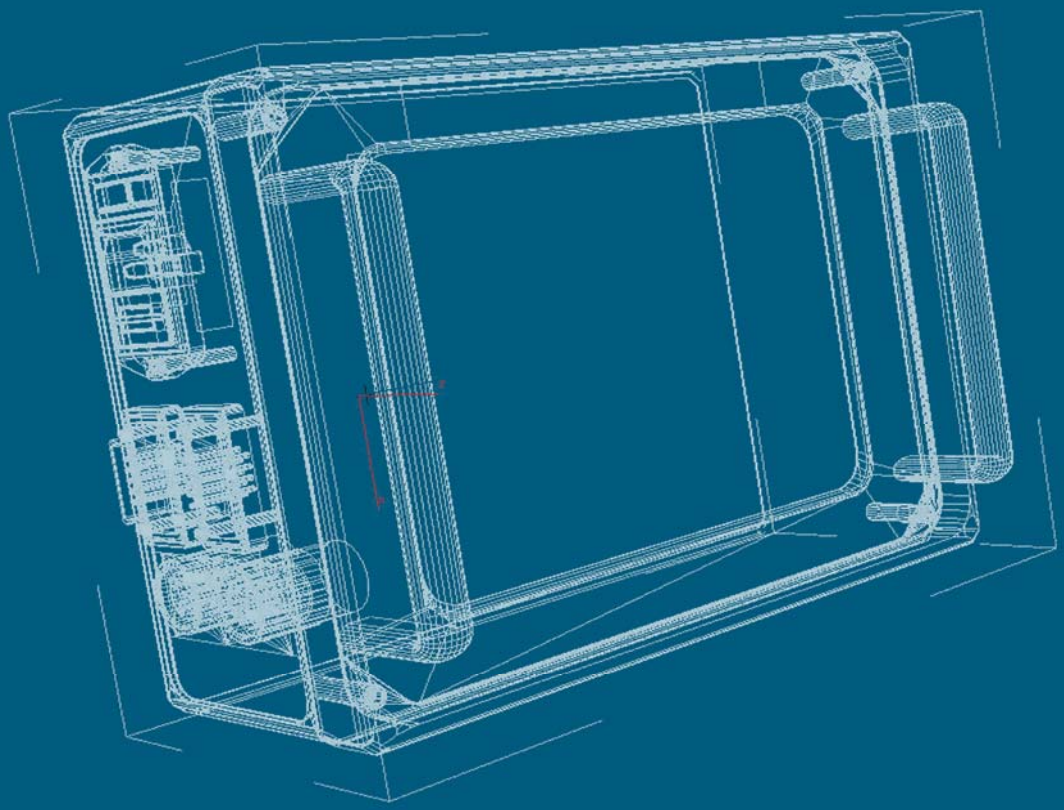
DDU2
Technical Manual



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Document Rev C

Table of Content

Table of Figures

Table of Tables

INTRODUCTION

1.0. WARNINGS AND NOTES

Throughout the manual the following symbols are used:

Indicates a warning. Failure to follow these instructions will result in serious injury, damage to equipment or incorrect operation of equipment.

Indicates a note. This indicates important information that should be followed to ensure correct operation of the unit.

1.1. GENERAL DESCRIPTION

The DDU unit is a compact and powerful touch-screen embedded PC designed for use in harsh environments. It provides display and control functions for a variety of CDL products. The DDU is controlled via an 8.4" 800x600 touch screen display giving a large viewing area and high resolution. The touch screen gives a simple and intuitive user interface. Once the equipment attached to the DDU has been identified the interface is configured accordingly allowing commands to be sent to the unit attached.

The DDU features a high-speed PC104 processor running embedded XP from non-volatile flash media. This gives a highly ruggedised and reliable PC with a fast and powerful operating system.

The housing is machined from solid aluminium and hard anodised for maximum corrosion protection. The unit is also 'O' ring sealed against water ingress.

Figure 1.1: The DDU in use with the MiniRLG2

Due to the use of non-volatile flash the DDU does NOT need to be shutdown. It is fine to simply switch it off!

1.2. USE OF AN RCD

The DDU is supplied with an RCD (Residual Current Detector) device.

The supplied RCD MUST be used with the system to reduce the risk of fire or electric shock. Failure to use the RCD could result in serious injury or death

The RCD measures any imbalance between the current on the Live and Neutral lines. If there is an imbalance then this indicates a fault and the unit trips, shutting down the DDU and attached systems. The RCD is an extremely important safety feature.

1.3. I/O TO THE DDU

The DDU has three input ports and one output port. The three input ports allow data from RS232, RS422 and Current loop devices. The output port has both RS232 and RS422 available on it. Figure 1.2 shows the connector arrangements.

Only one of the input ports should be connected at any one time.

Figure 1.2: Connector arrangement

Connector UMB 1:

This connector is a 7-way binder which is a current loop input used to receive data and control the attached system. There is also a mains output to provide power. See section 2.2 for wiring information.

Connector UMB 2:

This connector is a 7-way binder which is an RS422 input used to receive data and control the attached system. There is also a mains output to provide power. See section 2.2 for wiring information.

Connector CDL RS232 I/O:

This connector is and RS232 input/output port used to receive data and control attached equipment. See section 2.2 for wiring information.

Connector RS232/422 AUX:

This connector is an output port which can output a variety of strings selected through the software. See section 2.2 for wiring information.

2.0. SYSTEM PARTS

Generally the DDU will be supplied with another piece of equipment. Parts required for correct operation of the DDU are the unit itself and the RCD. The RCD is supplied with a standard 3-pin plug for connections to a mains supply and an IEC-C13 (Kettle plug) for connection to the DDU.

Where the DDU has been supplied with another piece of equipment there will also be a tail supplied to connect the two together.

2.1. INSPECTION

The system was shipped from CDL in a specially designed transit case that contains cavities that exactly fit each system component. This transit case should ensure that the equipment reaches its destination in perfect working order.

Retain the original transit case so that this may be used to transport the system when necessary. Improper packing whilst the unit is being transported will invalidate the warranty of the unit.

