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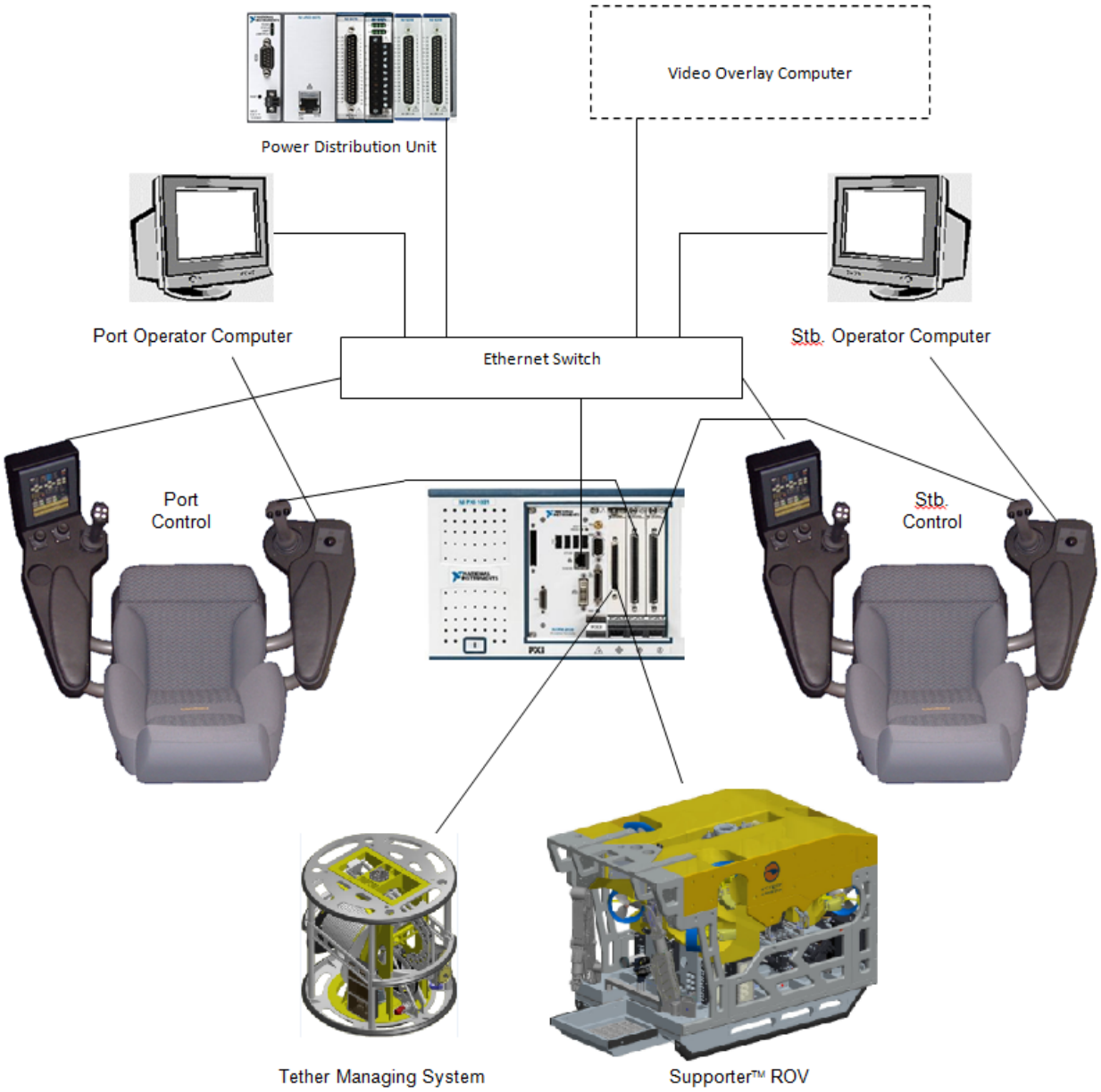
1. Introduction

The **KYSTDESIGN** topside control system is a real time CPU based system controlling the Supporter, Installer or Constructor (ROV), The Tether Management System (TMS) and the Power Distribution Unit (PDU).



The above illustration gives an overview of the control system main links. The PXI unit is the heart of the system being the main control.
The above illustration does however not illustrate the links between the operator computers and switching matrixes, the fibre-optic telemetry system etc.

The topside control system consists of 2 main levels, the **Real Time Level** and the **Information Level**.

1.1 Real Time Level:

A real time level gives reliability, deterministic loop speed, short boot time, and simplicity. This level is meant to be a “turn on and forget” level. It is made up of the following elements:

1. ROV control system
2. TMS Control system
3. PDU control system
4. Left Control joysticks and touch screen system
5. Right Control joysticks and touch screen system
6. Topside PXI real time controller:
   - Decode and control ROV serial links
     - TCU 20 times /sec at 57.6kbps
     - ACU, GFVPs, Light Box and Camera Ctrl card 57,6kbps
     - Gyro 38,4 kbps
     - Depth Sensor 9,6 kbps
     - Altimeter 9,6 kbps
   - ROV auto / command functions
   - Decode and control TMS serial link 5 times/sec 57,6 kbps
   - Decode and control PDU Ethernet link
   - Communicate with Left Control 10 times /sec Ethernet link
   - Communicate with Right Control 10 times /sec Ethernet link
   - Generate video overlay data
   - Generate data to be displayed at the “Information Level”
   - Handle setup change requests.

The PXI system reads and calibrates all I/O, control alarms and map functions together. It takes approx. 20 sec from power on to the real time level is up and running.

1.2 Information Level:

The information level consists of:

1. Video overlay system, e.g. “Options” SW.
2. Individual left and right pilot operator computers running ROV status programs.
3. Sonar PC etc.

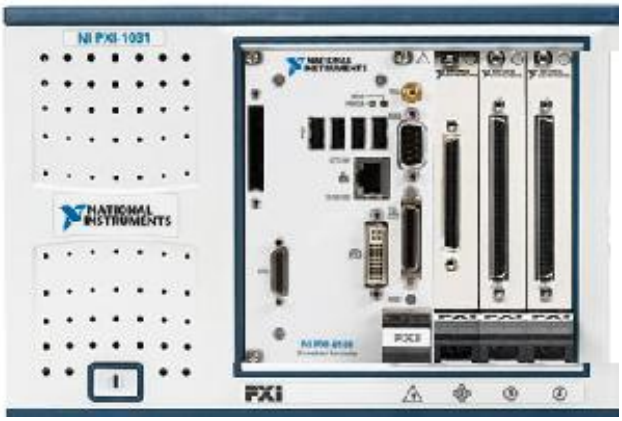
The PXI unit sends an Ethernet UDP telegram containing ROV motion system data.
The video overlay system decodes this telegram and displays the data overlaid in the video display. The video overlay data is always present, but may be supplied from other systems instead. An optional overlay-software installed on the sonar PC may be used to relay the UDP telegram through a serial port on the sonar PC.

The two operator PCs are used to supervise ROV system data and configure the ROV. The ROV System Setup program gives access to the real time level calibration and configuration, and the ROV Monitor displays control system information and alarms.

The sonar PC may run several programs. One program controls the video matrix, one monitor the fibre optic system and so on.
GP-pro, the Pro-face touch screen editor program gives access to the touch screens software and enables the user to modify button labels.
None of these programs are vital for system to run and can be turned off if needed.

This Operator Manual will only discuss control room equipment. The ROV, TMS and the PDU control system are covered in separate manuals. The video matrix and the keyboard & mouse switch are covered in manufacturer manuals.

2 Main Components



2.1 PXI System

2.1.1 General

The National Instrument PXI-1031 Compact PCI system has a 3U euro industry format with built in fans and power. It contains a high spec CPU module, 16ch serial card and two multifunction I/O boards, one for each chair.

Note:
Clean the PXI air filter periodically. If the PXI rack fan stops, the unit stops as well.
New models do not have air filters

2.1.2 Embedded Controller NI PXI-8108

- Real-time embedded PXI controller
- PharLab OS
- Intel processor
- Flash disk
- Real-time, deterministic performance
- 1 serial port, 1Gbit Ethernet

See Data Sheet section in this manual for more details.

2.1.3 16 Channel RS232 serial card PXI-8430/16

The PXI-8430 is a DMA type, 16-ch serial board. It's used to communicate with the ROV, TMS and ROV survey sensors.

Typical setup:

Ch 1	ROV Link (MUX)
Ch 2	TCU
Ch 3	ACU
Ch 4	GFVP1
Ch 5	GFVP2
Ch 6	Light box
Ch 7	Gyro
Ch 8	Depth sensor
Ch 9	Altimeter
Ch 10-12	Spare
Ch 13	(Isolated HPU)
Ch 14	ROV P&T 1&2
Ch 15	TMS P&T
Ch 16	TMS Link

2.1.4 Multi-Function I/O Card PXI-6025E

The 6025E features 16 channels analogue input, two channels analogue output, a 100-pin connector, and 32 lines digital I/O. The analogue out channels is not used.

See Data Sheet section of this manual for more details.

The I/O is terminated using a SCB-100 connector block mounted inside the pilot chairs.

The I/O cards read joystick commands, one card for each chair. The left card reads the left chair and right one reads the right chair.
The +-5vdc power mounted inside the chair is used to power the joystick. It's important that the voltage is adjusted as close as possible to +-5 vdc

A 24vdc power for each chair powers the touch screen and a 12vdc power the chair mechanical functions (up/dwn etc.)

Make sure that the high-density D-Sub connectors are all in and no pins are bent. If not, some joystick commands lines may not be read.

2.2 ROV Pilot Chairs

2.2.1 General

The two ROV pilot chairs:

- One Pro-face GP4401 touch screen
- Two 3-axis analogue joysticks
- One 14 channel digital joystick
- One hi spec analogue 7-axis + 4 digital channel joystick for ROV control
- Two Encoders
- One roller mouse
- ClearCom System
- Electric adjustable chair
- 12 & 24vdc power supply
- +-5vdc power supply
- SCB-100 termination block

The two ROV pilot chairs work in parallel. Only one chair can be pilot at a time, the other chair will be co-pilot. Each operator is free to work on whatever parts of system he or she wants.

2.2.2 Pro-face Touch Screens

The industrial Pro-Face GP4401 touch screens incorporate:

- A CPU with 3 sec boot time
- Ethernet link to the PXI system
- Supervise PXI system data in parallel
- Give only change commands, all data stored in the PXI system.
- Monitors PXI data
- Single 24vdc supply

GP4401 is a new model compatible with the AGP-3400, and must be programmed using the latest software GP-Pro v.3.
The touch screen is part of the systems real time level, but is not vital. The touch screens can be looked at as an operator panel attached to the PXI system. The power can be lost or the Ethernet connection can be broken without making a shutdown and unwanted commands. One touch screen must be operational to be able to activate pilot and joysticks etc.

Changes or software upgrades are handled by the configuration software “Pro-face GP-Pro EX” installed on the sonar-PC. See touch screen software chapter later in this manual.

Note that the current setup can be uploaded from the touch screen if needed.

See Data Sheet section for more Pro-face touch screen details.

2.2.3 Roller Mouse

The Penny & Giles 38mm trackball is connected to Keyboard and Mouse switch enabling the track ball to be connected to control several computers. Its main target however is the operator computer.

- USB Interface
- 5vdc Supply (powered by the Keyboard and Mouse switch PS2 port)

2.2.4 Low profile 3-axis joysticks

The Pilot Chairs contains two Hall effect HF series low profile 3-axis joysticks with two switches. The analog axes available are X, Y & Z and one digital. Their mapping to subsea valves can be edited. See ROV System Setup program description later in this manual.

STANDARD FEATURES:
• Reliable, non-contacting Hall Effect sensors
• Corrosion resistant stainless steel pivot pins
• Durable rubber boot and sealing gasket
• Industrial quality solid magnets
• Precision centre less ground stainless steel shaft
• Non-binding Teflon™ coated wires with connector for easy replacement.

2.2.5 Spohn + Burkhardt Digital Joystick

The single Spohn + Burkhardt digital joystick is mainly used for 5F manipulator control, but can be mapped to other subsea valves and functions if wanted. See ROV system Setup program discussed later in this manual. It has a base X & Y axes. There is a dual direction switch on left and right side of handle. Four switches are top mounted and two on the rear side.

Typical RigMaster configuration:

X axis	Arm Left/Right
Y axis	Arm Up/Down
Top Left two switches	Extend/Retract
Right two switches	Spare
Left Switch	Rotate Cw / Ccw
Right Switch	Claw Open/Close
Rear two switches	Tool Box In/Out

2.2.6 ROV Control Joystick

The Daco's DP174-1 Single Joystick ROV control consists of a 3-axis displacement joystick base fitted with a grip containing two force operated miniature joysticks, one 4 way trimmer switch and a rocking trigger switch. In total, 10 axes of control.

Force joysticks Specification

Electrical		
Excitation:	Rated	±5VDC
	Maximum	±6VDC
Input resistance		650 Ohms nominal
Output:	Resistance (per half bridge)	325 Ohms nominal
	No force	±125mV maximum
	Sensitivity	95mV/N nominal
	Full scale (FS)	1.0 ±0.2VDC
	Balance (+FS to -FS)	200mV maximum
	Resolution	Step less
	Non-linearity	±1% FS maximum
	Hysteresis at zero	±0.3% FS maximum
		±1.0% FS maximum if elastomer seal used
	Interaction	±5% maximum
	Zero offset thermal drift	±0.04% FS/°C typical
	Insulation	>50MOhms at 50VDC
Mechanical		
Force, full scale		10.5N nominal
Force, maximum		100N
Deflection, full scale		±0.35mm nominal
Weight		25gms maximum
Dimension		As installation drawing
Life		>3x10^6 FS cycles
Temperature:	Operating	-40 to +70°C
	Storage	-55 to +90°C
Sealing (Panel sealed)		BS 5490 IP67
External materials (front of panel)		Anodised aluminium alloy
		Epichlorohydrin 60 (Elastomer seal)
Joystick body		Black anodised
Joystick knob		Black anodised

Displacement joysticks specification:

Electrical	
Potentiometer resistance	5.6 Kohms +/- 10%
Power dissipation	0.1W at 70°C
Excitation	10VDC (25 Vdc Max)
Output (full scale, 10Vdc excitation)	+/- 5Vdc +/-10%
Life	5 x 10e^6 joystick deflections
Insulation	100 Mohms @ 500 VDC
Mechanical	
Deflection, full scale:	
Major axes (X & Y)	+/- 20°
45° to major axes	+/- 27°
Z axis	+/- 20°
Dead band	+/- 1°
Force, X and Y axes 125mm above mounting face, break out	5N nom
Force, X and Y axes 125mm above mounting face, at +/- 20° deflection	13N nom
Force, Z axes break out	0.7kNm nom
Weight	600gms typical (excludes grip)
Temperature, operational	-40 to +100°C
Seal to panel (2 axis)	IP66

Standard configuration:

Y Axis	Forward / Reverse
X Axis	Left / Right
Z Axis	Clockwise / Counter Clockwise
Left Force Stick X-axis	Not Used
Left Force Stick Y-axis	Up/Down
Right Force Stick x-axis	Roll Left / Right
Right Force Stick Y-axis	Pitch Up/Down
Centre 4 way trimmer switch	Top Pan/Tilt Up / Down / Left / Right
Rear rocking trigger switch	Tether In / Out

Joystick mappings to subsea valves & functions are editable. See ROV System Setup program description later in this manual.

2.2.7 Operator Computers

The standard operator computers are running Windows (7 – 32bit). For more information about these computers, video matrix, keyboard and mouse switches (KVM), see separate manuals in chapter 6 “Data Sheets”.

The fibre optic diagnostic program is used to monitor the optical link-budget. It is very critical to maintain a low link-budget, if it is too high it will cause link failure and black outs.
Whenever the system is re-terminated and/or mobilised, the optical loss-level should be noted.
Check the level regularly, if it is changing, it might indicate damage or wearing of the umbilical/tether.

The ROV System setup program and Monitor program are found in the Win Start menu (and short-cuts on the desktop). See chapter 3 in this manual for more software details.

In normal operation, the LAN (local area network) should be separated from any external networks (ship/rig or internet). Any external traffic might cause “traffic jam” in the ROV system, and vice versa the ROV system might overload the external network with its traffic.

If you need to run other programs, please use the Sonar-PC. This PC will be set up with software for video matrix, overlay UDP to serial and other diagnostic utilities.

3 ROV Software

3.1 Ethernet IP Addresses

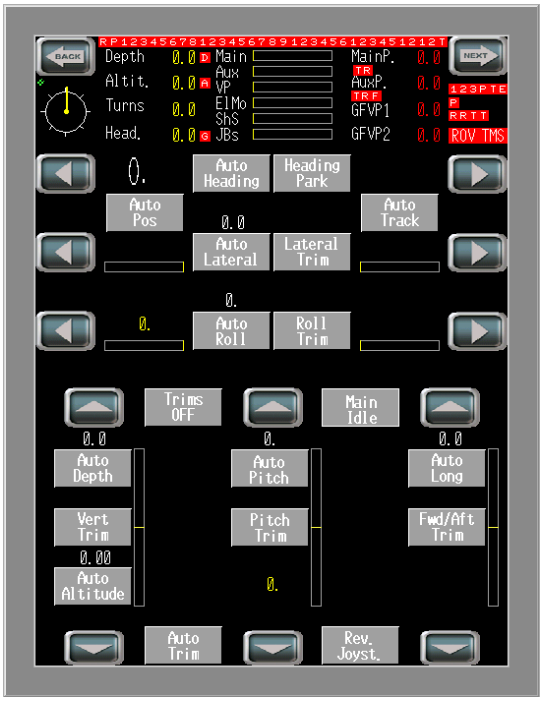
The Ethernet IP addresses for the different system units have to be unique.

PXI system	192.168.xx.3
Left Touch Screen	192.168.xx.4
Right Touch Screen	192.168.xx.5
Left Operator PC	192.168.xx.7
Right Operator PC	192.168.xx.8
PDU, NI-cRio	192.168.xx.6
Video Logger/Overlay	192.168.xx.9
MultiView System	192.168.xx.25

xx is set for each system, though 01 being the standard. See drawing -1061E10

3.2 Touch Screen System

3.2.1 General



The Pro-face touch screens, one on each pilot chair, are the main operator interface.

They have several pages logically grouped for easy and quick system control.

The touch screens contain a CPU and a program.

The touch screen takes approx. 3 seconds to boot and page changes are nearly instantaneous.

The two screens run in parallel connected to the control system over Ethernet.

The operators can work on whatever page except the Auto control page, which is only controllable from the active pilot chair.

The touch screens contain no system data.

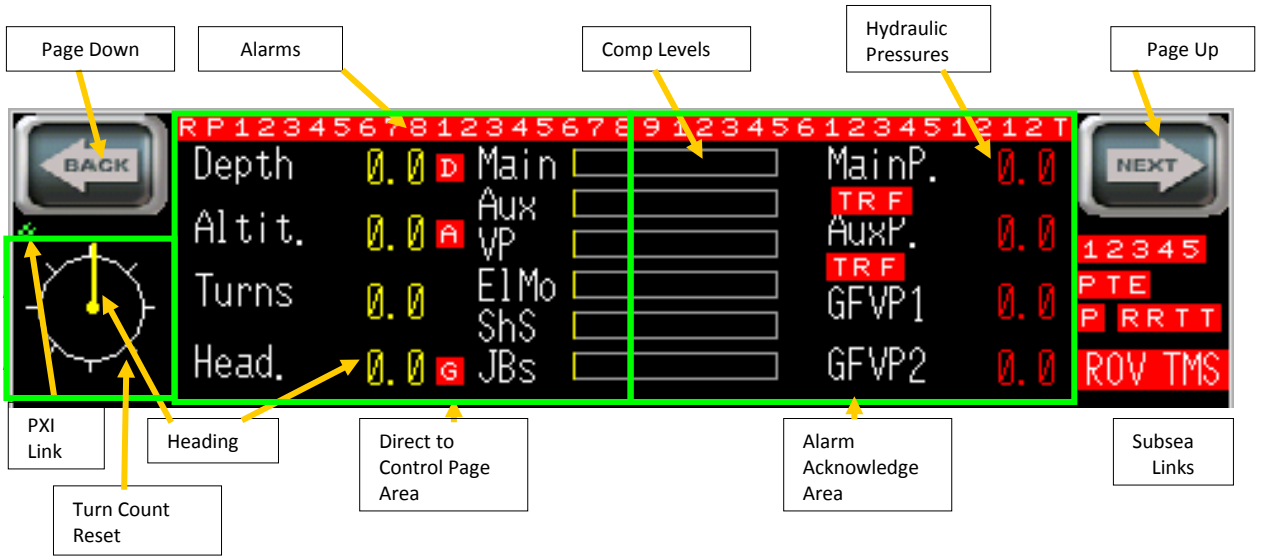
All system variables are stored and controlled by the PXI system.
Touch screen actions done by operator gives data change commands to the PXI system. The new PXI values are then fed back to the screens and displayed.
The change commands are polled / presented 10 times a second by the PXI system.

Note.
Since the screens are polled 10 times a second, a touch command has to be touched for approx. 1/10 sec to be read.
There will be a small delay of approx. 200ms from a page change until the screen reads touch commands.
The screens have to be touched by some force before any commands are read. This avoids unwanted touch commands to be read.

3.2.2 Common Touch Screen Switches & Indicators

The touch screen pages contain common items like alarms, ROV motion data, oil compensator levels and hydraulic pressures. By one quick look the operator obtains the complete system status. More detailed alarm information is given on status pages or from the "ROV Monitor" program discussed later in this manual.

To change between different pages, use the up or down page selectors or press the direct to control page area and select a page there.



Touching the "Turn count reset" area for 1 sec zeros heading turns.

PXI Link: A flashing green light indicates that the screen is linked to the PXI system.

Alarms: Red flashing colour is a present alarm, which is not acknowledged, orange alarms have been acknowledged, and flashing white alarms are previous alarms that have not yet been acknowledged but are no longer active.

Note:
It is only the square alarm indicators that can be silenced. The value coloured indicators like the slides and the digital number indicators cannot be silenced.

The square alarm numbers are there to help remembering which system alarms the indicator points to.

Top alarm line:
The first two ones is the roll, pitch sensors (read from the Gyro). The next 8 are ROV GFDs. Then the next 9 are ROV water detections. The next 6 are ROV RS485 card links. The last ten are TMS alarms.

Alarms:

R Roll sensor
P Pitch sensor

1 115vac main GFD
2 12vdc GFD
3 24vdc GFD
4 TCU 24vdc GFD
5 ACU 24vdc GFD
6 GFVP 1 24vdc GFD
7 GFVP 2 24vdc GFD
8 115vac Lights GFD

1 Water detect Termination
2 Water detect POD
3 Water detect Light box
4 Water detect TCU
5 Water detect ACU
6 Water detect GFVP 1
7 Water detect GFVP 2
8 Water detect El. Motor
9 N.A. Spare

1 TCU RS485 Link
2 ACU RS485 Link
3 GFVP 1 RS485 Link
4 GFVP 2 RS485 Link
5 Light Box RS485 Link
6 Subsea MUX RS485 Link

1 TMS Oil Temp
2 TMS Return Pressure
3 TMS Pressure
4 TMS Main Comp
5 TMS Aux Comp

1 TMS Leak
2 TMS El. Motor Leak

1 TMS 115vac GFD
2 TMS 24vdc GFD

T TMS El. Motor Temp

The alarms behind the depth, altitude and gyro values are motion sensor link / error alarms. D for depth A for altitude and G for gyro

Below right “Page Up” switch:

Voltage levels
1 115 vac Main
2 12vdc
3 24vdc
4 Va (150vdc)
5 Vb (48vdc)

Below are temperatures:

P Pod temperature
T Termination box, instrument transformer temperature
E El. Motor temperature

Below are PDU alarms:

P is an alarm summary of the 440-vac PDU supply & PDU Link.
1st R is a ROV HPU power alarm summary
2nd R is a ROV Instrument power alarm summary
1st T is a TMS HPU power alarm summary
2nd T is a TMS instrument power alarm summary

Subsea Links indicates the ROV and TMS RS232 subsea communication links.

Underneath the “MainP” there are two indicators indicating too high main temperature and too high return pressure. “T”, “R” & “F”

Underneath the “AuxP” there are three indicators indicating too high Aux temperature high aux return and filter pressure. “T”, “R” & “F”

3.2.3 Control Page

Joystick gains and pilot control are activated from the “Control Page”.

This page has a page selector area to select the next page directly.

Unlike the other pages the top left page area change page to the Auto Page and not to the Control Page.

Hence to move from e.g. the “Hydraulics Page” to “Auto Page” you simply press this area twice.
First touch moves to the control page and the next to the Auto Page.

Using the page-up and -down switches can be time consuming. To move rapidly to another page, press the top left page area to go to the control page and then select the next page directly.

A quick route to the PDU page from any page is to go to the control page and press the left page selector switch.

Similar, quick route to the light and camera ctrl page from any page is to go to the control page and press the right page selector switch.

The Joystick Mapping Matrix is used to link the joysticks functions (fwd/aft, twist, switches etc.) to system functions like valves & motion commands. There are 4 possible mappings for each joystick which can be activated alone or as a group. This enables to control one or more tools alone or in parallel.

e.g.

One mapping for port camera-boom, and one mapping for starboard camera boom. Both mappings turned on will control both booms simultaneously.

The above do not apply when the joystick analogue functions are mapped to motion commands (pilot operation).

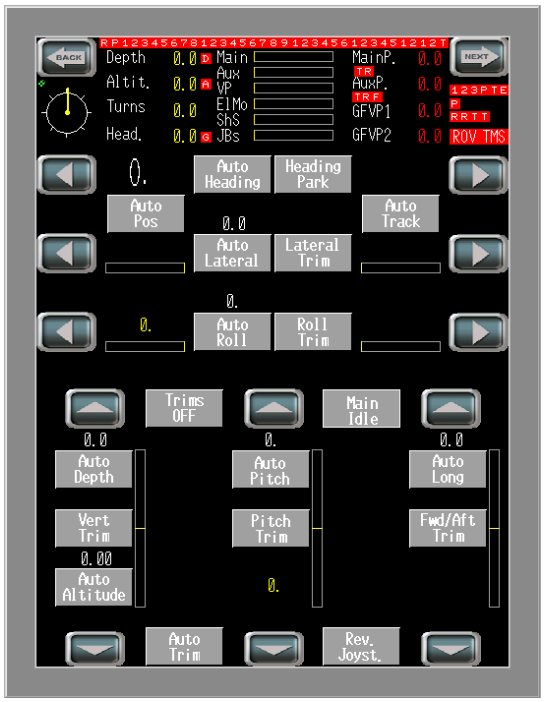
Claw Hold gives a continuous grabber hold function and the “Right (Left) Ctrl Is Pilot” determines who the pilot is.

The Auto Stick gain controls how quickly the auto set points shall move when controlled by the joysticks. This applies only when the auto is in standard auto mode. In semi auto mode the auto is turned off when the pilot gives a joystick order.

The Main Joystick Gain and the Auto Joystick Gain is dissimilar to all other controlled variables by being not controlled by the PXI system but by the touch screen systems. The gains are individual for each pilot chair enabling separate joystick settings for each chair.

