

Hydrotide Data Logger (TGR-1050-HT & TWR-2050-HT) User's Manual



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About this Manual

This manual provides instructions for the proper use and care of the Hydrotide data loggers manufactured by RBR Ltd. It contains operating instructions for field deployment and use. Information on the RBR Windows Software for programming and data recovery is located in the **Submersible Data Logger User's Manual**.

All RBR manuals are distributed on a mini-CD with each logger, and can also be found online at our website (www.rbr-global.com).

Warranty Statement

All data loggers manufactured by RBR Ltd. since September 2002, are warranted against defects in workmanship or original parts and materials for life.

Units suffering from such defects will be repaired or replaced at the discretion of RBR Ltd., provided that the problem has appeared during normal use of the instrument for the purpose intended by us. The liability of RBR Ltd. extends only to the replacement cost of the instrument. The customer will bear all costs of shipment to us for repair; all other costs, including return shipment, will be borne by RBR Ltd.

This warranty does not cover consumables or normal wear and tear, nor does it cover damage caused by negligent use or mishandling. Attempted modification or repair of any unit without the prior consent of RBR Ltd. will immediately void any warranty in force.

Users are expected to maintain a regular program of calibration. Equipment, such as sensors made by other companies, is warranted only to the extent provided by the original manufacturers.

We reserve the right to grant or refuse warranty repairs at our discretion if we consider that there are reasonable grounds for doing so.

Package contents

The RBR Hydrotide logger package consists of the following:

1. The RBR Hydrotide logger
2. The Druck sensor if supplied by RBR; or a sensor connector if sensor is customer supplied
3. A cable to connect to your computer, part #2204-604A-1.8m, 1.8m length
4. This Hydrotide User's Manual
5. RBR Datalogger User's Manual
6. Additional data connector for custom length, part #2204-604A-xm
7. A mini-CD-ROM containing the RBR Windows Software and associated manuals
8. If the RS-485 option was selected at the time of ordering, then an RS-485 to RS-232 adaptor will also be supplied.

Basic operating instructions

Installing and changing the batteries

For a discussion of battery life expectancy, please refer to

“Appendix A –battery lifetime calculation (p.16).”

Important: RBR Hydrotide data loggers do not have a backup battery. If the logger has entered its standby state, the clock can run for approximately two minutes without batteries; however, it will almost certainly lose a significant amount of time. It is also quite possible that the clock will reset. **We strongly suggest that the logger be programmed after the batteries have been changed.**

RBR Hydrotide data loggers are powered by eight 'C' size cells. Before changing the batteries, ensure that the logger is not sampling and leave it idle for at least one minute after disconnecting it from the computer. This will ensure that it has entered its standby state and its operation will not be disturbed by removing the old batteries.

To remove the batteries, open the box and gently pry each cell from its holder. When replacing the batteries note the polarity and replace batteries in each holder accordingly, see the photograph below. Always replace all eight batteries at the same time.



Photograph of battery holders

Installing the RBR Windows Software

Please see the **Software** section of the **Submersible Data Logger User's Manual** for instructions relating to logger programming and data retrieval.

Communicating with the logger



The DATA/PWR connector will have been configured for either RS-232 or RS-485 protocol according to the specification at time of order. It is possible to change the instrument from one to the other afterwards. Please contact RBR Ltd for details on how this may be done.

To establish a link between the logger and a PC, connect the supplied cable to the DATA/PWR connector and a RS232 serial port on the computer.

If your computer does not have an available serial port, but does have a USB port, a serial to USB adapter may be used. Simply fit the serial connector into the serial to USB adapter and plug the adapter into the USB port on the PC.

Please note that the USB adapter's drivers must be installed before it will work. When this installation is complete, the correct COM port must then be chosen in **COM settings** in the logger operating software. Please see the RBR Software User Manual for more details.

RS-485

If the TWR-2050HT or TGR-1050HT has been enabled for RS-485 connection, then an RS-485 to RS-232 converter will have been supplied. Use this with the RS-485 side connected to the logger and the RS-232 to the computer.

Using an RF modem

RBR Hydrotide loggers may be connected to an RF modem, making it possible to program the logger remotely and to view and save data as it is collected. This will require a slightly different connection cable to permit control of the modem.

The **COM settings** portion of the Software guide has configuration instructions for the RF modem. The **Real-time display** section has more details about live data collection.