On receipt of the equipment, the contents of the packing case should be carefully unpacked and checked against the items on the shipping documents for any errors or omissions. If the equipment or transit case has been fitted with a CDL MicroShock device (or similar) then the device should be checked in case the system has suffered any damage during transit. In particular the screen of the DDU should be checked to make sure it is not cracked or damaged. It is recommended that the original packing case be used for subsequent transportation of the equipment.

2.2. ELECTRICAL INSTALLATION

The DDU is powered via an IEC-C13 connector (kettle plug) and has three input ports and one output port, the wiring for these is given in the following sections.

The supplied RCD MUST be used with the system to reduce the risk of fire or electric shock. Failure to use the RCD could result in serious injury or death

Only one of the input ports should be connected at any one time.

The Mains input fed to the DDU is then looped straight to the output on both UMB connectors.

2.2.1. UMB 1 Connector

The UMB 1 connector is a 7-way binder. The pin out for the connections is given in table 2.1 and the pin orientation is given in figure 2.1. The mains output from this connector is the same as the mains input to the DDU.

Pin	Name	Function
1	AC Earth	Earth
2	C/L Tx Hi	Current Loop Tx (out of DDU) High
3	C/L Rx Hi	Current Loop Rx (into DDU) High
4	C/L Tx Lo	Current Loop Tx (out of DDU) Low
5	C/L Rx Lo	Current Loop Rx (into DDU) Low
6	AC Neutral	110-240 VAC Neutral
7	AC Live	110-240 VAC Live

Table 2.1: UMB 1 connections

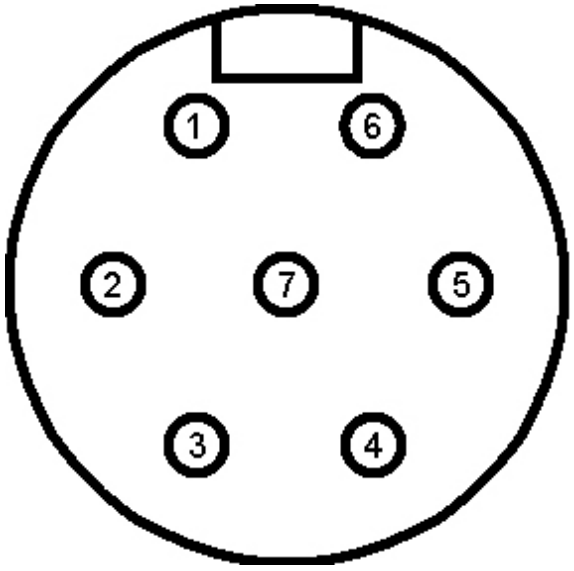

Figure 2.1: 7-way binder female face view

2.2.2. UMB 2 Connections

The UMB 2 connector is a 7-way binder. The pin out for the connections is given in table 2.2 and the pin orientation is given in figure 2.2. The mains output from this connector is the same as the mains input to the DDU.

Pin	Name	Function
1	AC Earth	Earth
2	RS422 Tx + (Y)	Tx (out of DDU) non-inverting output
3	RS422 Rx + (A)	Rx (into DDU) non-inverting input
4	RS422 TX - (Z)	Tx (into DDU) inverting output
5	RS422 Rx- (B)	Rx (into DDU) inverting input
6	AC Neutral	110-240 VAC Neutral
7	AC Live	110-240 VAC Live

Table 2.2: UMB 2 connections

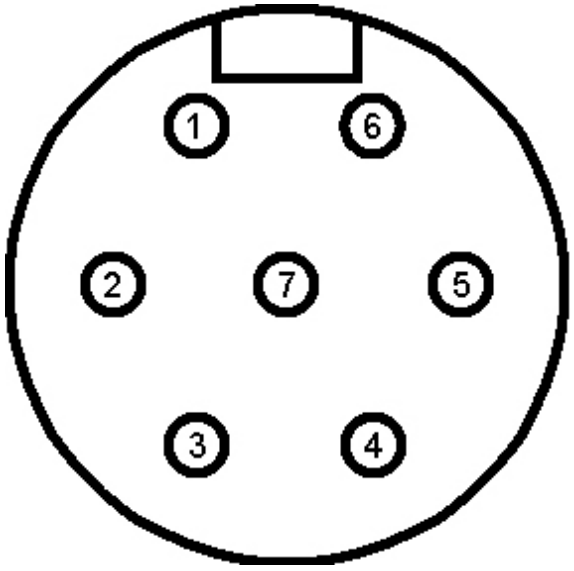

Figure 2.2: 7-way binder female face view

2.2.3. CDL RS232 I/O Connector.

The CDL RS232 connector allows an RS232 data string to be input to the DDU from a piece of equipment. This is useful where RS422 or current loop is not available or the user does not wish to use this format. The connector is a male 9-way D-type and the pin out is shown in table 2.3.

Pin	Name	Function
1	N/A	N/A
2	Rx	RS232 Rx (into DDU)
3	Tx	RS232 Tx (out of DDU)
4	N/A	N/A
5	Gnd	Data Ground
6	N/A	N/A
7	N/A	N/A
8	N/A	N/A
9	N/A	N/A

Table 2.3: CDL RS232 I/O pin out

2.2.4. RS232/422 AUX Connector

The RS232/422 AUX connector outputs data formatted data strings, as selected via the software. The data is available as RS232 or RS422 and the pin out is shown in table 2.4. The connector is a male 9-way D-type

Pin	Name	Function	RS232	RS422
1	RS422 Tx + (Y)	RS422		Tx + (Y)
2	RS232 Rx	RS232	Tx (from DDU)	
3	RS232 Tx	RS232	Rx (to DDU)	
4				
5	Gnd	Data Ground	Ground	
6				
7	RS422 Tx - (Z)	RS422		Tx - (Z)
8	RS422 Rx + (A)	RS422		Rx + (A)
9	RS422 Rx – (B)	RS422		Rx – (B)

Table 2.4: RS232/422 AUX pin out

Depending on the equipment that is being connected to this port it may NOT be possible to use a standard serial cable.