The small “Lamp Switch” opens a window to set the touchscreen background light level.

3.2.4 Auto Page



ROV auto functions and trims are controlled from the "Auto Page" (also referred as "Main Page").

Only the pilot can operate this page. The co-pilot can only monitor it.

The page is divided into 6 logical areas each covering 1 direction of freedom.

Auto pos, auto track, auto lateral and auto long are only visible in systems with this option activated.

The sections can have a set of arrow switches, trim enable and autos enable.

The arrows switches control trims and set points. Auto set point change has a higher priority than the trim change. Hence, if Trim and Auto are on the arrow switches will change the auto set point.

If the arrow switches are pushed down for more than 1 sec, it will trigger larger set point changes. This allows changing the set point values slightly or more rapidly.

Trims and set point values are displayed above their enabling switches and are only displayed when functions are active.

Trims are also shown graphically by bars.

A joystick command can change a set point value. The Auto Joystick Gain set on the Control Page controls the speed of set point change when changed by a joystick.

However, if the auto function is set to be semi auto, the auto function is disabled when there is a joystick command and turned on again when released. If so, the "Set Point Change" gain is not used.

"Trims Off" turns all current manual trims off.

"Auto Trim" converts the current thruster order to manual trims ("Trim Take").

e.g.
The ROV has trims that have to be adjusted. Neutralise the ROV with joystick commands while current trims if any are on and press "Auto Trim". Drop the stick and the ROV is trimmed again.

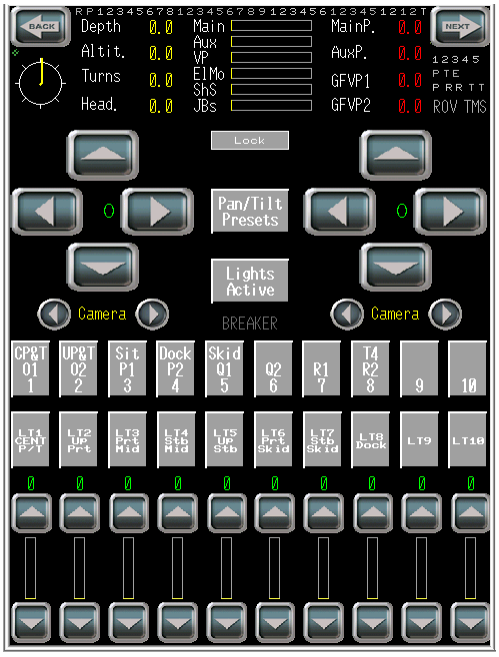
When auto functions are on the manual trim can be kept on, to smooth the change over from manual to auto or vice versa. Hence, the auto function will start from a steady trimmed ROV and don't have to "jump" and then adjust the auto trim (the auto PID integration part)

The "Heading Park" applies an alternative turn thruster matrix. It's not an auto function. It can be used in manual mode (Auto heading off) or in auto mode. The std. heading park matrix setting is that the

front thrusters are off, hence moving the rotating centre forward. It's normally used when the ROV is attached to a structure by a manipulator.

"Rev. Joyst" will reverse the joystick to ease flying the ROV backwards. Note that the touch screen trims will not be reversed.

3.2.5 Light & Camera Page



ROV camera functions like El. Pan & Tilt, cam power, focus & zoom, and light functions can be set from the Light & Camera Page.

All cameras are on as default, but can be turned off from this page.

In the Focus & Zoom panel the vertical arrow switches do zoom and the horizontal do focus.
As default the panel control camera 1, but other cameras can be selected by operating the arrow switches underneath the F&Z switches.

Hint:
Some cameras have auto focus which can be activated / deactivated by operating focus out and zoom near simultaneously. This can be done by using the small switches in the corners. The "Lock" switch has to be activated to make the switches visible.

Note:
It is not always the Top Zoom or the Right Focus switch. If the above procedure does not work, try the other "corner switches".
Focus & Zoom signals are powered from the 24vdc power which has ground fault detection monitoring, GFD. HD cameras HD-SDI signals are not isolated and electrically connected to 12vdc. Hence, HD cameras may generate 12vdc GFD which cannot be remotely isolated.

ROV Electric Pan & Tilts pre-sets can be made visible by the "Pan / Tilts Presets" switch. Which unit to control is selected by the top left/right arrow-switches. When a Sidus P&T is powered up, the operator has to manually move the P/T unit to its extents (up/down/left/right) to make sure that the P&T knows its absolute angle positions.

The "Zenith" switch moves the unit into its centre position.

Preset 1-3 moves the selected unit to user pre-sets which can be simply set by moving the unit to desired position and then press save and select which pre-set to save. The touch screen will give a "bip" sound to confirm that the pre-set has been saved.

"Finish" closes the Pan & Tilt sub panel

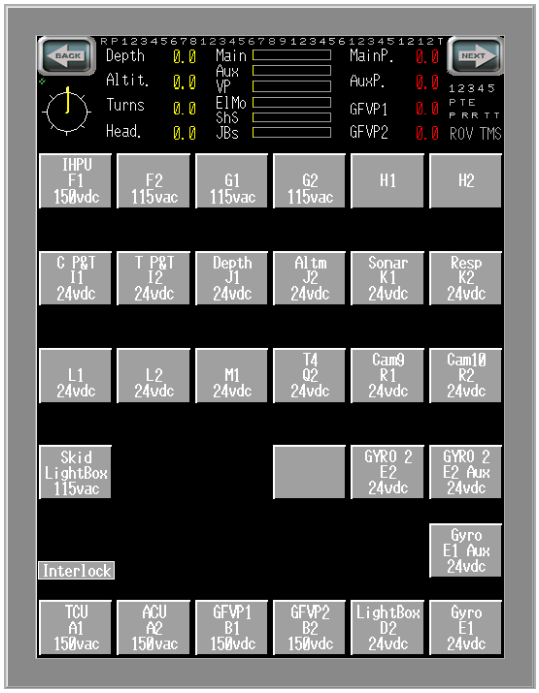
The “Lights Activated” switch enables all system lights (ROV and TMS). When activated it is the individual light controls that set lights state. When the “Lights Activated” switch is off, all system lights are off. The different light controls can still be operated, but with a different colour to indicate that the lights have been disabled.

The lights are dimmed and switched on or off individually. The dimmer levels are adjusted by the vertical arrow switches and levels are displayed as vertical bars and as a digital value.

If any of the light breakers inside the ROV light box trips the “Breaker” indicator will become red.

Use the Pro-Face page edit program discussed later in this manual, to edit the switch text to match the actual ROV light and camera configuration.

3.2.6 Power Page



The Power Page controls relays and serial lines in the control pod. In the setup program the user can map which serial line(s) and/or relay(s) to activate. Thus giving power and communication to ROV survey sensors and modules.

Here the ROV survey sensors and modules can be turned ON and OFF (NO/NC operation selectable).

The valve packs, light box and gyro are normally default ON. To avoid users to accidentally turn these units OFF, an “Interlock” switch has to be turned on to operate the power switches.

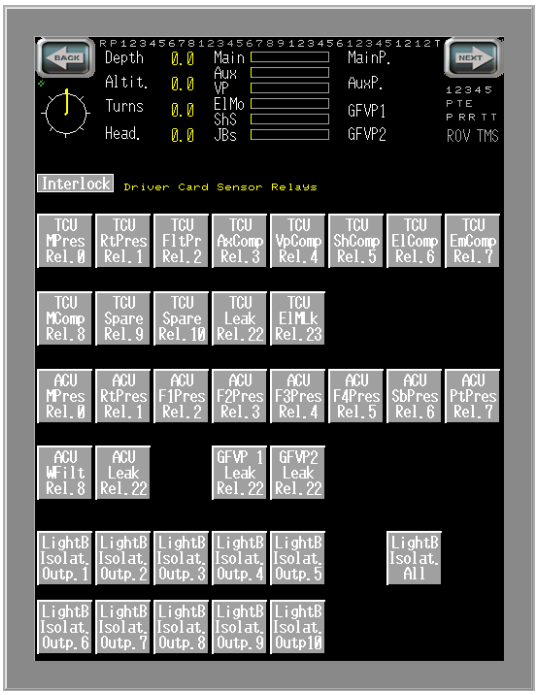
As long as the “Interlock” switch is active, press the wanted unit power switch OFF or ON.

Note
Use the Pro-Face page edit program discussed later in this manual, to edit the switches texts to match the actual system configuration.

Some survey connectors may be operated by more than one touch screen switch.

e.g.
The gyro connector has one switch giving power and comms to the gyro. A second gyro switch turns an additional 24vdc power line to the gyro. See el pod drawings and ROV setup program for more details.

3.2.7 Driver Card Relays Page



The driver cards controlling ROV valves and lights have solid state relays that supply power to ROV sensors. These relays can be controlled from the Driver card Relays Page.

The relays necessary to run the standard supplied sensors are normally default on.

To be able to turn the relays ON or OFF, an “Interlock” switch has to be turned on
While keeping the “Interlock” switch activated press the wanted switch OFF or ON.

Some of the relays supply power to external sensors. If a sensor is not working, this page can be used to turn the sensor power OFF. A sensor GFD will however not disappear since the sensor relays do not isolate the sensors signal lines (solid state).

Keep in mind that some of the controlled sensors like the compensator volume sensors may produce system shut downs. However by acknowledging a shutdown alarm and activate the shutdown override switch the system can be turned on again. See PDU control page discussed later in this manual.

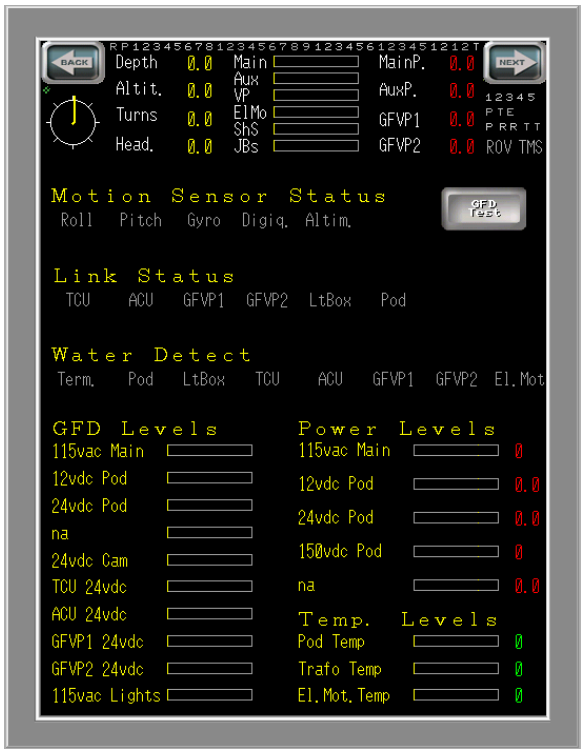
Warning
Do not override the shutdown functions if not absolutely necessary

The “Light Box” light outputs do have NC relays which during normal light on/off operations are not activated / deactivated. Hence, any light ground faults will not be isolated by just turning the lights off. To isolate light outlets, the NC light relays have to be engaged to disconnect all pins. These relays are accessible from this page.

The “LightB Isolat. All” switch disables all light box light outlets.

Note:
If the light relays are isolating the outputs, the corresponding light controls on the camera and light page are also disabled i.e. no light.

3.2.8 Electrical Status Page



The topside PXI controller is continuously monitoring the ROV system.

It monitors the RS485 bus links controlling the subsea electronic boards and the ROV motion sensors.

Each subsea enclosure has a water detect sensor and their status are shown.

The ROV system has 8 separate Gnd Fault Detection (GFD) channels in addition to the GFD located inside the ROV valve packs.

One GFD channel called “115vac Main” monitors the 115vac instrument supply driving the light box survey connector, the control pod and its 115vac sensors.

Survey equipment is supplied 12/24/48vdc, which is GFD-monitored.

The camera focus & zoom lines are generated from 24vdc which has GFD monitoring.

The valve packs are powered by 150Vdc. The 150vdc is generated from the 115vac lines. Note that a 0v(150v) ground fault will not be detected due to limitations in the detection circuit. A 150vdc ground fault will generate a 115vac ground fault.

Each of the valve packs has a 150vdc / 24vdc DC/DC power supply mounted internally. These 24vdc supplies are locally GFD monitored and are marked TCU 24vdc, ACU 24vdc, GFVP1 24vdc and GFVP2 24vdc.

The last GFD channel is used to monitor the 115vac power supplied to the lights. It is called 115vac Lights.

The GFD bars are not linear. Value read should be looked at as either being small or big. Normally conditions the bar should be unfilled.

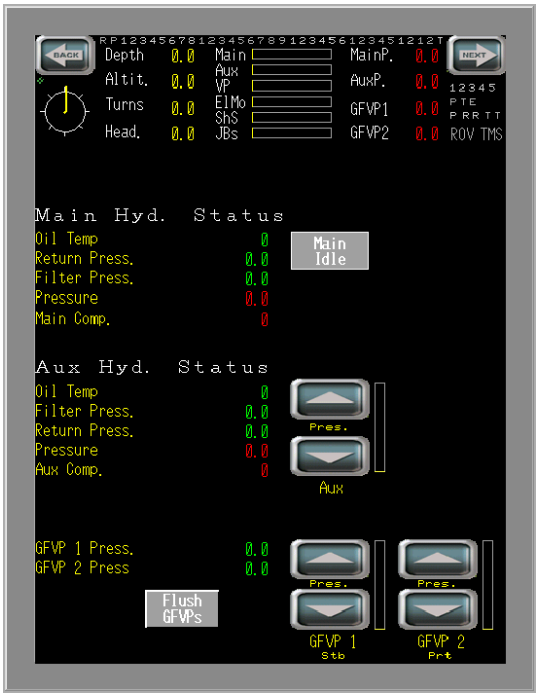
If any GFD is indicated try turning the power consumers off, one at a time and observe what is happening. The one that make the GFD indication is the one having a ground fault. If not, the GFD can be internally. Try to disconnect internal modules and plugs or use a multimeter to read the impedance between the power supplies and chassis ground.

All voltage levels are monitored. They are displayed under the Power Levels header.

The control pod temperature, instrumentation temperature and the electric motor temperature levels are shown under the “Temp. Levels” header.

3.2.9 Main Hydraulics Page

The “Main Hyd. Page” displays system hydraulic status.



The main system has an Idle Valve, which can be controlled. This valve idles the main pressure to approx. 20 bars.

The Aux pump pressure can be set remotely by arrow switches. The current order is displayed as a vertical bar.

If the HPU is turned on the system will automatically idle the main and the aux system for ca 4 seconds.

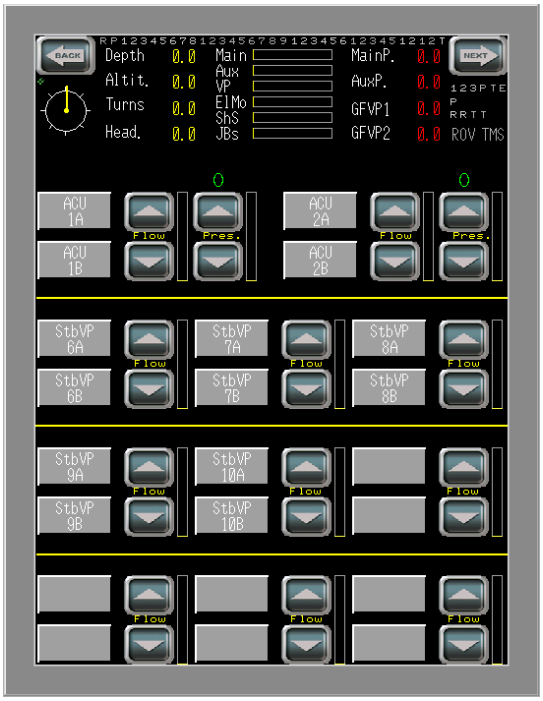
After the start-up the system pressure will be determined by the current Main Idle switch and the Aux Pump pressure control positions.

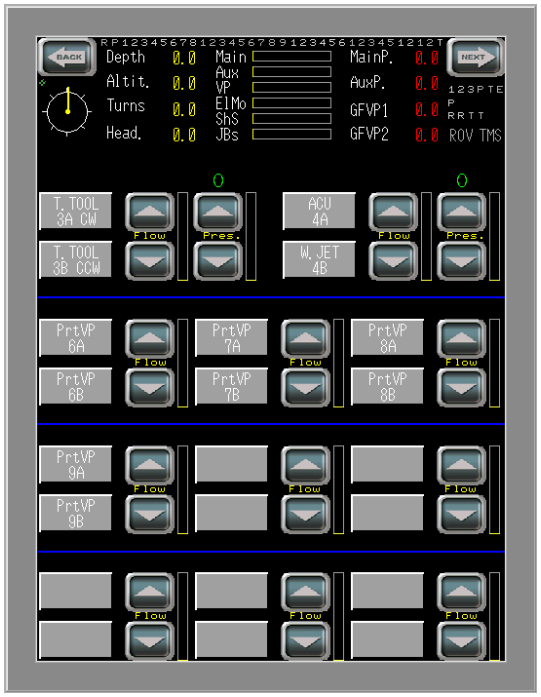
The General Function Valve Packs (GFVP) pressures are controlled remotely from the ACU and set by arrow switches. The current orders are displayed as vertical bars.

The button “Flush GFVPs” will toggle all the valves in the GFVPs for about 10sec. This is only available when the hydraulics is not running. You can use this function to prevent valves getting stuck when they are not used by the system.

3.2.10 Hydraulics Pages

Not all ROV controlled valves and functions may have a topside joystick control. To be able to operate these functions the touch screens have two hydraulic / function pages with arrow and A/B switches.





The arrow switches set flow or if present, pressure.

The A/B switches controls the function on/off and direction.

Two of the control blocks, on each page control four flow and pressure control able valves in the ACU.

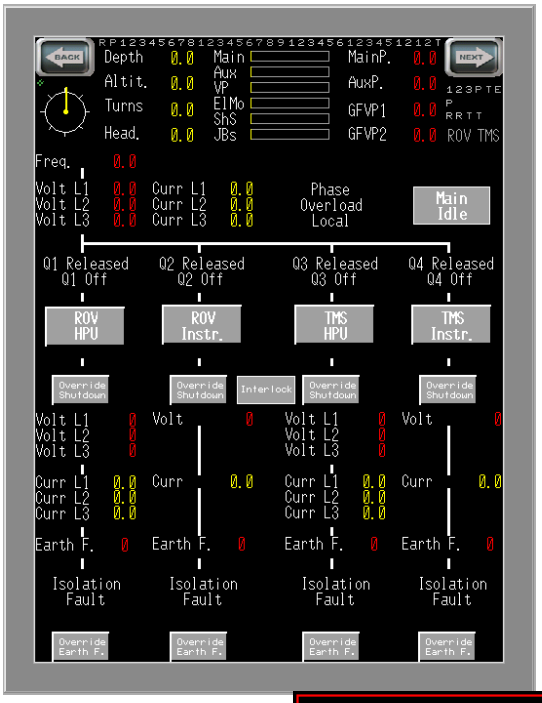
Note that the Installer ROVs only have one high flow on/off valve and two proportional and pressure controlled ACU valves. On page one there is one A/B block and one A/B with pressure and flow control. On page 2 there is only one block with pressure and flow control.

There are two configurable mapping tables linking these hydraulic control blocks and ROV valves.
To adjust the max flow or to have different flows in A and B direction, the mapping tables have a gain for each direction.
Use the ROV system setup program discussed later in this manual to configure the ROV panel mappings.

Do not change the Analogue Out configuration driving the valve to achieve the above since it will work on all units controlling the valve. (This applies for all valves except for hi flow on/off valves. The min and max value must be 254 and 255. This to make sure that the valve does open.)
Make sure that a touch screen switch and an active joystick (matrix joystick mapping on) do not control the same valve at the same. This may produce unwanted results.

Use the Pro-Face page edit program discussed later in this manual, to edit the switch descriptions to match the current system configuration.

3.2.11 PDU Page



The PDU page monitors and controls the topside power distribution unit supplying power to the ROV & TMS. See the PDU manuals for more information.

Details from the topside supplied 440/690-vac power to the subsea-supplied 3000/4260vac powers are displayed.

The page has contactor control for the ROV and the TMS Instrumentation and HPU powers. When activating the HPU switch a safety popup window appears which the operator must acknowledge to turn on the HPU.

For each system there is an interlock between the Instrument power switch and the HPU switch. The Instrument switch has to be on before turning the HPU on. Also the instrument switch cannot be turned off without first turning the HPU off.

Shutdown alarms may automatically shut down contactors e.g. low main comp value will turn off the HPU.

The shutdown can be overridden by acknowledge the shutdown alarm, activate the PDU page interlock, press the corresponding override switch positioned below the contactor switch, and then press the contactor switch.

If there is a GFD on the high voltage lines the PDU ground fault system installed locally will turn them off. The operator can override this by individual override switches. These switches disable the PDU GFD system by physically switching a relay disabling the GFD control lines. The GFD does also generate a shutdown alarm that has to be overridden by the above procedure.

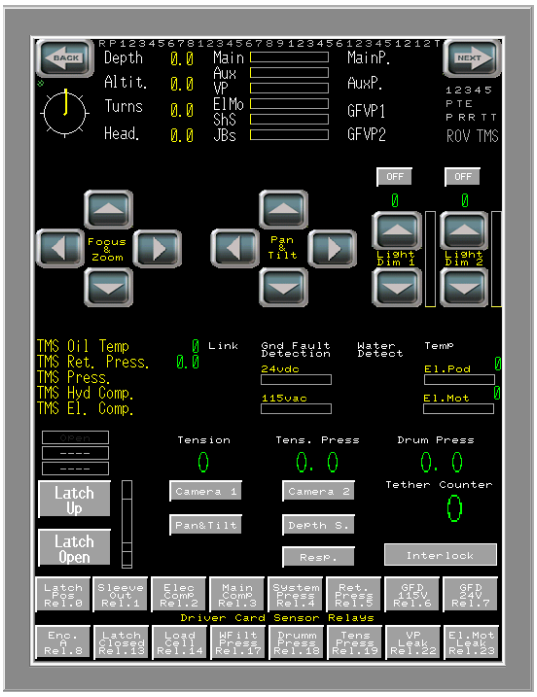
Any new shutdown alarm will make a new shutdown which again can be overridden.

Shutdown alarms can be disabled by the ROV Setup program if necessary.
e.g. Due to a faulty sensor.

WARNING
Do not disable or use the shutdown override functions before it is strictly necessary.

NOTE:
Shutdown override will only override current shutdown alarms that are active. Any new shutdown alarms will generate a new shutdown.
Shutdowns generated by intermittent sensor failures etc. can only be disabled by turning the sensor off and then override the shutdown alarm.

3.2.12 TMS Page



The Kystdesign TMS has an oil filled enclosure with an attached el pod containing all the electronics and valves needed to control the TMS.
The TMS has an el. pan & tilt with camera and 2 dimmable lights.
The TMS has a latch with one “Home” and one “Latch In” switch and latch vertical position feedback.
See separate TMS manual for more details.

The TMS page has one Focus & Zoom control. Use the vertical arrows to zoom and the horizontal arrows to focus.

A similar block as the focus and zoom, controls the Pan and Tilt.

Two vertical arrow & switch blocks control the two TMS lights.

One “A/B” block controls the latch.

There is a mapping table between this page control blocks and the TMS functions. To adjust the different command level the mapping table has a gain for each direction.

Use the ROV System Setup program discussed later in this manual to configure the TMS panel mapping.

Do not change the Analogue Out configuration driving the valves to achieve the above since it will work on all blocks controlling the valves.

The TMS tether counter value is displayed. Touching the count value after enabling the interlock switch, resets the counter value. The counter is also reset by the “Home 2” sensor.

The cable reel has a ramp function to smooth the in and out operation.
Hydraulic parameters like oil temp, pressure return pressure, main compensator level and aux comp level are shown.
Electrical data like ground fault detection for the 115vac and the 24vdc, and electric motor temp are also displayed.

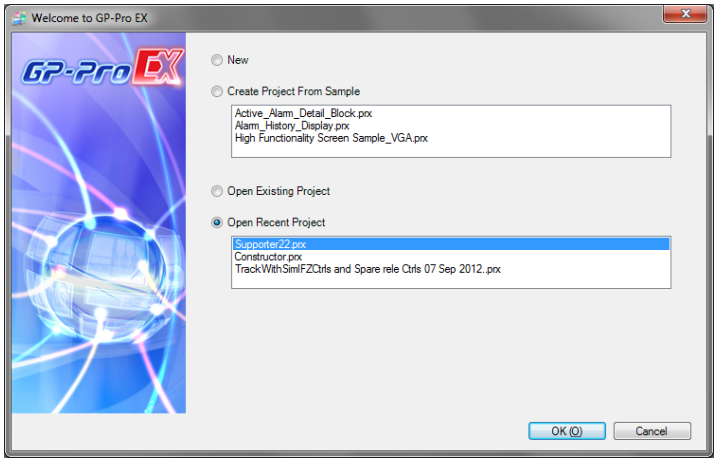
The driver card has solid state relays that supply power to attached sensors, which can be controlled from the TMS Page. The relays necessary to run the standard supplied sensors are normally default on. To be able to turn the relays OFF or ON an interlocked touch operation has to be performed. While having the “Interlock” switch activated press the wanted switch OFF or ON.

Note: A “Latch Position” signal in “parked” position will automatically reset the turn counter. Hence, a faulty sensor may continuously reset the turn counter.

3.3 Touch Screen Editor

The Pro-face touch screens are originally programmed by the GP-Pro Ex program. The same program can be used to change switch descriptions.

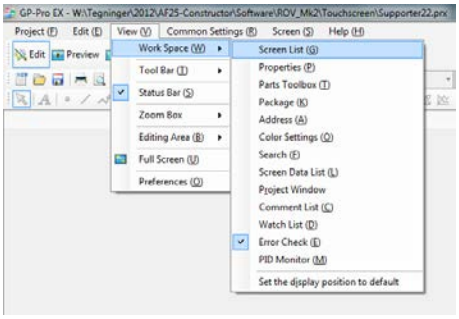
The Pro-face touch screen program is installed onto one of the operator or the Sonar PCs. (If installed on more than one computer, make sure that the same configuration file is used each time.)



To edit, simply start the GP-Pro Ex program found in the Windows Start Menu under the “Pro-face” folder.

On start-up a window will display resent projects. As a default the latest edited project will be on top. Select the one to be edited.