Calibration

There are two ways to calibrate this instrument.

Method 1. Using the sensor calibration certificate.

This will have two calibration numbers which give the output for zero pressure and that for full range as highlighted in the example (overleaf). To convert these to the two calibration numbers to insert into the logger, several steps must be taken. Conversions or corrections must be applied for (the bold figures refer to the supplied spreadsheet):

Conversion of psi to dBar	D20	0.689476
Density of water	D21	1.0281 for standard seawater
Acceleration due to gravity	D22	0.980665
Gain of the amplifier	D24	21.00000
Drive voltage	D25	3.00000

From the calibration sheet:

Full scale range	D29	15.0000 psi
Output at full range (mV)	D30	103.300 mV (assumes 10V excitation)
Output at zero (mV)	D31	0.0000 mV

From this, the calibration constants are computed:

$$\text{Constant a} = D30 * 10 * D29 * D20 / (D25 * D30 * D24 * D21 * D22)$$

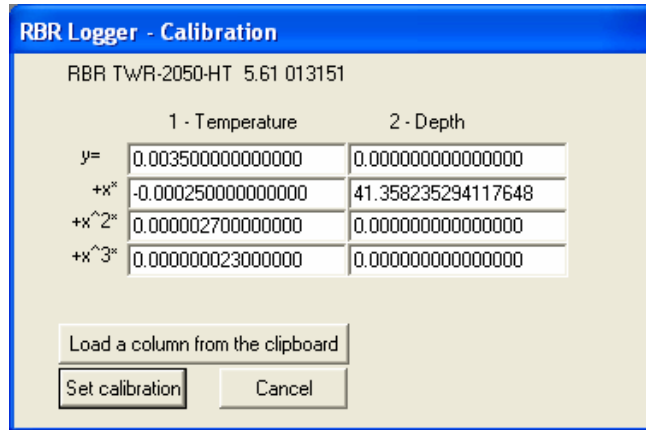
$$\text{Constant b} = D25 * 1000 * 10 * D29 * D20 / (D25 * D30 * D24 * D21 * D22)$$

Constants c and d may be set to zero.

When these constants are entered, the output will be in metres of water.

The multiplier is entered as the second coefficient in the calibration window (see page 31 of the **Submersible Data Logger User's Manual**).

If, as an example, the first coefficient is zero and the second one is 41.358235, then enter the coefficients at follows;

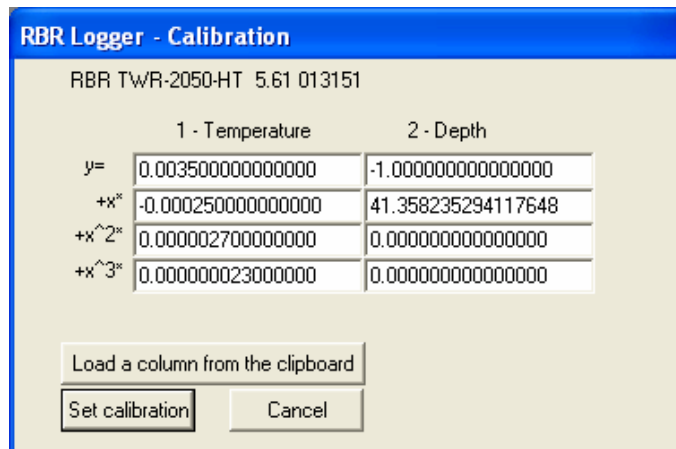


Having entered the multiplier value with an offset of zero, a measure should now be made of the real offset. Start the logger taking samples at a 1 second period without averaging set and with no wave bursts being enabled for a TWR-2050-HT. Locate the logger at the monitoring site and use a measured staff gauge to plunge the Druck sensor into the water. Maintain the sensor in place for two or three minutes. When the data is downloaded from the logger, use the View Statistics window (page 32 of the **Submersible Data Logger User's Manual**) to obtain a measure of the average depth of the sensor. With the Gauge depth and the logger readings, a value for the offset can be calculated:

$$\text{Offset} = \text{Gauge depth} - \text{Logger depth}$$

Enter this offset into the calibration coefficients window (y).

For example if the Gauge depth from the staff is 10m and the logger readings provide a value of 11m then the offset is -1m.



When calibration is completed, click on the “Set calibration” button to update the constants within the logger.

