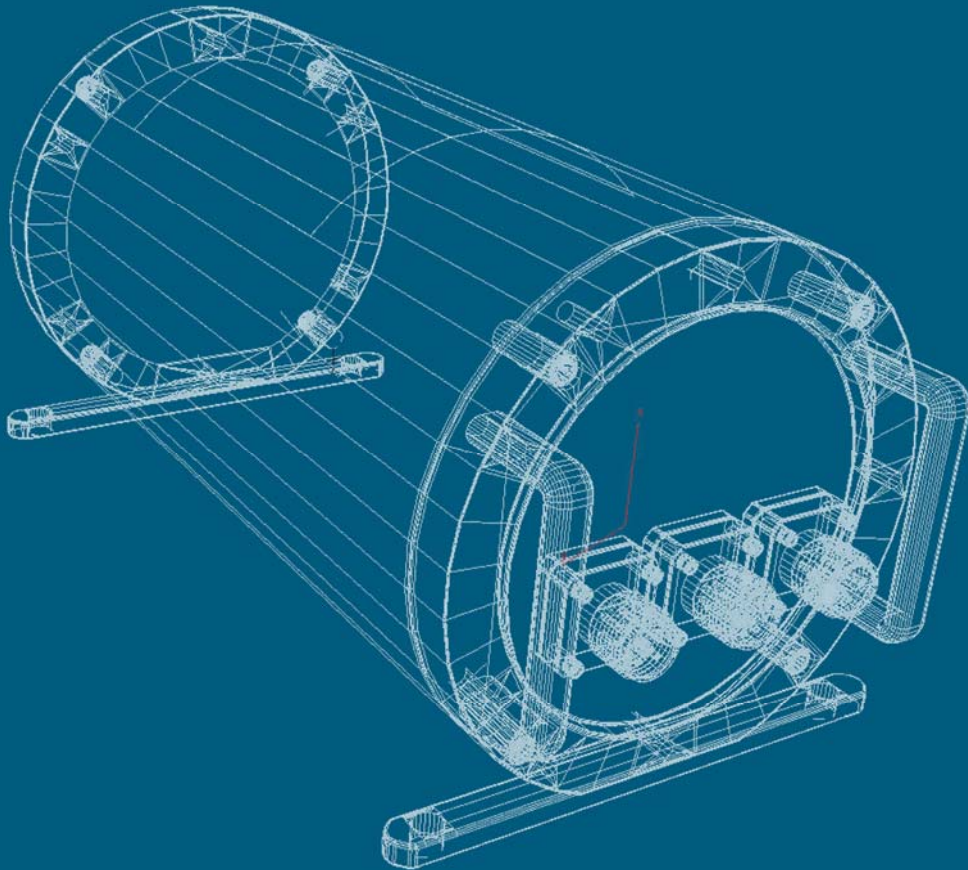




MicroGyro

Technical Manual



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Document Rev B

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1. Introduction

1.1 General description

The CDL MicroGyro has been designed to meet the requirement for high quality deep-water recovery of attitude information within the survey industry. Based around the industry standard Robertson SKR82 gyrocompass, the unit provides sensor information at a high update rate either through its own lightweight umbilical or through customer ROV umbilicals. The CDL MicroGyro is extremely small, measuring only 9" diameter by 19" long. This allows easy helicopter transportation for last minute projects and achieves a 3,000m depth rating with a total pod weight of less than 27kg. Installation is an easy one-man operation.



The MicroGyro contains CDL's MiniTilt high accuracy pitch and roll sensor as a standard item giving 0.05° accuracy over the full 360° range in both axes.

Maximum flexibility has been the major design criteria. An auto-switching power supply has been used for easy operation on either side of the Atlantic, alternatively the gyro can be powered from 24Vdc. The subsea pod has data available in current loop and RS232 formats for easy integration to ROV multiplexer or sonar network systems. A mechanical gimbaling system allows the MicroGyro to operate in rough water. The freedom of movement is greater than 90° allowing horizontal or vertical launch capability.