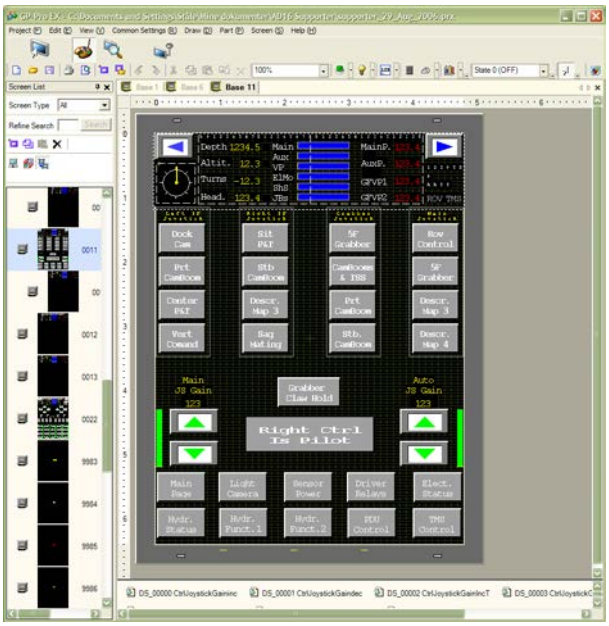
Note.
Have two copies stored on the computer, one used and the “factory” supplied version to get system back to as delivered if needed.



If the project Pro-face screens are not shown, go to the program menu, select “View”, then the “Work Space” sub menu an finally the “Screen List” item.

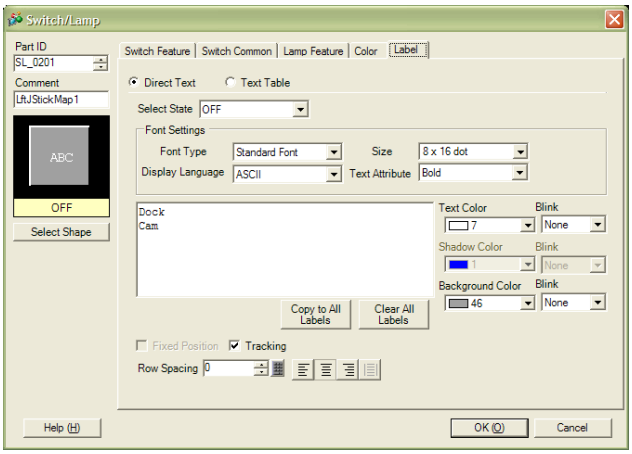
This will open a “window select” window. Make sure that the “Edit” switch is on.

To edit a screen, double click the one to be edited. This will open the screen making it editable.



To edit a switch text, double click it to open a switch settings edit box.

Select the Label folder. Remember to edit both states texts, “On” and “OFF”.



WARNING

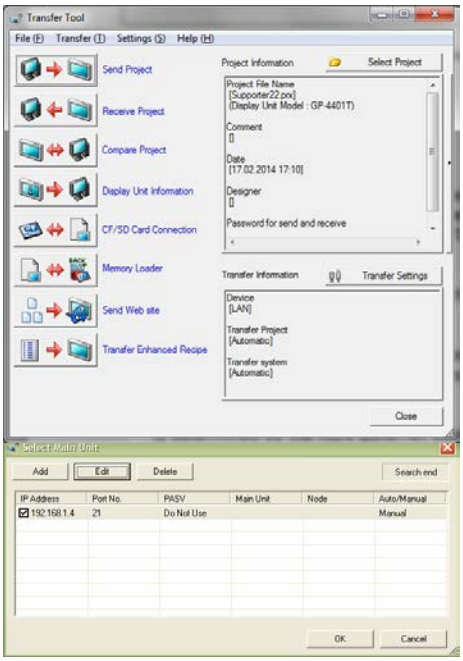
Never change anything else than the switch label text underneath the Label Folder.

To transfer the screens to the Pro-face panels, select the “Transfer Switch“,

This will open the Transfer Tool Window.

Select the “Send Project” switch.

This will ask the user to save the changes done and finally search for the screens on the Ethernet. When done it will display the ones found in the “Select Main Unit” window.



If no screens are found, first check that the screens are on and connected to the network.

Next, check that the switch found just below the Node List / Send screen window title is marked with 192.168.**.*; 8001.

**. is determined by the ROV Ethernet subnet used.
.* is nr 4 for left screen and 5 for the right one.

If not select it and write 192.168.**.* in the IP Address area and 8001 in the IP Port number and press OK.

Now the system will search for screens having an IP address within the 192.168.*.0-255 range with port no 8001.

When found, (should be 192.168.**.4 and 5) mark the IP address and press Start. The system will start transmitting the setup and pages to the screens. This can be seen on the touch screen by text displaying current operation. It will update one screen at a time.
When the screen transfer has been performed, close the window.

3.4 ROV Monitor Program

3.4.1 General

The “ROV Monitor” Program displays system data. When started, it establishes contact with the PXI controller over the Ethernet. This may take a few seconds. A link will be shown as a green “diode” on the top right part of the screen.
The PXI is broadcasting system data onto the Ethernet; hence the Monitor program will not load the PXI system. This means that the number of Monitor programs running does not affect the PXI performance.

3.4.2 Main Page

The ROV Monitor program main page displays ROV position data, command data, who is in charge, compensator levels and alarm status.

There is one link alarm “LEDs” for each system, the left & right touch screen panels, the ROV, the TMS and the PDU. The ROV, TMS and PDU have an alarm summary LED for current alarms.
No alarms, the indicators are transparent.
Any current acknowledged alarms they are orange.
Any previous not acknowledged alarms they are white and flashing.
Any current not acknowledged alarms are red and flashing.

The alarm summary table will only be visible if there are any not acknowledged alarms or shutdowns. Hence, any new alarms will make the alarm list visible.

Shutdown alarms are turquoise and a “Shutdown” label is shown at the top centre. Any present shutdowns will always be shown even if being acknowledged.

The TMS tether reel count value can be zeroed from the touch screen by switching the TMS touch screen page “Interlock” switch on and pressing the TMS touch screen TMS Tether count value.

The Heading turn value can be zeroed by pressing the touch screen heading meter shown in the top left corner for 1 second.
The optional auto track system includes a small navigation window on the Main Page. See the Navigation Page section below. The setting there will also control the graph on the main page.

3.4.3 PDU Page

The ROV Monitor program, PDU page, displays all vital power distribution unit data.

The 3 phase meters do have three needles, one for each phase.

Any unbalanced power, the needles will not overlap.

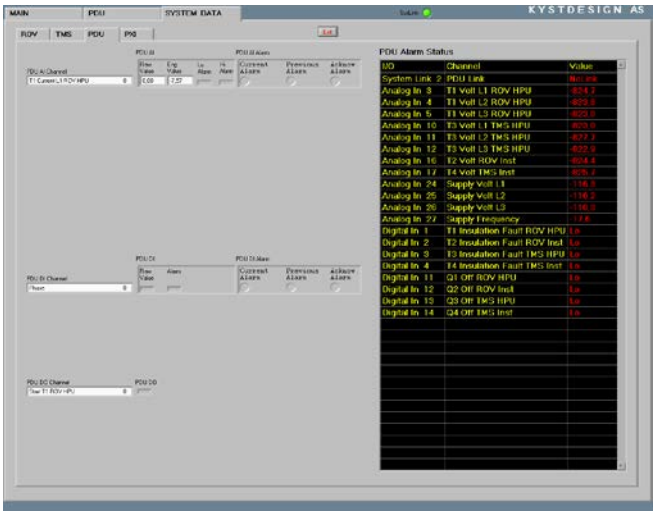
3.4.4 System Data Page

The System Data page displays current ROV, TMS, PDU or PXI I/O data.

The page contains a folder with one ROV, one TMS, one PDU and one PXI page.
An alarm summary panel displays selected system alarms.

Red colour is a currently alarm which is not acknowledged, orange alarms have been acknowledged, and white alarms are previous alarms that have not yet been acknowledged.

Shutdown alarms are shown in a turquoise colour.



The “Exit” switch on top of the screen terminate this program

To edit alarm levels, see the ROV system setup program discussed later.

Tip:
To silence an alarm, e.g. if you repeatedly have to acknowledge the alarm, change the channels associated alarm setup by the ROV system setup program and press “Use”. This will use the new values, but not save them. Next PXI power off start-up the old saved settings will be used.

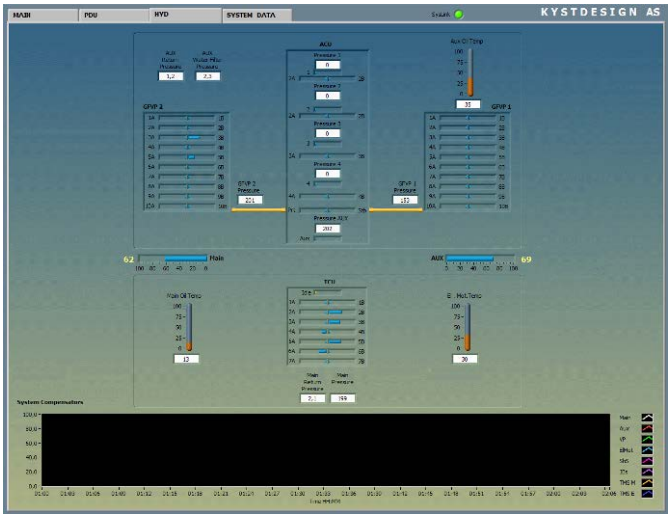
To look at data (AI, AO, DI or DO channel), “click” at the channel name area and a name list will be shown, Select the channel you want and the current values and alarms for this channel will be displayed.

3.4.5 Hydraulic Data Page

The Hydraulic Data page displays all ROV valves current value together witch pressures, Aux and Main comp values.

Compensator values are also shown in a trend graph. This is a good way to check if there has been a comp-volume change, and watch the rate of change in case of a leak.

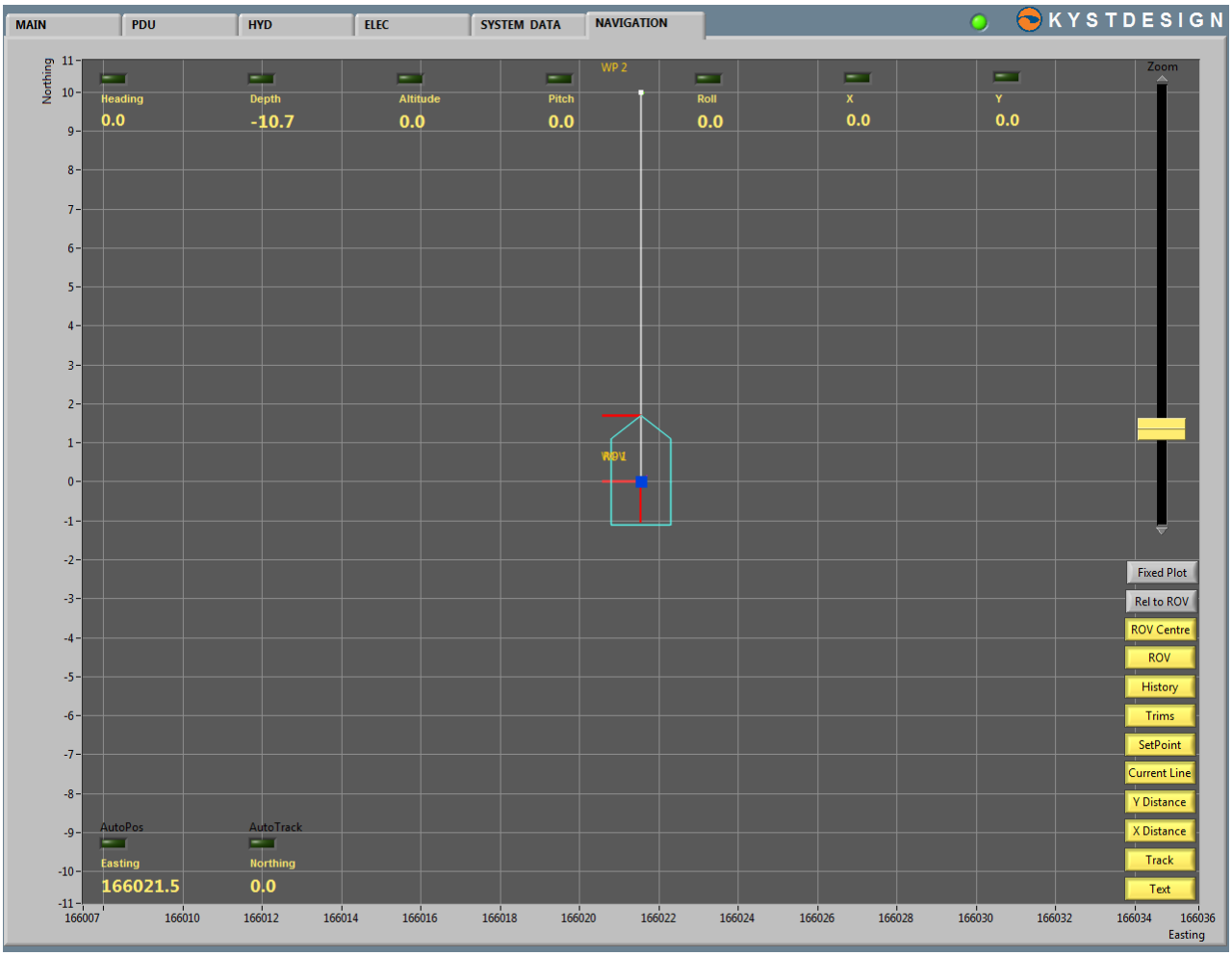
Use this page to verify mappings, sensors etc.



3.4.6 Electric Page

The Electric Data page displays electric status. Water ingress, system links, motion sensors links, subsea power levels, ground faults and temperatures.

3.4.7 Navigation Page (Track Option)



The optional Navigation page displays motion data like heading, pitch, roll, depth altitude easting and northing.
The ROV position is drawn graphically on a graph display. The data shown on graph and display settings can be set by the user. Note that any setting change done on this page will also set the ROV motion graph settings on the Main Page.

ROV Centre Switch:
Shows a dot where the ROV ref point is.

ROV Switch:
Draws the ROV figure

History Switch:
Draws the ROV position history “tail dots” that stays on for a limited time.
Trims Switch:
Draws the current thruster commands as lines from ROV centre and ROV front (Turn command). Vertical trims are not shown.

Set Point Switch:
Shows the current position ROV DP target

Current Line Switch:
In auto track mode the current ref track line will be highlighted when this switch is on.

Y Distance Switch
Shows graphically the line position on the current track line as a line from line start point to line position.

X Distance Switch:
Draws a perpendicular line from the current line position and to the ROV.

Track Switch
Displays a previously loaded track or a dummy track.
When there is no track loaded (can be done by the ROV setup program), a dummy track in the ROV direction is continuously drawn. The track shown when the auto track function is turned on, becomes the track to be run. Hence, it is possible to run a track operation whiteout a track being loaded beforehand.

Text Switch:
Shows graph points notations like ROV waypoint numbers etc.

Fixed Plot Switch:
Normally the graph centre is either the ROV position or the setpoint position depending upon current position mode.

In auto Track mode and when DP is off the ROV is in centre. In auto Pos mode the ref point is the graph centre.

If however the Fixed Plot switch is on, the graph map stops moving, but anything else may do. In this mode the map window area show can be manually be moved by using the mouse.

Rel to ROV Switch:
Instead of always having north upwards and east to the right, the ROV stays fixed and the graph rotates. This can be useful during track mode having the track rotating instead of the ROV. Any graph index values will in this mode be relative values to the ROV and not Easting Northing values.

Zoom Slide:
The system will always show the ROV and the ref point in Auto pos mode and in Autotrack mode the system will always show the ROV and the track ref point. To achieve this, the system zooms in and out automatically.
The minimum zoom is set by the Zoom Slide. Hence, the operator can zoom in and out manually, though not more than the above limits.
The above does not apply when the Fixed Plot switch is on.

3.5 ROV Positioning System (Option)

3.5.1 ROV System

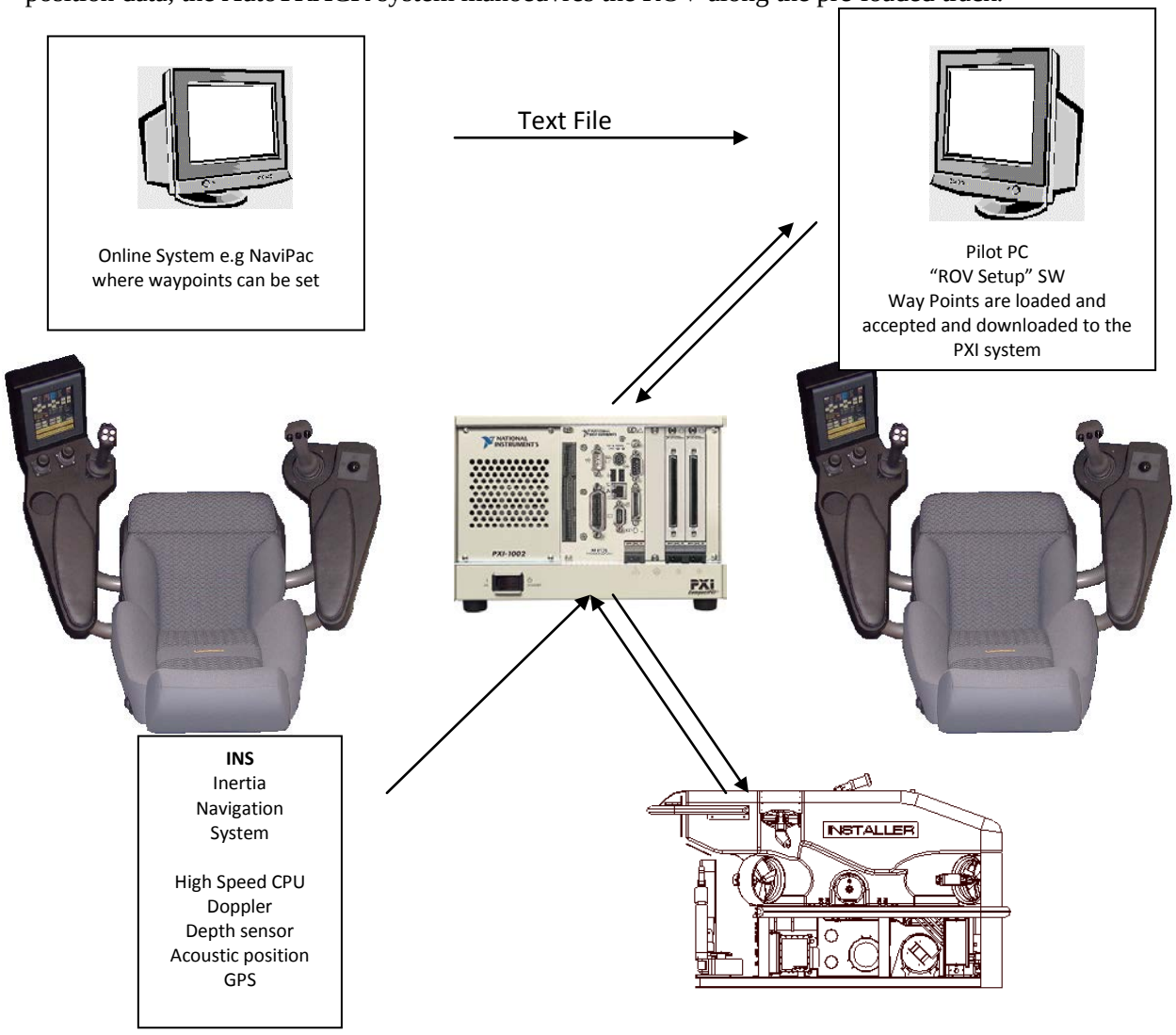
ROV operations are typically controlled by a pilot manually. The pilot is challenged by strong current, poor visibility and complex work tasks. A major focus is kept on ROV control and system monitoring instead of solving intended work tasks.

In addition to the standard ROV auto functions, the new ROV Position System (RPS) fills the last auto gap missing, keeping the ROV at a steady position or along a predefined path.

The new ROV Position System consists of two main parts, **AutoPOS** and **AutoTRACK**

The AutoPOS helps the pilot keeping the ROV steady at a fixed horizontal position. It turns on Auto Heading, Lateral and Longitude. Together with the other auto functions already used today, like Auto Depth, Altitude, Pitch and Roll, the ROV can be steady fixed to a 6 degree of freedom position.

The AutoTRACK system, in addition to the above, makes the ROV to follow a predefined horizontal path. A set of track waypoints are sent to the ROV Position System. Together with the ROV real-time position data, the AutoTRACK system manoeuvres the ROV along the pre-loaded track.



The ROV Position System is built into the topside real-time ROV controller (PXI) which controls the entire ROV system. Since it is a real time system (in contrast to a PC system running Windows), there is minimum amount of read and command latency and thereby being a determistic system. A quick system response is needed to make a stable ROV position control. Together with high quality motion sensors producing real time position data with minimum of data latency, everything needed to make a hi-quality DP system is present.

Track waypoints can be set by several methods. The waypoints can easily be made by writing a text file containing the points; using NaviPac or equivalent to set and export a set point file; or give the way points directly using the ROV Setup program.
The text files can be loaded into the ROV setup program, edited and then downloaded to the PXI. See ROV Setup program section for more details.

The ROV monitor program draws the loaded way points and the lines between them. Note that when the system does not have a track file loaded, a single track line in the current ROV pointing direction, is continuously generated by the system. Hence when the Auto Track function is turned on, a single track line is available that the ROV can follow.
See the above ROV Monitor program section described above.

3.5.2 ROV Positioning Control

New controls are built into the current well known pilot ROV interface and focus is kept making them simple and logic though with hi flexibility.

While operating the RPS, pilot is able to easily adjust the system to help or interrupt the RPS to perform a correct and safe automatic ROV control.

In AutoPOS mode, the pilot may need to move the ROV to another position slightly or abandon automatic system control due to unexpected events like thrusters failures, sensor readings etc. The pilot can turn off parts of the AutoPOS system to go into partly manual control. This can be running manually the ROV in longitude direction and the RPS system keeping a fixed sideway position and vice versa.

In AutoTRACK mode the prior made path may not be absolutely right. An example to this can be during a pipe survey and the pilot need to adjust the ROV sideway position to match the actual pipe path.

Environment factors like umbilical drag, water currents shall be in theory solved by the RPS, but the pilot will be given the opportunity to adjust current RPS commands or manually take over ROV control. This can be turning off or trim parts of the RPS functions like heading control, longitude control, sideway control etc.

In AutoTRACK the pilot is able to quickly interrupt the RPS system and take over the ROV control. This can be due to obstacle avoidance, system failures etc. This can be done by several methods depending upon system settings.
A Panic command value can be set so that when the pilot gives an absolute stick command above this value the system goes into manual mode. If the system auto functions are set to be Semi Auto, the system will go temporally into manual mode when the pilot is giving a joystick command.

3.5.3 Pilot ROV Control Interface

A new ROV touch screen layout is made to make space for the new ROV auto functions. The new functions together with the current can be turned on/off manually or automatically by activating the AutoPOS or AutoTRACK functions. See touch screen layout below.

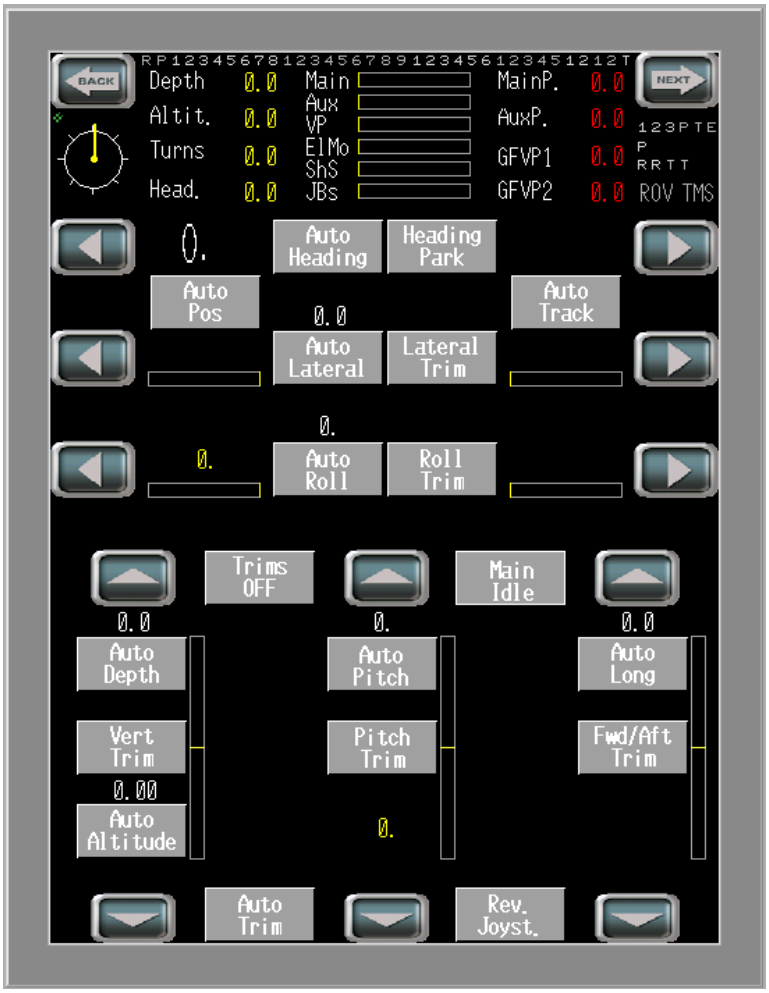
3.5.4 Activating ROV Positioning System (RPS)

The auto functions control functionality change slightly depending on RPS mode. In general, the auto functions have two methods of changing the autos set points, either by the touch screen or by the pilot joysticks and controls.

There are normally two auto modes, standard auto or semi-auto.
In standard auto, a pilot joystick command will change the auto set point.
In semi-auto mode a pilot joystick command will temporally switch the auto off and on again when there is no pilot command. A new position set point will then be sampled and used as the new auto function target.

The AutoPOS and AutoTRACK cannot be activated at the same time. Activating one turns the other off.

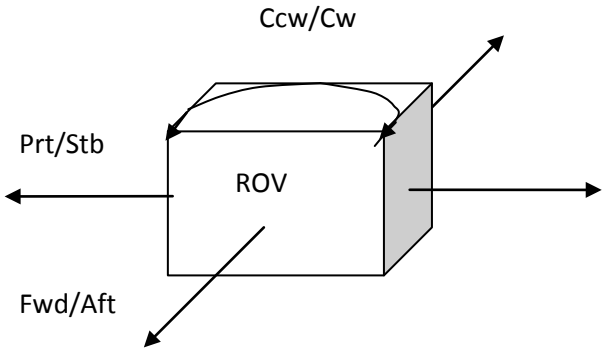
Auto depth, altitude, pitch & roll can run in parallel with the AutoPOS and AutoTRACK system, making the system capable to control the ROV in all 6 degrees of freedom.



3.5.5 RPS Command Directions

3.5.5.1 AutoPOS Command Directions

The AutoPOS directions are referenced to the ROV. Lateral commands make the ROV go Prt/Stb. Longitude commands make the ROV go Fwd/Aft.



