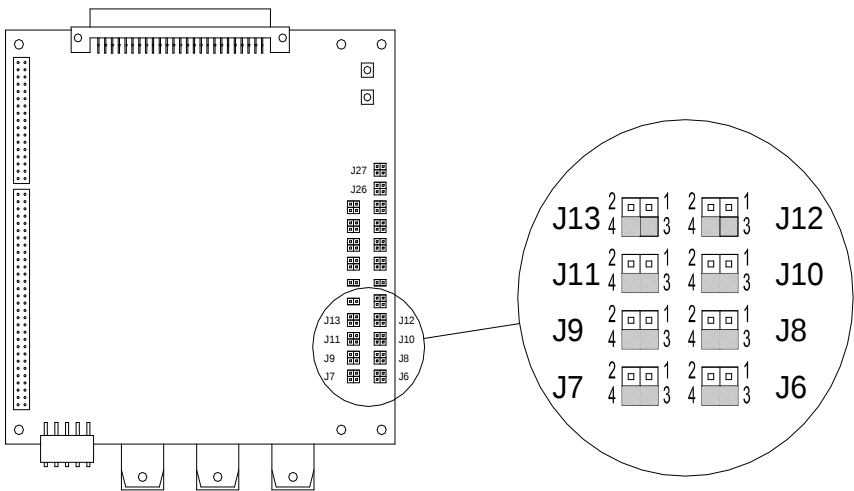


TX PORT	BOARD	JUMPER
1TX	SCC	J7, 5-6 short
2TX		J8, 3-4 short
3TX	SIFC	J6, 3-4 short
4TX		J7, 3-4 short
5TX		J8, 3-4 short
6TX		J9, 3-4 short
7TX		J10, 3-4 short
8TX		J11, 3-4 short
9TX		J12, 3-4 short
10TX		J13, 3-4 short

SCC board

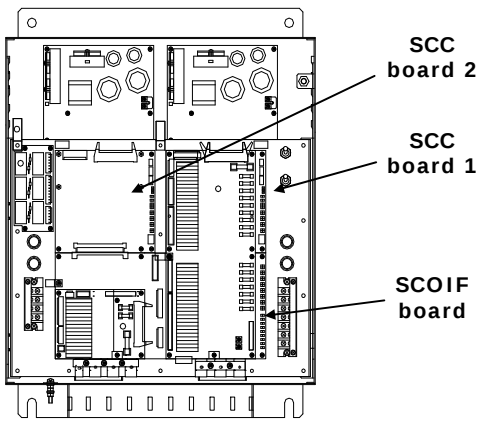


SIFC board



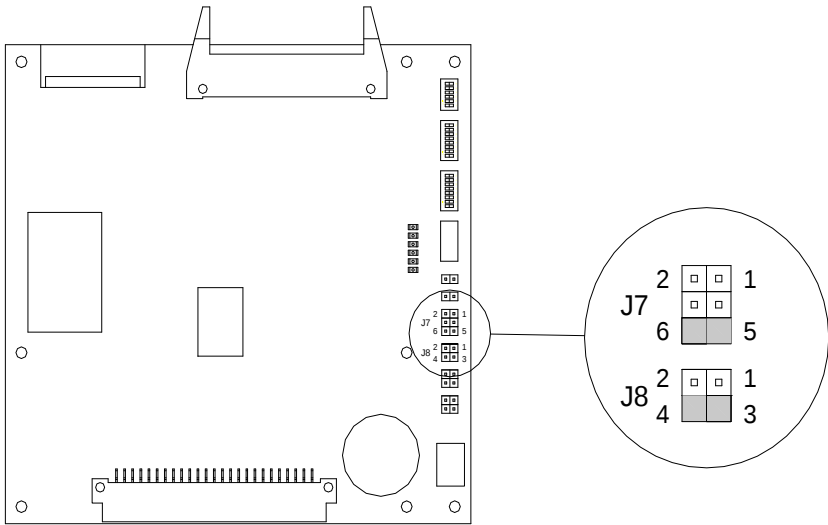
Refer to the manual for your gyro system for more detailed information about the different jumper settings.