Sample Calibration Certificate from Druck



GE Druck



APPLICATION DATA

- 1 Supply voltage may be up to a maximum of 12 volts. Transducer sensitivity and current consumption will be proportional to supply voltage.
- 2 Current consumption will not exceed 10 mA for stated supply voltage.
- 3 Zero offset can be nulled using a 250 Kohm potentiometer across the output terminals with the wiper connected to the negative supply via a 250 Kohm resistor.
- 4 For best temperature stability, the transducer must be operated into a load impedance of > 50 Kohm.
- 5 A shunt calibration resistor may be connected between the negative supply and the negative terminal to produce a positive output. The output obtained may be temperature sensitive. In case of difficulty, refer to the manufacturer.
- 6 If a power supply ground is to be used, then the positive side should be grounded.

SPECIFICATION

Date	5-DEC-2005
Sales Number	Y20273.1.1
Transducer Type	PDCR 1830-8335
Serial Number	2250182
Part No.	D1830-8335-07
Pressure Range	30 psig
Supply Voltage	10 V
Zero Offset	0 +/- 3 mV
Sensitivity	0.34 mV/V/PSI
Non-Linearity & Hysteresis	max +/- 0.10 % BSL
Temperature Error Band	max +/- 0.30 % FRO
Compensated Temperature Range	-2°C to +30 °C
Pressure Connection	DEPTH CONE
Electrical Connection	
Positive Supply	Red
Negative Supply	White
Positive Output	Yellow
Negative Output	Blue
Mounting Torque	15 lb.ft.

Calibration Traceable To National Standards

25m of depth cable



CALIBRATION DATA

Full Range Output (FRO) 103.28 mV at 23°C

Deviations From Best Straight Line

Pressure (psig)	0.00	0.00	6.00	12.00	18.00	24.00	30.00	30.00
(psig)	0.00	0.00	6.00	12.00	18.00	24.00	30.00	30.00
% FRO	0.04	0.04	-0.01	-0.04	-1.05	-0.03	-0.02	0.02 0.07

Thermal Zero Shift

Temperature (°C)	-2.0	23.0	30.0
% FRO	-0.04	0.00	-0.03

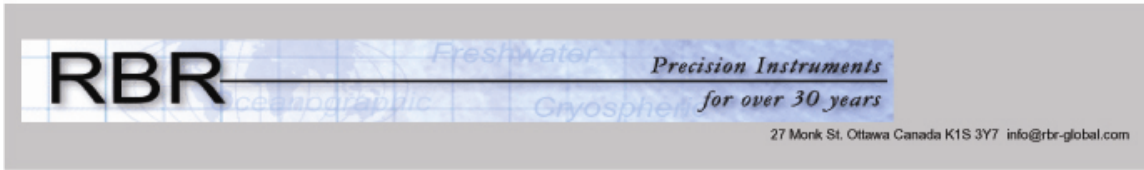
Thermal Span Shift

Temperature (°C)	-2.0	23.0	30.0
% FRO	-0.12	0.00	0.12

Temperature Error Band +/- 0.13 % FRO

Sample Spreadsheet showing calibration calculation.

Calibration for: Druck Transducer Two-point Calibration Sheet



Druck Transducer Calibration Certificate

Enter only the cells marked:

Standard Parameters

Conversion from psi to dBar 0.689476
 Density of water (1.00 fresh; 1.02810 sea) 1.028100
 Acceleration due to gravity 0.980665

Gain of Amplifier (=1+50k/R) 21.000000
 Drive Voltage 3.000000

Data from Druck Calibration:

Full scale range (psi) 30.000
 Output at Full Range (mV) 103.800
 Output at zero (mV) 0.000

Druck serial number: 2281630
 Logger Serial Number: 100456

Calibration Date: 22-Jul-06

Logger Calibration

Coefficients

a 0.000000
 b 94.116924
 c 0.000000
 d 0.000000

Test:

Enter water depth (metres) 10.258
 Predicted logger reading 0.108990
 Output in mV 51.900
 Actual mV/V/psi 0.348844704
 Coefficient 0.031372308

Operator: _____

Method 2. Calibration Using Online Two point Calibration.

Connect the unit, with a sensor, to a computer and run the RBR software.

Select the “Calibration” function, and then select “View statistics/ Two-point calibration”.