3.5.5.2 AutoTRACK Command Directions

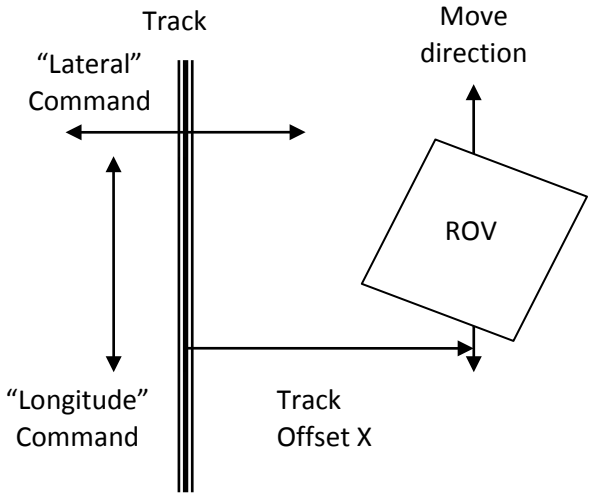
All AutoTRACK command directions are referenced to the track. Lateral commands make the ROV move perpendicular to the track. Longitude commands make the ROV go along the track.

Lateral offset X is the distance from the track.

Heading offset is the angle difference between the track and the ROV direction.

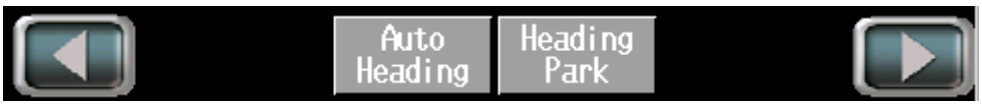
The lateral and angle offset trims are pilot changeable static values.

Note that the RPS will make to ROV move along the track even if a heading offset is present.



3.5.6 ROV Auto Functions

3.5.6.1 Auto Heading



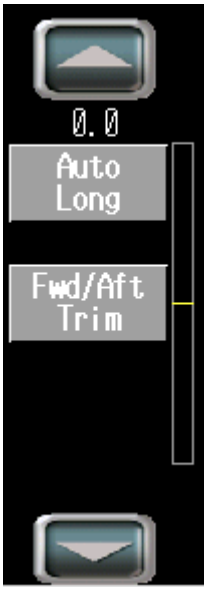
In standard auto heading mode the system is maintaining the ROV direction. The pilot can change the heading set-point by pressing the touch screen heading trim switches or by using the pilot joysticks and controls.

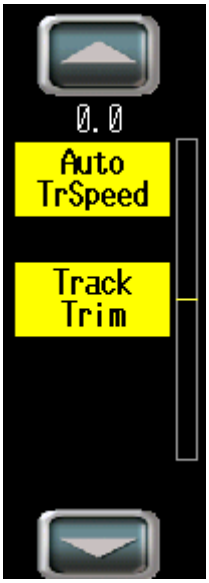
If heading park is activated, an alternative heading thruster configuration will be used. Heading park is mainly used in construction mode where the turn centre point should be at front of the ROV. Any front sideway forces should be avoided. (e.g. Attached to a subsea structure with a manipulator). It's also useful when running survey making the ROV turning around the front instead of the ROV centre. Note that Heading Park is NOT an auto function, but another thruster configuration, normally having the turn command to work on the aft thrusters only.

Activating AutoPOS, the auto heading is automatically turned on, although can be turned off afterwards, if needed. The heading target change is performed in the same way as in std. auto heading mode.

Activating AutoTRACK, the auto heading is automatically activated though can be turned off if needed. The AutoTRACK system will control the auto heading target dynamically while running the ROV along the predefined path. The pilot can change the heading set-point by pressing the touch screen heading trim switches or by the pilot trim controls. In AutoTRACK mode any heading trim will be a constant heading offset to the track heading. The system will still move the ROV along the predefined track.

3.5.6.2 Auto Longitude / Track Speed





Activating the AutoPOS mode, the system will turn auto longitude on to maintain the ROV longitude position. An AutoPOS Easting/Northing ref point will be stored and any change afterwards will be relative to this start position. Any touch screen trims or pilot controls longitude operations performed will move the auto longitude offset set point value making the ROV to move forward or aft.

If auto longitude is turned off while Auto Lateral is on, the longitude movement and position is controlled manually by the pilot though still maintaining the lateral position.

Activating the AutoTRACK mode the Auto Longitude is replaced with Auto Track Speed control. The system will **not** activate Auto Track Speed automatically and the pilot controls manually the position and speed along the track. This is due to practical issues like time to make the ship to move, obtain correct ROV position relative to the ship and so on. When a stable system is achieved, the pilot can activate Auto Track Speed.

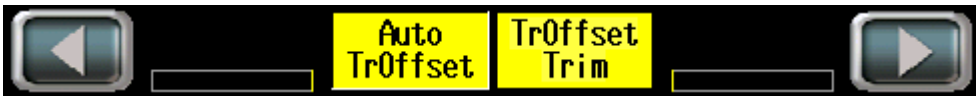
If the Auto Track Speed is turned on while in AutoTRACK mode, RPS will try to maintain the ROV speed along the track. Note that, as mentioned above, the ROV heading does not have to be the same as the track direction.

As a safety function horizontal joystick commands may interrupt the RPS. System settings determine what to be performed, if so.

3.5.6.3 Auto Lateral

Activating the AutoPOS mode the system will turn Auto Lateral on to maintain the ROV lateral position. An AutoPOS Easting/Northing ref point will be stored and any change afterwards will be as a relative to this start position. Any touch screen trims or pilot controls lateral operations performed will change the ROV lateral offset value to the Auto Pos set point value, hence move the ROV sideways. Lateral Values shown on the touch screen is the lateral offset to the AutoPOS position. To get back to the position where the AutoPOS was turned on, simply move to make the lateral and longitude offset values equal to zero.

If auto lateral is turned off while AutoPOS is on, the lateral position is controlled manually by the pilot.



Activating the AutoTRACK mode the system will instead of activating auto lateral it will activate an auto track offset function keeping the ROV at the current track lateral offset position. (Current position instead of track online position is to avoid a sideway jump command when turned on.) Any touch screen trims or pilot controls operations performed will move the ROV perpendicular to the track direction. By changing the sideway offset value the ROV can gently be moved to a correct track position.

If the auto lateral is turned off while in AutoTRACK mode, the pilot will be able to control the ROV track sideway position manually.

"TrOffset Trim" commands trims the ROV perpendicular to the track and **not** ROV lateral trim. Hence, changing the trim may produce a lateral AND a longitude trim depending upon current ROV heading relative to the track heading.
The trims bars shown however, is the ROV lateral trim. This is to ease an auto track operation where a lateral trim is to be minimized. A ROV has highest speed potential when running without lateral commands.
The system will automatically rotate trims when the ROV turns. Hence, when running in track mode, by rotating the ROV slightly the generated ROV lateral trim can be removed and is easily verified by watching the lateral trims shown.

Note that AutoPOS and AutoTRACK can be on without any autos being on.

In AutoPOS mode when autos are off, the start set point is still remembered and the system will rotate the horizontal trims to maintain a trim vector.

In AutoTRACK mode the system will as above rotate trims and run a track function where the line identification function is still running.

3.5.7 RPS Performance Parameters

Motion Sensors
Type of motion sensors system used determines the AutoPOS and AutoTRACK performance. High speed; good quality motion data will improve the auto functions performance. Reducing data rate and quality will reduce system performance and limit functionalities possible.

E.g. the Phins INS gyro, produce hi quality Heading Pitch and Roll and their angular speeds, Longitude Lateral and Vertical position and their linear speeds. The data rate should be set to minimum 10Hz. Normal data rate is 20Hz.

The system will achieve best results when Doppler, depth sensor and acoustic position are connected to the INS and all being on and working well. Feeding GPS data to the INS while on deck will reduce the time the INS needs to stabilize when the ROV is put into water and the acoustic position takes over.

The INS can run with the Doppler or the acoustic position being off, but not when they both are off. Note that with only the Doppler running, the position generated will not be the correct one though giving a fairly stable position that will drift over time. Hence AutoPOS will work but AutoTRACK will not.

External Forces
ROV shape, umbilical used, ROV position relative to the ship, ROV trimming etc. do have a major impact upon the system performance by changing the system characteristics dynamically. Sometime should be spent before and during run to reduce these factors.
E.g. in track mode, make the ship take most of the umbilical load by positing the ROV behind the ship. As a general rule, less autos, better performance. Autos may fight each other.

Auto track run direction should preferably be along the water currents making the environmental factors working with and not against the system.

Start and end of track may have to be partly in manual mode. Auto track speed has to be off. Unlike the other auto functions the auto track speed takes the current speed as a set point when turned on and leave the current order as fwd trim when turned off. This is to smooth the fwd command changeover at the start and end off track.

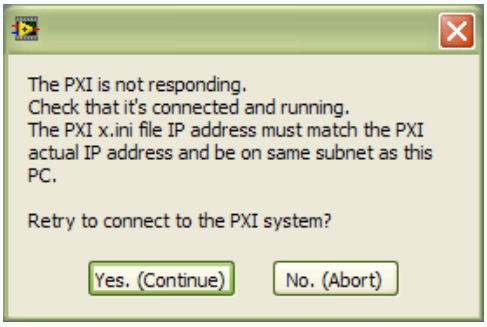
3.6 ROV System Setup Program

3.6.1 General

The ROV System Setup program gives access to the system configuration, to view and edit calibrations. With this program, calibration, alarm levels, auto functions etc. can be configured. It contains calibration calculators to simplify the calibration process where needed.

WARNING Only qualified personnel should use this program. Changes made may produce system errors.

When the program starts it will try to establish contact with the PXI controller. If not, an error message will be displayed.



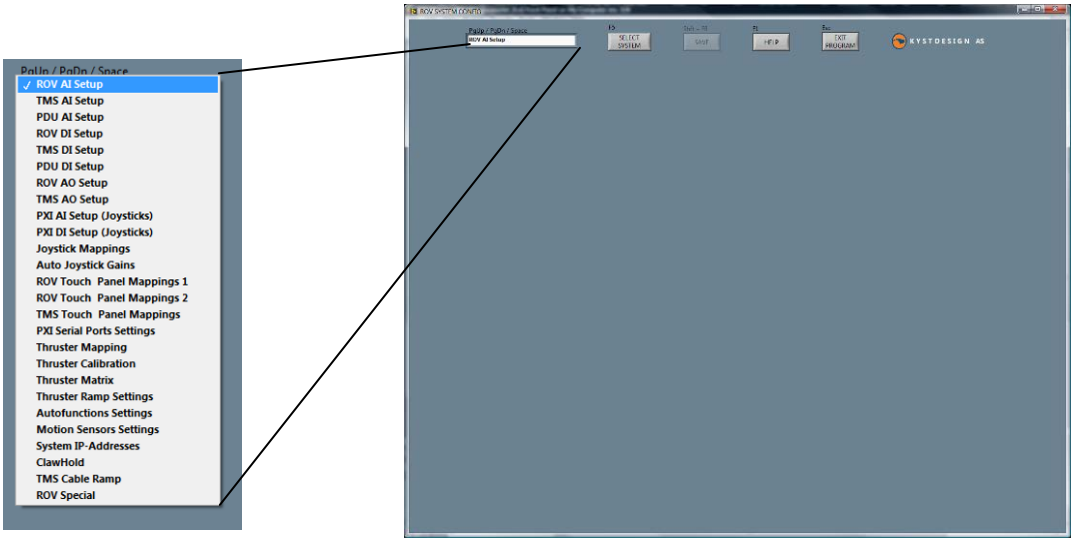
The PXI controller IP address is configured by using a “National Instrument” made program called “Measurement & Automation” (MAX).
The PXI controller has an “.ini” file stating which ROV, TMS and PDU is used. This file also contains a PXI IP address. To be able to link to the PXI controller, this IP address is broadcasted onto the Ethernet (UDP). The actual IP address and the IP address given in the “.ini” file must match. If not, no link to the PXI controller can be established.
The PXI ip address should normally be 192.168.1.3

Also, the PC running the setup program must be on the same subnet as the PXI controller. See IP addresses given earlier in this document.

Use the “Help” button to retrieve information about the current system.

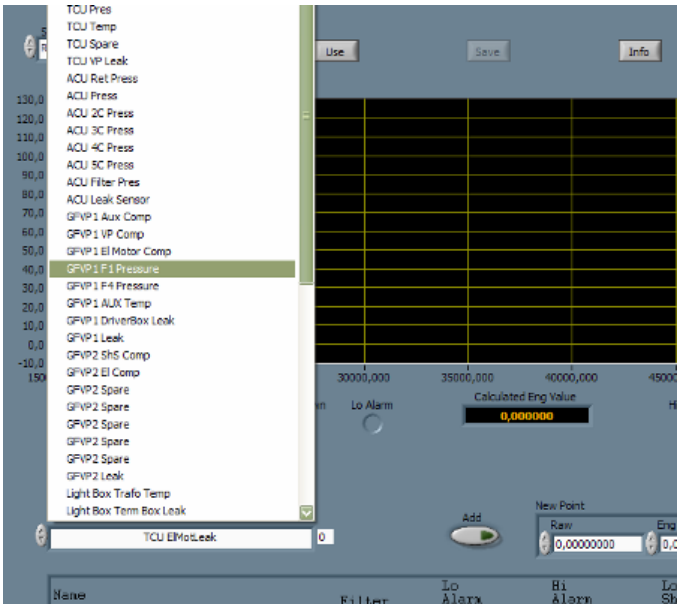
3.6.2 I/O Group Selection

When a connection to the PXI controller has been established, the operator can select which I/O group to configure. Select the Tab Control and a list of configurable subgroups are displayed. When you click on the item you want to configure, a new page shows up.



Next is to select the item to be configured.

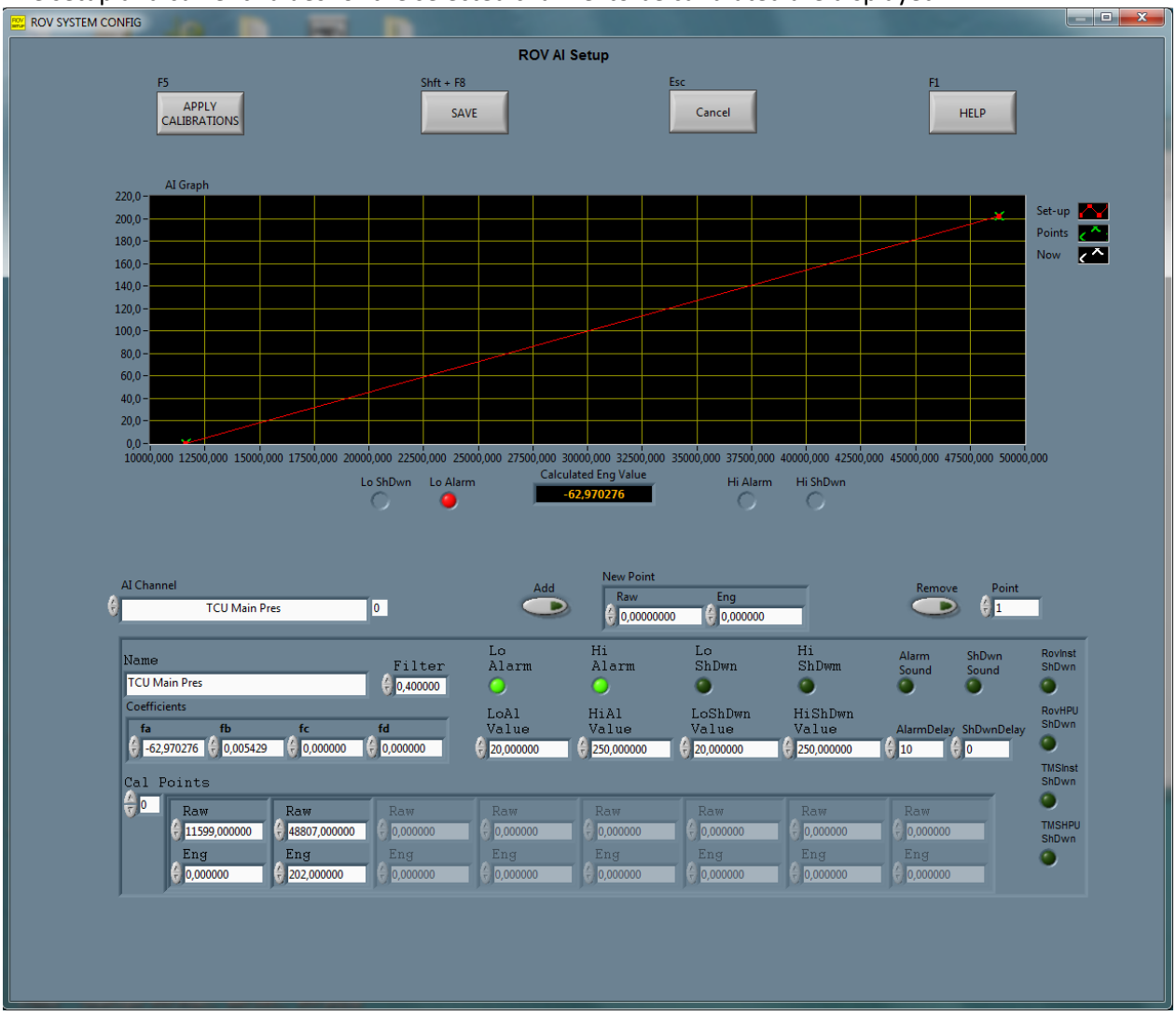
Current set-up is displayed.



3.6.3 ROV, TMS, PDU & Tool Analogue In Configuration

General for all I/O (Input / Output) is that the system with an AI (Analogue Input), calculates an Eng (Engineering) value from a raw input value.
(For an AO I/O, the system calculates a Raw value from a Eng value.)

The setup and current values for the selected channel to be calibrated are displayed.



For each Analogue In, calibration points can be logged to simplify the calibration operation.

The logged points are displayed graphically and as a table. The logged points can be manually edited to e.g. specify the Engineering value.

Since points are logged, the calibration can be done in several operations by one point at a time.

e.g.

Log low Eng value with associated Raw value first, and save e.g. a pressure sensor with no pressure being present. Then later when the sensor value has changed to another level (hydraulic is on), log this point as the next point on the graph.

To delete points, set the point selector to the point to be deleted and press the “Delete” switch.

The logged points are used to calculate curve calibration parameters.

If no points are logged, the calibration parameters can manually be set.

If only two points are logged, the system will generate a standard gain and offset calibration. The “fa” value being the offset and the “fb” value” being the gain.

If more than two points are logged, the system will try to perform a curve calibration.

The system calibration together with the points logged will be shown on the graph.

If the system has made a curve calibration, the curve made may not match the points logged. To better match the sensor, try manually changing the logged points values slightly to change the system made curve. Not all sensors can be calibrated by a 4 parameter determined curve estimation, but the most of them can be.

Alarms can be enabled. There are two alarm levels, high and low. High alarm is when the Eng value is above the high level. Low alarm is when the eng value is below the low value.

Shutdown alarms can also be configured. If set, make them outside the alarm values. (This will not make the system mal function, but no alarms will be generated before a shutdown alarm.)
The system PDU power to be turned off has to be selected. Remember that if an instrument power has been selected and the sensor made this to happen is powered from this power, strange shutdowns can be generated.

“Alarm Sound” and “ShDwn Sound” switches enable alarm sound to be generated.

“Alarm Delay” and ShDwnDelay” delays alarms, this to avoid intermittent alarms to be generated. Be careful to do this for shutdown alarms.

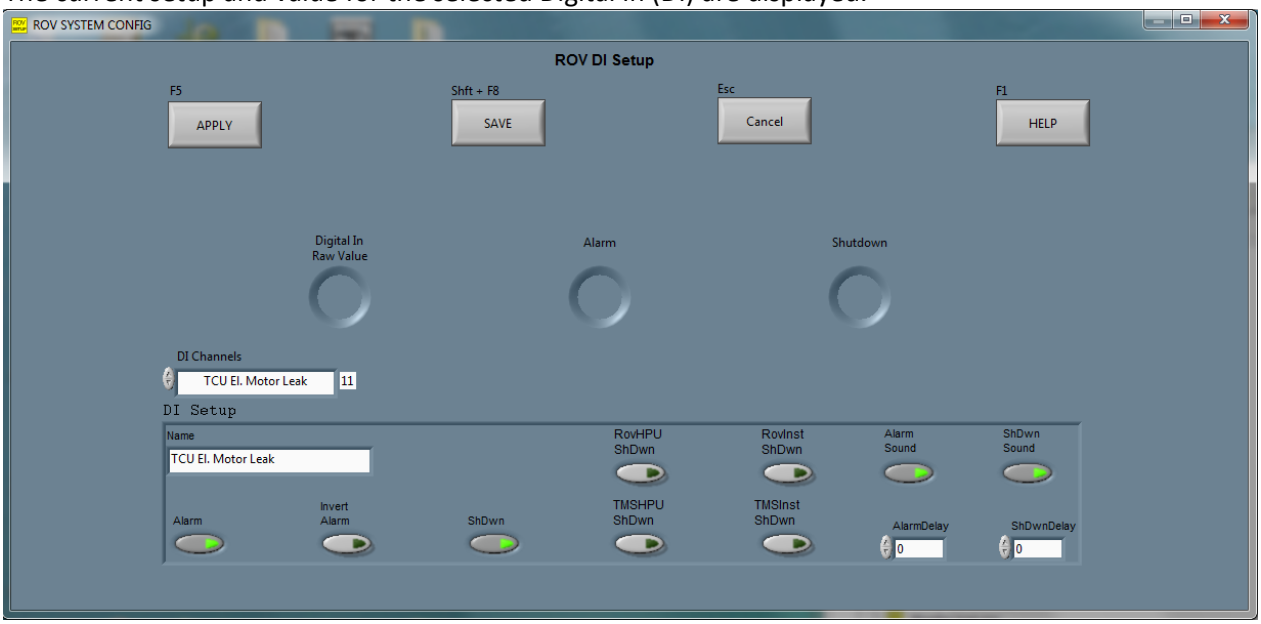
A signal filter can be set to filter the channel raw value before any calibrations is performed. This can be used to stabilize sensor readings. Remember that this may produce a sensor reading delay. No filter is set by setting the filter value to zero. A value above zero will enable the filter function. The highest value is just below 1 and this will produce a very stable signal value though with a very slow response.

To temporary use the new settings (RAM only), press “Apply Calibrations”. To permanently store the new values (RAM and on HD) press “Save”.

Tip:
To temporally turn off an alarm, change the settings and press “Apply Calibrations”. Since the new settings are only stored in the PXI RAM, next time the PXI is turned off / on, the old settings will be loaded again from the Hard Disk.

3.6.4 ROV, TMS, PDU Digital In Configuration

The current setup and value for the selected Digital In (DI) are displayed.



To enable Alarm to be generated turn the “Alarm” switch on. The ”Invert Alarm” switch will invert the alarm level.

i.e.
When the digital value is off and the “Alarm” and the “Invert Alarm” switches are on, an alarm will be generated.

The alarm can be set to be a shutdown alarm. To do so, turn the the “ShDwn” switch and the system PDU power to be turned off switch, e.g. “RovHPU ShDwn” on.

3.6.5 ROV, TMS Analogue Out Configuration

The setup and values for the selected channel is displayed.

The "PerF Calc" (perform calculation) switch enables output calibration. If the switch is off, the Raw value will be the same as the Eng value.

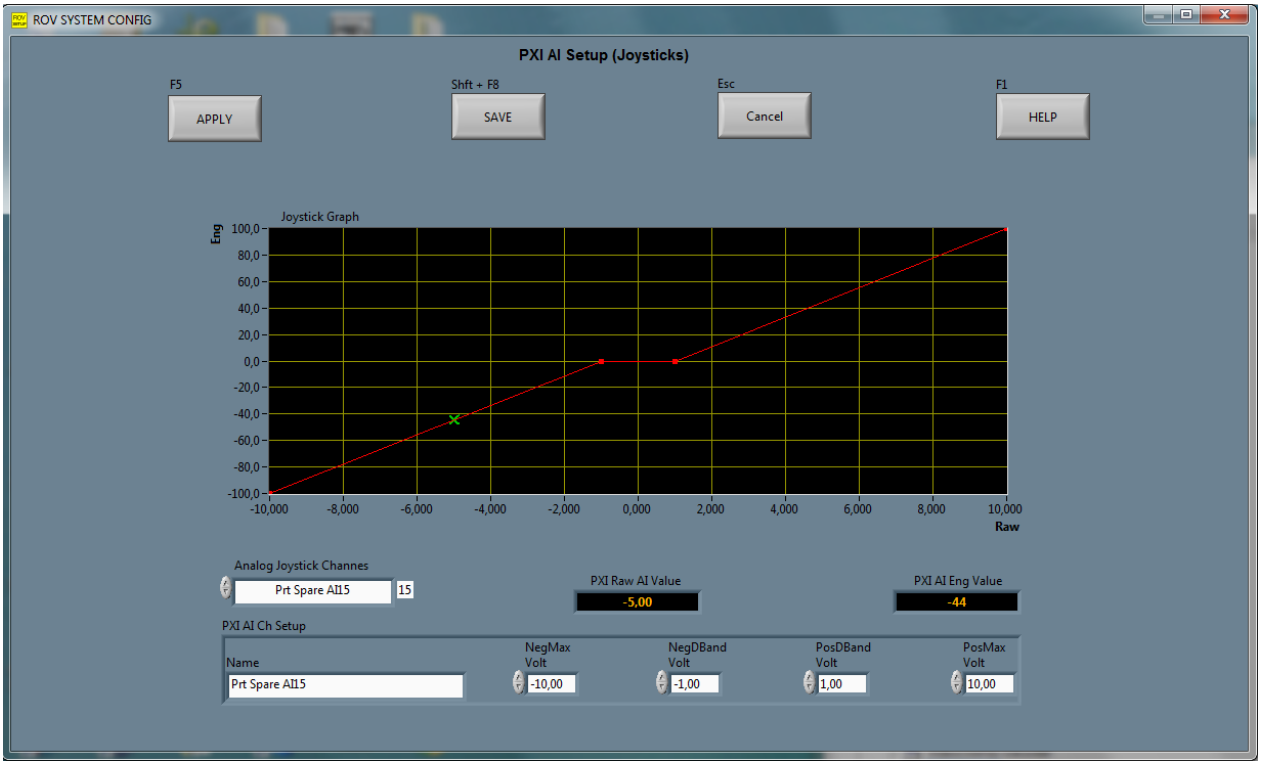
AO are usually used for driving valves. The AO Raw, used to drive a valve, has a range from 0 to 255 (8bit) (except for the TCU valves that has a range from 0 to 65535).

Eng 0 → Raw 0
Eng > 0 → Raw > Min value
Eng => 100 → Raw = Max value

Note that the TCU valves are calibrated by using the thruster calibration section discussed later.

3.6.6 PXI Analogue In Configuration (Joysticks)

The setup and values for the selected PXI AI channel value is displayed as values and as a graph.



The PXI AI channels are used to read the pilot chair mounted joysticks.

A joystick function Eng value goes from –100% to –0% and +0% to +100% and has a centre dead band between the -+0% values.