At the topside, the MicroGyro is controlled by the new CDL data display unit (DDU). The DDU is a general use display unit which contains a high contrast colour display powered by the Windows CE™ operating system. This allows maximum flexibility for producing custom data outputs and displays to clients requirements. The DDU has 2 RS232 outputs for connection to existing survey software packages. Multiple data output formats and baud rates are selectable on the front panel to minimise telegram compatibility problems.

System options include high accuracy temperature and depth sensors and acoustic data recovery.

1.2 Options

1.21 Temperature & Depth

A temperature and depth module can be fitted to the MicroGyro. The depth sensor is digitally corrected via a look-up table built into the module. This removes the non-linearity typically seen in strain gauge sensors. This allows the module to provide an accuracy better than 0.25%FSD on depth measurement.

Temperature measurement is by means of an integrated temperature sensing IC mounted directly onto the gyro pod. This sensor achieves an accuracy of 0.5°C.

A voltage sense circuit is also built into this module to allow remote sensing of external battery voltage .

1.22 Acoustic data recovery

Acoustic data recovery is available for the CDL MicroGyro in a variety of configurations. This allows 'through water' recovery of attitude information via acoustic systems manufactured by Datasonics, Sonardyne, Simrad and Sonatech.

2. Data Display Unit (DDU)

The CDLtd DDU is a self contained unit designed to interface with the CDLtd MicroGyro without the requirement for any other equipment. The user interfaces with the DDU by means of a touch-screen display which uses Windows CE™ based software.

The DDU is mains powered and contains a universal switch mode power supply for worldwide use. AC power is passed to the gyro through the 7 way Binder series umbilical connector on the front panel. This connection also provides a bi-directional data link for sending setup commands to the gyro and receiving gyro data.

Two 9-way D-type connectors are provided for RS232 data output. The output data telegram is software controlled via the touch-screen display.

A set of LEDs to the right of the display give system status information.

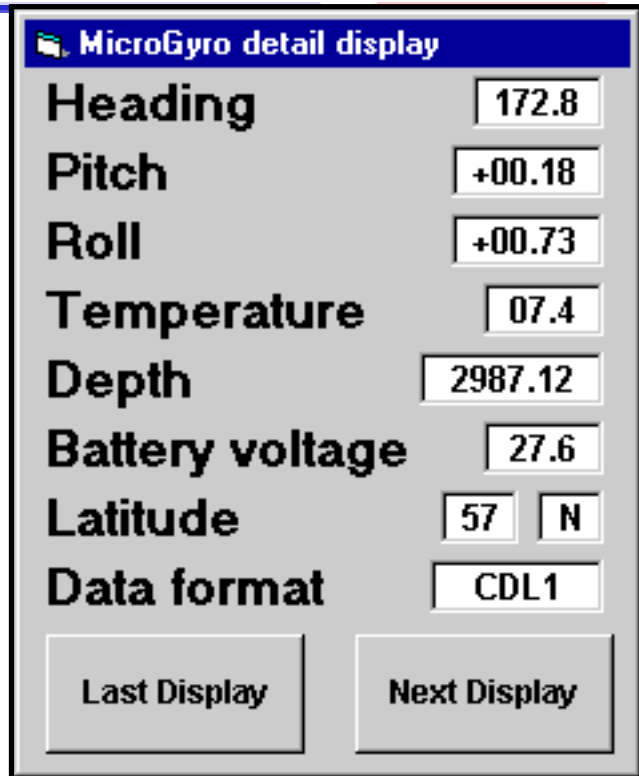


2.1 Main Display

When the DDU is switched on, the screen will display whichever of the following pages was displayed last. To select a page, either press the 'Last display'/'Next display' buttons, or select a page using the menu bar at the top of the window.

