Operator's Manual for the Labview Net Plankton Acquisition software

Shipboard Technical Support

Revision 1.00 August 2019

Table of Contents

1.0 General Information

This acquisition and control program is intended to be used with a Seabird SBE9Plus CTD mounted on a Towed NET frame along with an SIO built controller to trip the nets.

Main features:

- Acquires and stores Real-time data from the CTD.
- Controls the NET motor and sends commands to close Plankton nets.
- Acquires and stores Flow Meter and Net Trip data.
- Acquires and stores data from the GPS via RS232 or UDP ports.
- All data is displayed on strip charts and XY plots.
- Acquired data can be played back and displayed.
- Data is stored in the Seabird format so that it can be processed and viewed using the Seabird data processing software. In addition the Labview software uses Seabird XMLcon files to input Sensor calibration coefficients.

- Produces a standard formatted Proc file and supplementary NET data files.

- Currently supports the Seabird SBE 911Plus CTD system as the acquisition instrument and deck unit.
- Supports dual T&C sensors. Sensors can be pumped or not pumped.
- Supports sensors that can be plugged into Seabird CTD's such as Fluorometers, transmissometers, oxygen sensors, altimeters, PAR sensors etc.

- Utilizes an SIO/STS built Plankton NET interface located on the frame to control the Net tripping motor and acquire data from the flowmeter and net response sensors.

- Utilizes an SIO/STS built NET Angle sensor that is mounted directly on the frame.

- Ability to monitor Net Release motor and CTD voltages during the tow.
- Supports an additional flowmeter.
- Supports the use of two confirmation (RSP) switches.
- The Net NET interface unit and Release motor are powered through the CTD - not by a battery pack. The nominal current draw from the CTD is 20-30ma.

1.2 Minimum System Requirements

Windows PRO 7/8/10 64 bit
Minimum monitor display resolution 1980x1080
3 or more RS232 serial ports

2.0 System setup

There are two installer programs. The primary installer (Lvpki_vxxx_Installer.exe) contains the program and drivers. It is used if the Labview drivers are not already installed. The ND version (Lvpki_vxxx_Installer_ND.exe) is a smaller file and contains just the program and is used if the drivers are already installed. After the installer has completed restart the PC.

Make a folder called C:\LVpki. Create a xmlcon file using Seabird's Seasave program for the CTD and sensors that are installed on the plankton net frame and put it into C:\LVpki.

Connect the serial cable between the SBE11 deck unit and the CTD_Port port on the PC. Connect another serial able between the 300 baud modem port on the deck unit and the selected serial port on the PC. Connect the NMEA serial cable between the GPS source and the selected serial port on the PC Depth sounder or gyro NMEA messages can be added by selecting additional NMEA ports. NMEA messages can also be acquired through UDP ports instead of serial ports.

NMEA messages that are recognized and parsed by the program are:
Position: GGA, GLL, GNS, RMC, VTG, ZDA
Speed log: VBW, VHW
Gyro: HDT, HDG
Depth: DBT, DBS, DPT and Knudsen PKEL (it is preferred to input only one depth message type)

The program does not look for any specific two letter talker ID code. It looks for the 3 letter sentence type. It is not necessary to input all of the above message types. The program will add information from the NMEA messages to the data files if they are present.

On the underwater package the flowmeter(s), motor and response switch should be connected to the STS modem interface. The STS modem interface connects to the SBE9 CTD modem connector. The

CTD T&C sensors are installed as usual and connected to the CTD. All components are powered from the SBE9 CTD. The NET Angle and NET Roll sensors are plugged into one of the A/D ports on the CTD as configured in the XMLcon file.

On Windows systems add Lvpki.exe to the list of excluded processes in the anti-virus configuration settings to keep the data files from being continuously scanned. Anti-virus scanning of the data files may cause the system to slow down.

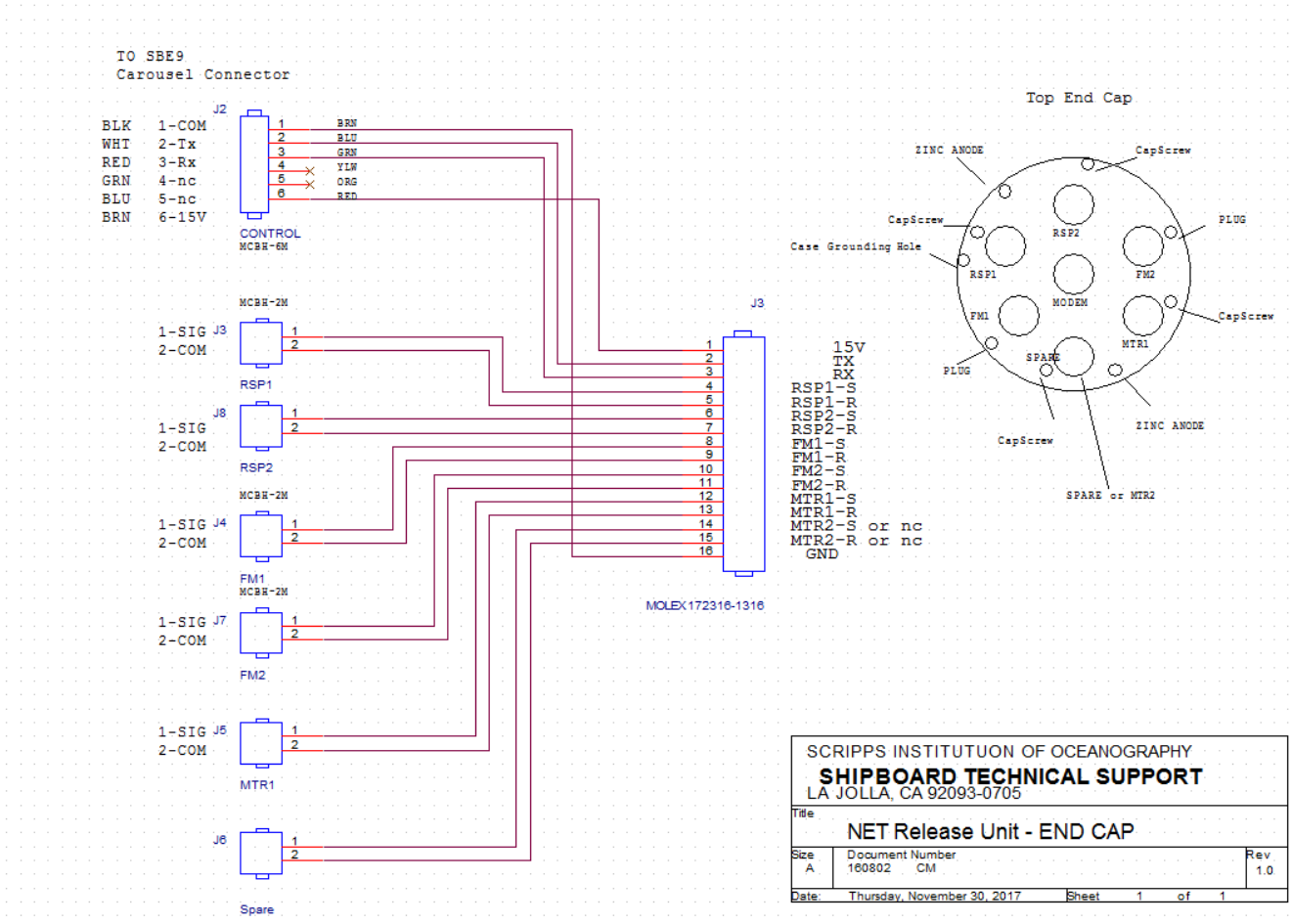


Illustration 1: System Hookup Diagram

Text 1: Plankton NET Interface Connection Diagram

2.1 Net Angle Sensor

The net angle sensor should be mounted flat so that when the frame is laying horizontal on the deck the connector of the net angle sensor should be up and the arrow is pointing toward the direction of the tow which is toward the front of the frame or bow of the ship. The square base is intended to mount downward and bolted to the frame so that the base is in the same horizontal plane as the frame, the flat side of base that is on the same side as the arrow is oriented to point to the front of the frame and perpendicular to the long side of the frame. When the frame is sitting flat (horizontal to the deck) then the net angle will read 90 deg and when the frame hangs vertical so that the arrow is pointed straight up then the angle should read 0 deg.