Follow the on-line instructions for setting the zero level and to obtain a reading at a known depth.

The program will then compute the appropriate values for the calibration constants which may then be entered into the logger.

For more details of calibration procedure, please refer to the RBR Data Logger User’s Manual, Software - Calibration functions - View Statistics/Two-point calibration.

Deployment

Once you have ensured that the batteries are fresh and have programmed the logger, the instrument is ready to be deployed. There are three precautions you should take to avoid damaging the logger:

1. **Heed the maximum pressure rating.** All RBR loggers with pressure sensors are individually rated to a maximum depth/pressure.
2. **Mounting the logger and the pressure transducer.** The Hydrotide instruments need to be mounted so that the electronics enclosure is protected from the weather, and the cable to the transducer needs to be carefully routed to prevent any accidental damage. The pressure transducer itself needs to be fixed at some known depth, and also protected from accidental damage.
3. **Use desiccant when necessary.** The critical part of this instrument that could be affected by moisture is the vent cable which goes from the pressure transducer to the electronics enclosure. Every precaution must be taken to ensure that this remains dry during installation. The sensor is supplied with a desiccant pack sealed to the connector. When ready for installation, quickly remove this pack and connect the cable to the electronics. If moisture does enter the tube, then condensation may occur and the pressure will have a fixed offset. The hydrotide data logger also has desiccant cartridges installed inside the logger box. These DriCap[®] desiccant cartridges have indicating silica gel, which turns from blue to pink, warning when adsorption capacity has been reached and cartridges should be replaced.

Maintenance and repairs

Repairs

We support all instruments and software that we manufacture. First line support is always available by phone, fax or e-mail. Please contact us immediately if you are experiencing problems with your RBR product. It is very important to contact us before returning your instrument, as some difficulties can be easily solved on-site by the user. Please have the **model** and **serial number** of the unit handy when you contact us.

There are no user-repairable parts of the logger. Any attempt at repair, whether successful or not, without prior authorization from RBR Ltd. will void the warranty.