As the connections on the 9-way D-type are not standard (it contains RS422 data) this connection is unlikely to function properly if connected directly to a PC using a standard serial cable. Rather a cable should be made up that only uses the pins available for RS232 or RS422.

OPERATING INSTRUCTIONS

3.0. INTRODUCTION

The CDL Data Display Unit (DDU) is touch sensitive and will display data from CDL attitude sensors in graphical and numeric form. It will automatically detect the string format of the data from the sensor and will also detect the baud rate of the data stream. The DDU also has an output port with output selectable data strings.

3.1. ON START-UP

When the DDU has booted up you will be presented with a reminder to make sure that the RCD is plugged in.

It is imperative that an external RCD is used at all times!

Figure 3.1: RCD confirmation

If the RCD is not plugged in power down the unit and fit it. Re-power the unit and press “yes” otherwise just press “yes”.

Having confirmed that the RCD is being used you will be asked to choose the equipment type that is being used, see figure 3.2.

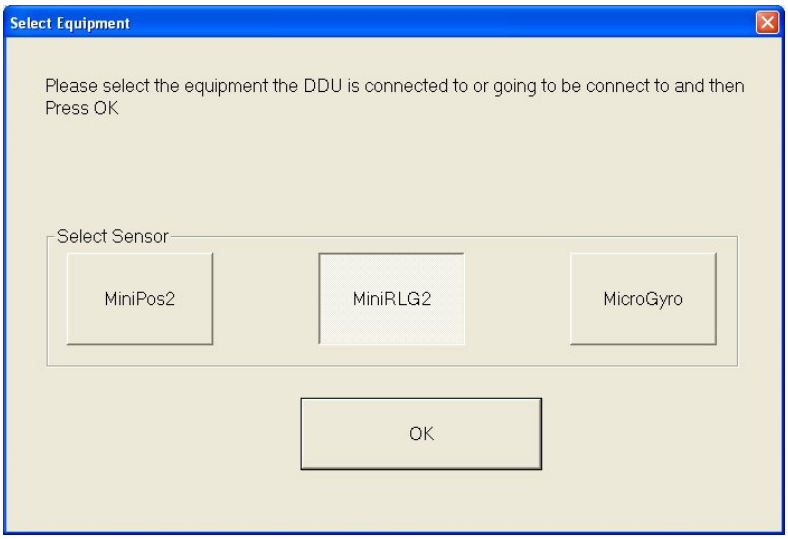

Figure 3.2: Equipment selection

Select the attached equipment and press “OK”.

3.2. MAIN DISPLAY

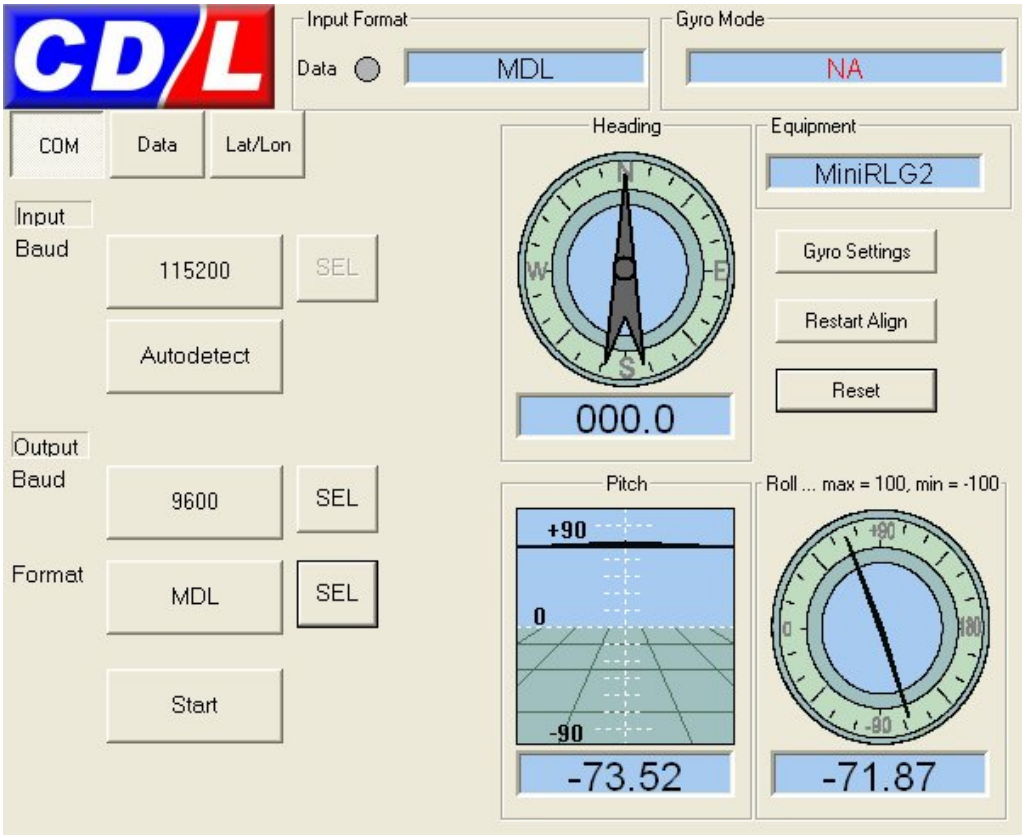

Figure 3.3: main window

Depending on the attached sensor some functions/displays will not be available

Fig 3.3 above shows the DDU with the MiniRLG1 string input from an MiniRLG2 sensor. It is very important that the correct sensor is selected. This is done when the unit is first started. If the connected sensor needs to be changed then the "Reset" button can be pressed.

There are graphical displays for heading, pitch and roll and the data values from the input string are displayed below them. The three buttons below the equipment box perform the following operations:

- Gyro Settings - will bring up a menu dialog by which means you can make adjustments to the gyro settings. This button is only active with MiniPos2 and MiniRLG2.
- Restart Align - will perform a restart of the alignment procedure. Again this button is only active with the MiniPos2 and MiniRLG2.
- Reset - will momentarily close the DDU software and immediately start up again.