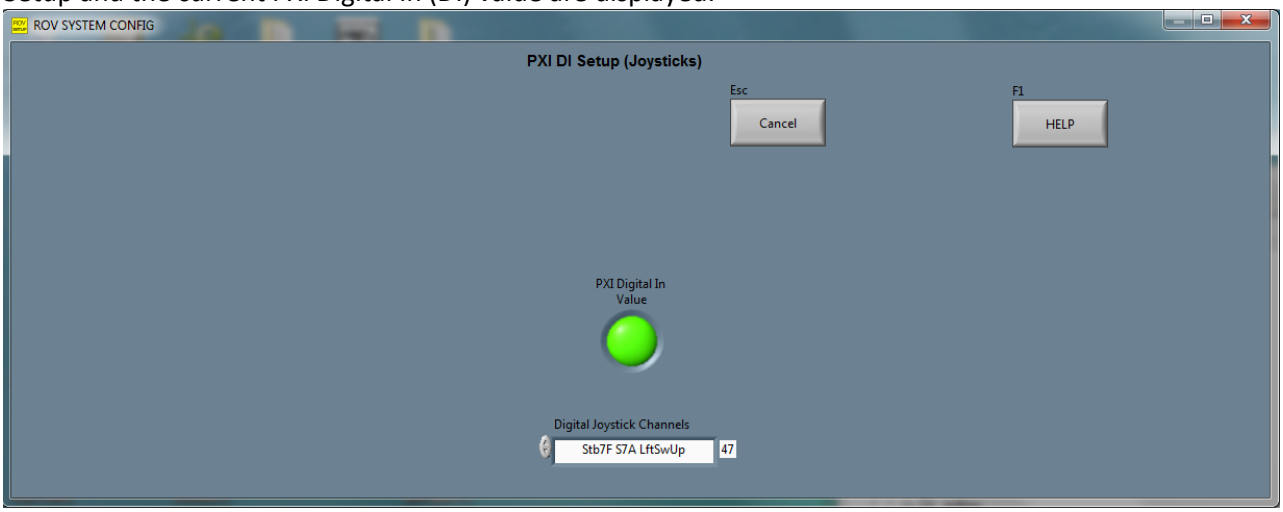
There are 4 calibration points which map the raw value to the 4 eng points which determine –100%, -0%, +0% and +100% joystick commands. These are called "Neg Max Volt", "NegDBand Volt", "PosDBand Volt" and the "PosMax Volt"

The 4 calibration points are drawn on a graph with a green cross indicating the current analogue input value.

The PXI AI can be mapped directly to Analogue output channels Eng value. See Joystick Mapping configuration discussed later below.

3.6.7 PXI Digital In Configuration

Setup and the current PXI Digital In (DI) value are displayed.



PXI DI is used for topside joysticks.

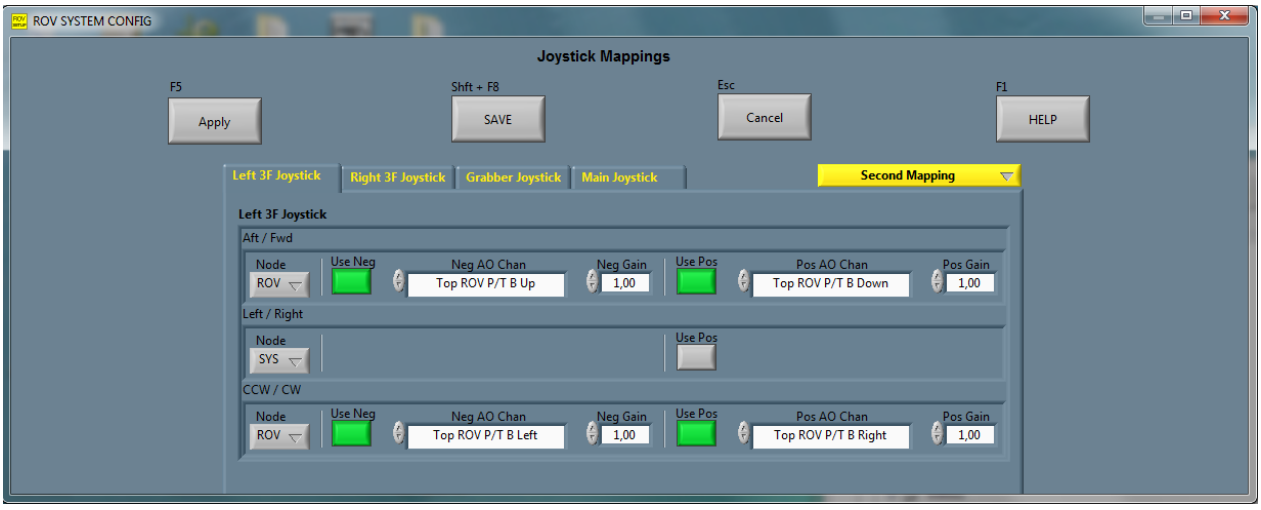
The PXI DI can be mapped directly to Analogue output channels Eng value.

See Joystick Mapping table configuration discussed below.

3.6.8 Joystick Mappings

To be able to use the pilot chair joysticks for different system operations, a mapping matrix table can be configured to produce several set of links to system controlled functions for each joystick. e.g. pan & tilts, grinding tools etc

Which mapping to be “On” is controlled from the touch screen “Control page” joystick enable matrix. See touch screen “Control page” section described earlier.



There is a folder for each joystick; Left 3F, Right 3F, Grabber and the Main Joystick i.e. the matrix columns. The folders contain a listing of the joysticks functions and their links to system valves etc.

For each folder there is 4 set of different tables possible (think pages), one for each possible mapping switch on the control page.

Which joystick mapping list (page) shown is determined by the yellow mapping selector, which has four possible values; First Mapping, Second Mapping, Third Mapping and Fourth. i.e. the matrix rows.

Analogue Joystick functions Configurable Parameters:

There is a line for each joystick function, e.g. Cw / Ccw twist.

The “Node” selector determines which system; Nav, ROV-AO, TMS-AO, ROV-DO etc. to control

“UseNeg” and “UsePos” switches (green) enable a link between the joystick function and valves, ROV motion commands etc.

The “UseNeg” links the negative joystick range, –100% to -0% and the “UsePos” maps the positive, +0% to +100%.

If “Nav” is selected, the joystick function controls a ROV motion command e.g. ROV fwd / aft.

The “Neg Chan” and “Pos Chan” selectors determine which channels to map to.

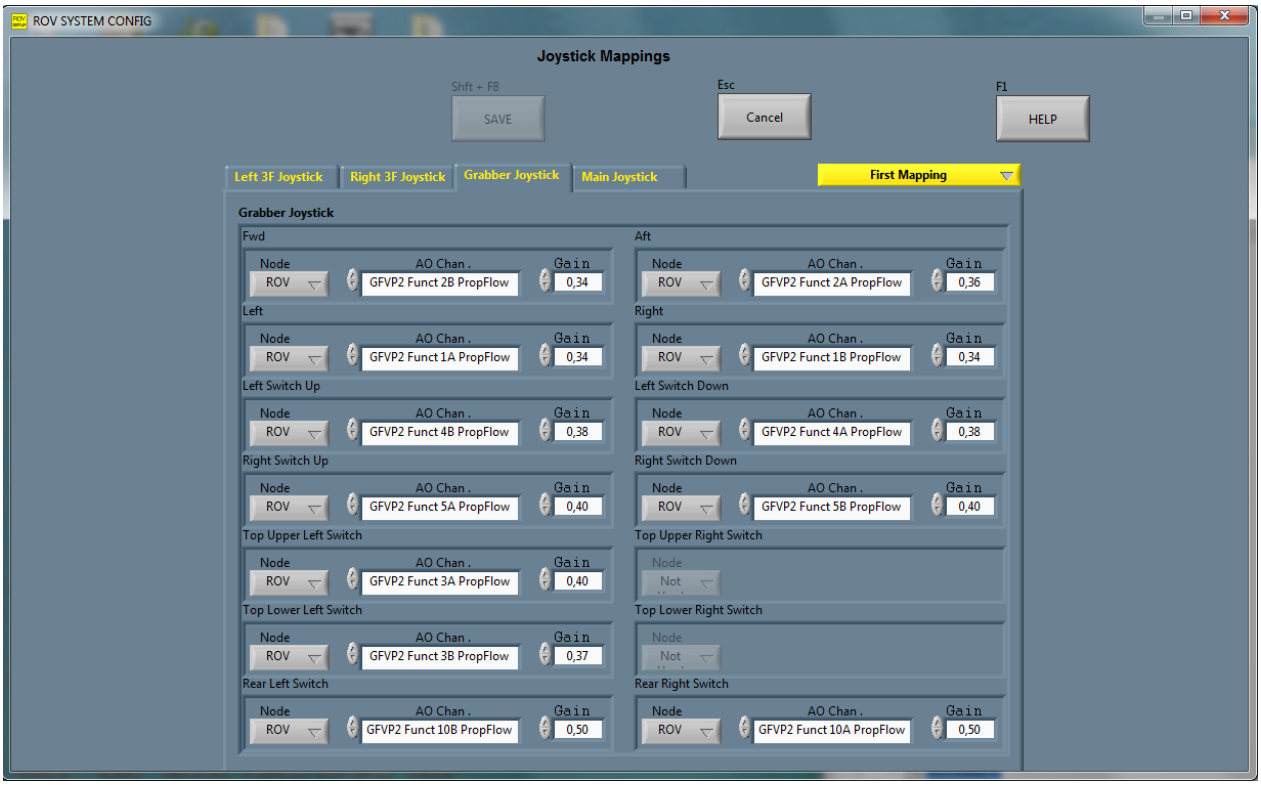
“Gain –“ and “Gain +” calibrates the joystick value to the controlled output channel.

e.g.

A gain of 0.2 makes a 100% joystick” command produce a 20% system command. For example, a valve and hence the max flow the joystick command may produce.

Note:
The actual valve min and max flow is configured by the Analog Out calibration done for each valve. The Joystick mapping gains is applied to the Joystick command before applied to the valve order which again is calibrated to the raw valve command.

Digital Joystick functions Configurable Parameters:



The “Node” selector determines which system to control. There is no link if set to “Not Used”

A digital in “OFF” value maps a zero value and a digital in “ON” value maps a 100% x “Gain” value.

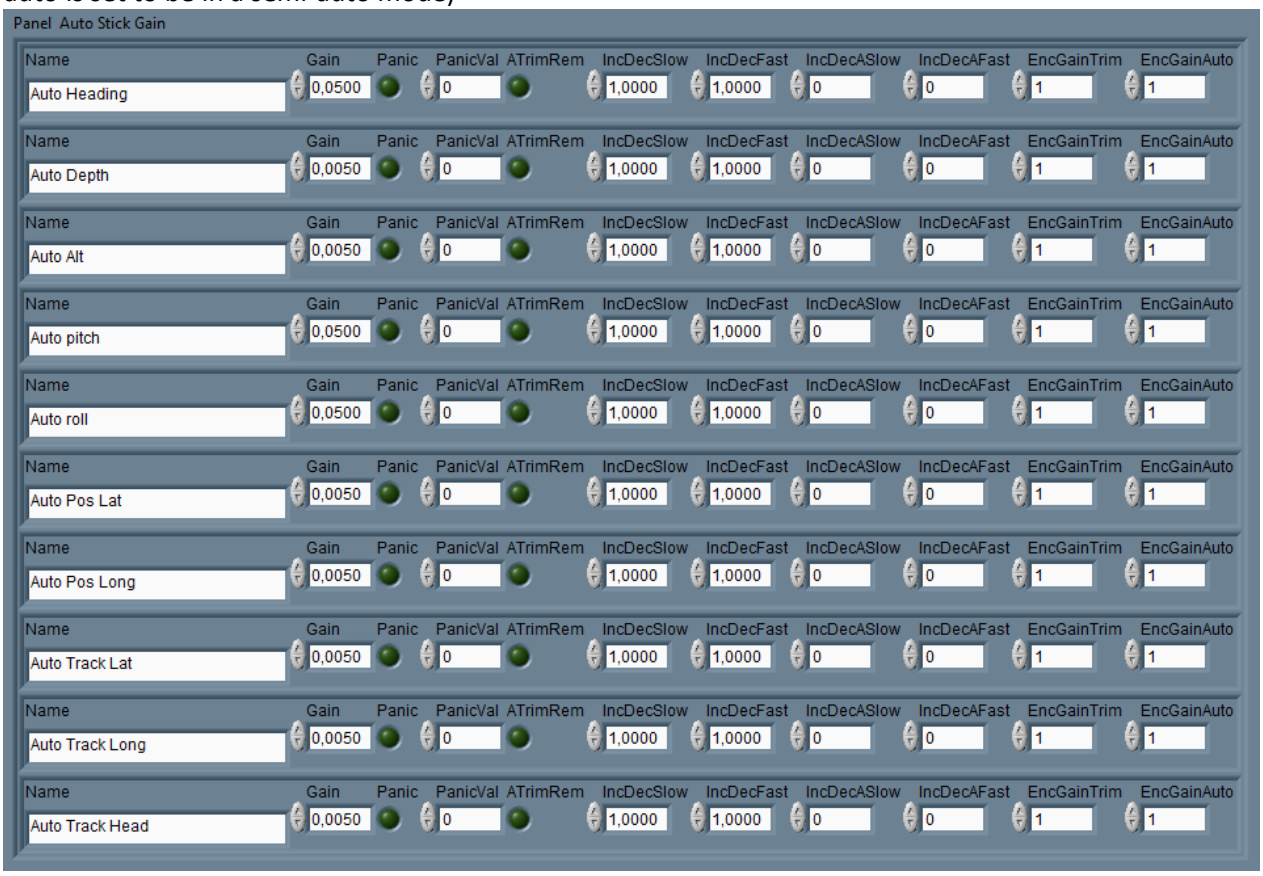
e.g.

A gain of 0.3 makes a switch “ON” command produce a 30% command. For instance a valve, when switch is on, the valve will have a 30% flow output.

The “Chan” selector determines which channel to map to.

3.6.9 Auto Joystick Gains Configuration

During an auto function operation, the joysticks can modify the auto set point. (Does not apply if the auto is set to be in a semi-auto mode)



"Gain" is the balance between the maximum speed of set-point change for the different auto functions when the autos are in std auto mode. Note that the auto sticks gain controlled from the touch screens control page works on all auto function set point change speeds. It is multiplied with the above gains. The gains specified are a change value per software loop in std. auto mode (not semi auto).

Change/Loops = "Touch screen Auto Stick Gain" x "Panel Auto Stick Gain" x "Joystick command"

"Panic" gives direct joystick command when the joystick command is above "PanicVal", e.g. Obstacle avoidance.

"ATrimRem" is not used.

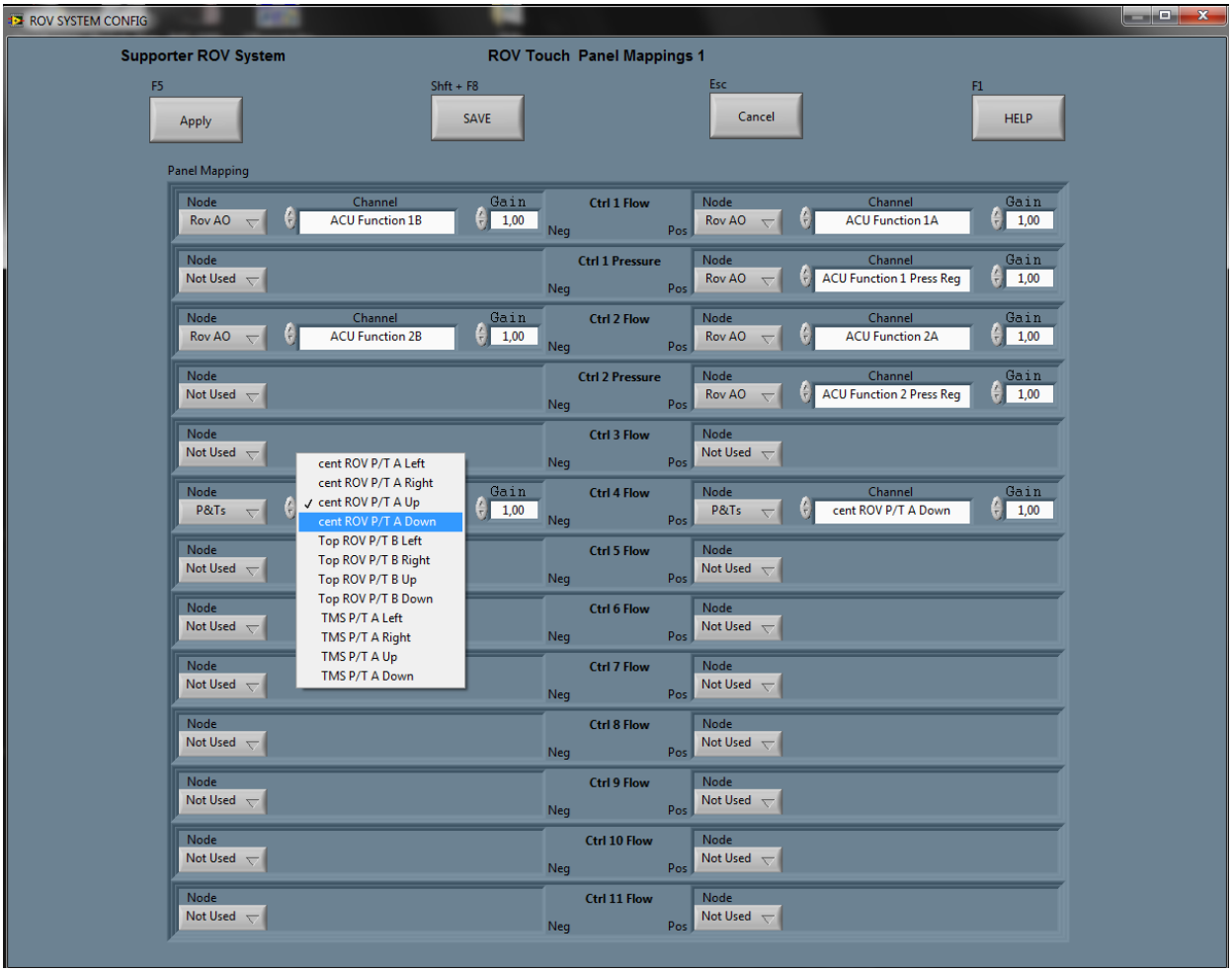
"IncDecSlow" & "IncDecFast" control the touch screen control arrows trim change rate when not in auto. "Fast" is after the switch has been held for more than 1 sec.

"IncDecASlow" & "IncDecAFast" control the touch screen control arrows change rate when the corresponding auto is active. "Fast" is after the switch has been held for more than 1 sec.

"EncGainTrim" and "EncGainAuto" determine the chair encoder controls trim and auto setpoint change rate pr encoder "click". Which one used is determined by which autos being enabled or not and trim enables being on or not.

3.6.10 ROV and TMS Touch Panel Mappings

There are three touch panel configuration pages, Function page 1 and 2 and one for the TMS page that controls TMS functions. Note that these pages can also control other functions than valves e.g. electric P&Ts.



There is one row for each touch screen function.

“Node” enables mapping and mapping target e.g. ROV-AO, TMS-AO, P&Ts etc. The left column maps the negative screen range, –100% to -0% and the right column maps the positive range, +0% to +100%. e.g. Enabling one way only can be used to avoid running a tool in both directions.

The “Channel” selectors determine which channels to map to.

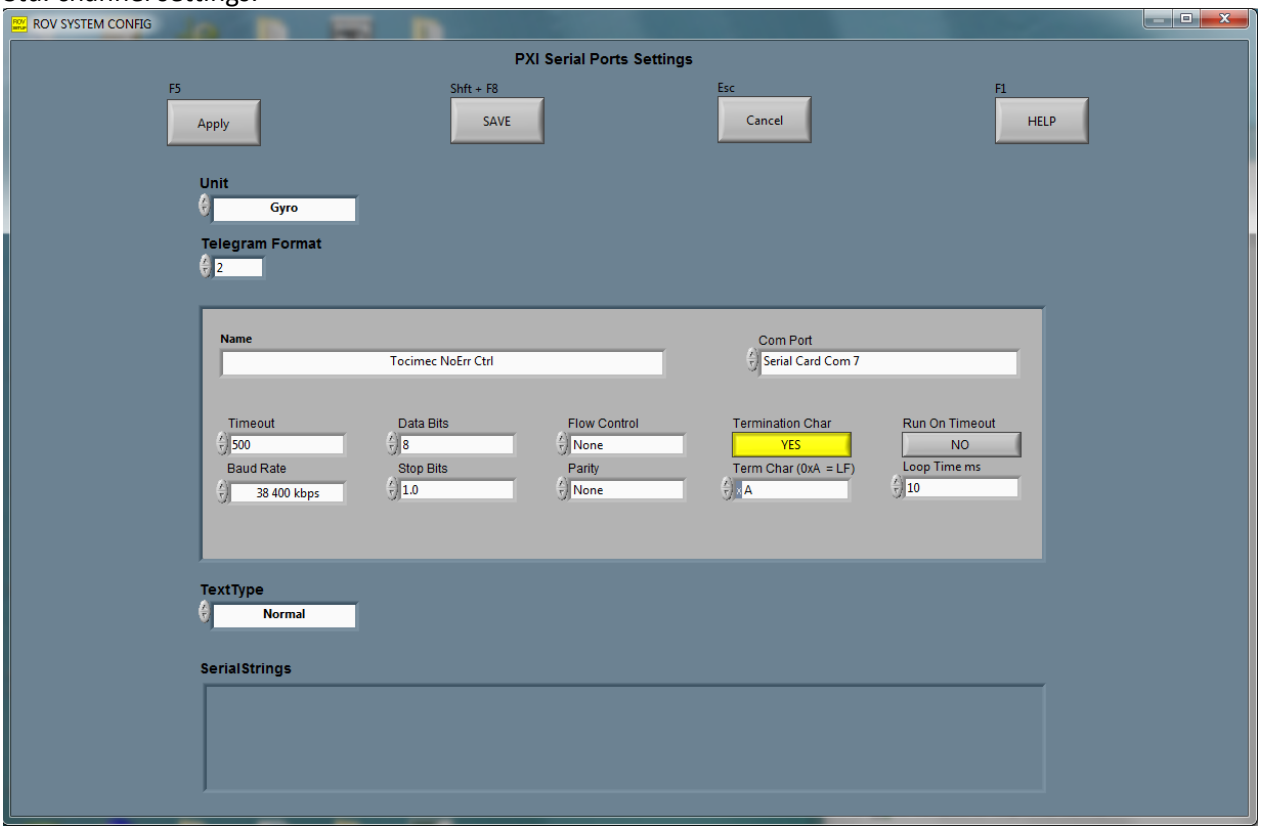
“Gain“ calibrates the screen value to the function Eng value. Hence setting e.g. the max hydraulic flow/pressure wanted when operating the switch. Note that this is not the same as calibrating the actual valve. The mapping gain only limits the possible % command that can be produced.

e.g. A tool do not handle the max possible flow/pressure that the system can produce. Setting the gain below 1 limits the flow/pressure.

3.6.11 PXI Serial Ports settings

The PXI unit has a 16ch serial card. Gyro, depth, altitude, TMS, ROV links are read by this card. The CPU card has serial ports too. These ports should not be used. The serial card operates in DMA-mode and gives less system load.

Std. channel settings:



1	ROV Link (MUX)	57 600 baud
2	TCU	57 600 baud
3	ACU	57 600 baud
4	GFVP1	57 600 baud
5	GFVP2	57 600 baud
6	Lightbox	57 600 baud
7	Gyro	38 400 baud
8	Depth sensor	9 600 baud
9	Altimeter	9 600 baud
10	TMS Link	57 600 baud

Name	Link name, for information only
Telegram format	Specify the type of telegram to receive. See below
Com Port	Which comport is used. Do not mix with other channels
Timeout	Determine comport timeout before a new read, See below
Baud rate	See above
Data Bits	
Stop Bits	
Flow control	None. There is no HW serial sync used.
Parity	
Termination Char	Telegrams terminated by a termination char. Line feed etc
Therm. Char	Sets the termination character if used

Run on timeout	Read telegram within a timeout. See timeout above.
Loop time	Sets how long to wait before doing the next read operation.

Settings can only be set for the Gyro, Depth and Altitude sensor. Link settings are not shown.
The “Serial String” shows the received string. If a string is shown, the system receives strings and decodes them.

Changes are made active after you press “Apply” or “Save”.

Gyro Telegram format:
The std. gyro telegram used is Tokimec. This telegram comes in different versions due to history reasons. “Dorado” gives position data and is only used in ROV-DP mode

0 None, not used
1 Tokimec PTVF

• Standard: Output NMEA 0183 compatible, Tokimec proprietary
• Data sent:
Heading
Roll
Pitch
Rotation speeds
Status

• Data frame:

$PTVF,abbbbP,accccR,ddd.dT,aee.ePR,aff.fRR,agg.gAR,ajj.jN,yyyMD,zzzzAL*hh<CR><LF>

abbbb is the pitch
bb(deg).bb(min)
a [-] bow up / [space] bow down

acccc is the roll in degrees
cc(deg).cc(min)
a [-] port up / [space] port down

ddd.d is the heading in degrees

aee.e is the rate of pitch in degrees/second
a [-] bow up / [space] bow down

aff.f is the rate of roll in degrees/second
a [-] port up / [space] port down

agg.g is the rate of turn in degrees/second
a [-] CCW / [space] CW

ajj.j is the vessel speed in knot
a [-] Astern / [space] Ahead

yyy mode of operation
zzzz status
hh is a checksum
Remember to use the telegram format that does have a checksum. The std telegram frequency is 10Hz

2 Tokimec PTVF as above where the status bits are ignored.

Some CDL gyros the status bits are not used. To be able to read the gyro the telegram has to be set to be format 2. Some versions do also have the signal inverted. Run the gyro and make sure that the data received are correct. Use the "Motion Sensor" settings discussed later to do this. The signal can be inverted again by setting the corresponding system sensor gain to negative.

3	**Dorado**	ROV DP
4	**Tokimec PTVG**	
5	**Digilog ASCII**	
6	**Long Binary Nav HR**	ROV DP

Depth sensor telegram format:

Only telegram format "1" is used:

*000199.9999\r\n

*	Prefix	Checked to identify that it is the correct telegram
00	Sender id	Not used
01	Receiver id	Not used
99.9999	Depth	The decimal divider can move. (Saiv sensor only)
\r\n	Termination character 0xA which is line feed	

Std telegram frequency is 5 or 10 Hz. The depth can be in meters of water psi etc., but the std. is absolute psi and converted to meters by changing the "Motion Settings" depth configuration discussed later. See the sensor manual for more details.

Altimeter telegram:

Telegram format "1":

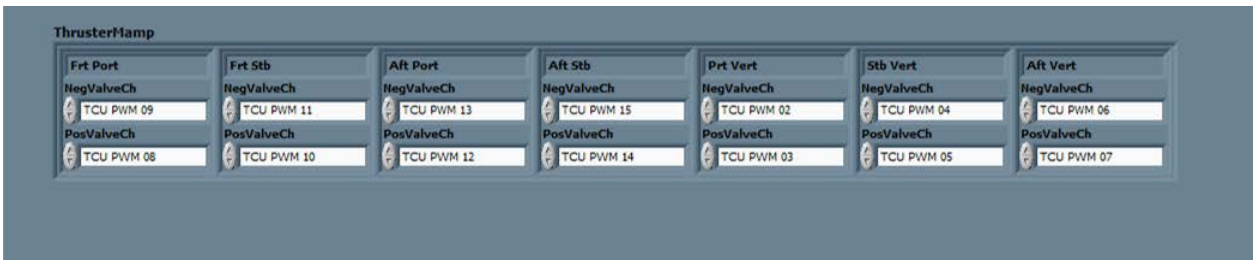
123.45m\r\n

123,45	Altitude
m	Altitude format
\r\n	Termination character 0xA which is line feed

Telegram format "2" is equivalent to the above except that the vertical speed is not calculated from the sensor value, but red from the gyro. Hence, this format can only be used if vertical speed is read from the gyro (Dorado, Long Binary Nav HR).