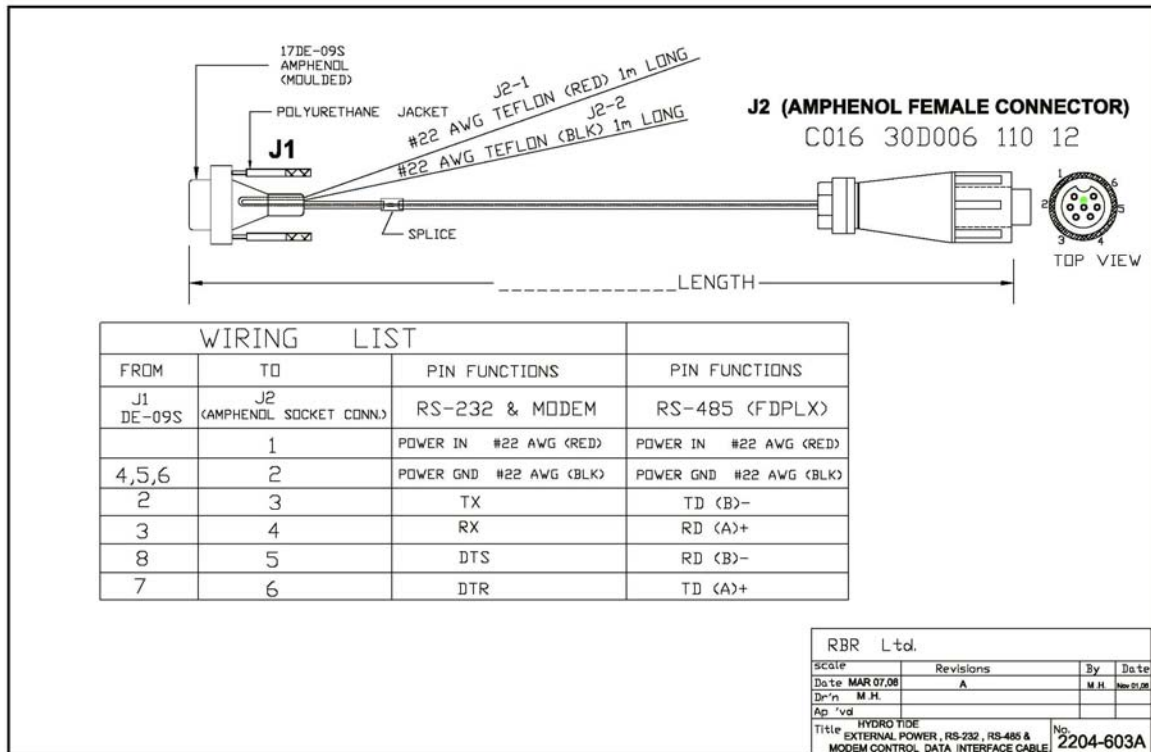
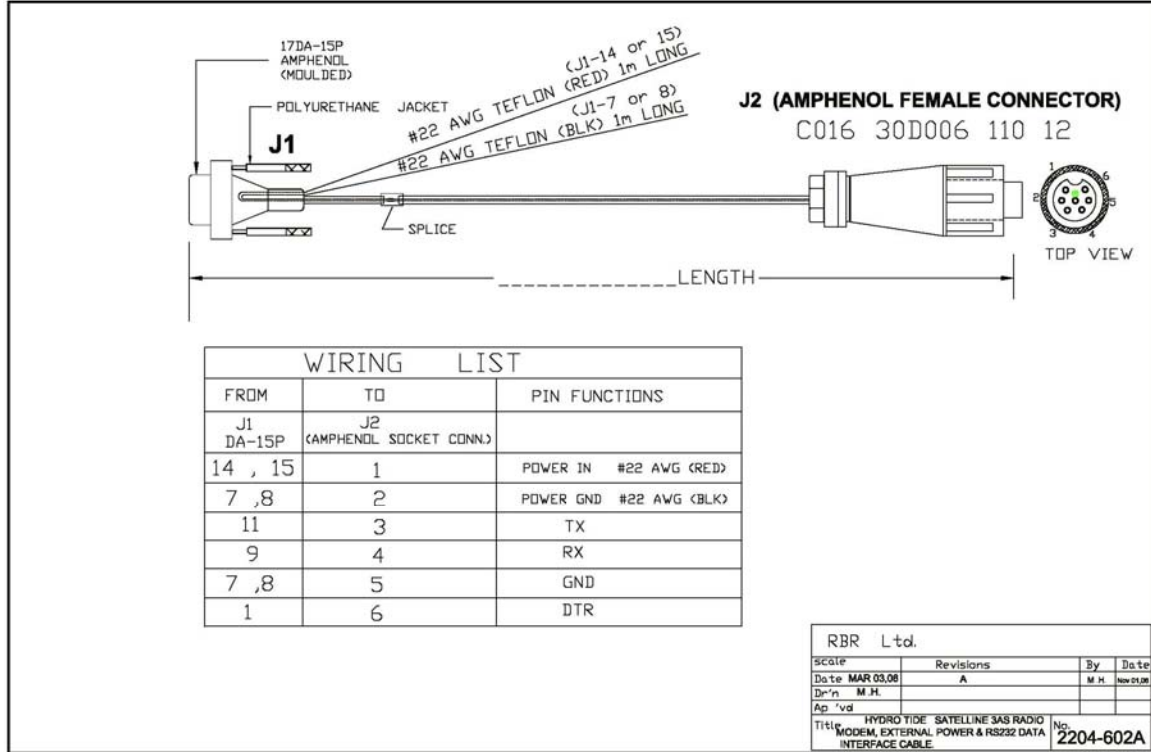
If it is necessary to return the product to RBR for an upgrade, repair, or calibration; please review the detailed shipping information on our website before returning the unit.