The Net Angle sensor should be plugged into one of the Aux Port connectors on the CTD. If it is in Aux1 (Ch 0,1) then in SeaSave modify the XMLcon file to select A/D Voltage 0 and select sensor type “User Polynomial” and enter the following:

Serial number = <Enter serial number of your sensor>
Calibration date = n/a
Sensor name = NET Angle
A0 = -22.5
A1 = 45.0
A2 = 0.0
A3 = 0.0

click on OK. Select A/D Voltage 1 and select the sensor type “User Polynomial 2”

Serial number = <Enter serial number of your sensor>
Calibration date = n/a
Sensor name = NET Roll
A0 = -112.5
A1 = 45.0
A2 = 0.0
A3 = 0.0

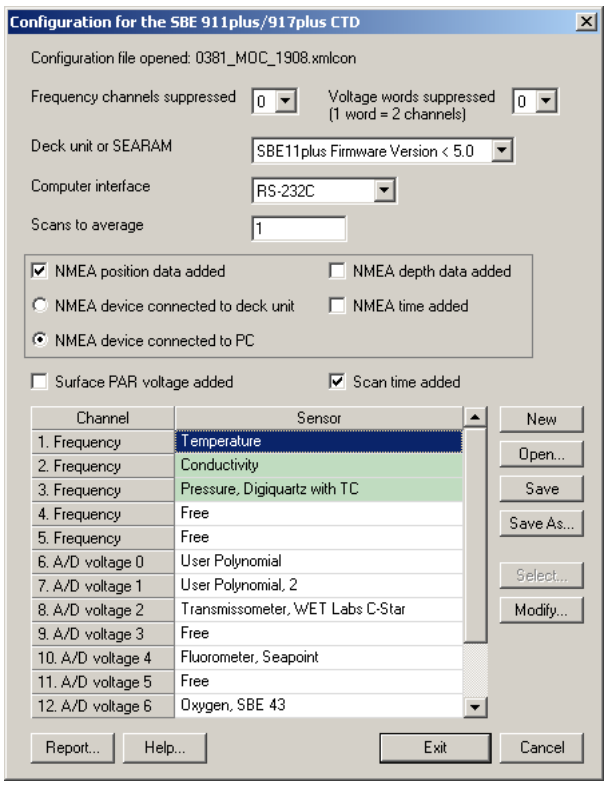
Click on OK.

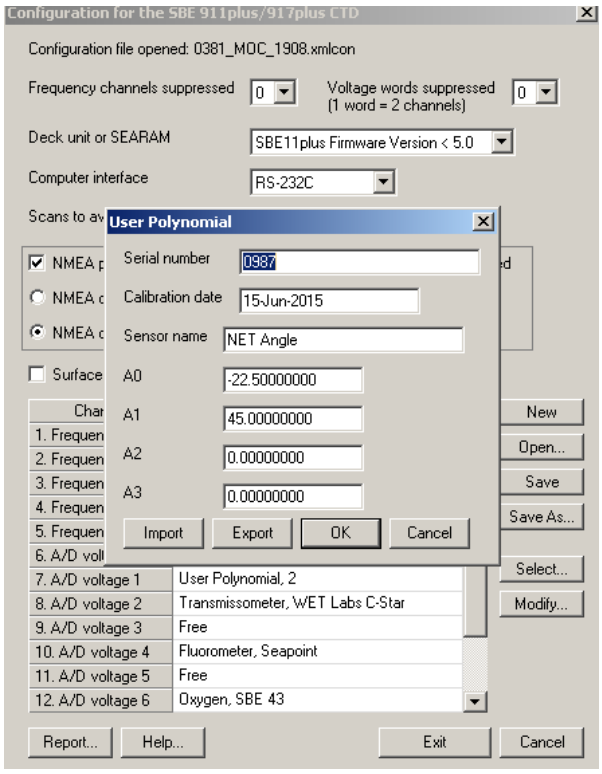
The Sensor names should be entered exactly as shown above as it is case sensitive. Since this is a User Polynomial sensor then the Sensor name is the only way that the Lvpki program knows that it is the net angle sensor. In Lvpki versions 1.00f or higher these sensor names are not case sensitive.

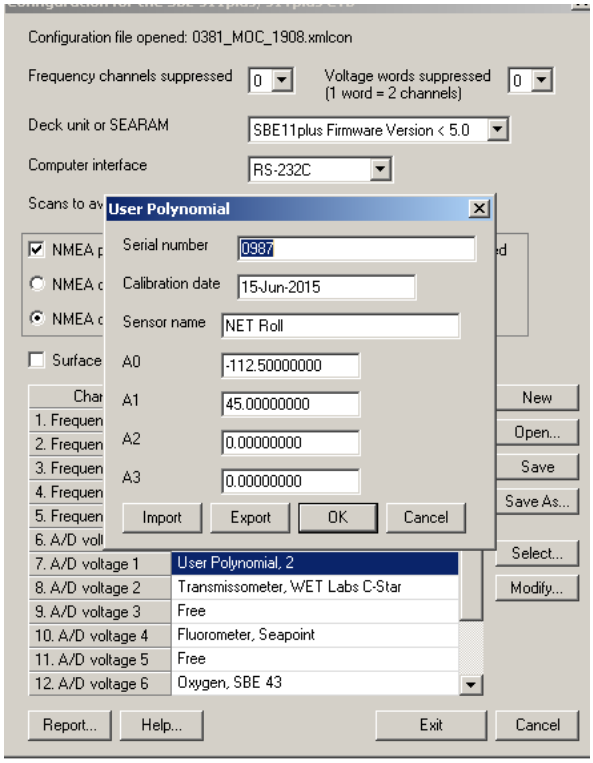
Net Angle should appear as “User polynomial” and the NET Roll should say “User polynomial 2”

Click on Save

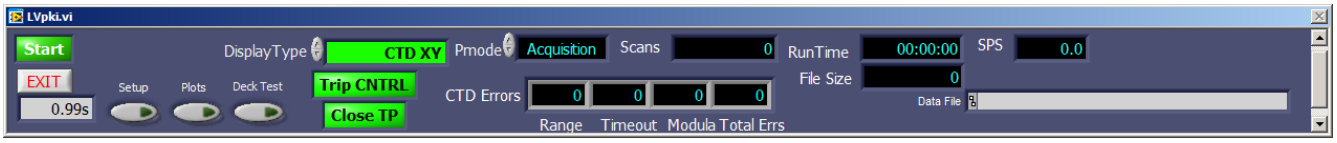
An example of this setup is shown on the next page.


