



TRL-50 Sonar Telemetry
Users Manual
Rev 07/01/2002

Remontec Ltd
Tel: +44 (0)1493 444722
Fax: +44 (0)1493 443763
www.remontec.com

1. OVERVIEW	3
2. APPLICATIONS	4
3. SPECIFICATIONS.....	5
4. SET-UP AND DEPLOYMENT	6
DEPLOYMENT	6
TRL-TX50	7
TRL-RX50	8
TRL-PC50.....	8
SOFTWARE (WINDOWS 98, 2000).....	8
5. TECHNICAL OPERATION	10
OPERATING PRINCIPLE	10
<i>TRL-TX50</i>	10
<i>TRL-RX50</i>	12
<i>TRL-SENS</i>	12
<i>TRL-PC50</i>	13
<i>TRL-PSU</i>	13
6. MAINTENANCE	14
7. PACKING LIST.....	14
8. CONTACT DETAILS	14

1. Overview

The TRL-50 is a microprocessor-controlled system for determining when a beam trawl or other towed body is on the seabed and uses a Sonar communication link to send and receive data.

A bottom detect sensor connected to the underwater unit sends data via the Sonar link through the water column to a “dunking” receiver unit connected to a PC. The PC is used to display the results on a graph and to log the data.

The underwater transmitter unit is a self-contained underwater unit and contains re-chargeable batteries that can be re-charged in-situ. The TRL-50 consists of the following sub-items:

TRL-TX50

This is the underwater transmitter which relays the state of the bottom detect switch at 1 second intervals. Dimensions: 355mm X 50mm.

TRL-SW50

This is the bottom detect switch that determines if the towed body is on the seabed and consists of a sealed 18mm threaded body containing a reed switch operated by a magnet attached to the bottom detect lever.

TRL-RX50

This is the Sonar receiver and cable drive unit consisting of a stainless pressure housing 300mm X 38mm which is lowered over the side of the ship, (or mounted in a moon pool), and allowed to trail below the ship.

TRL-PC50

This is the decoder, which converts the Sonar signal into a form that the PC can read via the serial port. The TRL-RX50 plugs into the unit and is supplied with power and data over the same link. Dimensions 65mm X 55mm

TRL-PSU

12VDC 1A universal power supply for the TRL-PC50 and is also used for charging the TX50 using the adapter lead, TRL-ADPTR

TRL-ADPTR

4 pin Impulse connector to 2.1mm standard DC power supply socket. The 4-pin connector must be plugged in to the TX50 before connecting the power supply, (PSU) to charge the batteries

TRL-SENS

18mm threaded sensor containing reed switch to detect state of bottom detect lever.

2. Applications

The TRL-50 system was built with flexibility; reliability and low cost in mind to monitor underwater towed bodies, e.g. fishing beam trawls.

The system can be deployed quickly and requires no setting-up to enable operation to commence.

The TRL-TX50 can also be re-programmed to read the Remontec Ltd “Tcount” underwater counter sensor unit thus allowing on-line monitoring of distance run using a pre-defined circumference wheel attached to the towed body.



3. Specifications

Transmit Frequency:	50kHz
Transmit pulse width:	2mS
Beam Pattern:	50 deg
Pulse repetition rate:	1.05 PPS/0.66PPS
Range:	1000 metres approx
Receiver sensitivity:	-XXXX dB re uPA
Transmitter S.P.L	XXXXX dB re uPA
Battery life:	> 24 hours
Re-charge time:	4 hours fast then trickle
Operating depth:	1000 metres
Connector:	Impulse MCIL4MP
TRLTX50 dimensions:	355mm X 50mm
TRLRX50 dimensions:	300mm X 38mm
TRLPC50 dimensions:	65mm X 55mm
Input1:	N/O contact
Input2:	Tcount current loop
Charger voltage:	+12VDC 650mA PSU
Charger plug:	2.1mm DC type +ve inner
Weight, (TRL-TX50):	2kg
Weight, (TRL-RX50 & 30m cable):	6kg

4. Set-up and deployment

Deployment

The TRL-TX50 transmitter, (the larger diameter stainless steel tube), is fixed to the beam trawl side arm using stainless steel “U” bolts. Make sure the fixing is secure and cannot be damaged if the beam turns upside down. The transmitter has a beam angle of 50 degrees therefore angle the transducer, (the potted end), accordingly.

The switch sensor is plugged into the small connector at the opposite end to the transducer, make sure the steel locating pin is aligned with the small locating socket on the connector; the transmitter is now turned on.