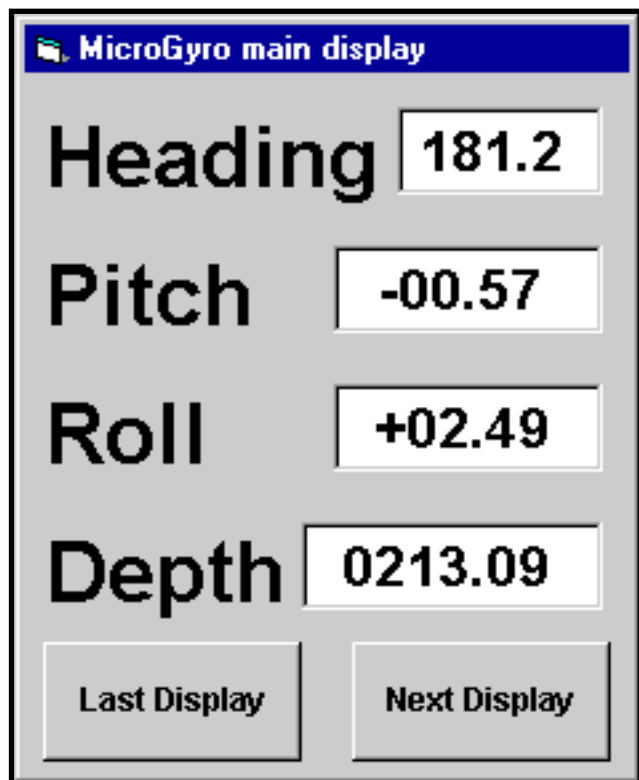
An extra 'Info' display can be selected from the right hand side of the menu bar. This displays contact information for CDLtd (for technical support) and also the current software version number in use by the DDU.

Page 1: MicroGyro detail display.



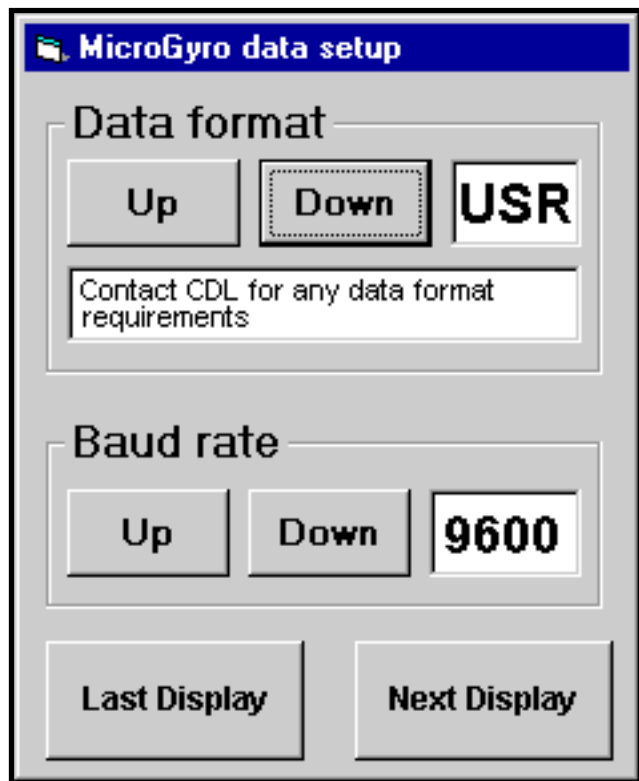
This page displays all of the data sent from the gyro, including the latitude, hemisphere and data format to which the gyro has been set.