Configuration for the SBE 911plus/917plus CTD
Configuration file opened: 0381_MOC_1908.xmlcon
Frequency channels suppressed
0
Voltage words suppressed (1 word = 2 channels)
0
Deck unit or SEARAM
SBE11plus Firmware Version < 5.0
Computer interface
RS-232C
Scans to average
1
NMEA position data added
NMEA depth data added
NMEA device connected to deck unit
NMEA time added
NMEA device connected to PC
Surface PAR voltage added
Scan time added
Channel
Sensor
1. Frequency
Temperature
2. Frequency
Conductivity
3. Frequency
Pressure, Digiquartz with TC
4. Frequency
Free
5. Frequency
Free
6. A/D voltage 0
User Polynomial
7. A/D voltage 1
User Polynomial, 2
8. A/D voltage 2
Transmissometer, WET Labs C-Star
9. A/D voltage 3
Free
10. A/D voltage 4
Fluorometer, Seapoint
11. A/D voltage 5
Free
12. A/D voltage 6
Oxygen, SBE 43
New
Open...
Save
Save As...
Select...
Modify...
Report...
Help...
Exit
Cancel


Configuration for the SBE 911plus/917plus CTD
Configuration file opened: 0381_MOC_1908.xmlcon
Frequency channels suppressed
0
Voltage words suppressed (1 word = 2 channels)
0
Deck unit or SEARAM
SBE11plus Firmware Version < 5.0
Computer interface
RS-232C
User Polynomial
Serial number
0987
Calibration date
15-Jun-2015
Sensor name
NET Angle
A0
-22.50000000
A1
45.00000000
A2
0.00000000
A3
0.00000000
Import
Export
OK
Cancel
7. A/D voltage 1
User Polynomial, 2
8. A/D voltage 2
Transmissometer, WET Labs C-Star
9. A/D voltage 3
Free
10. A/D voltage 4
Fluorometer, Seapoint
11. A/D voltage 5
Free
12. A/D voltage 6
Oxygen, SBE 43
New
Open...
Save
Save As...
Select...
Modify...
Report...
Help...
Exit
Cancel

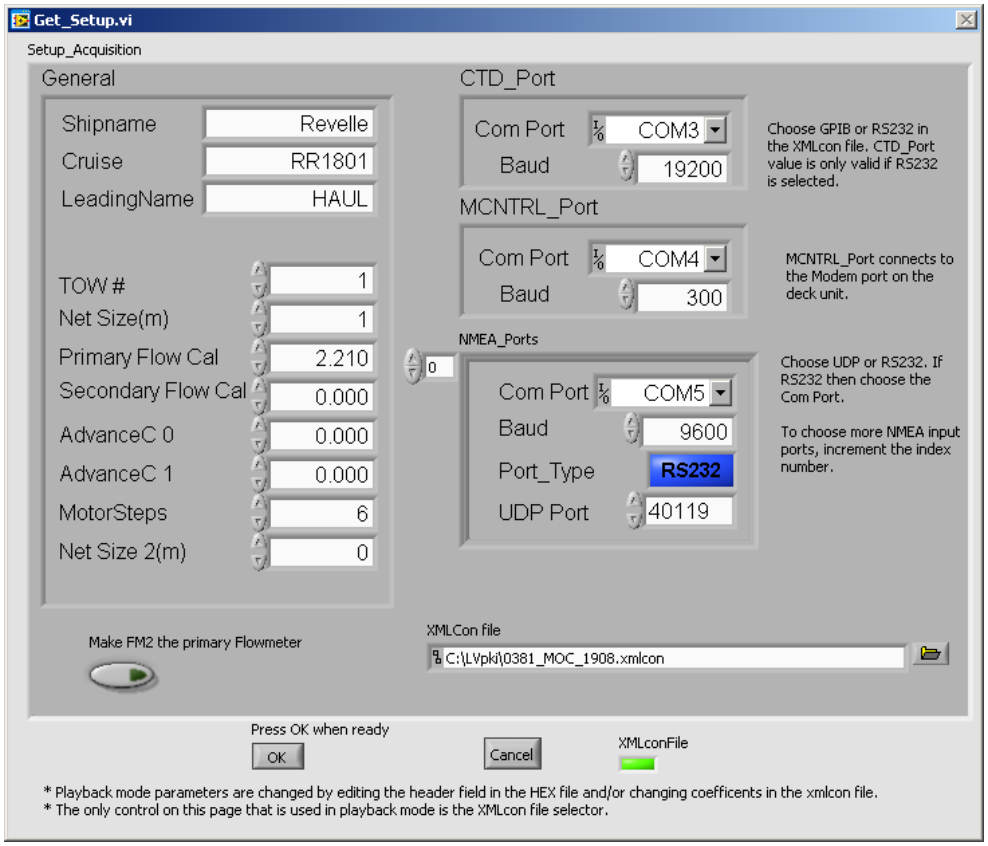

Configuration file opened: 0381_MOC_1908.xmlcon
Frequency channels suppressed
0
Voltage words suppressed (1 word = 2 channels)
0
Deck unit or SEARAM
SBE11plus Firmware Version < 5.0
Computer interface
RS-232C
User Polynomial
Serial number
0987
Calibration date
15-Jun-2015
Sensor name
NET Roll
A0
-112.50000000
A1
45.00000000
A2
0.00000000
A3
0.00000000
Import
Export
OK
Cancel
7. A/D voltage 1
User Polynomial, 2
8. A/D voltage 2
Transmissometer, WET Labs C-Star
9. A/D voltage 3
Free
10. A/D voltage 4
Fluorometer, Seapoint
11. A/D voltage 5
Free
12. A/D voltage 6
Oxygen, SBE 43
New
Open...
Save
Save As...
Select...
Modify...
Report...
Help...
Exit
Cancel

3.0 Program Operation



3.1 Setup for the Tow

Run the LVpki program. The LVpki control panel will appear. Click on the “Setup” control. A configuration window will appear.



Select the desired XMLcon file. If this file does not exist then a new one can be made using the Seabird Seasave program. Next enter the Ship-name, CruiseName, File Name, Tow number, Net Size, Flowmeter calibration factor and AdvanceC0 AdvanceC1 values. If the T&C sensors are not pumped then enter 0.0 for both Advance Cx values. If they are pumped using the Seabird SBE5T pump then enter 0.073 for both values. In MotorSteps enter the number of steps that the motor needs to trip a net (normally 3). If there are a 2nd set of NETS then enter the size in meters in NET Size 2 (normally 0). If there is an issue with the Flowmeter#1 connection then flowmeter#2 can be made the primary flowmeter by setting “Make FM2 the primary Flowmeter”.