3.6.12 Thruster Mappings

This setting only applies to Installers and “old” supporters (up to 17).
The thruster mappings are used to define which driver card PWM channels are used for the different thrusters. This is to be able to configure the system to be an Installer or a Supporter ROV.



See the electrical and hydraulic drawings to verify settings. These settings have to be set before any thruster calibrations are performed.

However, any MK2 system use driver card PCB stacks inside the TCU. Hence, the output mappings cannot be changed.

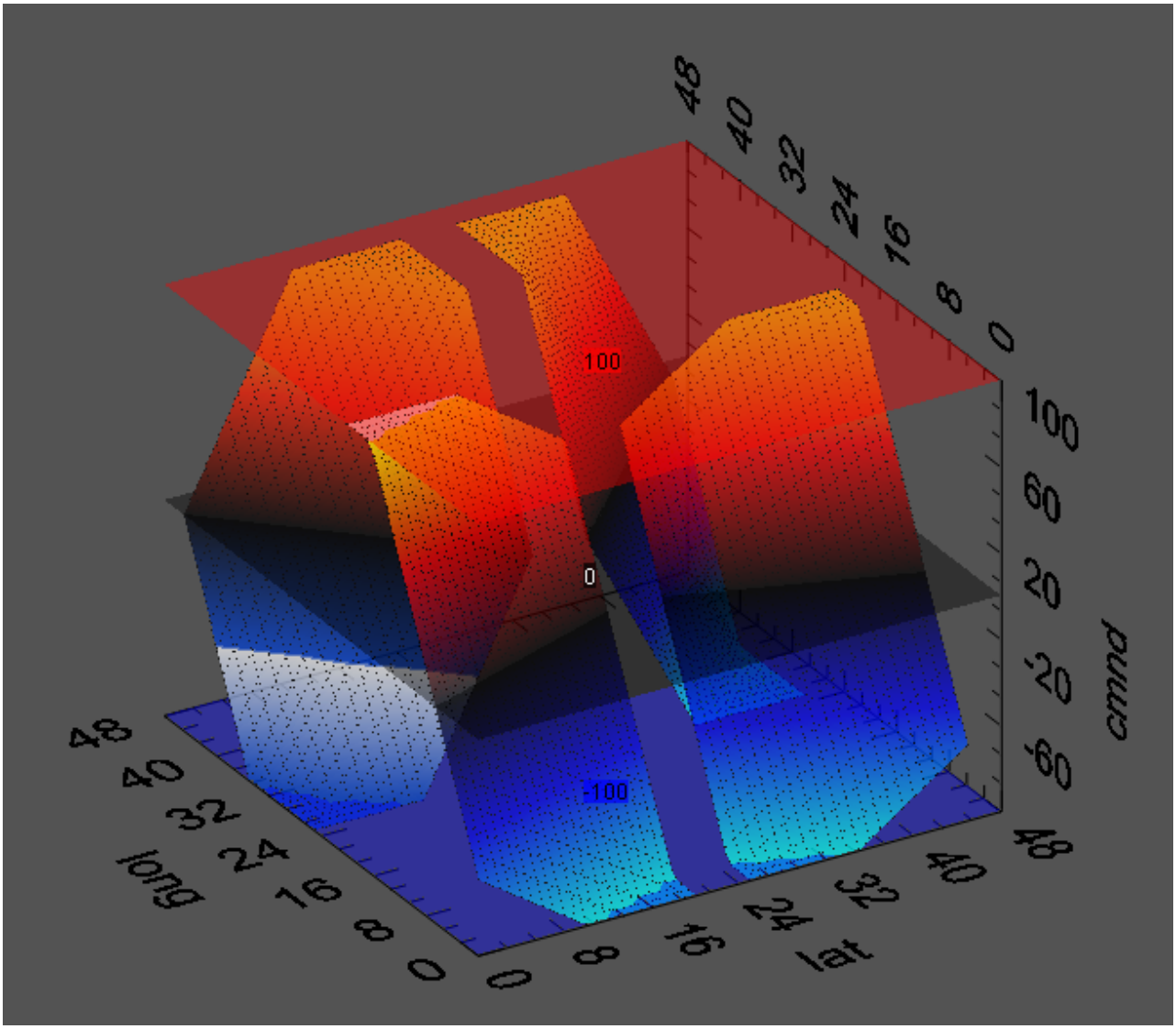
3.6.13 Thruster Matrix

This setup section should not be altered by the general user. It's for information only.

The thruster matrix tables determine the balance between the ROV thrusters for different thruster commands.

e.g.

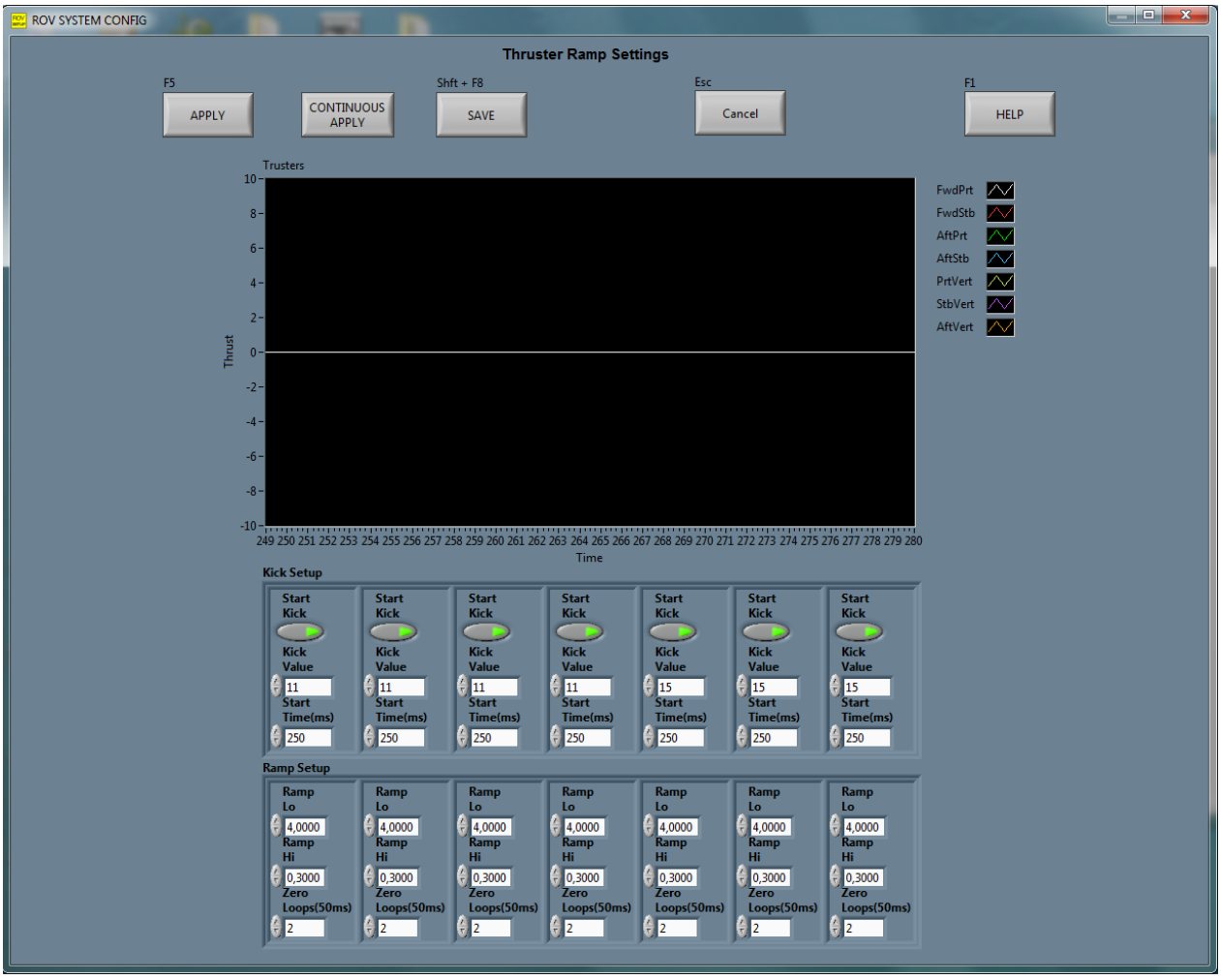
Going sideways, this will balance the front thrusters and the aft thruster to make the ROV go straight without turning for different pilot commands (slow or fast).



The system makes a table estimate to perform this. A separate program is used to calculate these values which are not available for the general user.

3.6.14 Thruster Ramp and Start Kick settings

Ramp:
The thrusters must have a ramp function to protect the thruster when there is a rapid thruster command change.
The system does use an "S" type of ramp function where the rate of thruster command is dependent upon current thruster command.
The ramp function can be set to be constant *or* high at high thruster commands and small around zero.



A zero wait time can also be set to make the thruster hydraulic flow to settle when the wanted command goes across zero. This is done by keeping the output command equal to zero for some time before going into the opposite direction.

The system loop time is 20 Hz and the ramp function is run at the same speed.

New Output Change = RampLo + Current Output x RampHi

The "Ramp Low" value is a constant command output change independent of current thruster command.

The "Ramp Hi" produces a dynamic ramp value. It's obtained by multiplying the current order with "Ramp Hi". A high ramp value is produced at high thruster order and small at low thruster order.

The Hi and Lo produced ramp values are added together to produce the max change of command pr loop cycle.

The end result is an “s” shaped ramp, slow around zero and an increasing response above.

If the ramp is to be constant, the Hi ramp value has to be set to zero.

Note that if the Lo ramp value is set to zero, the thruster command will never cross zero.

To see the end result, the produced ramp shape is drawn on “Thruster” graph.

The high ramp response at high thruster commands does improve the auto functions response at high pilot commands and hence make the ROV more stable at hi ROV speeds.

Start Kick:

The Supporter and Constructor ROVs do use pressure controlled TCU valves to run the thrusters. To be able to run the thrusters at low commands i.e. at low pressure, the thrusters have to be “kicked” by a higher pressure for some time before they do turn.

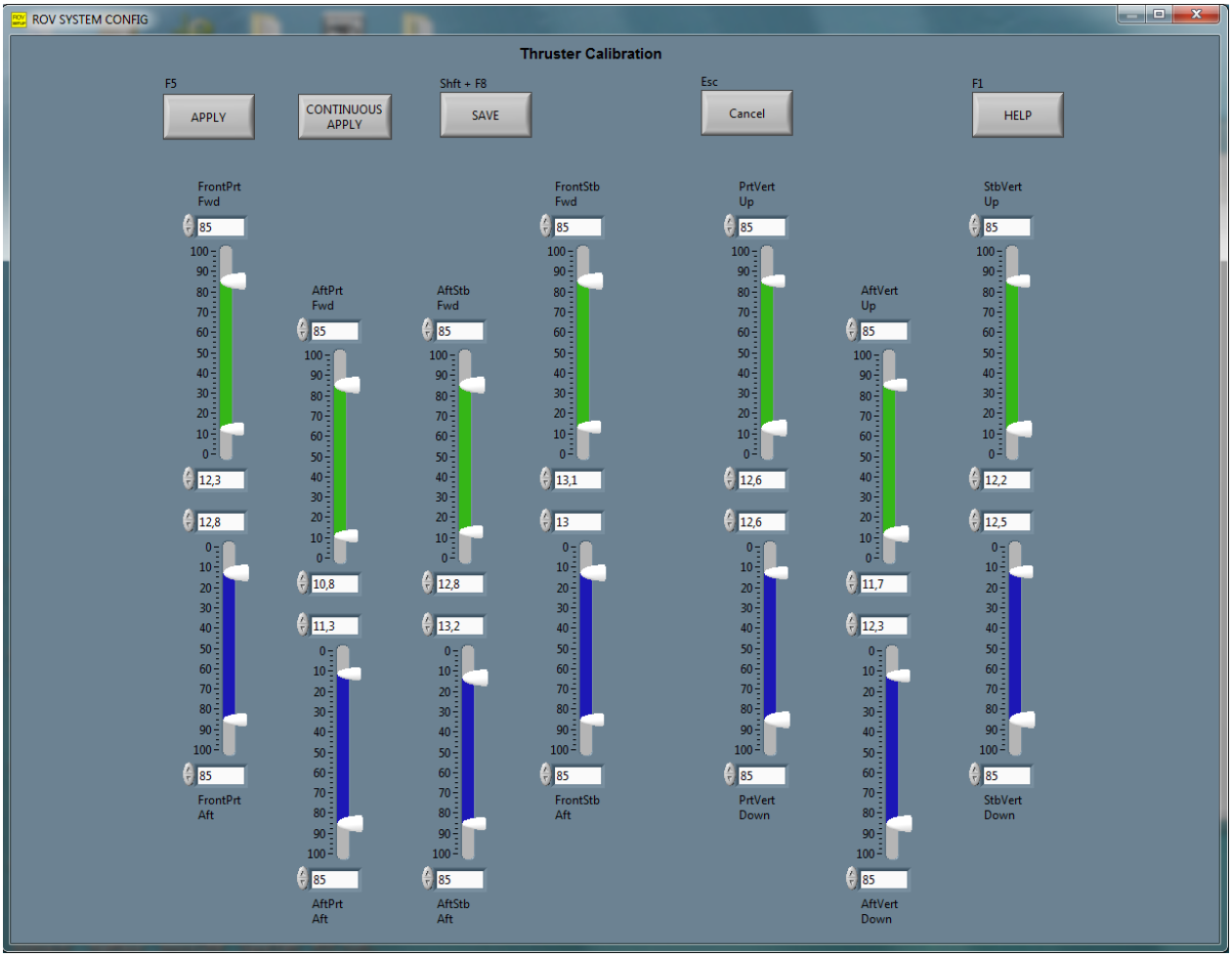
The “kick” value which is a % driver card PWM command is run for “Start Time” time.

Set this value before any thruster calibration is set.

Set these values when the hydraulic temperature and ROV conditions are as close as possible to the normal ROV environments.

3.6.15 Thruster Calibration

The thruster valves have a start dead band before any pressure / flow is produced. There is also an end dead band where the valves do not give any more pressure / flow. The start value and the maximum value corresponding to 0 and 100% pilot command for the different thrusters have to be set.



The green controls are for going forward or up, and the blue controls are for going aft or down.

There is for each control a low value slide and a high value slide. The coloured area shows the thruster range.

Typical start values are 14% for Supporter ROVs and 25% for the Installer ROVs. The typical max values are equal to 85%.

The “Kick” setup has to be set before performing the thruster calibration. Remember that the thruster matrix will generate different thruster orders. Hence when going lateral the front thrusters normally go faster than the aft ones. The same applies for an up/dwn command.
To make the calibration process easier, set all vertical thrusters to 1 and use a longitude command instead of a lateral command.
Keep the Thruster Command dead band equal to zero (discussed later)
Have the ROV is submerged, to keep the el. motor and oil temperature low. Mount some extra cameras to observe the thruster responses.

Try going very slowly forward/aft or up/ down to see that all thrusters start at the same time and moves slowly with more or less at the same speed.

To try out new values press the “Use Calibrations” switch or “Continuous Apply”. Make sure that there is a coloured area for each slide before the new values are sent to the system. When you are happy with the new settings, press “Save” to store the new values.

Remember to reset the command dead band and the matrix settings back to their old values after the thruster calibration has been performed.

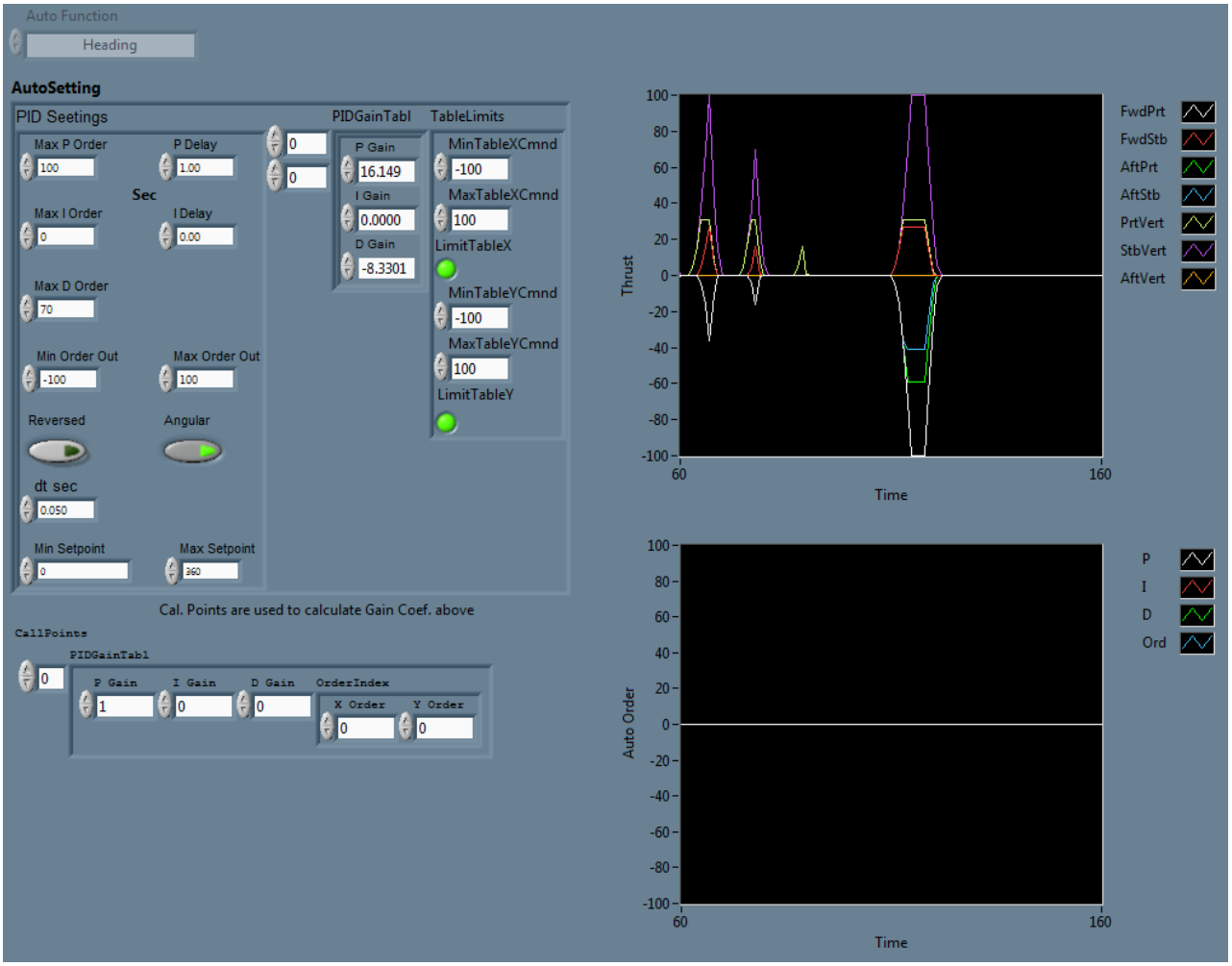
3.6.16 Auto functions Settings

A standard simplified auto function is made up of three parts P, I and D.

The P is the proportional part of an auto function, think a spring.
The I part is a sum of errors accumulated over time, think a static force like a lift.
The D part is a damper working against the rate of change, think a speed reducer.

All these parts are added together to generate an auto function command.

The auto function used here is a bit more complicated. The auto functions PID function parameters are generated by a table calibration system. The table calibration is used to compensate for the ROV un-linear response.



The table calibration settings are produced by logging the different PID gains for different pilot commands. These values are then put into the Proportional, Integral and Derivative “Cal points” tables. The system will use these values to generate a PID gain depending upon current command. The parameters must be verified by using a separate program, hence not done by the operator

PID settings:

Max P Order	Is he maximum the “P” part of the auto function can give
Max I Order	Is the maximum the “I” part can give
Max D Order	Is the maximum the “D” part can give
Min Order Out	Is the most negative command value the PID function can give
Max Order Out	Is the most positive command value the PID function can give
Reversed	Is telling the auto function to give the order in the opposite direction
Angular	Auto heading is a circular function, depth not.
dt	The auto loop time (always 50 ms)
Min / Max set point	The auto signal range, e.g. gyro being 0 to 360.

The P-delay is used when the auto function is in semi-auto mode. The auto are temporary “off” when a there is joystick command and on again when there is not. To avoid that the ROV kicks back when the joystick is released, the new set point sampling is delayed by the P-Delay value.

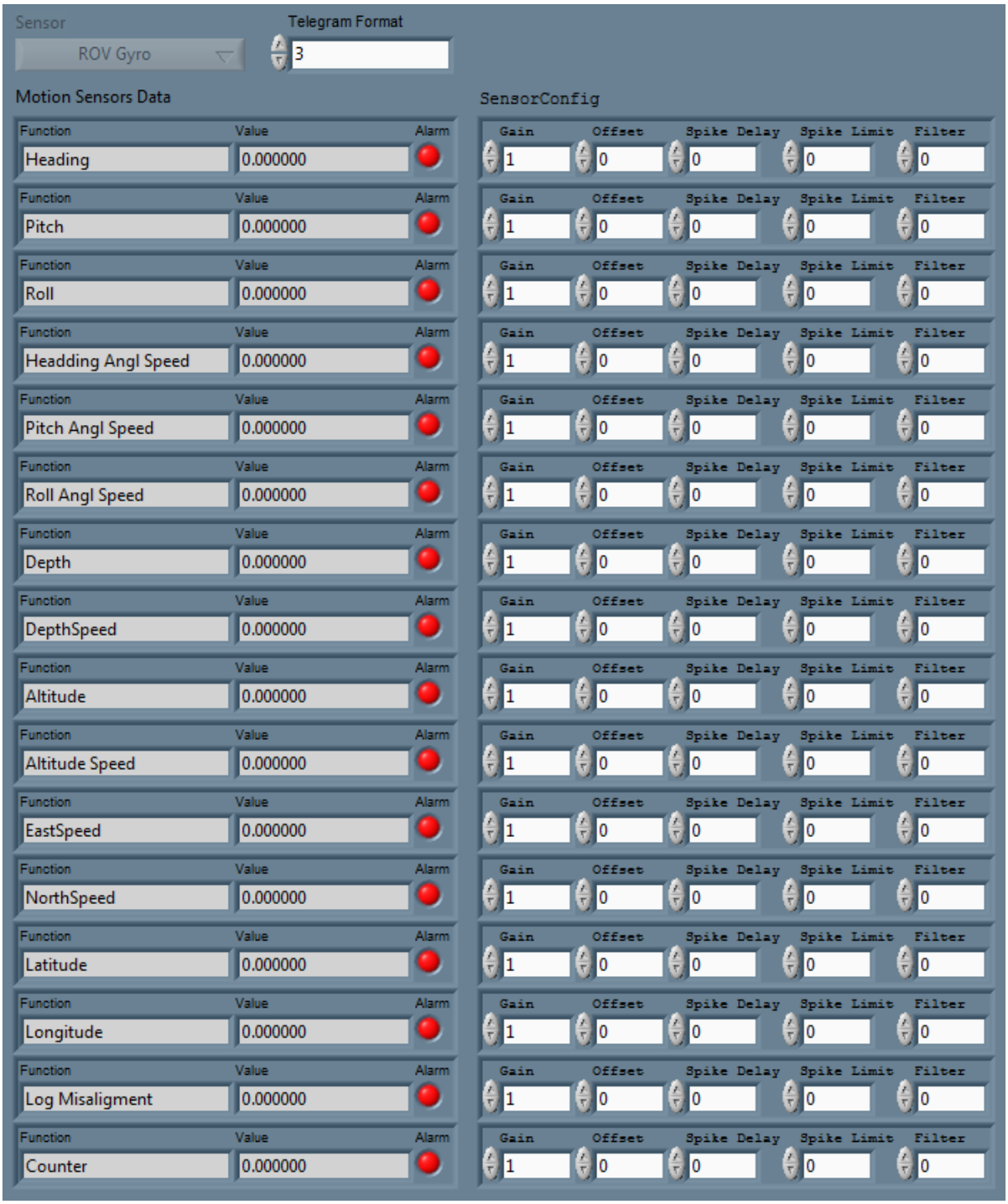
The same applies for the I-Delay except that it is the integration process (not the integrated value) that is temporally stopped by the I-Delay value.

The thruster commands and the PID generated commands are displayed on graphs. The graphs can be used to verify auto functions performance.

Make sure that the motion sensor settings are set correctly before the autos are calibrated. See motion sensor calibration section below.

3.6.17 Motion Sensor Settings

The different motion sensors generate motion data used by the control system.



The current sensor values read are shown together with their alarms and settings.

There can be different configuration settings depending upon sensor type and telegram format used. Which setting to be edited is selected by the “Telegram Format” switch.

The data may have to be calibrated before being used. The depth sensor reading an absolute psi pressure and the value has to be converted to depth expressed in meters.

Some sensors are not 100% stable e.g. the altimeter loose sea floor detection and give a zero altitude value as default out. To avoid these incorrect values being used, there is a step filter built into the sensor decode system. The control system will detect that the read value has jumped by a value that is higher than the +- “Spike Limit” and will continue to use the old read value. If the jump value exists for more than the “Spike Delay” time the new read sensor values will be used.

Some sensor data have noise, e.g. depth sensor and altitude sensor. The values can be filtered before being used by the control system. The “Filter” value controls this.

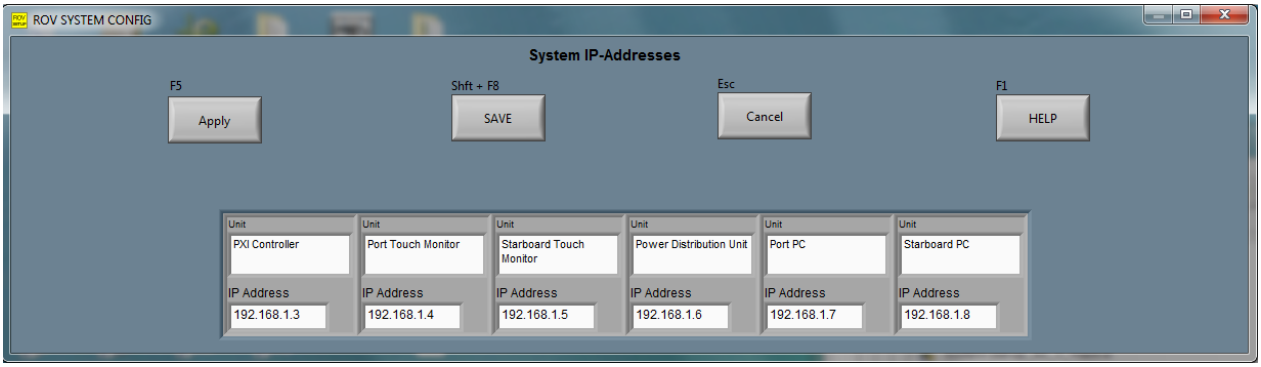
The filter range is 0 to 0,9999…. A high value gives a highly filtered signal, but with a slow response.