At the left of the screen are tab buttons which will change slightly depending upon the input string and the sensor the DDU is connected to. Pressing the tab will display the relevant page.

3.3. DISPLAY AND COMMAND PAGES

There are a variety of display and command pages available in the software. These are documented in the following sections.

3.3.1. Com page

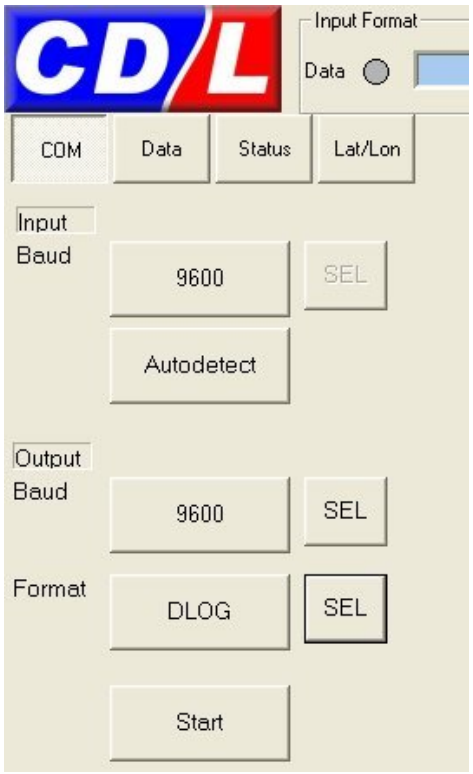

Figure 3.4: Com page

This is the page the left side of the screen always defaults to. Here you have controls to:

- Autodetect the baud rate.
- You can also select the baud rate manually. Scroll through the available bauds by pressing the large button to the left of the Sel button then press the Sel button when the correct baud rate is displayed.
- The Output Baud can be selected in the same way as above.
- And the choice of string format for the output can be selected, again in the same way.
- When a suitable string format has been selected press the Start button to begin output.

3.3.2. Data page

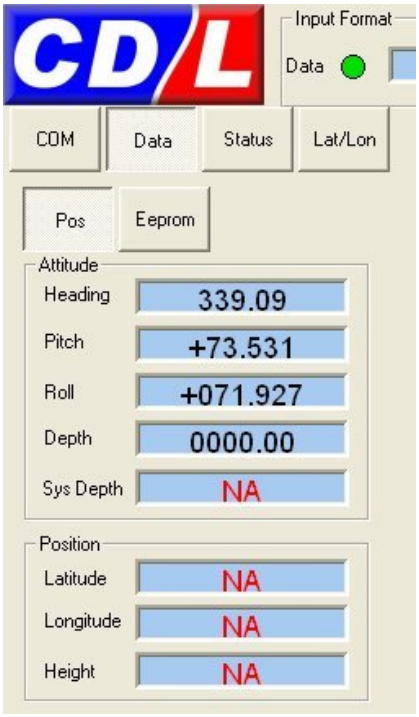

Figure 3.5: Data Page

The Data has two sub buttons: Pos and Eeprom. The Pos (Positional data) display the data from the incoming string in numerical form. Depending upon the incoming string only some fields will be displays.

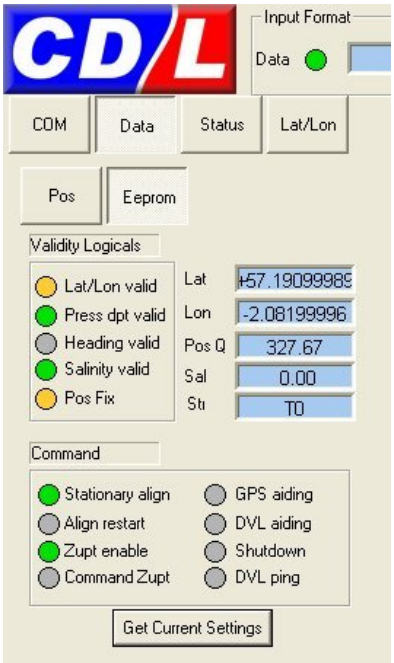

Figure 3.6: EEPROM info

Fig 3.6 shows the EEPROM page. This page only applies to the MiniPos2 and MiniRLG2. On pressing the Get Current Settings buttons the software will request an EEPROM dump from the sensor and display the results.

3.3.3. Status Page

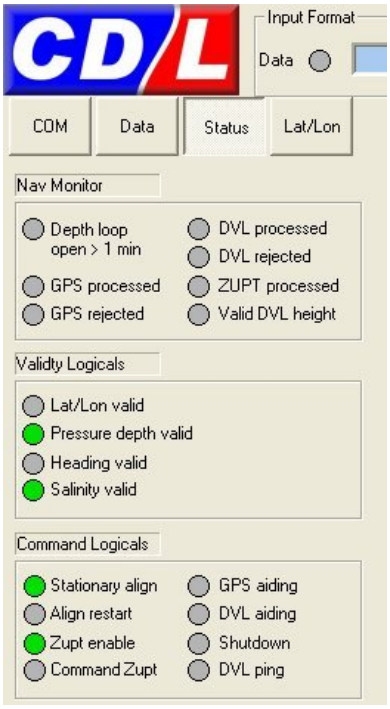

Figure 3.7: Status Page

The Status page displays a variety of message bits as set (coloured) or unset (grey). Refer to the MiniPos2 or MiniRLG2 manual for an explanation of these bits. This page will only be displayed if the incoming string provides relevant data.