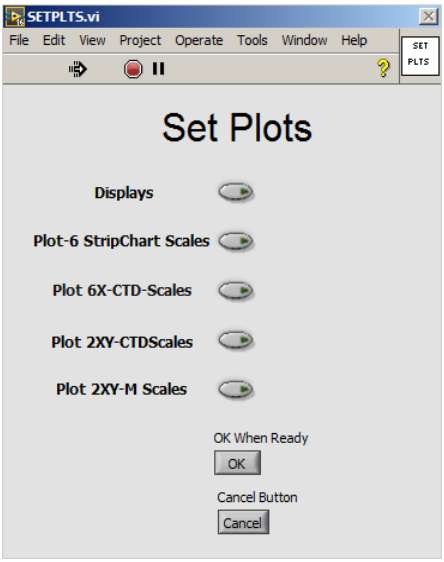
If the deck unit is connected to the PC using GPIB then that needs to be indicated in the XMLcon file using the selected XMLconfile builder program (Seasave). If GPIB is selected then the CTD_Port serial data section is ignored. Next enter the serial port number for the MCNTRL_Port. And lastly enter the serial port number(s) for the NMEA data. Optionally you can input this data using a UDP port instead of serial. If there is more than one NMEA source then \increment the small index control and enter the next NMEA source. Continue incrementing the index for as many sources as desired.

3.1 Deck Test

The Deck Test control allows testing of the Net Release motor, FlowMeter and Response switches without having to start a full acquisition. First turn on the SBE11 deck unit. Ensure that the data indicator on the deck unit is green and that there are no errors. Click on the “Deck Test” button. The NET TRIP window will appear. The data from the underwater unit will be displayed in the Modem Data indicator. This will indicate that a connection has been established. The Motor Volts and CTD Volts will also be displayed. When ready to test trip a net click on the Trip NET button. The Trip in Progress and Motor ON indicators will come on. The Trip in Progress signal is an acknowledgment that the underwater unit has received the TRIP command. The Motor ON indicator confirms that power has been applied to the motor. If either indicator does not come on then it means that the NET did not trip. The lack of a Trip in Progress signal could indicate a communications/connection problem. The lack of the Motor ON signal could mean a hardware problem. Trip a NET and then flip the RSP switch to ensure that the confirmation is functional. Spin the flowmeter to ensure that flow counts increment. If desired press the Reset Trip or Reset Flow counts to ensure that the count gets reset properly The Motor can be Single stepped by clicking on the Single Step Motor control. To prevent accidental resets then lock the reset controls by clicking on the lock button. It can be unlocked again by clicking on the unlock button. When finished testing click on small stop button in the lower right corner. At this time time the deck test feature only tests the functionality of the PKI interface unit. It does not test the CTD data. In order to check the CTD then it is necessary to start the lvpki program normally and select a data file for testing purposes.

3.2 Setup Plots

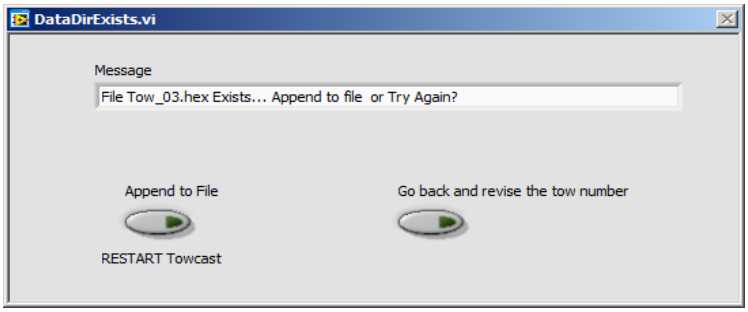
The plots can be setup in advance of the tow. Press the “Plots” button. These plots can also be modified anytime during the tow by clicking on the Plot Scales on the currently displayed page.



3.3 Acquisition

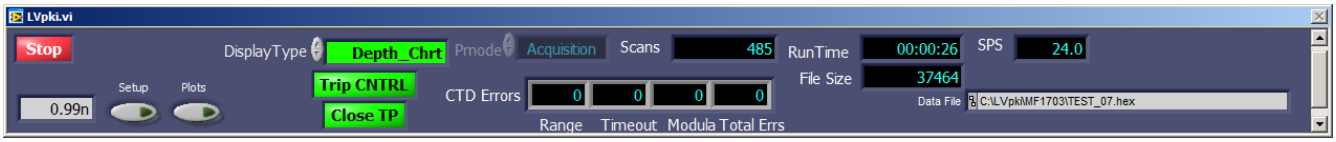
When ready to start the system open the LVpki program. Click on the Setup control in the lower left and setup the cast parameters as well as selecting the XMLcon file. In the middle of the panel there is a control labeled Pmode. It should be set on Acquisition. On the upper left side of the panel is a control with a green background labeled Start. First turn on the SBE11 deck unit. Ensure that the data indicator on the deck unit is green and that there are no errors. Click on the Lvpki Start button. A small popup will appear – Click on the OK button.

If the specified data files exists then the below popup will appear. There are two choices. If the operator had forgotten to update the data file information during the Setup period then it is best to choose the right-most button to go back and revise the tow number. However, if the towcast is still in the water from a pre-existing cast and if the acquisition computer crashed during the cast then upon restarting the program the operator can choose the RESTART Towcast button and the data will be appended to the end of the existing data files.

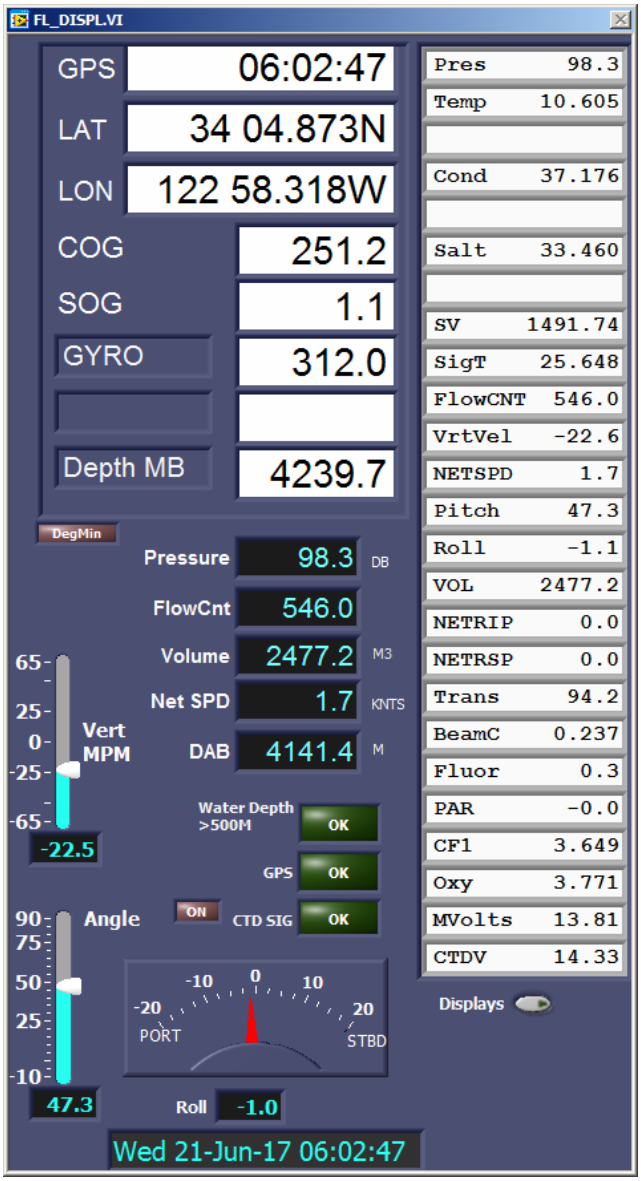


If the cast is restarted using the RESTART Towcast button then the flowcounts, tripcounts and confirmation data will be preserved in the underwater unit. However, if the cast is started using new data files then all of this data will be reset to 0 in the underwater unit.