GC80 / 85 Dual gyro system

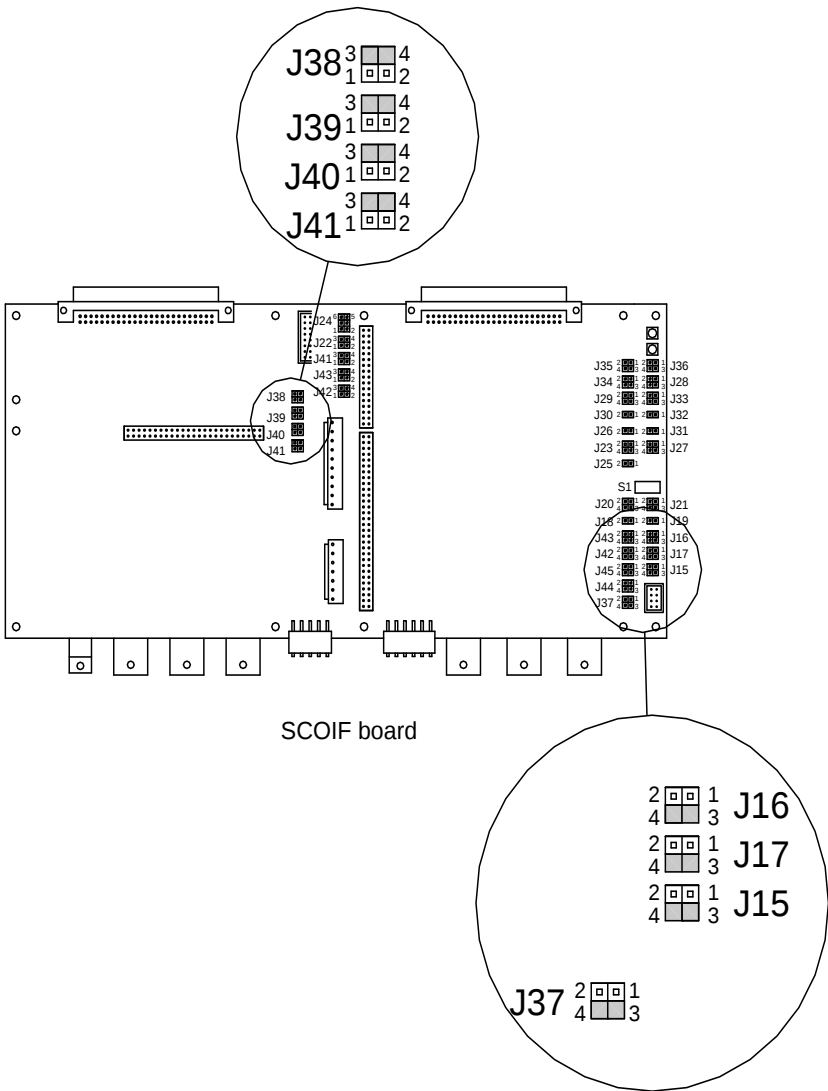


TX PORT	BOARD	JUMPER
1TX	SCC	J7, 5-6 short
2TX		J8, 3-4 short
3TX	SCOIF	J15, 3-4 short
4TX		J16, 3-4 short
5TX		J17, 3-4 short
6TX		J37, 3-4 short
7TX		J38, 3-4 short
8TX		J39, 3-4 short
9TX		J40, 3-4 short
10TX		J41, 3-4 short

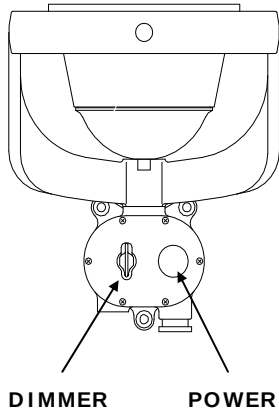
SCC board



SCOIF board



4.4 Operation



Turning the repeater ON

The repeater holders and the repeater stand have a power button on the connection box.

When the cables are connected and the jumper set in the control unit according to the previous pages, the repeater is turned on by switching the power button.