3.3.4. Lat Lon page

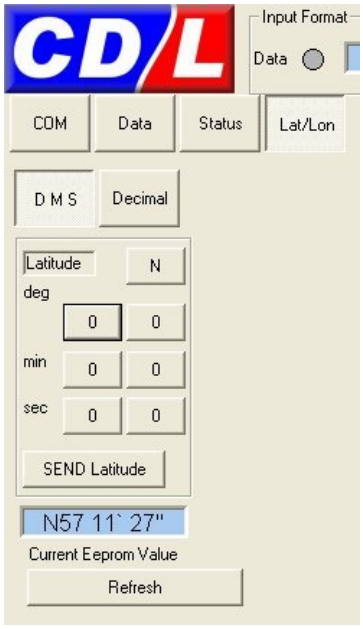

Figure 3.8: DMS entry of Lat/Lon

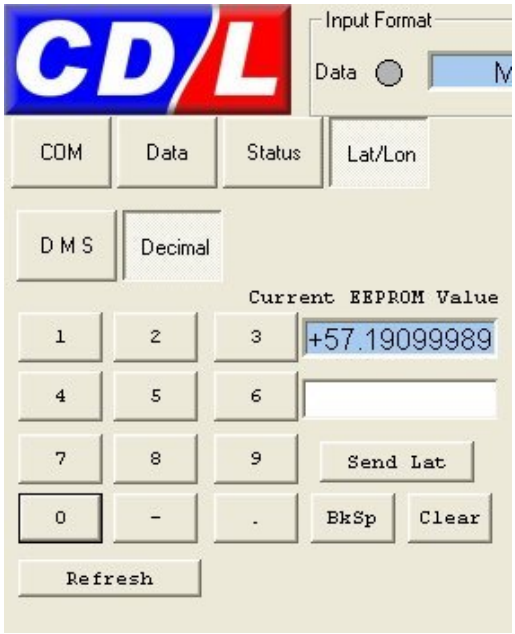

Figure 3.9: Decimal entry of Lat/Lon

The Lat Lon page has two sub pages, D M S (Figure 3.8) and Decimal (Figure 3.9) for changing the sensor's Latitude and or Longitude in Degrees Minutes Seconds or Decimal format respectively. In the D M S page just select "N"orthern or "S"outhern (E or W for longitude) by pressing the button then press the Degrees Minutes and Seconds buttons until the value you want to send is displayed. When all is well press the SEND Latitude (or Longitude) button. You can check that the value received by the sensor is correct by pressing the refresh button. The updated value will appear in the Current

Eeprom Value text box. Similarly, use the keypad on the Decimal page to set the value you want to send the press the Send Lat button.

3.3.5. Aiding Page

This page gives access to control parameters affecting the way the sensor operates. To make changes to the setting scroll through the options until the desired operation is displayed then press the corresponding send button to the left.

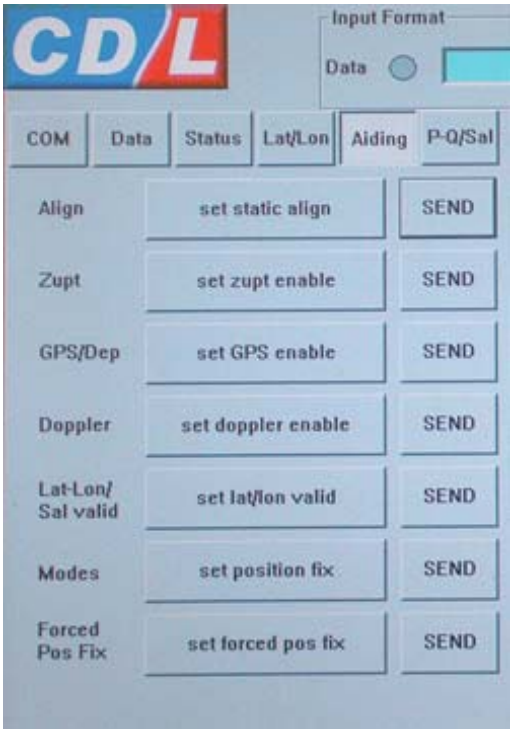

Figure 3.10: The Aiding Page

The ‘Align’ button scrolls through:

- "set static align"
- "clear static align"
- "set align restart"
- "clear align restart"

The ‘Zupt’ button scrolls through:

- "set zupt enable"
- "clear zupt enable"
- "set zupt command"
- "clear zupt command"

The ‘GPS/Dep’ button scrolls through:

- "set GPS enable"
- "clear GPS enable";
- "set press/depth valid"
- clear press/depth valid"

The ‘Doppler’ button scrolls through:

- "set doppler enable"
- "clear doppler enable"
- "set doppler ping"
- "clear doppler ping"

The ‘Lat/Lon Sal valid’ button scrolls through:

- "set lat/lon valid"
- "clear lat/lon valid"
- "set sal valid"
- "clear sal valid"

The ‘Modes’ button scrolls through:

- "set position fix"
- "set align mode"
- "set free flight"
- "set Zupt"

The ‘Forced Pos Fix’ button scrolls through:

- "set forced pos fix"
- "clear forced pos fix"

3.3.6. P-Q/Sal Page

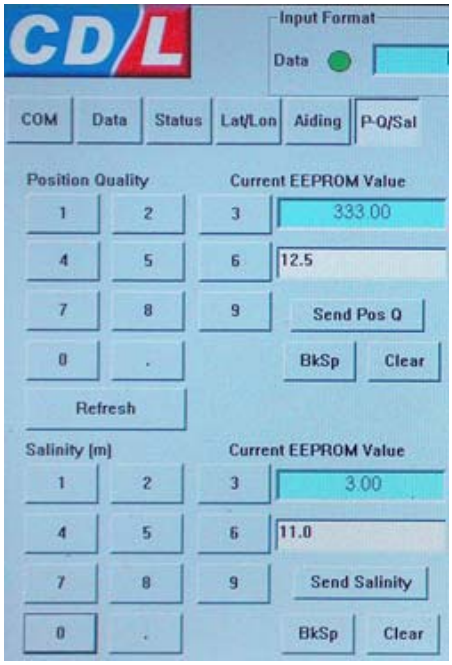

Figure 3.11: The P-Q/Sal Page

The P-Q/Sal Page allows you to set values for Position Quality and Salinity. Use the Refresh button to read these values from the system EEPROM. Use the keypad to edit the required value then press the Send Pos Q or Send Salinity button to update the EEPROM with the required value.