Page 2: MicroGyro main display



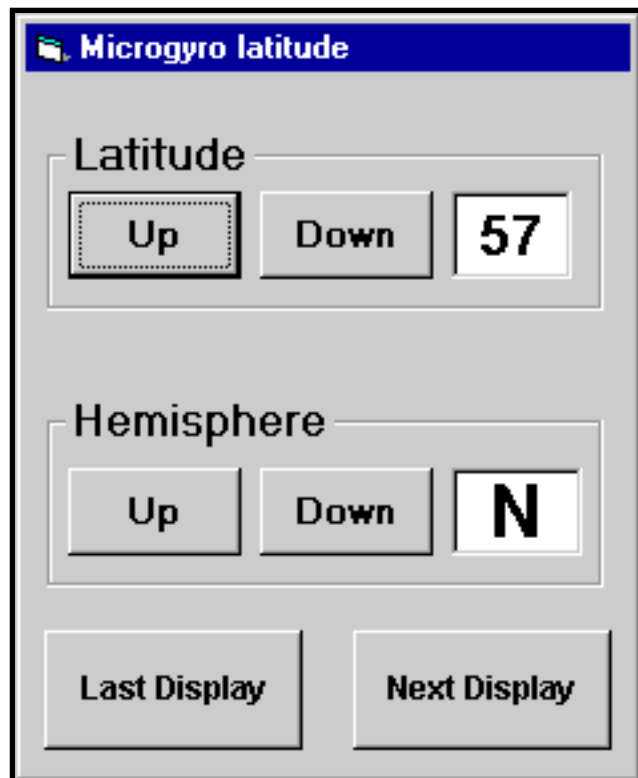
This page shows the current heading, pitch and roll values in a large character format for easy reading, as well as the current depth reading if this option is fitted.

Page 3: MicroGyro data setup



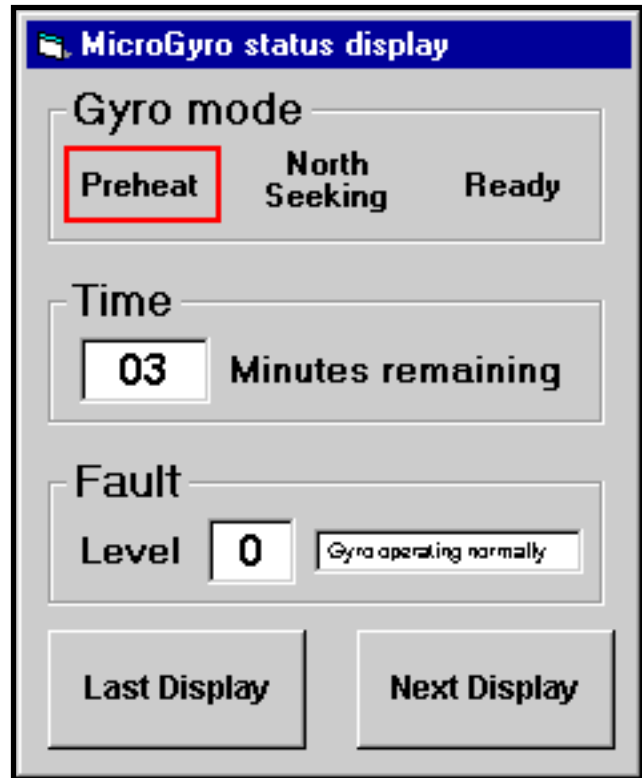
This page allows you to select the format and baud rate of the data from Com1 and Com2. Simply tap the 'Up' and 'Down' buttons on the screen to cycle through the available options. The format selected is displayed in the window below the data format buttons.

Page 4: MicroGyro latitude.



For correct operation, the gyro must be correctly compensated for latitude and hemisphere. The user can select correction factors for both on this page.

Page 5: MicroGyro status display.



The current gyro mode is highlighted by a red box, and the time window indicates time remaining before exiting this mode. Any system faults detected are also indicated, along with a brief description.

Page 6: MicroGyro info display.



This display gives contact information for CDLtd including telephone, fax and email. This info can be used to contact CDL for technical support. The current software version number fitted to the DDU is also displayed.

2.2 Slew controls

The gyro can be slewed using the two slew buttons mounted on the front panel of the DDU. Note that the gyro should not be slewed once the gyro has entered 'Ready' mode. This will produce a fault indication of '2' (non-fatal error). The gyro will seek North while in 'Ready' mode but can only do so at a low gain setting which is roughly equivalent to 4° per hour.