If the signal is invalid or missing after 1 second, the repeater will indicate this by rotating the dial back and forth $\pm 35^\circ$ around the last known heading.

When the defined input signal is lost, the power must be switched off and on again. If the cable not is connected via an external switch, the cable must be disconnecting and reconnected again to define a new input signal.

Adjusting display illumination

The rotary button is used for adjusting the illumination on AR81/83 repeater. Rotating the button in clockwise direction will increase the light intensity, while the light intensity will be decreased when the button is turned counter-clockwise.

4.5 Commissioning

Perform the following tests when commissioning the repeater:

- 1 Ensure that the mechanical installation and cable connection has been completed according to the description on previous pages
- 2 Turn the repeater on.
 - The repeater will align itself to zero and then to the transmitted gyro heading
- 3 Ensure that the lighting is set to a suitable level. Adjust if necessary with the dimmer button

4.6 Fault finding

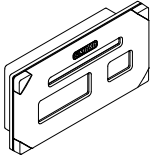
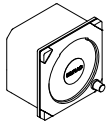
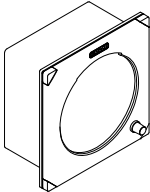
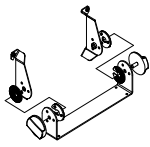
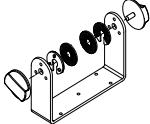
The AR81/83 are sealed units, and breakage of the security seal will invalidate the warranty.

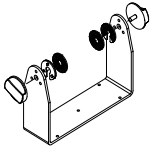
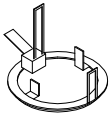
If trouble is encountered, make preliminary checks as described below. If the problems remain unsolved, contact your nearest Simrad dealer for assistance.

Symptom	Probable fault	Remedy
The repeater does not operate.	No power or incorrect power connection.	Check incoming power supply.
The repeater aligns itself to zero and does not respond to heading input.	The digital signal to the repeater is either not present, or the sentence being sent is incorrect or has wrong polarity.	Switch the unit off and on again. Check the sentence from the heading sensor.

5 SPARE PART LIST

The following tables list part numbers for all standard and optional equipment that may be delivered for DR76, AR78, AR80, AR81 and AR83 repeaters.

Part no		Description
27103365		DR76 Digital repeater
27103340		AR78 Analog repeater
27103324		AR80 Analog repeater
27101732		Single scale Bearing Repeater NMEA. To be mounted in BB holder, MB Holder or BH stand. IMO A424
27101740		Dual scale Bearing Repeater NMEA. To be mounted in BB holder, MB Holder or BH stand. IMO A424
27103407		Repeater mounting accessories for DR76 and AR78/AR80. Including 4 front panel corners and 4 screws
44170702		2.5 m Repeater cable with plug
22084941		DR76 Mounting bracket
27103589		AR78 Mounting bracket

Part no		Description
27103571		AR80 Mounting bracket
27102870		AR81/AR83 Repeater Holder Gimballed bracket for indoor mounting of bearing repeater
27103076		AR81/AR83 Repeater Holder. Trunnion bracket for bearing repeater
27102862		AR81/AR83 Repeater Stand Binnacle for outdoor mounting of bearing repeater.
27102888		AR81/AR83 Azimuth Circle Used on bearing repeater to take bearings on celestial bodies and surface targets etc.
27102912		Course Recorder Records day, hour and course.