The sensor must be un-plugged to switch off the transmitter; the same socket is used to connect the charger adapter lead which charges the internal batteries in 4 hours using the same power supply as TRL-PC50.

The unit can be tested by listening to the change in repetition rate of the transducer “clicks” as the switch is operated, (the repetition rate will be shorter for switch closure).

The receiver transducer cable is plugged in to the link cable and connected to the TRL-PC50 dongle via the phono socket.

The power supply is connected to the TRL-PC50 dongle and the data cable plugged into the serial com port of the PC.

The receiver transducer can now be deployed, preferably down a moon pool or other fixed location that is clear of turbulence or other forms of interference such as mechanical vibration. If this is not possible the transducer can be deployed as a “dunking” transducer over the side of the ship making sure to avoid contact with the propeller! The transducer will require a weight attaching to the cable if used in this manner to enable the unit to submerge ensuring that no strain is taken by the transducer, (a suggested method is shown in the picture).



The “Windmill” software can now be started, (see instructions on initialising the software), by clicking on the logger and entering a file name to store data; this data can be read later by a spread sheet such as Excel.

An on-line graph is produced by clicking the chart programme then “start” the line will show the low value for on the bottom and the high value for off the bottom.

Make sure that no echo sounders are operating at 50 kHz as this will interfere with the system.

TRL-TX50

The TRL-50 incorporates a Sonar transducer, which is encapsulated in the end cap using an epoxy seal.

Although the transducer face can withstand compression impact the transducer face must be protected from abrasive damage.

The unit is charged using the supplied 12VDC mains power adaptor by un-plugging the sensor and connecting the power



supply using the adapter lead to connect between the waterproof 4 pin connector on the TX50 and the small DC connector on the power supply, ensure that no undue force is used on the connector. **The adapter lead must be connected to the TX50 first.**

The 4-pin connector must be used with a suitable silicone lubricant to enable the two connectors to mate without damage. Connect the “dummy” plug to the connector when not being used to prevent damage.

The unit is automatically switched off when charging and will switch back on when the bottom detect switch is re-connected, this will be indicated by a clicking noise from the transducer at a 1 second or 0.5 second rate depending on the state of the bottom detect switch.

Make sure the bottom detect switch works correctly by operating the switch and listening to the transducer clicks, these should change from 20 per second when in the “bottom” position, (switch open), to 10 per second when in the “up” position, (switch closed).

TRL-RX50

The TRL-RX50 incorporates an acoustic transducer, which must be carefully handled. The transducer is omni-directional, i.e. the transducer can receive signal in all directions below the housing. The transducer is exposed therefore, (unlike the TRL-TX50); the module must be handled carefully especially when out of the water.

The cable can be used to suspend the TRL-RX50 over the side of the ship, ensuring the unit is well clear of the propellers and other hazards around the ship.

Ensure that all the grub screws are present before the unit is deployed. Position clear of aerated water, but if this is not possible make sure the unit is lowered below the aeration. Do not exert strain on the cable it is designed to hold the weight of the RX50 only.

The system frequency has been carefully chosen to avoid interference with echo sounders aboard most ships, however, if problems persist try switching the ship-borne systems off until the problem disappears. Different frequencies can be programmed if necessary.

The TRL-RX50 should be connected to the TRL-PC50 described next

TRL-PC50

The TRL-PC50 is used to supply the power for the TRL-RX50 sonar receiver and to decode the detected sonar signals superimposed on the same power supply.

The phono socket connects to the main umbilical cable using an interconnecting lead. This lead should be placed away from sources of electrical interference

The other connector on the PC50 is connected to the +12VDC mains adapter power supply using the 2.1mm plug.

The third connector is a 25 way serial connector that is plugged into the serial port of a PC; a 25 way to 9-way adapter is supplied to enable the unit to be plugged into the more usual 9 way "com port" on most PC's.

An "in air" test can be performed to check out the system before deploying. Make sure the bottom detect connector is plugged in and the transducer is clicking, as described earlier. Connect the TRL-PC50 and TRL-RX50 and place the RX50 close to the TX50.

Connect the PC50 to the com port of the PC and switch on the PC, the message from the PC50 can be read using the standard Windows "HyperTerminal" set to 9600 N81 or by following the instructions for the supplied software as described next.

Software (Windows 98, 2000)

Insert the floppy disk labelled "Windmill" and, assuming that you have Winzip or similar installed, click on the Windmill.zip file and follow the Winzip instructions

for installing from the set-up file. If Winzip is not installed download a copy from the web before proceeding.

Follow the instructions in the software installation programme noting the installation directory.

Run “CONFIML” from the programme\windmill menu and click on “add” then “LABIML RS232 ASCII instrument handler” then “add”.