Keep in mind that the auto functions do use the motion sensors and any changes made here may alter their performance.

Some Motion sensors have inverted signal output values. To get them right, set the gain to the opposite signature.

3.6.18 System IP Addresses

The control system different building blocks like the touch screens, PDU etc. have static Ethernet IP addresses. To make the system able to connect to these units, their IP addresses have to be known by the PXI system. The IP addresses configured here must not be mixed with the actual ones that have to be configured by other Programs / methods.



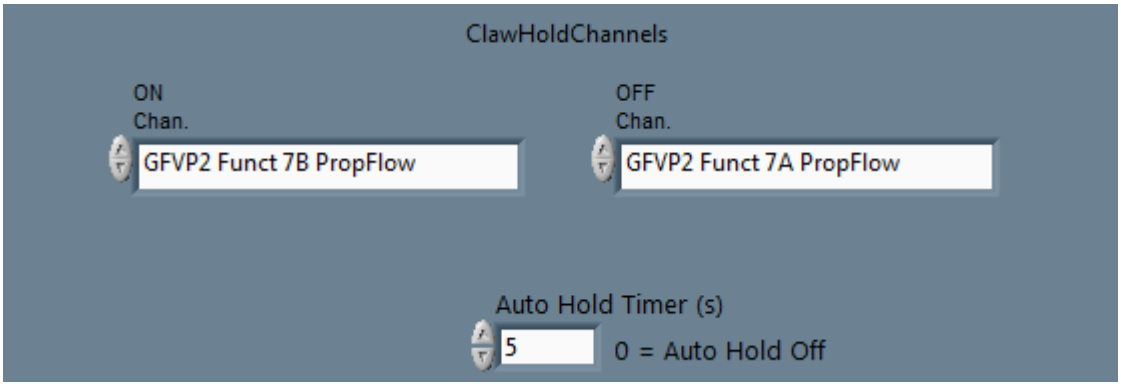
Also, the PXI system must also have an ".ini" file configured which have the IP address used by the PXI system. Again, this must not be mixed with the actual one used. It's there to be broadcasted onto the network so that the ROV system setup program can obtain a link with the PXI system.

The PXI system has to be restarted to be able to use any new IP address settings.

Normally the IP addresses stays within the 192.168.1.xx range.

3.6.19 Claw Hold

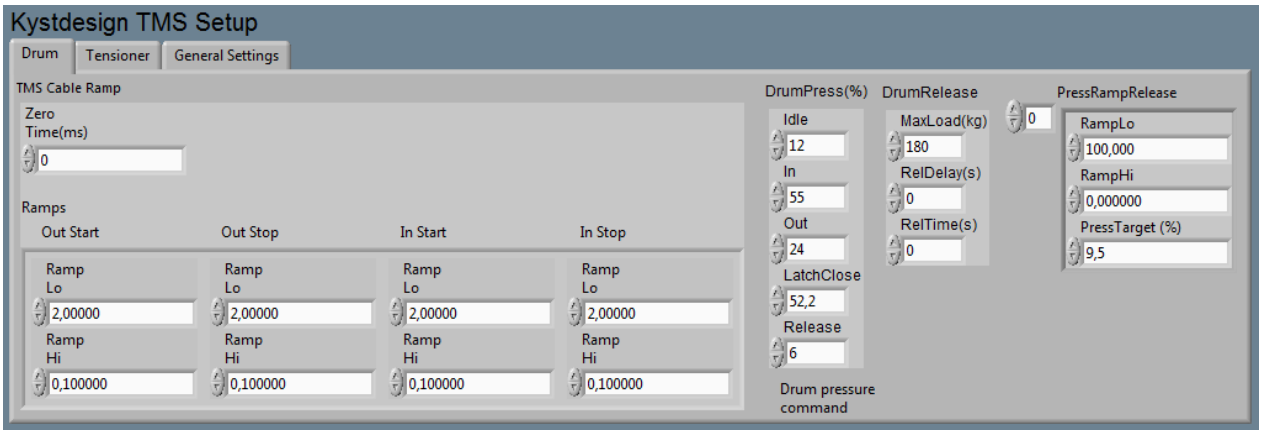
The touch screen "Control" page does have a switch that can make the grabber manipulator keeping a claw hold command.



The valve used by the grabber hold function can be set by the ROV system setup program.

There is also an automatic hold / keep open function activated by holding the open or close command longer than a pre-set time. A short beep from the touch screen reports that the hold function is activated/deactivated.
The function is disabled by simply setting the "Auto Hold Timer" to zero.

3.6.20 TMS Setup



WARNING Only qualified personnel should use this program section. Changes made here may produce fatal system errors.

The Kystdesign TMS setup settings folder has three pages; Drum, Tensioner and General Settings.

Drum:
To protect the TMS mechanical structure and tether a ramp is applied to the drum pay in/out tether command.

Note:
If the drum ramps, but suddenly stops, the valve calibration may not be correct. Adjust drum valve "TMS AO Settings" and make sure that start order is when the valve starts giving flow.

"TMS Cable Ramp":
RampLo and RampHi sets the max allowed drum speed change
The RampLo is a fixed value change for each control loop. The RampHi is multiplied with the current ramped order out to generate a dynamic ramp value. The LoRamp and the HiRamp generated values are then added to set the max order change pr system loop (100mSec)
The above make it possible to make a nonlinear ramp function ("s" shape) or a linear straight line (HiRamp equal to zero).

Zero time is a 0 crossover wait time where the order should stay at 0 before going in the other direction.
Out Start /Stop is when paying out and In Start / Stop is when pulling in tether in.

DrumPress(%):
The drum pressure has a double hydraulic function; to operate the drum (pay in / out) and to release safety (clutch function). The control system sets the drum pressure depending upon system state, paying in, idle, paying out, latch up command (close) and the load cell value during a pay in command. Cable on drum and paid out cable is also used as an input to the system to set the drum working pressure. Hence, a rather complex algorithm is used to make sure that the TMS can pay in or out, but at the same time release safety whenever an unexpected load appears e.g. TMS heave, ROV pulling out cable etc.

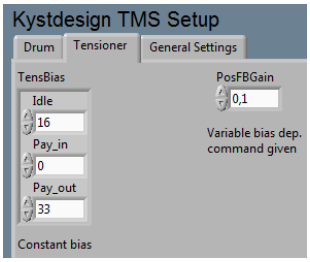
DrumRelease:

Drum release values controls the load release trig level and release timing parameters during a pay in tether operation. MaxLoad(Kg) is pay in load cell release value that will trigger a release. RelDelay(s) determine time before a release is triggered and RelTime(s) the minimum time the system shall stay in the release state after max load before starting to recover the pay in operation.

PressRampRelease:

The PressRampRelease table determine how the control system regains the drum pressure after a tether release state has been triggered.

Tensioner:



The tether tension command change depending upon paying in or out tether. The tensioner is always pulling out.

TensBias:

"Idle" sets the tensioner pressure during no operation and "Pay_in" and "Pay_out" accordingly.

PosFBGain

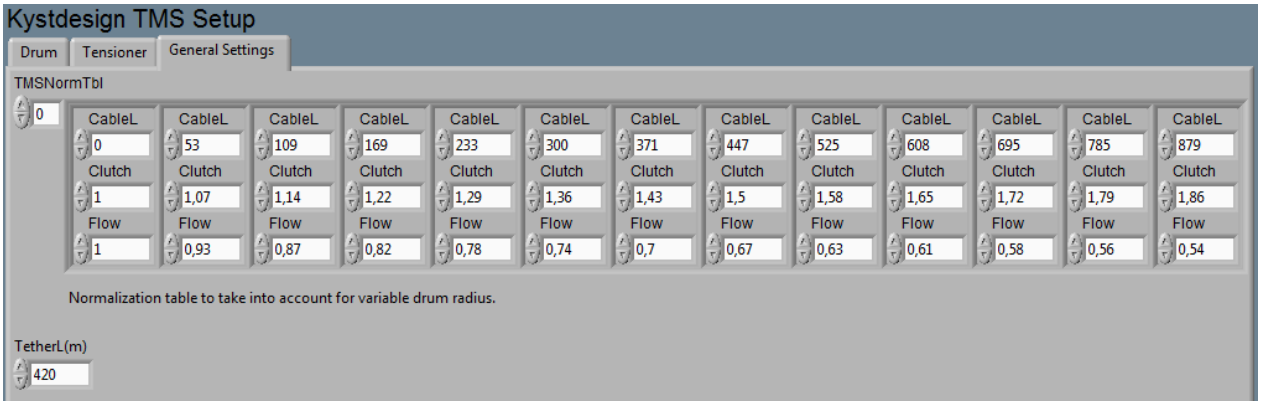
The positive feedback gain adds or subtracts a proportional tension command depending upon the pay-out/in command given. E.g. a PosFBGain equal to 0.1 with a 100% out command will add 10% more tension to the out command.

General Settings:

The control system adjust the flow and drum pressure depending upon type of TMS (KD10/KD20) and cable left on drum. To be able to do this it needs to know the total length of cable installed and the length of cable for each layer on drum.

Note that the tether count calibration is vital.

Tip: Use the tether manufacture's meter markings to calibrate the tether counter.



TMS NormTbl:

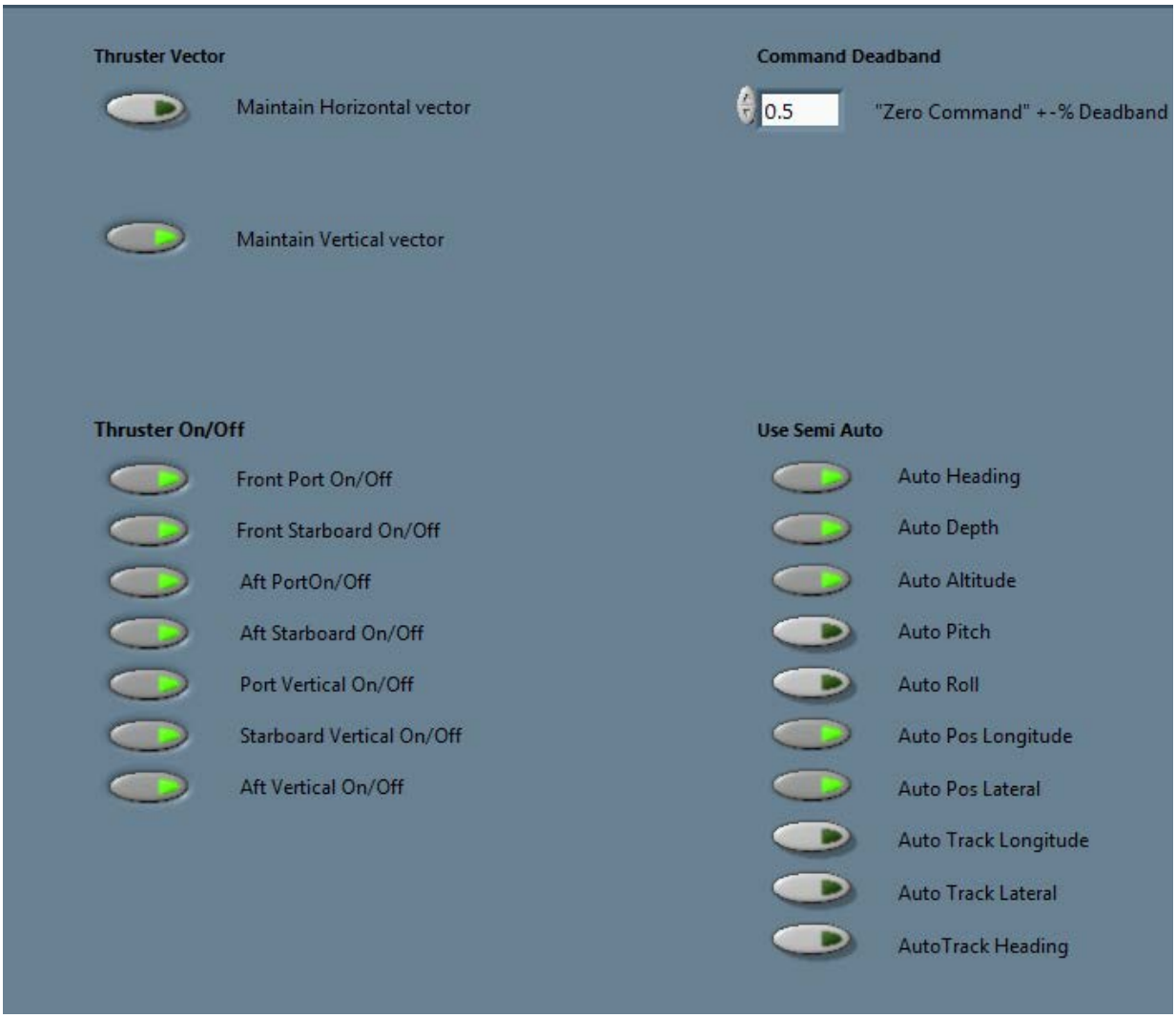
The left column is the inner layer and next for the second layer and so on.

TetherL(m):

The total amount of tether left on drum when the ROV is docked into the TMS latch.

3.6.21 ROV Special settings

There are some special ROV settings like maintaining the command direction, turning off thrusters, command dead band (Supporter ROV) and auto function modes to be used.



The “Maintain Horizontal” and “Maintain Vertical vectors” determine if the system shall maintain joystick/system thruster order direction or not.

If on, any generated thruster order will be limited to max 100% and the other thruster orders will be calibrated down to keep vector direction.

The "Zero Command" +-% Dead band produces a dead band around zero. This function should only be used by ROVs which have pressure regulated thruster valves (e.g. the Supporter ROV).

Since the thrusters need some pressure to start to rotate, the system has a kick function. See Kick and Ramp Program section.

The "Kick" function will "kick" the thrusters as soon there is a command. A zero dead band the system will in auto mode make the thrusters continuously kick. To avoid this, a small dead band is applied.

The "Thruster On/Off" switches disables thrusters.

The "Use Semi Auto" switches selects witch auto mode the different auto functions shall have. If Semi-auto is on, any joystick command while the auto is on, will temporary disable the auto function. Later with no joystick command the system will turn it on again. Any auto generated trims will be remembered.

In standard auto, any joystick command will move the set point without turning the auto function off.

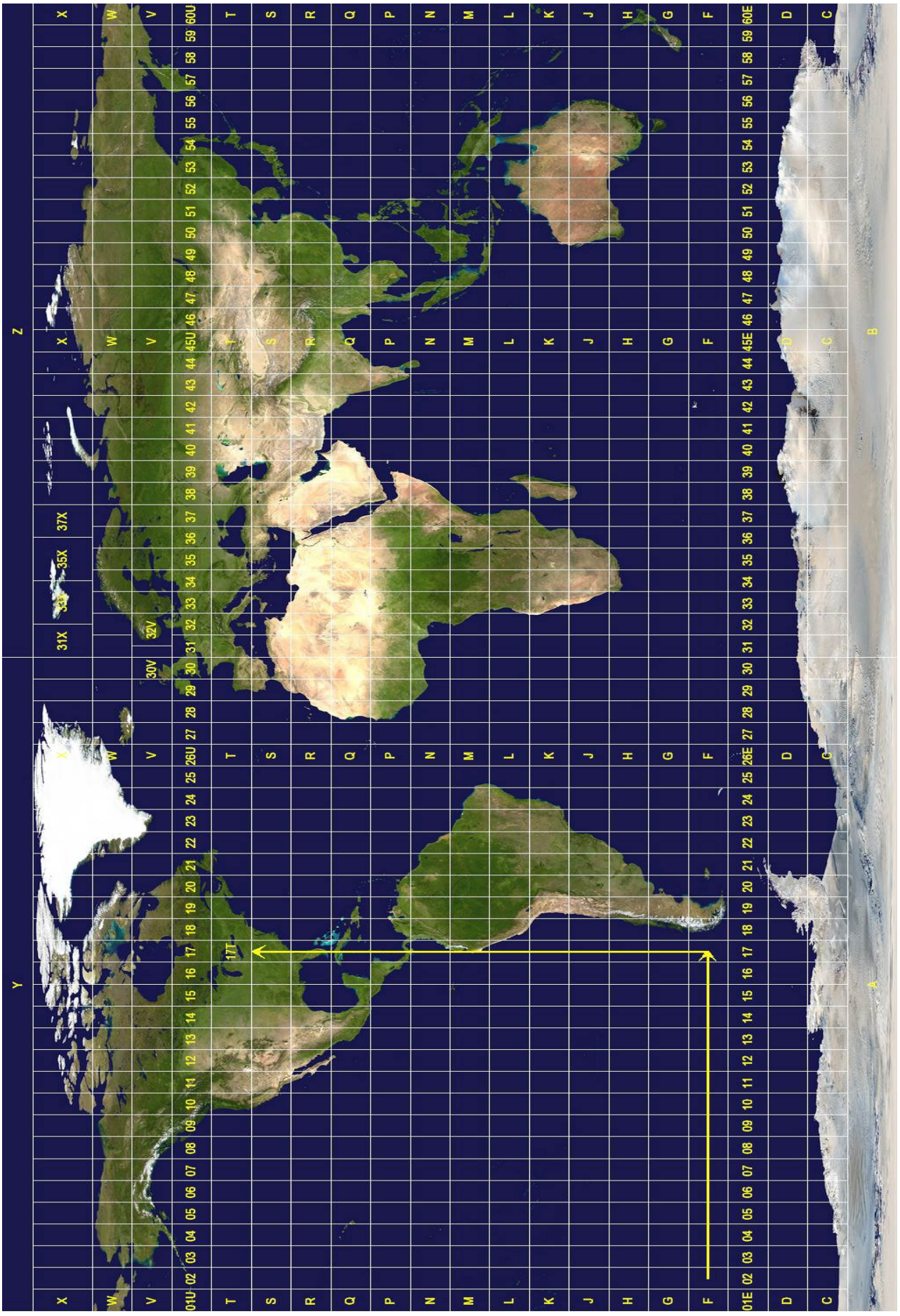
3.6.22 Track Way Points Option

To run ROV AutoPOS and AutoTRACK there are several parameters that have to be set.

GPS position coordinates are given as longitude and lateral position in degrees. This position has to be converted into UTM Easting and Northing values which are in meters.
The conversion methods to be used have to be specified.

3.6.22.1 UTM Coordinate System Theory

The **Universal Transverse Mercator (UTM)** coordinate system is a grid-based method of specifying locations on the surface of the Earth. It is used to identify locations on the earth, but differs from the traditional method of latitude and longitude in several respects.
The UTM system is not a single map projection. The system instead employs a series of sixty zones, each of which is based on a specifically defined secant transverse Mercator projection.
The Universal Transverse Mercator coordinate system is based on an ellipsoidal model of the Earth. The WGS84 ellipsoid standard is normally used as the underlying model of the Earth in the UTM coordinate system.
But, others may be used and has to be specified for the ROV control system. The different navigation systems on board the vessel have to speak the same “language”. If not, the ROV generated position used and shown on the ROV monitor screen, the position drawn on the Nav Screen and any track waypoints given, will not match. In the North Sea the “International 1924” is often used. Check to verify.
The projection of the Earth onto a cylinder is not conformal, and Mercator projections are invariably non-linearly scaled to provide this property. UTM involves non-linear scaling in both Eastings and Northings to ensure the projected map of the ellipsoid is conformal.



UTM zone

The UTM system divides the surface of the Earth between 80° S latitude and 84° N latitude into 60 zones, each 6° of longitude in width and centred over a meridian of longitude. Zones are numbered from 1 to 60. Zone 1 is bounded by longitude 180° to 174° W and is centred on the 177th West meridian. Zone numbering increases in an easterly direction.
The secant projection in each zone creates two standard lines, or lines of true scale, located approximately 180 km on either side of, and approximately parallel to, the central meridian.

Latitude band

Each zone is segmented into 20 latitude bands. Each latitude band is 8 degrees high, and is lettered starting from "C" at 80° S, increasing up the alphabet until "X", omitting the letters "I" and "O" (because of their similarity to the digits one and zero). The last latitude band, "X", is extended an extra 4 degrees, so it ends at 84° N latitude, thus covering the northernmost land on Earth. Latitude bands "A" and "B" do exist, as do bands "Y" and Z". They cover the western and eastern sides of the Antarctic and Arctic regions respectively. A convenient trick to remember is that the letter "N" is the first letter in the northern hemisphere, so any letter coming before "N" in the alphabet is in the southern hemisphere, and any letter "N" or after is in the northern hemisphere.
Latitude band is not required to calculate the ROV position since Northing is the distance from the equator line, See below.

Notation

The combination of a zone and a latitude band defines a grid zone. The zone is always written first, followed by the latitude band. For example, a position in Toronto, Canada, would find itself in zone 17 and latitude band "T", thus the full grid zone reference is "17T". The grid zones serve to delineate irregular UTM zone boundaries.

Exceptions

These grid zones are uniform over the globe, except in two areas. On the southwest coast of Norway, grid zone 32V is extended further west, and grid zone 31V is correspondingly shrunk to cover only open water. Also, in the region around Svalbard, the four grid zones 31X, 33X, 35X, and 37X are extended to cover what would otherwise have been covered by the seven grid zones 31X to 37X. The three grid zones 32X, 34X and 36X are not used.

Locating a position using UTM coordinates

A position on the Earth is referenced in the UTM system by the UTM zone, and the easting and northing coordinate pair. The easting is the projected distance of the position from the central meridian, while the northing is the projected distance of the point from the equator. The point of origin of each UTM zone is the intersection of the equator and the zone's central meridian. In order to avoid dealing with negative numbers, the central meridian of each zone is given a "false easting" value of 500,000 meters. Thus, anything west of the central meridian will have an easting less than 500,000 meters. For example, UTM Eastings range from 167,000 meters to 833,000 meters at the equator (these ranges narrow towards the poles). In the northern hemisphere, positions are measured northward from the equator, which has an initial "northing" value of 0 meters and a maximum "northing" value of approximately 9,328,000 meters at the 84th parallel — the maximum northern extent of the UTM zones. In the southern

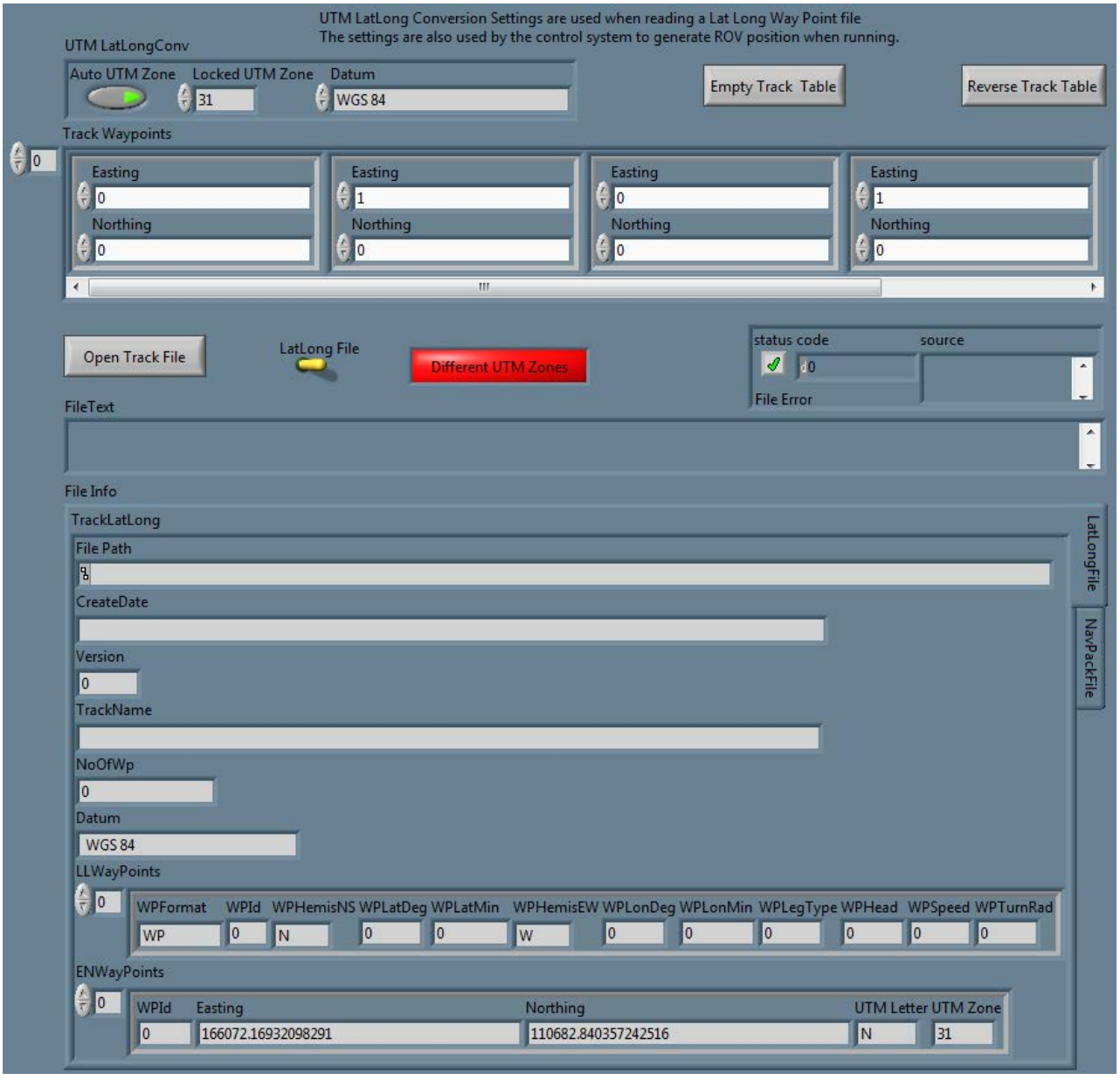
hemisphere, Northings decrease as you go southward from the equator, which is sometimes given a "false northing" of 10,000,000 meters so that no point within the zone has a negative northing value.

Note that the ROV system use negative Northing values when the system is in the southern hemisphere.

Overlapping Grids

It is often convenient or necessary to measure a series of locations on a single grid when some are located in two adjacent zones. When the ROV goes from one UTM zone to an other, it will automatically change over to the new UTM zone. This can be avoided by setting the UTM zone to be fixed, using the ROV setup program. An example where this is necessary is when running an auto track operation that goes from one zone to the next, the Easting Northing values will jump at the zones boundaries.

3.6.22.2 Position and Track settings



UTM Lat Long Conv setting:
As mentioned above the ROV control system needs to know the method to be used when converting from Lateral / Longitude position to an UTM position. Note that these settings are used in real time when reading the Gyro position data **and** when reading a track file where the way points are given as lat long values.

Auto UTM Zone:
If true, the system will automatically select which UTM zone to be used when converting the position data from the gyro and reading Lat/Long way point track files. If set to be false, the zone to be used has to be specified.