2.3 LED indicators

To the right of the main display, a bank of 6 LEDs give a visual indication of various system functions. These are detailed below.

Power:	Indicates whether or not power is being supplied to the umbilical connector.
Gyro ready:	Illuminates once the gyro has finished seeking North and is ready for use.
Gyro data:	Pulses whenever valid data is received from the gyro.
Pitch/Roll data:	Pulses whenever valid pitch and roll data is received from the gyro.
Depth data:	Pulses whenever valid depth data is received from the gyro.
Error:	Illuminates whenever the gyro fault status is not zero.

3. Connection Information

3.1 Surface connection

Connection to the Data Display Unit is by way of an IEC connector for mains input and a Binder 723 series connector for umbilical connection. The pin-outs are detailed below.

DDU umbilical connector	Function
1	AC Earth
2	C/L Hi
3	C/L Hi
4	C/L To Gyro
5	C/L From Gyro
6	AC Neutral
7	AC Live

This connector allows connection to the subsea pod by dedicated umbilical cable or can be used to pass these lines through an ROV cable. Please note that the current loop format used by CDLtd is based on the HPCL4100, CNY17-1X current loop system. This gives greater distance performance and noise immunity than standard current loop but means that the data stream cannot be read by a standard opto-isolator as the pod driver is passive. If it is required to read the data stream without using the surface display unit, please contact CDLtd for details of the circuit required.

Note that this system has another advantage which is that the bi-directional data system is optically isolated at the top end **only**. This means that in the event of a comms problem, a repair can normally be made without opening the subsea pod.

The connector required at the DDU is as follows:

Binder 723 series 7-way male (RS part no. 261-5957)

3.2 Subsea connection

Connection to the MicroGyro pod is by way of the *Mini Burton* range of connectors. Three connections are available on the subsea pod housing. The connectors and pin-outs are explained below.

3.2.1 Umbilical connector

Pod umbilical connector	Function
1	C/L To Gyro
2	AC Neutral
3	C/L To Gyro
4	N/C
5	AC Live
6	AC Earth
7	C/L From Gyro
8	C/L From Gyro

The AC voltage connection is universal input in the range 85-260Vac. The current loop system sends a full data string to the surface at a speed of 9600 baud. This baud rate gives the best ratio of update rate and useable cable length.

The connector required is as follows:

Mini Burton series 8 way female (part no. 5501-1508-0004)

3.22 RS232 connector

AUX. connector	Function
1	GND
2	RS232 In
3	RS232 Out
4	N/C

The RS232 connector makes data available in RS232 format from the subsea pod. This can be used to pass gyro data into a subsea multiplexer, acoustic interface or any other subsea device which requires attitude information.

The connector required is as follows:

Mini Burton series 4 way female (part no. 5501-1504-0004)

3.23 Battery connector

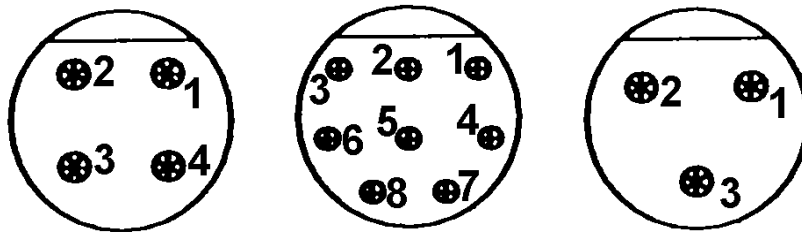
Pod battery connector	Function
1	+24Vdc
2	+24Vdc
3	Gnd

The battery connector can be used to power the MicroGyro directly from a DC source (22-30Vdc). This power source can be taken from the ROV or from subsea batteries. When using the acoustic interface this allows fully remote operation using no umbilical. The battery connection is wired through power diodes to prevent overcharging of the battery and current leakage (and corrosion) into the seawater environment.