3.3.7. Menu Display

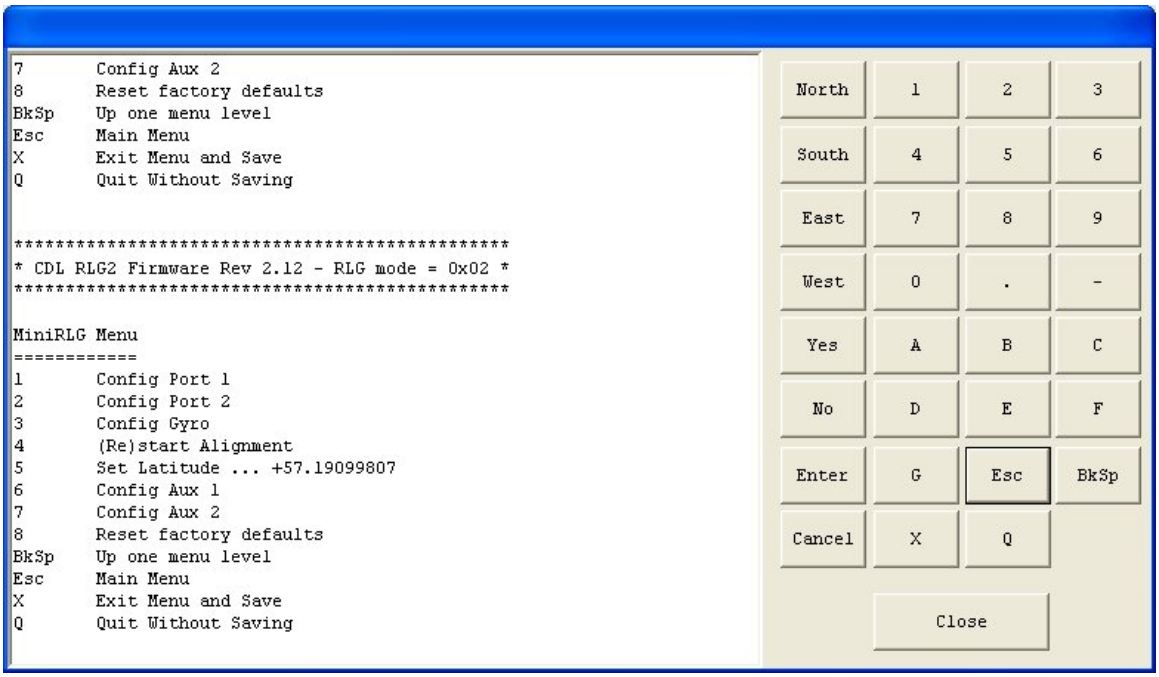

Figure 3.12: Menu Display

On pressing the Gyro Settings button you will be presented the Gyro (MiniPos2 or RLG2) configuration utility. Use the keypad to navigate through the menu system and make selections and settings. For a full description of the menu system refer to the MiniPos2 or MiniRLG2 manual. The MiniPos2 and MiniRLG2 firmware has a timeout of about 20 secs. After this time you will see the incoming data displayed in the dialog. Simply press the Esc button to get back into the menu system or press close to exit. In this software the X and Q buttons do the same thing in that all pressing either of these buttons will save any changed setting to the sensor's EEPROM.

4.0. MINIPOS 2

The MiniPOS 2 is CDL's full inertial Ring Laser Gyroscope capable of outputting inertial computed system location, attitude and heading reference.

4.0.1. Data Displayed

Heading, pitch and roll are displayed via the graphics and the data page. Also available in the data page is system latitude and longitude and depending on attached sensors system height and depth. The RLG mode is also displayed.

4.0.2. Commands Implemented

Latitude and longitude can be set via Lat/Lon page and restart alignment is available through the "Restart Alignment" button. The Aiding page gives access to commands which allow enabling and disabling of alignment, GPS, DVL, etc. The P-Q/Sal page allows you to set values for Position Quality and Salinity.

All other commands, including those above, implemented in the MiniPOS 2 (see MiniPOS 2 manual) are available through the "Gyro Settings" button which brings up the menu display.

4.0.3. Input Strings Accepted

All strings outputted from the MiniPOS 2 are recognised by the DDU.

4.1. MINIRLG 2

The MiniRLG2 is CDL's Attitude Heading Reference System. This system calculates heading pitch and roll.

4.1.1. Data Displayed

Heading, pitch and roll are displayed via the graphics and the data page. The RLG mode is also displayed.

4.1.2. Commands Implemented

Latitude can be set via the Lat/Lon page and restart alignment is available through the "Restart Alignment" button. The Aiding page gives access to commands to allow enabling and disabling of alignment GPS, DVL, etc. The P-Q/Sal page allows values for Position Quality and Salinity to be set.

All other commands, including those above, implemented in the MiniPOS 2 (see MiniPOS 2 manual) are available through the "Gyro Settings" button which brings up the menu display.

4.1.3. Input strings accepted

All strings output from the MiniRLG 2 are recognised by the DDU.

4.2. MINIPOS

The MiniPOS is CDL's full inertial Ring Laser Gyroscope capable of outputting inertial computed system location, attitude and heading reference. This system has now been superseded by the MiniPOS 2

4.2.1. Data Displayed

Heading, pitch and roll are displayed via the graphics and the data page. Also available in the data page is system latitude and longitude and depending on attached sensors system height and depth. The RLG mode is also displayed.

4.2.2. Commands Implemented

Latitude and longitude can be set via the Lat/Lon page and restart alignment is available through the "Restart Alignment" button. The Aiding page gives access to commands to allow enabling and disabling of alignment GPS, DVL, etc. The P-Q/Sal page allows values for Position Quality and Salinity to be set.

4.2.3. Input strings accepted

All data strings output by the MiniPOS are accepted by the DDU **EXCEPT** the C100 string.

4.3. MINIRLG

The MiniRLG is CDL's Attitude Heading Reference System. This system calculates heading pitch and roll. This system has now been superseded by the MiniRLG 2.

4.3.1. Data Displayed

Heading, pitch and roll are displayed via the graphics and the data page. The RLG mode is also displayed.