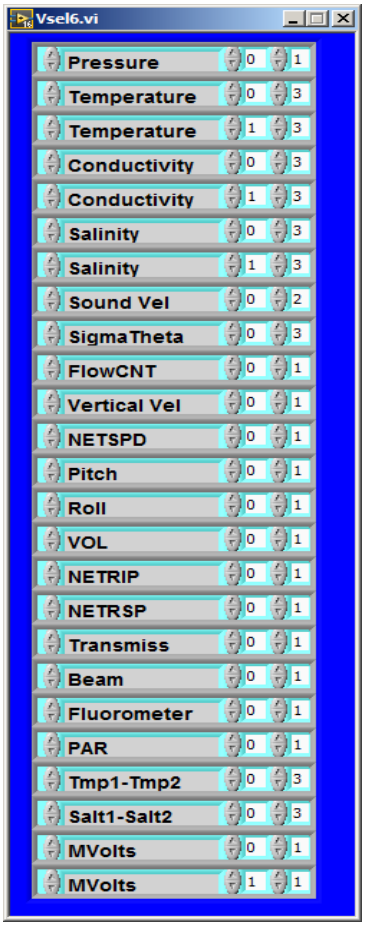
Once data are being acquired observe the indicator labeled CTD Errors located near the bottom of the screen. If all is well there should be no errors. If there are timeout errors it indicates that the data is not coming into the program and the connections should be checked to see if they are properly connected and that the deck unit is connected to the underwater unit. If there are modula errors then the settings in the XMLcon file should be checked. If there are no errors then look at the SPS indicator. It should read 24 if there are no frames averaged in the deck unit. If frames are averaged it should read 24 divided by the number of frames averaged. The Runtime and Scan indicators should also be incrementing.



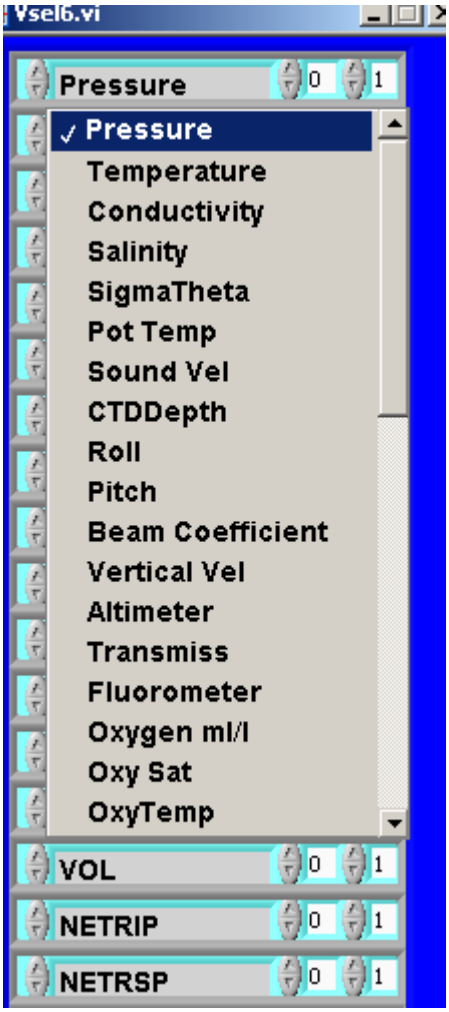
On the upper left panel, GPS data should be displaying. Near the bottom of the panel the Net Angle indicator should be seen. There are two green warning indicators that will flash red if there is a problem with either the CTD or NMEA signals. Latitude and Longitude can be displayed in either traditional or decimal format by clicking on the DegMin or Decimal button



Click on the “Displays” Control to select parameters in the display box on the right.

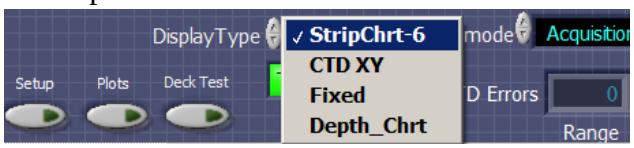


In the display menu box click on the parameter name to get the list. Select the desired parameter to display in the selected slot The 2nd selection is the sensor number. If there are more than one sensors such as two temperature sensors then the 2nd temp value can be selected by flipping the index value from ‘0’ to ‘1’. The 3rd selection is the precision where the number of decimal places can be selected. If the precision is set to 3 then the value will be displayed with 3 decimal places such as 24.123. In the below example pressure is selected, sensor number 0 and a precision of 1 decimal place.



Different pages can be selected by clicking on the control labeled DisplayType. There are four choices.

1. Stripchart – 6 stripcharts are displayed that plots data vs time.
2. CTD XY - A Multi XY plot that plots data vs CTD Depth
3. Fixed - CTD data in tabulated form
4. Depth Chart – Depth vs Time strip chart