Name the instrument e.g. Trawlometer and set channels to 1 and a description if necessary now press OK.

Select “Continuous flow”, Instrument Idle time 0, data persistence 10000, returned message length 8.

Now click on “Channels” and set maximum value to 5000, minimum value 2000, and engineering units to mS.

Set “Reply Parse String” by clicking “string search” enter **9**: Click on “**extract until char**” then “**non-printable**” then “**return**” then click **OK**.

Click on “**Ignore next n**” and enter ignore **1** The reply parse string should now look like “\S”9:E”\C013”\I01 which can also be entered directly.

From the start menu select “setup IML” and select “load setup file from disk”, select the .IMS file that was configured in the previous step then save.

Form a short cut on the Windows screen by clicking the right mouse button on the screen background. Select “new” then “shortcut” and browse in the installed directory until the file “chart.exe” is found.

Repeat for the logger programme.

Clicking on the chart icon will now start the programme. The chart programme is configured for paper speed, minutes etc from within the menu. When this is completed save the configuration file. This file can be added as an extension to the short cut command to allow the programme to start up with the correct parameters e.g. C:\windmill\chart.exe trawl [space]trawl.wch where trawl.wch is your config file for the chart programme.

The same applies to the logger programme short cut. i.e.

C:\windmill\logger.exe[space] trawl.wlg where trawl.wlg is the logger configuration file saved after the first session.

The start button can now be pressed to start the graph, whilst the logger programme must be started separately and saved to a file. The configuration file can be saved like the chart file to enable start up parameters to be loaded correctly from the short cut.

To see the raw data from the serial port right click on the “IML Device0” at the bottom of the screen and select debug option. Select “Output receive strings”

Further information can be read in the Help menu of the Windmill programme. Please see terms and conditions of the programme before using.

5. Technical operation

Operating principle

The TRL-50 system consists of 3 basic units, the TRL-TX50 transmitter unit, the TRL-RX50 receiver unit and the TRL-PC50 PC interface unit. The receiver and PC interface are connected using a 2 core interconnecting cable carrying both data and the +12VDC power required for the receiver unit.

TRL-TX50



This unit contains a sonar transducer and a single printed circuit card that perform the following function:

Power circuit

The power is provided by 4 NIMH re-chargeable batteries, which supply 4.8 volts at 4AH when fully charged. The power supply contains protective circuits to prevent overload and a switch mode regulator to ensure correct voltage output at battery voltages down to 2.75 volts.

Three regulated voltages are produced these are 1) 13.7V Transmitter voltage, 2) +12V power supply, 3) +5V logic supply.

A full bridge transmitter configuration is used to power 4 high power MOSFETS this ensures that the full power is presented to the transducer and that the correct frequency is transmitted into the water, a power transformer and inductor match the low impedance 26V p-p at the primary to the high voltage signal required by the transducer which requires approximately 1V to output 155dB re uPA at 1 metre.

Charger circuit

The 4 NIMH batteries are soldered to the rear of the Printed circuit board and are charged from an internal charger circuit with automatic cut-off from fast charge to trickle charge. The charger rate is set at 0.76A for fast charge dropping to 60mA when fast charge is complete.

D6 LED next to the terminal strip indicates when fast charge is operating. The charger employs switch mode circuitry to ensure minimum heat build up from the power components, Components M1, L1 and D1 will become warm whilst in fast charge mode. F1 is an automatic resettable fuse, which will trip if the current exceeds the design maximum. The adapter lead, TRL-ADPTR is used to charge the unit, plug the adapter lead into the trawlometer first then the power supply.

Adapter lead (TRL-ADPTR)



CPU circuit

IC4, the central micro controller, is used to read the bottom detect switch and to output the sonar transmitter frequency.

The power bridge driver is enabled at the start of the sonar pulse train by the micro before switching to standby to conserve power when the sonar pulse has finished.

The micro-controller is run at 4 MHz thus providing an accurate transmitter frequency and ping rate. TR4 provides the current limited DC supply required by external sensors such as the Tcount distance run wheel.

J4 is used to select different sensors. The link should be in position 2-3 for the bottom detect switch

Sea switch

The sea switch monitors the charger line and switches the power off when a +12VDC level is seen at the terminal or when the terminal is floating. The power is switched on when the charger terminal is taken to ground. F2 is an automatic reset table fuse to ensure that excessive current is not taken by the power circuitry, this will reset when the overload has been removed

TRL-RX50



The receiver consists of a six stage hard limiting pre-amplifier followed by a differential detection amplifier and pulse shaper.