The connector required is as follows:

Mini Burton series 3 way female (part no. 5501-1503-0004)

3.24 Pod connections: male face view



The above diagram shows the bulkhead connectors on the face of the gyro pod (see picture). The pin numbers can be related to function in the table in 3.3. The umbilical connector has been designed with the mains connections (Live and Neutral) on the center pins and the two current loops on pins which are mirrored in the vertical axis. As the current loops are reversible, this means that wiring the umbilical connector backwards will not damage the system, in fact the system will still function.



3.3 Deck cable connection

The deck cable provided with the MicroGyro is connected as follows.

Mini Burton (8 way)	Burton Cable colour	Function	Binder (7 way)
1	Black	C/L To Gyro	4
2	White	AC Neutral	6
3	Red	C/L Hi	2
4	Green	N/C	N/C
5	Orange	AC Live	7
6	Blue	AC Earth	1
7	White/Black	C/L From Gyro	5
8	Red/Black	C/L Hi	3

4. Data Output Formats

The MicroGyro DDU can generate a variety of data output formats. The formats can be changed by using the 'Data Format' up and down buttons on the touch screen. The last format selected is stored in memory and will be automatically selected after a power reset.

The available formats and output strings are detailed below.

MDL

H1234P+1234R+1234<CR><LF>

SGB

1234<CR><LF> (heading)

DLOG

H1234P+1234R+1234E<CR><LF>

Final flag character is either:

E Exact heading available

S Gyro settling

SKR

4 characters (most significant first)

UART encoded with address encoding in bits 4 and 5 and BCD digit in bits 0-3

Bits 6 and 7 always zero

00110011=Hundreds digit 3

00100101=Tens digit 5

00010111=Units digit 7

00000010=Tenths digit 2

Heading 357.2 degrees

CDL1

H123.4P+123.45R+123.45T12.3D1234.56B12.3L12F1<CR><LF>

Digit after 'F' (flag) is either 1 (ready) or 0 (not ready)

CDL2

H1234P+12345R+12345T123D123456B123L12F1<CR><LF>

Digit after 'F' (flag) is either 1 (ready) or 0 (not ready)

USR

User defined data formats. These data formats can be configured to predefined user formats for compatibility with existing survey software. Please contact CDL to have these formats configured for use with existing software applications.

5. MicroGyro Specifications

Gyro Performance:

As per SKR82

Settling point error	$\pm 0.5^\circ$ x sec. latitude
Repeatability:	$\pm 0.25^\circ$ sec. latitude
Dynamic (at sea):	$\pm 0.7^\circ$ rms.

Pitch and Roll:

Accuracy	0.05°
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Temperature (option):

Accuracy	0.5°C
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Depth (option):

Accuracy	0.25% FSD
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Battery Voltage:

Accuracy	$\pm 0.25\text{Vdc}$
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Gimballing system

Range	$\pm 95^\circ$
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Power requirement:

Run-up (4mins)	125W
Operating	32W (average)
IP Voltage	85-260Vac (Universal)
Or	22-30Vdc

Weights and Dimensions:

Pod	228mm dia x 487mm	27kg
Display unit	120mm x 180mm x 240mm	4.5kg
In Transit case	580mm x 480mm x 380mm	45kg

Pod weight in water	8kg
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Settling Time:

54 minutes from switch-on

Mounting

EXTERNAL FEET PITCH **436MM X 188MM (4 HOLES 13MM DIA)**

6. CONTACTING CDL

BY PHONE

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BY EMAIL

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Murray Leys (Production Manager)	(mobile)	-	+44 (0) 7801 431986
Mads Fogh (Development Supervisor)	(mobile)	-	+44 (0) 7808 064973
Craig Spy (Development Engineer)	(mobile)	-	+44 (0) 7590 643243

In case of faults or queries please contact the Development personnel in the first instance.