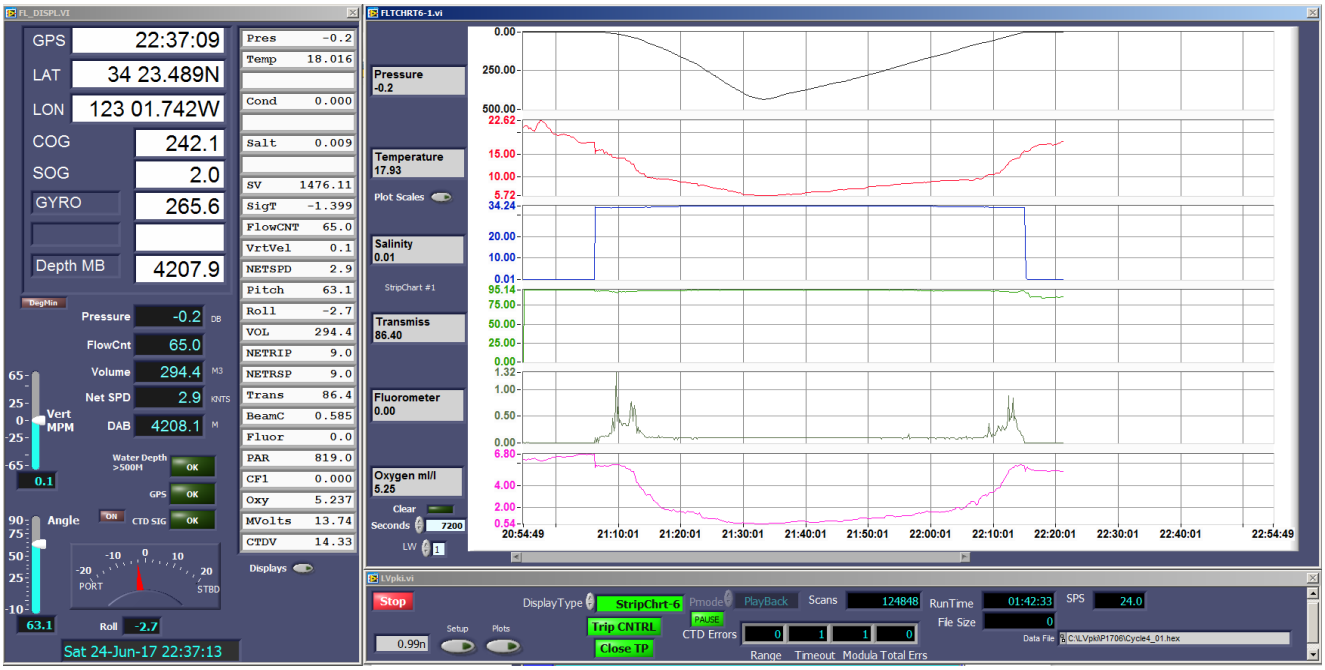
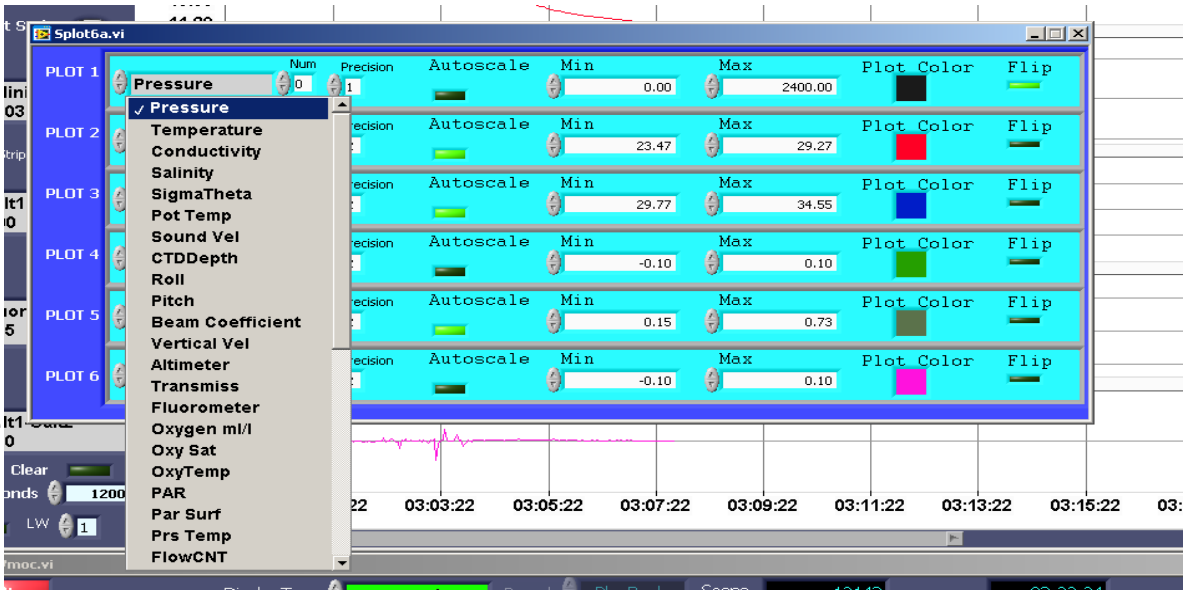


Illustration 2: Stripchart Plots

Plot Scales Control



CTD XY Plot In this menu, select the parameter to plot, choose the sensor number with the Num control and the precision that the value is to be displayed using the "Precision control". Either select Autoscale or turn off Autoscale and enter the desired Min, Max values and choose the plot color.