Incoming signals are fed to a non-limiting amplifier and then to a wide band pass tuned amplifier stage to remove unwanted noise. The band pass stage is followed by four hard limiting amplifier stages to ensure that the full dynamic range of the sonar signal is received.

A narrow band-pass tuned filter is used to detect the required frequency, the threshold of detection being set by the VR2 potentiometer, (a/c to increase bandwidth).

The detected signal is then used to modulate the incoming +12VDC line between +12VDC and 6VDC for transmission to the PC interface, (a +5V low drop-out regulator is used to ensure the receiver power supply remains stable).

Maximum current drawn by the receiver is approximately 150 uA in standby.

The receiver printed circuit is supplied tuned to the correct frequency to match the TRL-TX50, the board can be re-tuned by adjusting pre-set components on the board but this must be done in controlled conditions using calibrated test equipment to set the centre frequency and bandwidth of the receiver. See the technical alignment procedure for further information.

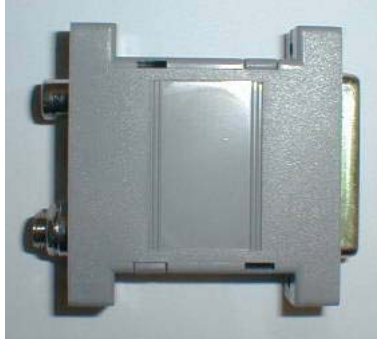
The printed circuit J1 connector has an additional connector for monitoring the data output as a TTL pulse this can be monitored at J1/3 and 0V at J1/1&2

TRL-SENS



The stainless steel sensor contains a reed switch to detect the state of the bottom detect lever. The 4-pin connector switches the TRL-TX50 on and causes the transmitter to output Sonar pulses at 1S or 0.5S.

TRL-PC50



The detected signal from the Sonar receiver is decoded in the TRL-PC50 and passed to the serial port of a standard PC using the 25 or 9 way serial com port. The circuitry is small enough to fit in a small plastic case 65mm X 55mm, which is the same size as the 25 way serial plug.

The PC interface supplies current limited power to the TRL-RX50 receiver and separates the data signal from the 2 wire power line before presenting the data to a micro-controller which carries out the following:

- De-bounces the bottom detect switch contacts

- Rejects noise and multiple sonar pulses produced when reverberation or echo occur.

- Decodes the pulse position sonar pulse into a serial ASCII message

- Adds a unique address to the message to identify the unit.

The unit should be connected to the 25/9 way serial adapter and plugged into the “COM1 or COM2” port of the PC.

The PC50 can be checked for correct electrical operation by connecting a digital voltmeter to the receiver phono socket and checking that the voltage is +12V +/- 1VDC.

Switch the digital voltmeter to current mode and check the current limit circuit by connecting the leads to the phono plug output again, the reading should be 30mA +/- 5mA.

TRL-PSU

12VDC 0.65A power supply terminated with a 4-pin IMPULSE underwater connector for use on deck. The unit plugs directly into the AC mains supply and can operate between 100VAC and 240VAC with automatic selection. The unit is not waterproof.

6. Maintenance

The transducer on both the TRL-TX50 and the TRL-RX50 should be cleaned with fresh water and a mild detergent.

Ensure that silicone grease from the connector is kept off the transducer face.

When replacing the end cap of the housing remove the O-ring and clean the groove. Fit a new O seal and apply silicone grease to both the rubber O-ring and associated machined component.

When charging the TRL-TX50 connect the dummy plug to the bottom detect sensor to protect the exposed plug.

When the bottom detect sensor is plugged into the TRL-TX50 connect the dummy plug to the charger lead to prevent damage.

7. Packing list

REF	QTY	Part no	Manufacturer	Description
1	1	TRL-TX50	Remontec Ltd	Transmitter unit
2	1	TRL-RX50	Remontec Ltd	Receiver unit
3	1	TRL-RXLEAD	Remontec Ltd	Link lead
4	1	TRL-PC50	Remontec Ltd	PC interface
5	1	TRL-PSU	Egston	12VDC PSU
6	1	TRL-ADPTR	Remontec Ltd	PSU Adapter lead
7		TRL-SENS	Remontec Ltd	Bottom sensor
8	1	TRL-UM50	Remontec Ltd	Users manual
9	1	TRL-DATA	Remontec Ltd	Data/manual
10	1	TRL-IFLEAD	Remontec Ltd	9way D lead

8. Contact details

Remontec Ltd
20-22 Beccles Road
Bradwell
Gt Yarmouth
Norfolk, U.K.
NR31 8DF
Email
info@remontec.com