4.3.2. Commands Implemented

Latitude can be set via the Lat/Lon page and restart alignment is available through the "Restart Alignment" button. The Aiding page gives access to commands to allow enabling and disabling of alignment GPS, DVL, etc. The P-Q/Sal page allows values for Position Quality and Salinity to be set.

4.3.3. Input strings accepted

All data strings output by the MiniPOS are accepted by the DDU **EXCEPT** the C100 string.

4.4. MICROGYRO

The MicroGyro is a spinning mass gyroscope capable of outputting heading, pitch and roll.

4.4.1. Data Displayed

Heading, pitch and roll are displayed via the graphics and the data page. Preheat and Alignment times are also displayed.

4.4.2. Commands Implemented

Latitude can be set via the Lat/Lon page and the slew commands are available via the Slew page.

4.4.3. Input strings accepted

The CDL1 string is the only output from the MicroGyro that is accepted.

4.5. MINITILT

The MiniTilt is a ±180° pitch and roll sensor.

4.5.1. Data Displayed

Pitch and roll are displayed as graphics and in the data page.

4.5.2. Commands Implemented

There are no commands for the MiniTilt.

4.5.3. Input strings accepted

The following two strings are accepted.

Pbccccc**R**deeeee**<CR><LF>**

Pbccc.cc**R**deee.ee**<CR><LF>**

If one of the above is not outputted from the MiniTilt see the MiniTilt manual for instructions on how to change the string.

4.6. OTHERS

If desired any piece of CDL or other manufacturer's equipment can be accommodated in the DDU with additional programming. Please contact CDL for more information.

5.0. DATA FORMATS

The DDU is able to output a range of industry standard ASCII and binary strings to enable it to be interfaced to other systems.

These string outputs are changed via the Com Page (see section 3.3.1).

Figures 5.1 shows the sign convention for the MiniRLG 1, MiniRLG 2 and MiniRLG 3 strings. Figure 5.2 shows the sign convention for the CDL 1, CDL 2, MDL, Digilog, Tokimec, EM3000 strings.

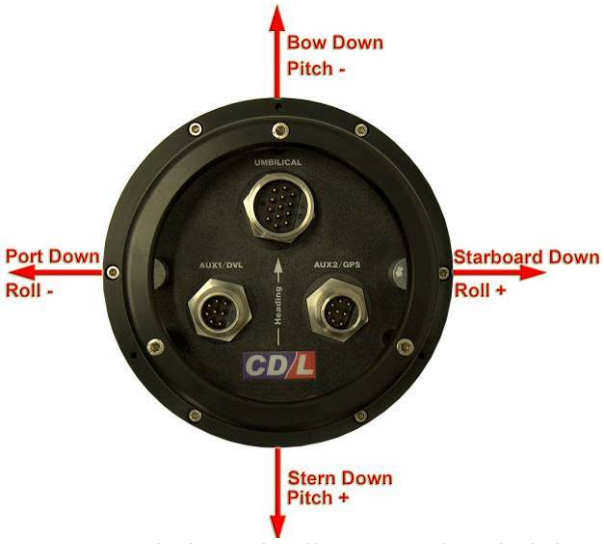

Figure 5.1: Pitch and roll convention (MiniRLG)

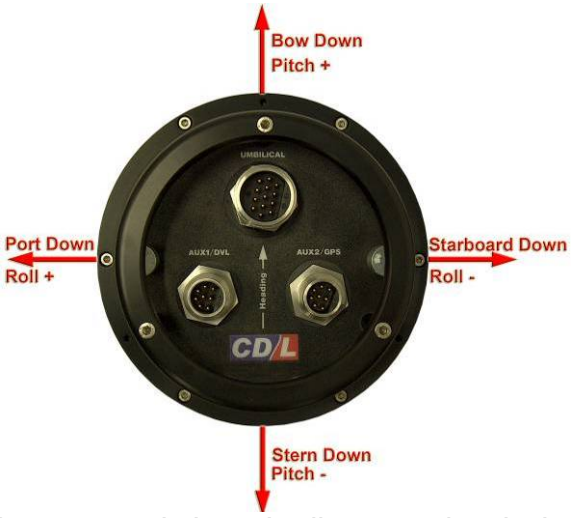

Figure 5.2: Pitch and roll convention (Other)

Where <CR><LF> is shown this refers to ASCII characters 0Dh and 0Ah respectively.

5.0.1. CDL1 Format

Haaa.a**P**bccc.cc**R**deee.ee**T**ff.f**D**gggg.gg**B**hh.h**A**ii**W**jj**LN**kk**F**l**<CR><LF>**

Where:

aaa.a	is Heading in degrees aaa(deg).a(decimal)
bccc.cc	is Pitch in degrees ccc(deg).cc(decimal) b [+] bow down / [-] stern down see figure 5.2
deee.ee	is Roll in degrees eee(deg).ee(decimal) d [+] port down / [-] starboard down see figure 5.2
ff.f	Not used
gggg.gg	Only available in POS units
hh.h	Not used
ii	Not used
jj	Not used
kk	Latitude
l	Fault flag

Number of characters in the string (including carriage return line feed): 54

5.0.2. CDL 2 Format

Haaaa**P**bccccc**R**deeeee**T**fff**D**ggggggg**B**hhh**A**ii**W**jj**LN**kk**F**l**<CR><LF>**

Where:

aaaa	is Heading in degrees aaa(deg).a(decimal)
bccccc	is Pitch in degrees ccc(deg).cc(decimal) b [+] bow down / [-] stern down see figure 5.2
deeeee	is Roll in degrees eee(deg).ee(decimal) d [+] port down / [-] starboard down see figure 5.2
fff	Not used
ggggggg	Only available in POS units
hhh	Not used
ii	Not used
jj	Not used
kk	Latitude
l	Fault flag

Number of characters in the string (including carriage return line feed): 48

5.0.3. MDL Format

Haaaa**P**bcccc**R**deeee**<CR><LF>**

Where:

aaaa	is Heading in degrees aaa(deg).a(decimal)
bcccc	is Pitch in degrees cc(deg).cc(decimal) b [+] bow down / [-] stern down see figure 5.2
deeee	is Roll in degrees ee(deg).ee(decimal) d [+] port down / [-] starboard down see figure 5.2