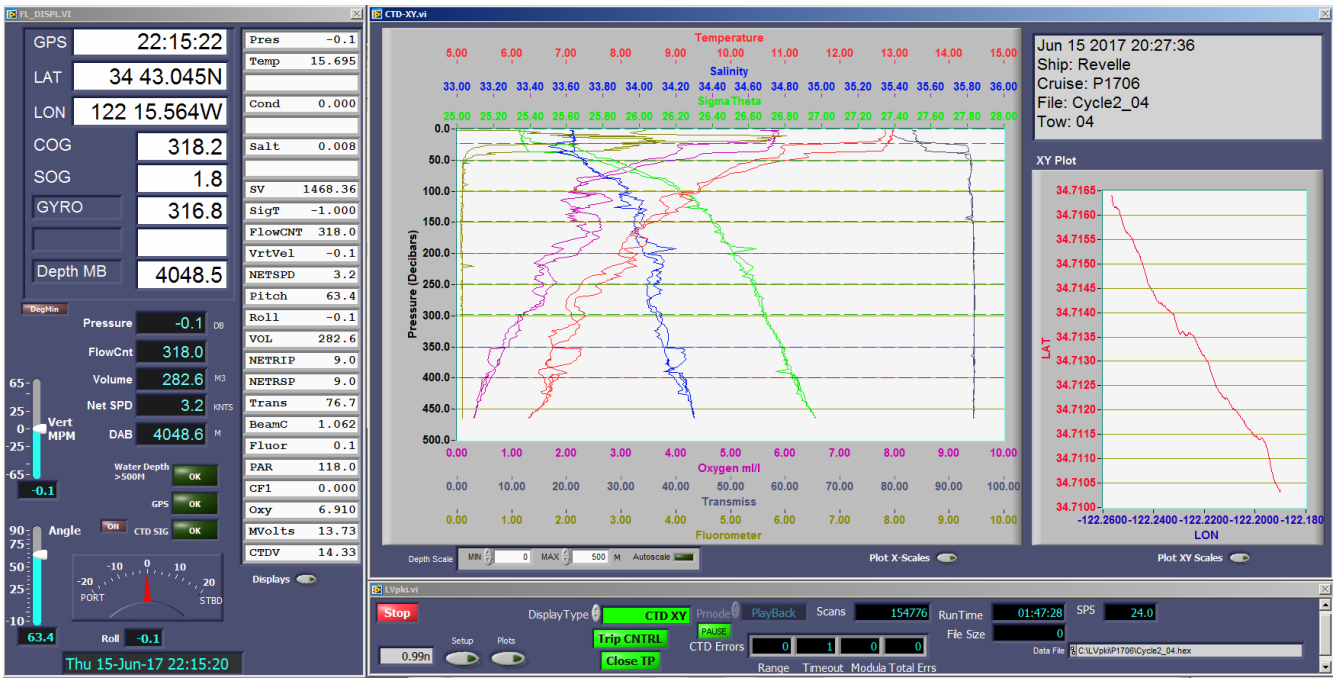


Illustration 3: CTD XY Multi Plots

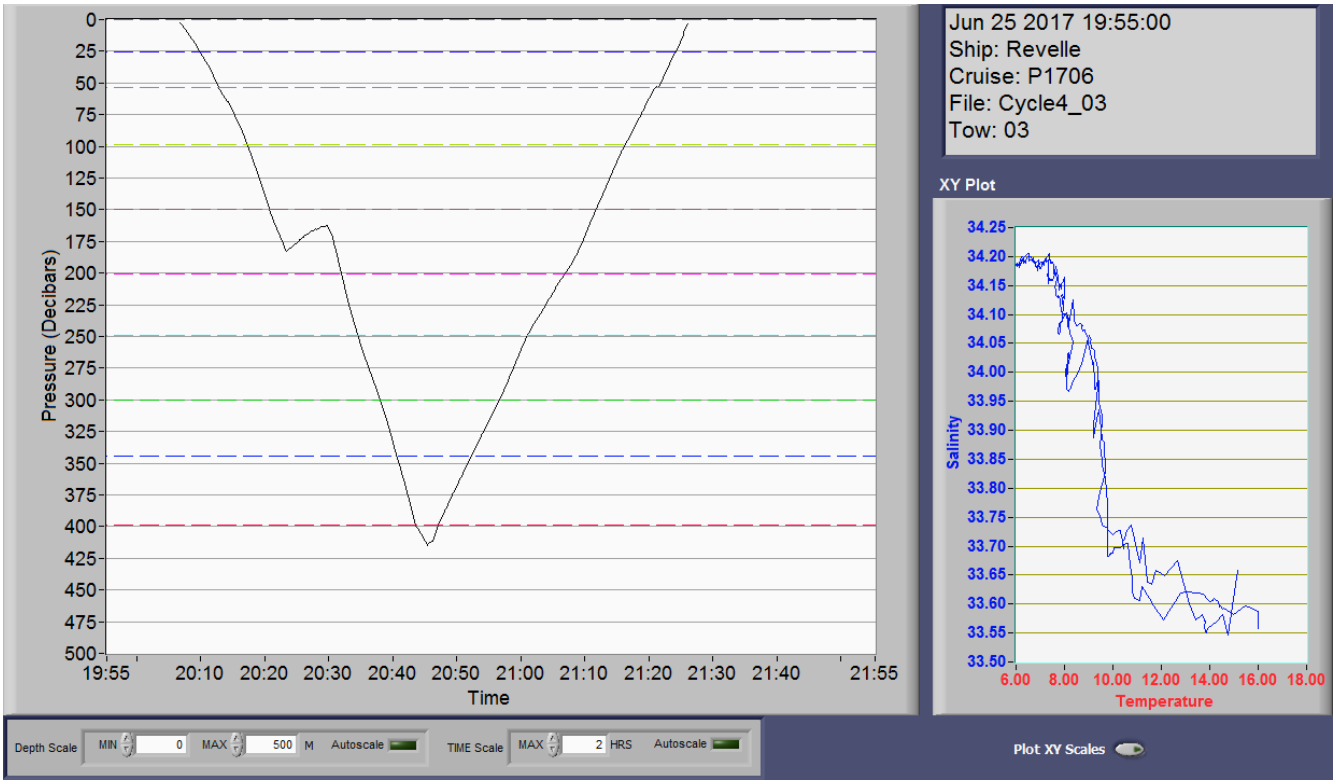


Illustration 4: Depth vs Time

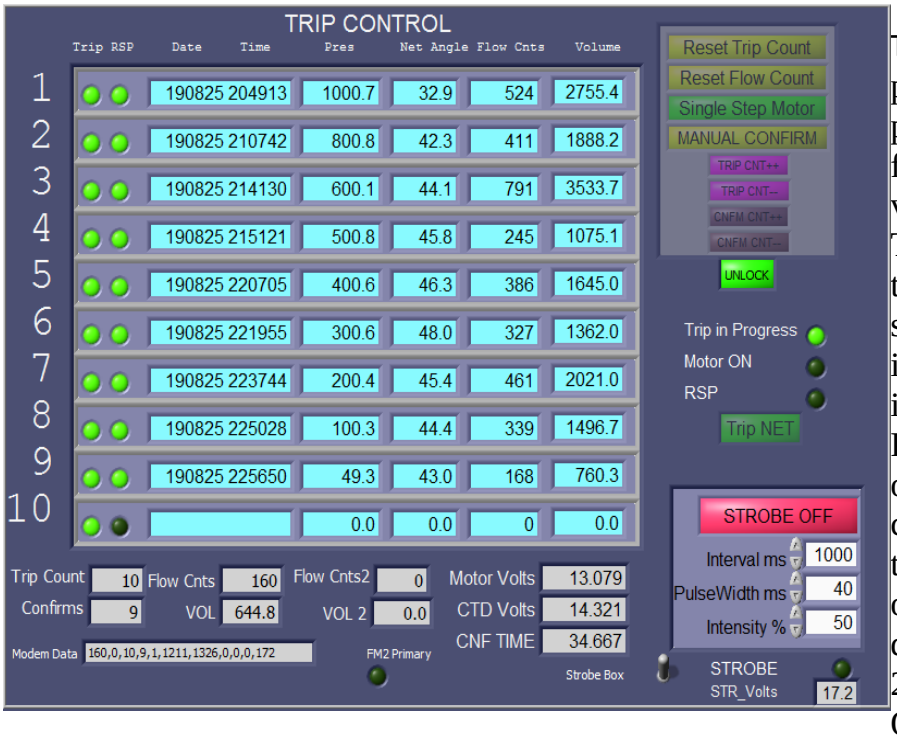
3.4 NET Trip

The NET trip control window can be brought up by clicking on the Trip CNTRL button located on the lower main panel. In this window the Net Trip info is displayed along with Flow count data from the Flowmeter. The operation of this panel is the same as the description in the Deck Test section. When ready to trip a net press the green Trip NET button. Once it is pressed the on the Trip in Progress indicators will come on. This indicates a NET trip is in progress. When the NET response switch is toggled signaling that the Net has closed then the confirmation indicator will come on. If the response switch does not toggle within 60 seconds then the confirmation indicator will not change and the Trip in Progress indicator will go out. The Net Trip data from both the Trip signal and the response signal is recorded in the data file. If desired then the operator can select the Manual Confirm button to confirm the NET closure. NET confirmations are indicated by a colored dashed line on both the CTD XY plots and the Depth Profile Strip Chart pages. The RSP indicator will light up for 10 seconds anytime the RSP switch is depressed regardless of whether or not a Net trip has been initiated. The RSP indication is recorded in the PROC file at or near the end of the data line. It will show an 'R' to indicate an activated position for a 10 second period and a 'N' for not activated.

3.5 NET Strobe UNIT

If a strobe system is connected to the PKI interface then it can be activated on the Trip Control window by flipping the small toggle switch at the lower right of the page. The strobes can be turned on/off during the tow using the displayed controls. Strobe parameters such as interval, pulse width and brightness can also be adjusted at any time during the tow. The strobes are not powered by the CTD and have their own battery pack. The battery voltage is displayed on the lower right of this window. When the strobes are not used then this display can be kept off and out of view.

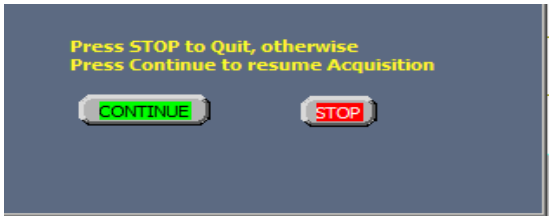
Overall size and shape:
2 LED BARS mounted above the top of the nets, forward projecting, to illuminate the volume directly in front of the MOCNESS (the LED array is slightly wider than the 1 m width of the MOCNESS net)
Number of LEDS:
Each Light bar has 12 LED sets, each set with 3 adjacent LEDS. Total of 36LEDs per Light bar.
Wavelength range
Peak LED output approximately 505 nm
Strobe interval
100 -10,000 ms
Strobe pulse width
2 - 100 ms.
Software controls
On/Off, Flash Interval, Pulse width, Flash intensity (as % of maximum, ranging from 0 to 100%)



The strobe light bars are powered by a ni-cad battery pack -16.8V at 5AH. When fully charged it may show a value between 18-19 volts. This voltage is monitored in the STR_Volts indicator. The strobes are enabled by inserting a 3-pin shorting plug into the connector labeled PWRON. They are turned on or/off using the strobe controls. They can also be turned on/off in a stand alone operation by inserting a different shorting plug into the 2-pin connector labeled LOC-ON.