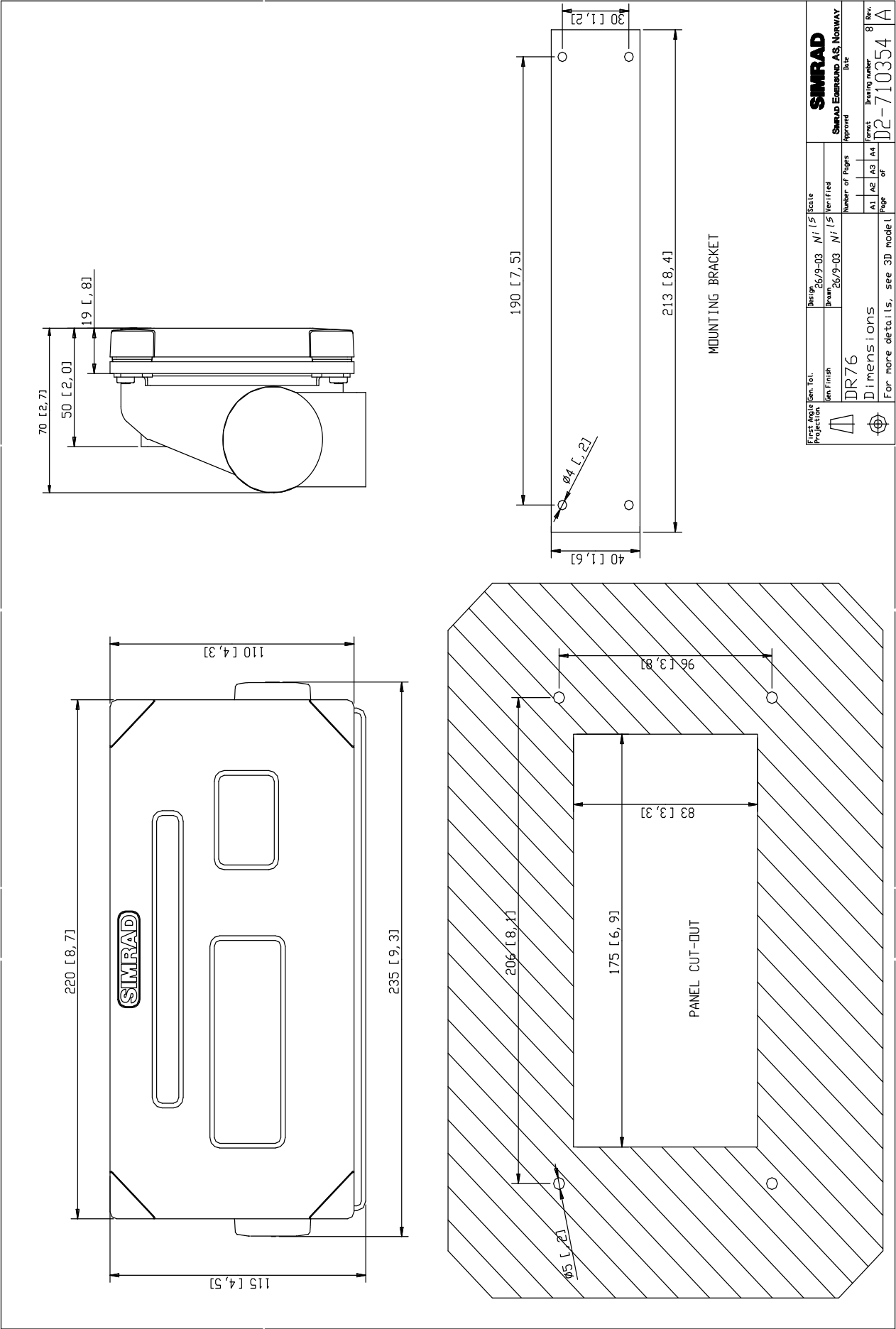
6 DRAWINGS

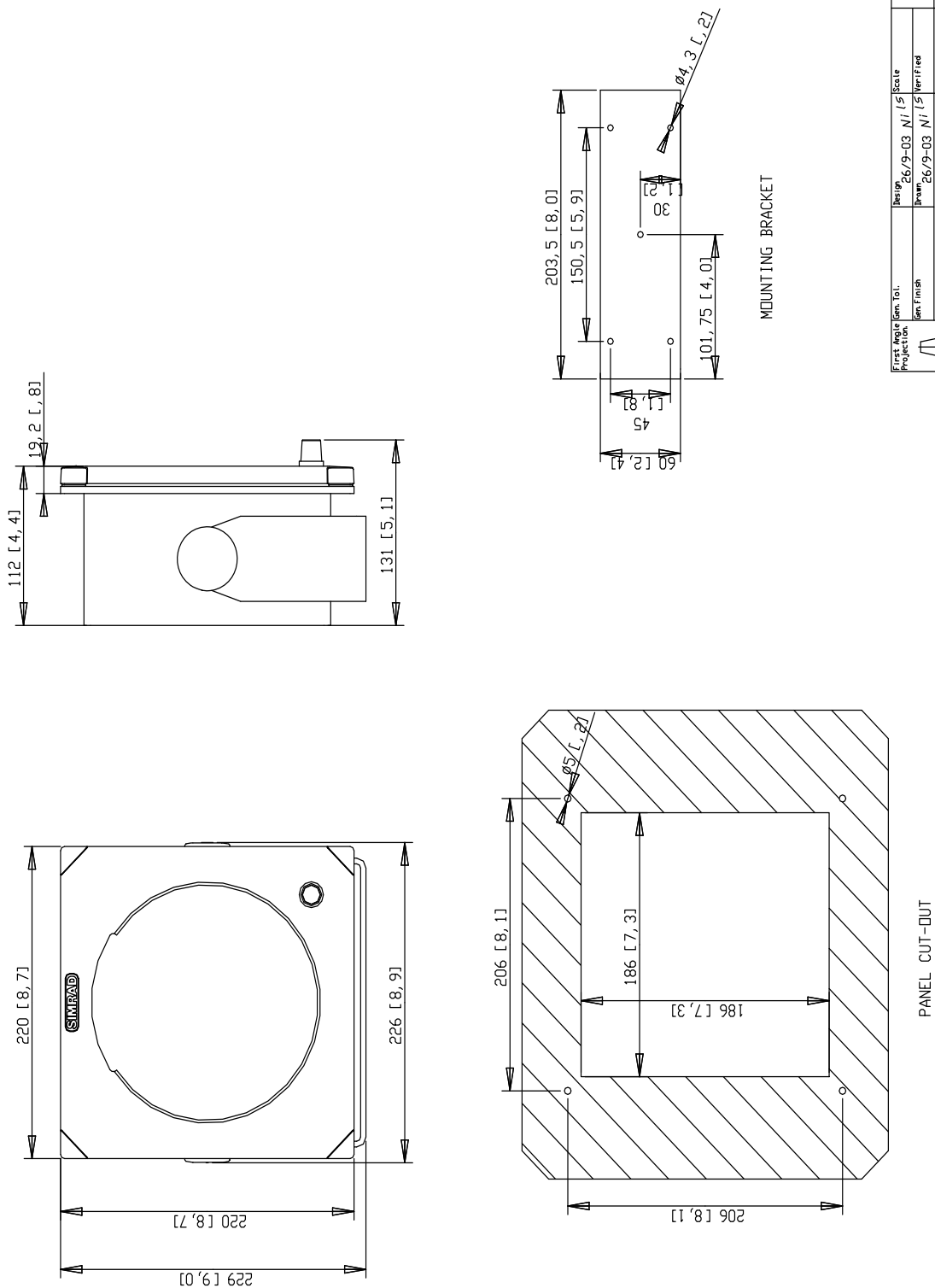
The following drawings are enclosed:

Drawing name	Drawing no.	Rev.
DR76 Digital repeater. Dimensions	D2-710354	A
AR78 Analog repeater. Dimensions	D2-710355	A
AR80 Analog repeater. Dimensions	D2-710356	A
AR81/AR83 Bearing repeater. Dimensions	N4-710302	A
AR81/AR83 Repeater holder (BB). Dimensions	N4-710303	-
AR81/AR83 Repeater holder (BH) Dimensions	N4-710304	-
Repeater stand (BH). Dimensions	N4-710308	-

Note

The original signed drawings are recorded at Simrad Egersund.





	Design	Scale	SIMRAD SIMRAD EIDEBAUM AS, Norway Approved Date
	26/9-03 N	1:5	
	Drawn	26/9-03 N	
Number of Pages			
A1 A2 A3 A4			
Page of			
For more details, see 3D model			
AR80 Dimensions			
Drawing number			
D2-710356			
Rev.			
3			
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