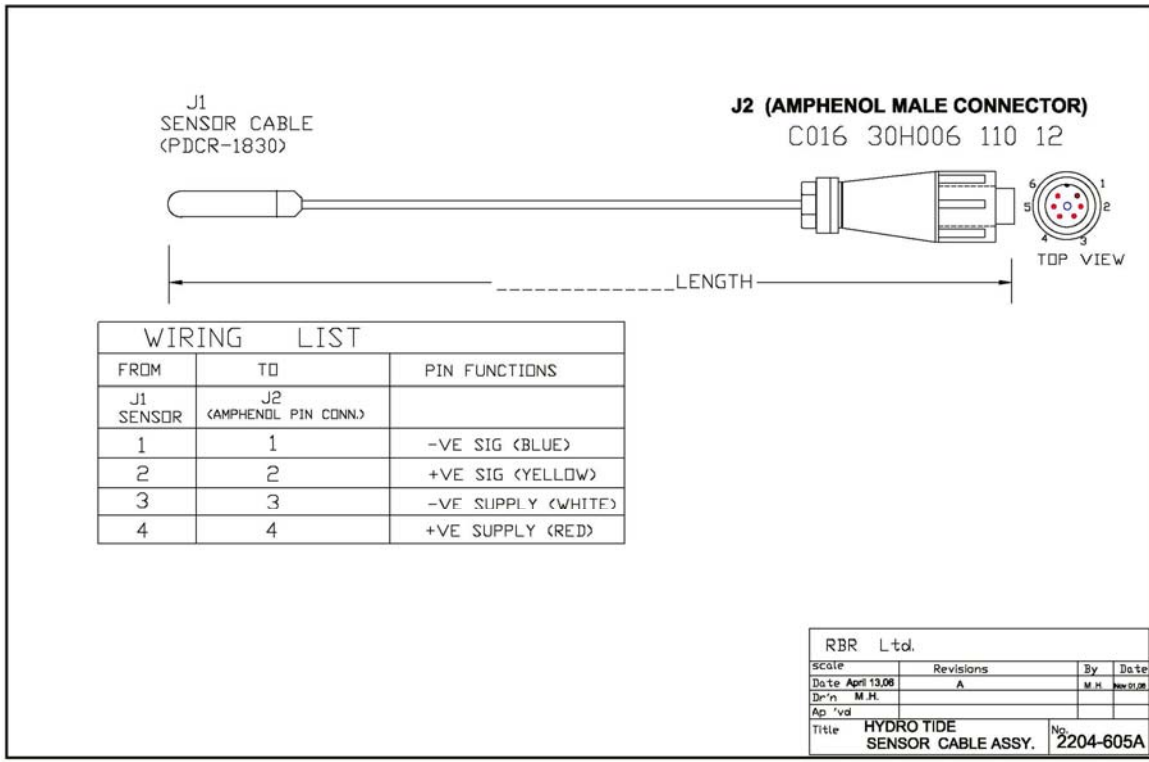
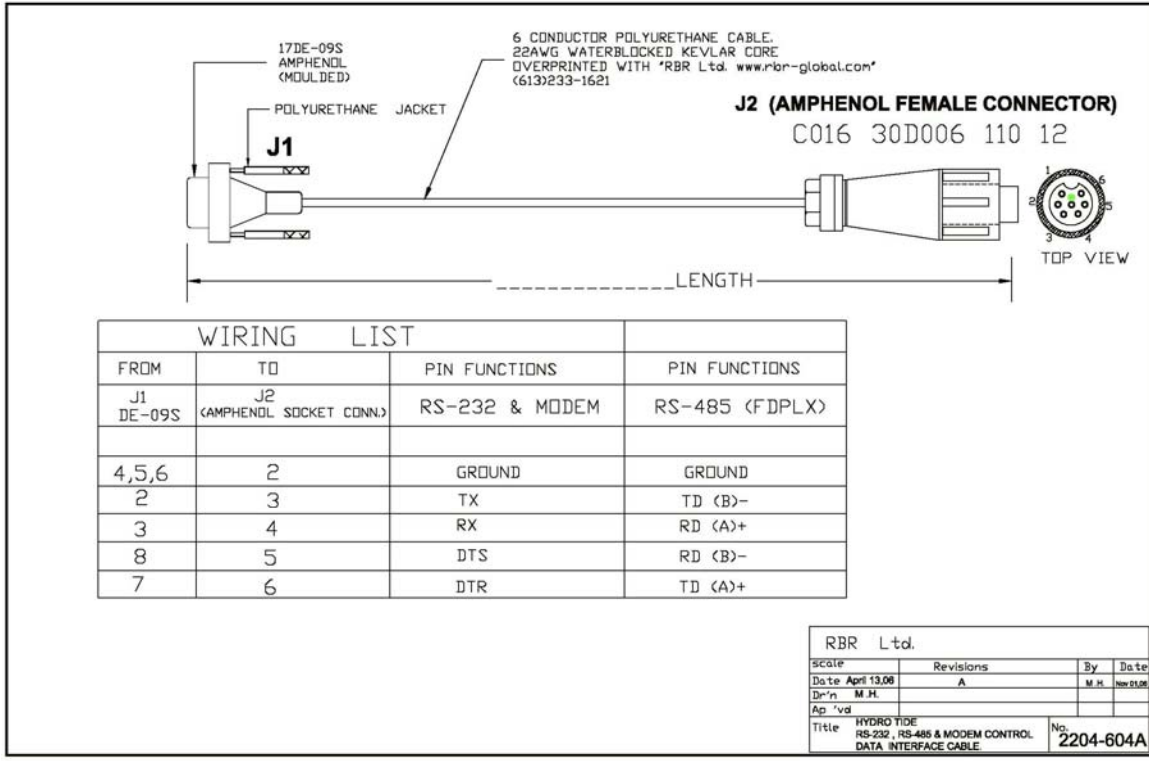
Calibration