Number of characters in the string (including carriage return line feed): 19

5.0.4. MiniRLG1

Haaa.aa**P**bcc.ccc**R**deee.eee**M**fgghhii**W**jjjj.jj**U**kk.k**<CR><LF>**

Where:

aaa.aa	is Heading in degrees aaa(deg).aa(decimal)
bcc.ccc	is Pitch in degrees cc(deg).ccc(decimal) b [-] bow down / [+] stern down see figure 5.1
deee.eee	is Roll in degrees eee(deg).eee(decimal) d [-] port down / [+] starboard down see figure 5.1
f	is status digit see section 4.1 for details
gg	is the navigation monitor in ASCII hex
hh	is the validity byte in ASCII hex
ii	is the mode control logicals byte in ASCII hex
jjjj.jj	Only available in POS units
kk.k	Not used

Number of characters in the string (including carriage return line feed): 47

5.0.5. MiniRLG2

Haaaaa**P**bccccc**R**deeeeee**M**fgghhii**W**jjjjjj**U**kkk**<CR><LF>**

Where:

aaaaa	is Heading in degrees aaa(deg).aa(decimal)
bccccc	is Pitch in degrees cc(deg).ccc(decimal) b [-] bow down / [+] stern down see figure 5.1
deeeeee	is Roll in degrees eee(deg).eee(decimal) d [-] port down / [+] starboard down see figure 5.1
f	is status digit see section 4.1 for details
gg	is the navigation monitor in ASCII hex
hh	is the validity byte in ASCII hex
ii	is the mode control logicals byte in ASCII hex
jjjj.jj	Only available in POS units
kk.k	Not used

Number of characters in the string (including carriage return line feed): 42

5.0.6. Tokimec 1 Format

$PTVF,abbbbP,cddddR,eee.eT,fgg.gPR,hii.iRR,jkk.kAR,lmm.mN,yyyMD,zzzz AL<CR><LF>

Where:

abbbb	is Pitch in degrees bb(deg).bb(min) a[-] bow up / [space] bow down
cdddd	is Roll in degrees dd(deg).dd(min) c[-] port up / [space] port down
eee.e	is Heading in degrees
fgg.g	is the rate of pitch in degrees/sec f[-] bow up / [space] bow down
hii.i	is the rate of roll in degrees/sec h[-] port up / [space] port down
jkk.k	is the rate of turn in degrees/sec j[-] CCW / [space] CW
lmm.m	is the vessel speed in Knots l[-] is astern / [space] ahead
yyy	not used
zzzz	status

Number of characters in the string (including carriage return line feed): 72

5.0.7. Tokimec 2 Format

$PTVF,abbbbP,cddddR,eee.eT,fgg.gPR,hii.iRR,jkk.kAR,lmm.mN,yyyMD,zzzz
AL*nn<CR><LF>
Where:

abbbb	is Pitch in degrees bb(deg).bb(min) a[-] bow up / [space] bow down
cdddd	is Roll in degrees dd(deg).dd(min) c[-] port up / [space] port down
eee.e	is Heading in degrees
fgg.g	is the rate of pitch in degrees/sec f[-] bow up / [space] bow down
hii.i	is the rate of roll in degrees/sec h[-] port up / [space] port down
jkk.k	is the rate of turn in degrees/sec j[-] CCW / [space] CW
lmm.m	is the vessel speed in Knots l[-] is astern / [space] ahead
yyy	not used
zzzz	status
hh	checksum of all in string but $ and * characters

Number of characters in the string (including carriage return line feed): 75

5.0.8. EM3000 Format

The Simrad EM3000 format consists of a fixed length message using single byte unsigned, 2-byte unsigned and 2-byte twos-complement integer data elements. For the 2-byte elements, the least significant byte is transmitted first.

Status	**Header**	**Roll**		**Pitch**		**Not Used**		**Heading**	
A0	90	LSB	MSB	LSB	MSB	FF	FF	LSB	MSB

Where:

Element	Scaling	Format	Size	Value
Status		Unsigned	1 Byte	90h,91h,A0h
Header		Unsigned	1 Byte	90h
Roll	0.01 degrees	2's compliment	2 Bytes	-999 to 999
Pitch	0.01 degrees	2's compliment	2 Bytes	-999 to 999
Heading	0.01 degrees	Unsigned	2 Bytes	0 to 35999

Table 5.1: EM3000 Fields

Roll is positive with port side up. Pitch is positive with bow up. Status Byte indicates the following:

Value	**Status**
90h	Normal
91h	Reduced Performance
A0h	Invalid Data

Number of bytes in the string: 5

5.0.9. SGB Format

aaaa**<CR><LF>**

where:

aaaa	is Heading in Degrees aaa(deg).a(decimal)

Number of characters in the string (including carriage return line feed): 6

5.0.10. DLOG Format

Haaaa**P**bcccc**R**deeeef**<CR><LF>**

Where:

aaaa	is Heading in degrees
bcccc	is Pitch in degrees b [+] bow down / [-] stern down see figure 5.2
deeee	is Roll in degrees d [+] port down / [-] starboard down see figure 5.2
f	final flag: E Exact heading available S Gyro settling

Number of characters in the string (including carriage return line feed): 20

5.0.11. SKR Format

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

Number of characters in the string (including carriage return line feed): 4

5.0.12. NMEA HEHDT Format

$HEHDT,aaa.a,**T<CR><LF>**

Where:

aaa.a	is Heading in degrees aaa(deg).a(decimal)

Number of characters in the string (including carriage return line feed): 16

5.1. STATUS FLAG

The MiniRLG 2 outputs a status flag in some of the strings. This flag has the following meanings.

Status Flag	Meaning
0	Idle
1	Coarse stationary align
2	Fine stationary align – not complete
3	Fine stationary align – complete
4	Coarse GPS align
5	Fine GPS align – not complete
6	Fine GPS align – complete
9	Aided navigation
A	System failure

Table 5.2: RLG/POSStatus flag

CONTACTING CDL

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