3.6 Ending the TOW acquisition

When the acquisition is over click on the STOP button and verify that you want to end the acquisition. When the program stops it will create a hard-copy of all of the plots and put them in the in the images sub-folder of the cruise directory.



4.0 Playback Mode

To play back a data file change the Pmode control to Playback. Next click on Setup and select the XMLcon file that is associated with the data file that is intended to be played back. This file may be located in the same data folder as the HEX and MCN files. Click on Start and navigate to the desired HEX data file and click ok.

Starting with Lvpki Version 1.00f It is not necessary to select the XMLcon file. Just put the Pmode control to Playback and click on the green Start button. Select the hex file to play back and the program will automatically pick the XMLcon file that was used when it acquired the selected hex file.

The program will read the data from both the HEX and MCN files and display the data on all display pages, strip charts and XY plots. After finished viewing the played back data click on STOP and the plots will terminate and a hard-copy of all of the XY plots and NET Trip window will be placed in the images sub-folder. The Played back plots will not overwrite the original plots. The plots from the playback will be indicated with a ‘-P’ at the end of the file name. The original plots will have a ‘-A’ at the end of the filename. The trip window will have a ‘-T’.

If a change to the flowmeter calibration has been determined then the correct flowmeter calibration can be entered. The data file can then be played back and it will create a new Proc file with a ‘-P’. This file will have new volume values. The place to enter the new correction is not on the Setup page but in the hex file. Use a text editor and edit the header field in the hex file. Near the end of the header section there are lines that begin with 2 asterisks: “**” where it says “Flow Calibration”.

** Ship: R/V Atlantis
** Cruise: P1908
** Tow: 04
** Net Size: 1.0
** Flow Calibration: 4.400
** Flow2 Calibration: 0.000
** LVpki Version: 1.00e
* System UTC = Aug 20 2019 20:13:46

Other sensor calibration coefficients that may have been corrected or updated can be entered into the appropriate xmlcon file that was used when acquiring the tow data. The data file can be played back and new proc files using the new sensor coefficients will be generated. These new files will have the ‘-P. in their filenames.

5.0 Data Files

The Lvpki Acquisition program produces seven different files for each NET Tow deployment. The files are written into C:\LVpki in a sub-folder by cruise name. The First four files are Seabird formatted files. The last three are specific to NET Data.

1. Hex file – Main data file from the Seabird SBE9 CTD.
2. HDR file – Header information – Seabird format.
3. BL file – Trip info - Seabird bottle format.
4. XMLCON file – XMLcon file copy.
5. NET file – NET Trip data in text format.
6. PROC file – Traditional Processed data file.
7. MCN file – contains all other related data that is not included in the Hex file.

Information on the formatting content of the HEX, HDR and BL files can be found in the Seabird Seasave manual. The PRO processed data file is created during the real-time data acquisition during a deployment. This file can also be created during the Playback mode while playing back and displaying archived data files. The file created during acquisition is indicated by an 'A' at the end of the filename but before the extension e.g. HAUL_03A.PRO. The file created during data playback is indicated by a 'P' e.g. HAUL_03P.PRO. This is useful in case change(s) have been made to the calibration coefficients after the data was acquired. Each data line in the PRO file is recorded at a rate of one data line per second.

The MCN data file is an ascii text file:
21 Fields delimited by commas recorded at one data line per second.
1. Date yymmss
2. Time hhmmss
3. System Time (Seconds since 1/1/1970)
4. Flow counts
5. Volume M3
6. NET Trips
7. NET Response
8. NET Speed (Knots)
9. NET Angle
10. Latitude
11. Longitude
12. COG Course over ground
13. SOG Speed over ground (Knots)
14. Gyro
15. Water depth – (Meters)
16. GPSTime
17. Speed Log (Knots)
18. Motor Volts
19. CTD Volts
20. Flow Counts 2 (From 2nd Flowmeter)
21. Volume 2 M3 (From 2nd Flowmeter)
22. CTD Pressure (DB)

NET Angle and NET Roll are also recorded in the HEX file as this sensor plugs directly into the CTD.

MCN File example:

```
170626,065743,1498460264,18,82.51,8,8,2.6,46.5,34.49209,-122.98498,277.9,2.1,284.2,4165.9,25061,-99.0,13.15,14.33,0,0.00,43.3,97234
170626,065744,1498460265,18,82.51,8,8,2.6,46.6,34.49209,-122.98499,281.7,2.1,284.2,4165.9,25062,-99.0,13.15,14.33,0,0.00,43.2,97258
170626,065745,1498460266,20,82.51,8,8,2.6,46.6,34.49209,-122.98500,283.6,2.2,284.1,4165.9,25063,-99.0,13.18,14.33,0,0.00,43.1,97282
170626,065746,1498460267,20,91.47,8,8,2.6,46.6,34.49210,-122.98502,283.4,2.2,284.1,4165.9,25064,-99.0,13.18,14.33,0,0.00,42.9,97306
170626,065747,1498460268,20,91.47,8,8,2.6,46.6,34.49210,-122.98503,285.7,2.3,284.1,4165.9,25065,-99.0,13.18,14.33,0,0.00,42.6,97330
170626,065748,1498460269,20,91.47,8,8,2.6,46.6,34.49210,-122.98504,289.1,2.3,284.1,4168.0,25066,-99.0,13.18,14.33,0,0.00,42.4,97354
```

The NET Trip File format is as follows:

```
NET FILE:Cycle4_04_net.txt
Jun 26 2017 05:50:05
Ship: Revelle
Cruise: P1706
File: Cycle4
Tow: 04
```

Date	Time	TC	CNF	FC	VOL	Pres	Temp	Cond	Salinity	Fluor	Trans	Oxy	Angle
170626	062915	1	1	302	1732.70	399.4	6.438	34.2433	34.216	0.09	94.90	0.502	32.2
170626	063319	2	2	91	461.56	349.5	6.878	34.6009	34.197	0.09	94.95	0.652	40.5
170626	063652	3	3	88	439.88	300.6	7.212	34.8546	34.167	0.09	94.92	0.899	41.4
170626	064143	4	4	121	586.14	250.4	7.680	35.2334	34.142	0.09	94.90	1.154	43.5
170626	064542	5	5	108	520.44	200.7	8.064	35.5008	34.078	0.09	94.80	1.716	43.7
170626	064908	6	6	74	330.10	150.2	8.903	36.2176	34.050	0.09	94.55	1.905	48.0
170626	065314	7	7	76	339.78	100.7	9.574	36.6732	33.907	0.09	94.46	2.149	47.8
170626	065702	8	8	76	338.46	51.1	10.658	37.4201	33.676	0.16	94.29	3.513	48.1
170626	065928	9	9	64	292.24	25.4	13.379	39.8705	33.610	0.27	93.41	5.402	46.7

TC – Trip Count
CNF – Confirmation Count
FC - Flow Counts
VOL - Volume
Pres - Pressure(DB)
Temp -Temperature Deg C
Cond Conductivity S/M
Salinity PSU
Fluor -Fluorometer ug/l
Trans - Transmissometer %
Oxy - Oxygen mll
Angle – NET Angle