We recommend that you verify the calibration of your data logger before any critical deployment, periodically once a year, or if you suspect the calibration to be out of specifications. Discuss your calibration needs with RBR. In some cases, you will be recommended to return the instrument to RBR to have it checked and re-calibrated. Please contact us for our current calibration fees.

Technical information

Connector wiring instructions and pin assignments





Connector Assembly Information

Follow the diagram for the assembly of Amphenol connectors.

Mounting Instruction, straight cable connector

Stripping Lengths	Measure a ¹⁾	Measure b
Screw contacts		
with internal cable retention	18 ⁺¹	7 ⁺¹⁻²⁾
without internal cable retention	25 ⁺¹	7 ⁺¹⁻²⁾
Solder contacts		
with internal cable retention	14 ⁺¹	4 ⁺¹
without internal cable retention	22 ⁺¹	4 ⁺¹
Crimp contacts		
0,14 – 0,50 mm ²		3 ^{+0,6}
0,50 – 1,5 mm ²		3,5 ⁺¹
with internal cable retention	14 ⁺¹	
without internal cable retention	22 ⁺¹	

1) PE +2mm 2) end splice recommended

The diagram illustrates the assembly process for a straight cable connector. It shows the following components and steps:

- Male and Female Contact Inserts:** Each insert includes a locking ring. The male insert is shown with dimensions 'a' and 'b'.
- Internal Strain Relief:** A component used to secure the cable within the connector.
- Back Shell:** A blue cylindrical component that houses the contacts. Tightening torque: 1,5 - 2 Nm.
- Clamping Ring with Mounted Gasket:** A ring that secures the back shell to the cable. Tightening torque: 1,5 - 2 Nm.
- Cable Nut:** A component that secures the cable. Tightening torque: 1,5 - 2 Nm.
- Locking Ring:** A ring that secures the contact inserts. Tightening torque: 0,5 Nm.
- Dimensions:** 6.8mm and 8-12.5mm are indicated for specific parts.
- Additional Gasket:** An additional gasket is included for extra sealing.

Appendix A – Battery life calculation

When to replace the batteries

Compared to the cost of deployment, the cost of a new set of batteries is close to negligible. We highly recommend that the batteries be replaced before every deployment unless there is no doubt that they have sufficient capacity.

Battery voltage does not decrease linearly and is therefore not an accurate indicator of battery capacity. However, if the logger software indicates that the batteries have less than 6V remaining, the batteries should be replaced.

When in doubt, replace the batteries.

Predicting battery life

Battery life prediction is a complicated issue. In RBR loggers, battery life is a strong function of the type of logger, the type and number of sensors attached, the sampling scheme (sampling period and the use of: real-time data collection and averaging), and the temperature of the logger during the deployment. Manufacturers' data for the batteries do not provide information that can be directly related to way the batteries are used in RBR Loggers.

The RBR Windows Software calculates the expected battery usage (in mA Hours - mAH) for the logger during setup. The nominal capacity of the batteries used in the Hydrotide loggers is 8000mAH at room temperature. The software will warn the user if the expected battery usage for a particular deployment scenario is above this value. The software will not prevent a logger from being started even if a warning is given. The user should view these predictions and further de-rate the batteries if the expected deployment is in the cold. The battery usage estimate is stored as part of the log files and may be used after deployment to enable the user to obtain a characterization of how a particular logger performs.

RBR continues to characterize battery life in its loggers and will continue to improve the battery life calculator in future versions of the RBR Windows Software.