Check with the other systems onboard to match their position settings.

Locked UTM Zone:
Specifies the fixed UTM zone to be used if "Auto UTM Zone" is set to be false.

Datum:
Datum specifies which conversion standard to be used.
ROV system available standards:

WGS 84
NAD 83
GRS 80
WGS 72
Australian 1965
Krasovsky 1940
North American 1927
International 1924
Hayford 1909
Clarke 1880
Clarke 1866
Airy 1830
Bessel 1841
Everest 1830

Track Waypoints:
The "Track Waypoints" table contains the current way points. The way points can be set manually or red from a text file, edited and downloaded to the ROV control system.

The "Empty Track Table" switch removes the way points currently stored in the way point table. If downloaded to the ROV system, by pressing the "Save" switch, there will not be any stored track in the system anymore, hence no track indication on the ROV monitor program.

The "Reverse Track Table" switch reverses the way point table so that the first way point to becomes the last one and vice versa. This is useful when running the track backwards.

To remove track points, edit the text files and load them again or right click when pointing on a waypoint and select "Delete Element".

Track Files:
The system can read two types of text files. The "Open Track File" switch will open a file dialog to open a track file. The "LatLong File" switch has to be set prior to specify type of file to be opened.

Exported from NaviPac:

The NaviPac program can export track text files which can be read by the ROV setup program. Remember to use the correct conversion standard and UTM zone settings in the NaviPac program when exporting the file.
The NaviPac program exports an Easting Northing file, hence no Lat/Long to UTM conversion has to be performed when loading the file.

```
# 09.11.2008 09:56:40
""; 64; 0.0000; "Meter"
630543.410; 6579654.370; 630538.810; 6579654.040; 0.00000000; 0.00461182; 0.0000; 1; 64
630538.810; 6579654.040; 630534.540; 6579653.710; 0.00461182; 0.00889455; 0.0000; 1; 64
630534.540; 6579653.710; 630526.340; 6579652.730; 0.00889455; 0.01715290; 0.0000; 1; 64
630526.340; 6579652.730; 630519.780; 6579652.070; 0.01715290; 0.02374601; 0.0000; 1; 64
```

Lat/Long track way point file format:

There is also a way point track file format that specifies the points as Lat / Long values. These values have to be converted into Easting /Northing values before they can be used by the ROV.

```
CreateDate,Wednesday.July18.2007-21:27
Version,4
TrackName,GKA
NoOfWp,287
Datum,WGS84
WPFormat,WPId,WPHemisNS,WPLatDeg,WPLatMin,WPHemisEW,WPLonDeg,WPLonMin,WPLegType,WPHead,WPSpeed,WPTurnRad
WP,1,N,57,43.06132,E,0,45.32943,0,  0.000, 0.0000,    0.00
WP,2,N,57,42.96960,E,0,45.43528,0,  0.000, 0.0000,    0.00
WP,3,N,57,42.87788,E,0,45.54213,0,  0.000, 0.0000,    0.00
WP,4,N,57,42.78670,E,0,45.64798,0,  0.000, 0.0000,    0.00
WP,5,N,57,42.69498,E,0,45.75381,0,  0.000, 0.0000,    0.00
END
```

The “LatLong File” switch has to be ON to be able to read a lat long waypoint file.
If the file data goes from one UTM zone to another, a red indicator will be lit indicating “Different UTM Zones”. If the system is set to have a fixed UTM zone, the data generated will be in this UTM zone, hence no problem.

File Reading Errors
There will be an error indication if the file reading operation has failed. This can be due to text errors or wrong type of file has been selected. Remember to use the “LatLong File” switch to specify which type of file to be read.

File Text
The file text window contains the read file text.

File Info
The “File Info” folders show the data decoded from the track files. Note that it’s only the “Track Waypoints” table that is finally used by the system. The rest is for information only.

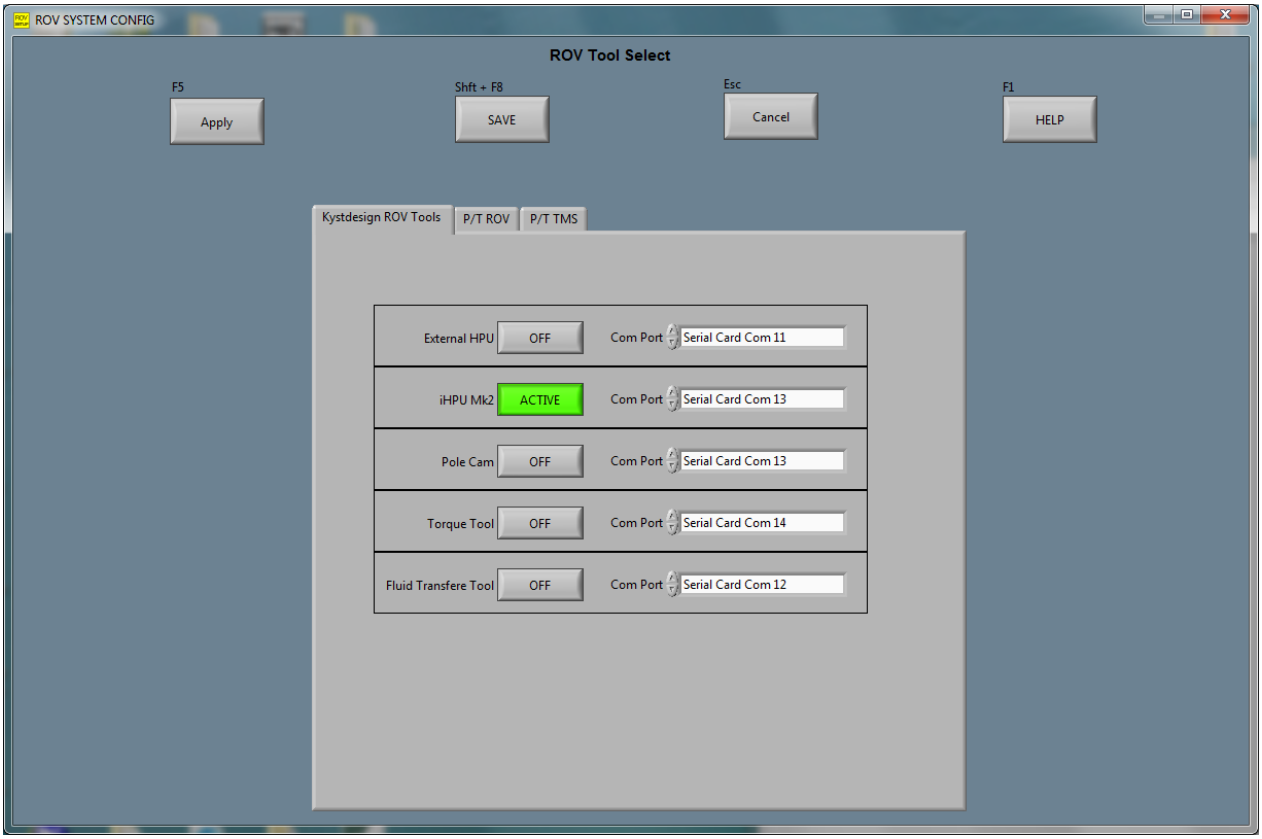
3.6.23 ROV Tool Select

In this page, the operator can activate different tool systems on the ROV, and electrical pan/tilt units.

3.6.23.1 ROV Tools

The number of tools available may grow, as Kystdesign develops new integrated tools for the ROVs.

Only one tool can be activated at a time. Once activated, a special tool page will be made available in the touch-screen for the operator to operate the tool.



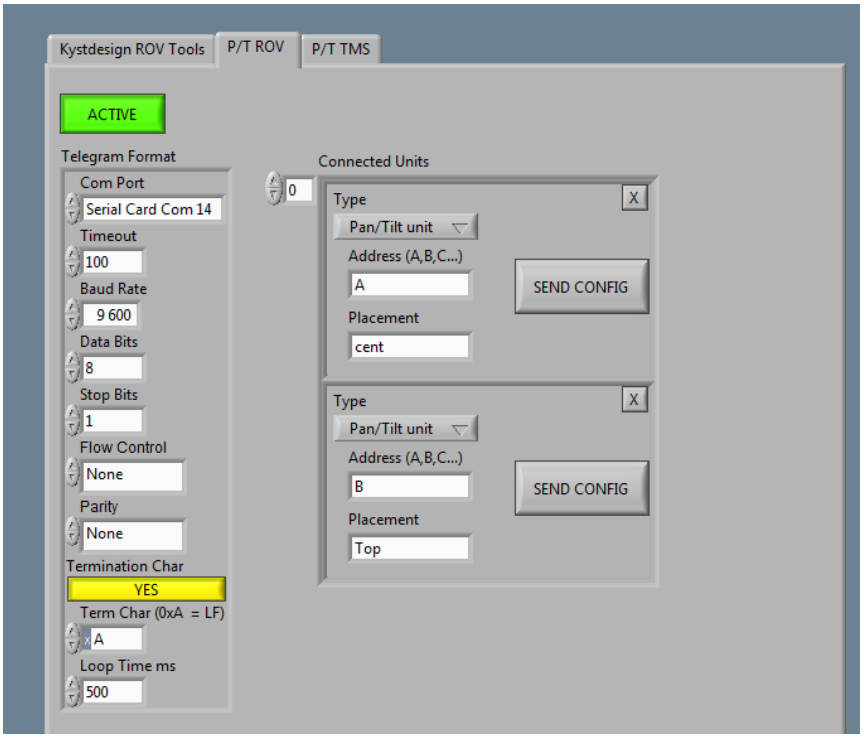
Make sure that the selected com port is connected to the selected tool (hardware).

When a tool is activated, it is important to check the tool calibration settings. The tool may have to be recalibrated to operate correctly.

Important:
Restart the PXI after adding or removing ROV Tools.

3.6.23.2 Electrical Pan & Tilts

The ROV and the TMS can have electrical Pan & Tilts installed.



The system supports Actuade & Sidus P&T units, which by default have telegram-settings 9600baud, 8data bits, 1stop bit, no flow control, no parity and at least 100ms timeout.

Add units by typing in empty clusters inside the “Connected Units” table or remove units using the “x” switch. You can have many units connected even though the table only shows two at a time. Use “Connected Units” table index number to see the other unit clusters not shown.

Select type: Pan, Tilt or Pan & Tilt

Unit address: A, B, C …

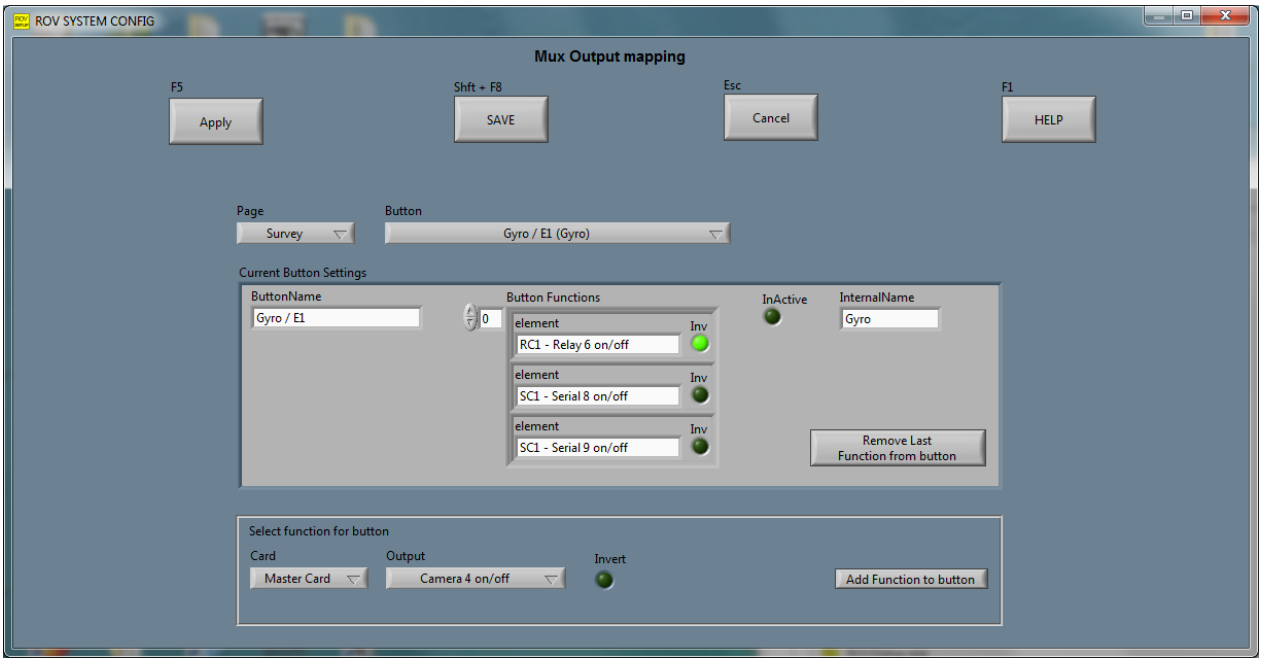
The placement field describes where it is mounted on the ROV and as index name in the joystick mappings.

After installation or replacement of P/T, it might need to be reconfigured. Make sure that only one unit (the new or replaced) is powered. Press the “send config” button for that unit, and a set of commands will be sent to the P/T. When the command finishes, the touch panel replies a short beep.

Important:
Restart the PXI after adding or removing units.

3.6.24 Mux Output Mapping

Use the Mux output mapping to select which relays/video channels/serial channels to be activated when buttons on the touch screen is pressed. One button can activate many functions; the list will grow as you add functions to it.



The mappings apply to two different touch screen pages; the camera-page and the survey sensor page. Select which page to make mappings to by the "page" drop-down-list.

Then select which button to make mappings to by selecting from the "button" drop-down-list.

You can change the name of the button by altering the “ButtonName” field. But, please do not change the connector identification after the slash (/) as it is helpful to know what connector the current sensor is connected to.

The non-changeable “InternalName” field is for internal use. It’s the touchscreen switch address name.

To remove functions from the functions table, press the "Remove Last Function from button" or the “x” in the right corner in the element-box.

If the touch screen button is no longer in use, press the "InActive" LED indicator.

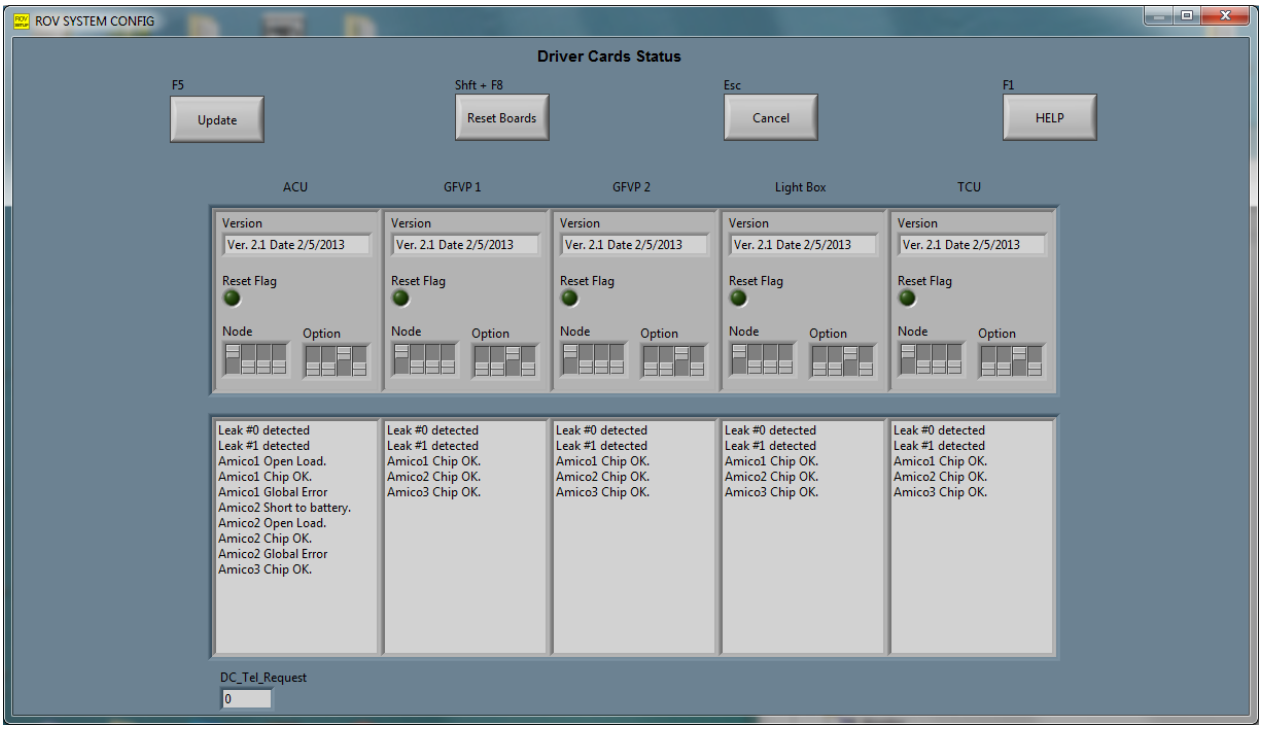
To add a function to the table, use the "Select function for button" field.
Select which card to select sub-functions from, and then select a sub function.
The Invert indicator should be selected if it is a "normally closed" function you are adding.

Press "Add Function to button" and the function you selected will be added to the "button functions" table above.

When all functions related to the activation of the button is set. Press the apply or save button.

3.6.25 Driver Card Status

The driver cards have built-in diagnostics. This might be helpful when conducting fault-finding.



The driver card version number will be helpful for Kystdesign personnel to know, as the problem might be solved in a newer driver card firm-ware.

The reset flag indicates that there has been a power dropout, and the board might not have booted correctly.

The "Node" and "Option" shows the dip-switch settings of the driver card.

The table at the lower part of the screen will give information from the driver card status registers.

"Amico" is the name of a chip that each driver card has 3 off installed. The first "Amico1", controls and monitors the first 8 PWM outputs, 0-7, and reports problems related to these. Amico2 controls and monitors the PWM 8-15 and Amico3 controls and monitors the PWM 16-23 outputs.

The following codes can be shown:
"Short to battery", PWM output is connected to supply.

"Open load", the PWM output is activated, but there is no load (valve) connected.

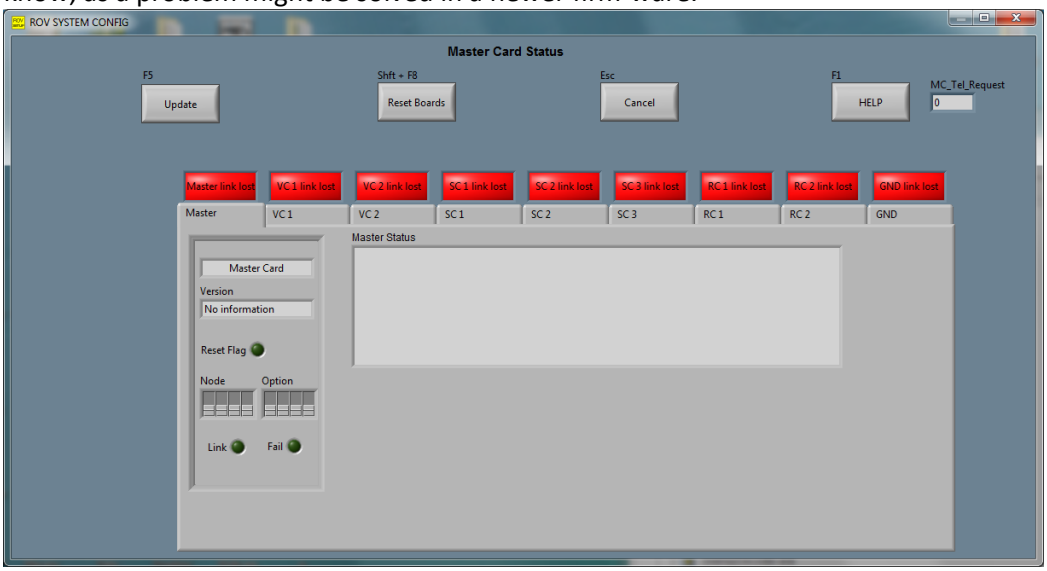
"Overload", the PWM is either shorted or a too heavy load is connected to it.

"Temperature warning", appears before overload.

“Overload” will make the card turn off the output to protect the card. The problem must be fixed and the card must be reset for the output to function and remove the error message.

3.6.26 Master Card Status

All the cards installed in the Mux subsea, are controlled and monitored by the "Master Card". As with the driver cards, the cards in the mux also have built-in diagnostics. This might be helpful when conducting fault-finding. The version number of the card will be helpful for Kystdesign personnel to know, as a problem might be solved in a newer firm-ware.



An indicator above each tab shows which cards the master has detected during its boot sequence. If a red indicator is shown in a position where the master should have detected a card, check that position in the POD.

The reset flag indicates that there has been a power dropout, and the board might not have booted correctly. Note that the master card will always have the reset flag set.

The "Node" and "Option" shows the dip-switch settings of the cards (set by the back-plane).
Tables or fields in the different tabs will show input/output states.
As with the driver cards, the mux cards also have "Amico" chips installed. The number of chips might vary.

The following codes can be shown :
Video cards and Master –

"Over Current", an output is drawing too much current.
"Open load", the output is activated, but there is no load connected
"Temperature warning", appears before overload.
"Temperature shutdown", a heavy load has made the chip turn off all outputs.

Relay cards –

"Shorted to ground", a relay coil might be burned out or shorted.
"Open load", a relay coil might be burned out or missing (not connected).
"Overload", a relay coil is drawing too much current

Any of the above will make the card turn off the output to protect the card. The problem must be fixed and the card must be reset for the output to function and remove the error message.

Serial cards –

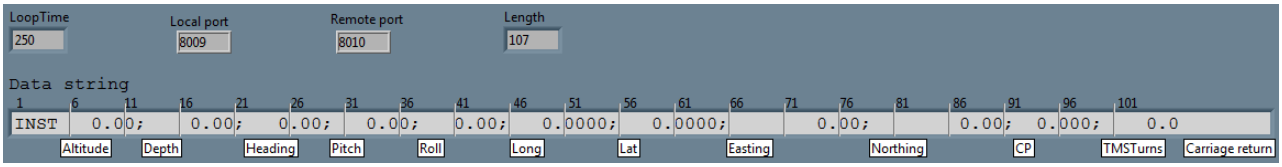
Only indicates which channels are activated, and traffic in/out of the ports.

3.7 Video Overlay String

The PXI system is broadcasting an Ethernet UDP telegram containing video overlay data.

The telegram is sent 4 times a second and it contains the PXI calibrated data like altitude, depth, heading, pitch and roll values.

The telegram is sent to remote UDP port 8010, and any video overlay program that is capable of reading UDP telegrams has to use this UDP port to be able to decode the telegram.



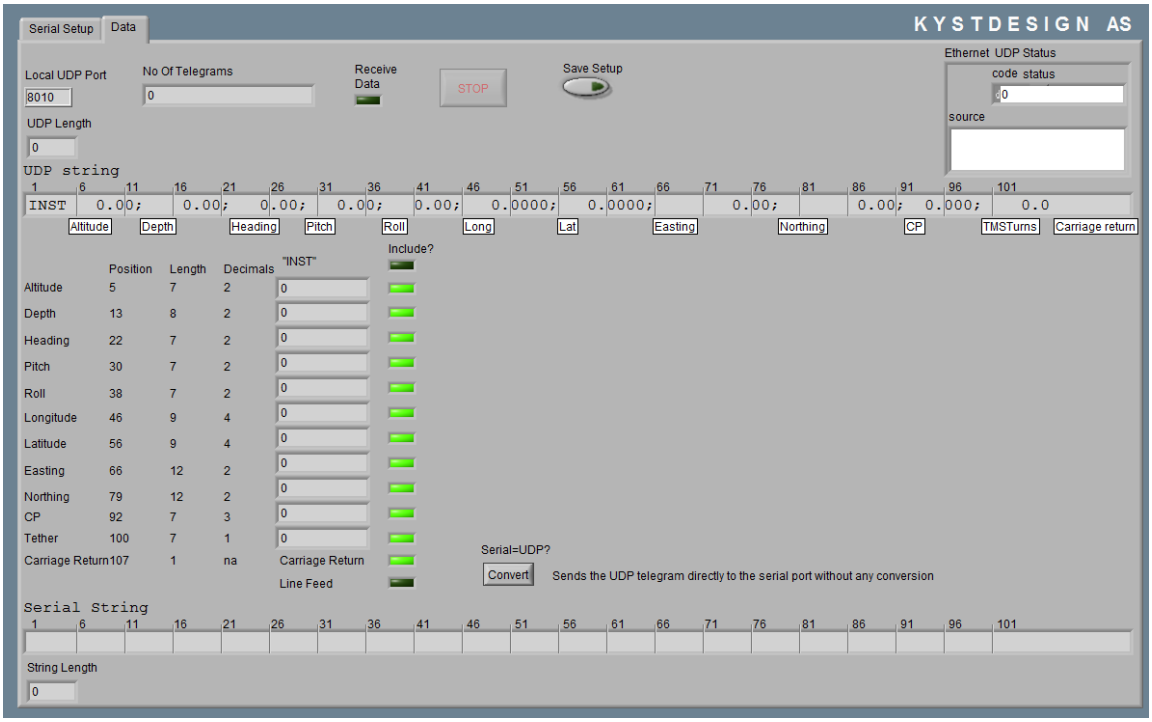
107 char length including the carriage return character
The values have fixed locations and padded with spaces on the left side. See above.
The numbers are separated by a semicolon character.

INST	Telegram heading 4 characters	1-4
Altitude	4 significant and 2 decimals	5-11
Depth	5 significant and 2 decimals	13-20
Heading	4 significant and 2 decimals	22-28
Pitch	4 significant and 2 decimals	30-36
Roll	4 significant and 2 decimals	38-44
Longitude	4 significant and 4 decimals	46-54
Latitude	4 significant and 4 decimals	56-64
Easting	9 significant and 2 decimals	66-77
Northing	9 significant and 2 decimals	79-90
Current Probe	3 significant and 3 decimals	92-98
TMS Turns	5 significant and 1 decimal	100-106
Carriage return	1 character	107

Note:
Older program versions may have a different output string which did not take care of negative large values. Though in practice this did not have any influence to the end result.

The significant characters include the negative - sign character.

A remote serial server, working as an Ethernet to serial UDP decoder, listen on UDP port 8010, can be used to convert the UDP Ethernet overlay broadcast telegram over to a serial telegram. Several converters can be installed, but they must all have separate dedicated IP addresses, different from all other units in the system.



Another option is to run the “Video Overlay Decoder” software, normally installed onto the pilot & sonar PCs. The program does the same as above serial server, but the program enables the operator to select which data to be included in the serial telegram.

When the program starts, it reads a setup file that has the telegram conversion setup, and serial port settings.

The program reads the UDP Ethernet telegram and decodes it. Data to be included in the serial string are selected by the “Include?” LED switches. The UDP telegram does not have “Line Feed”, but this can also be added using the above program.

The conversion setup can be stored using the “Save Setup” switch.

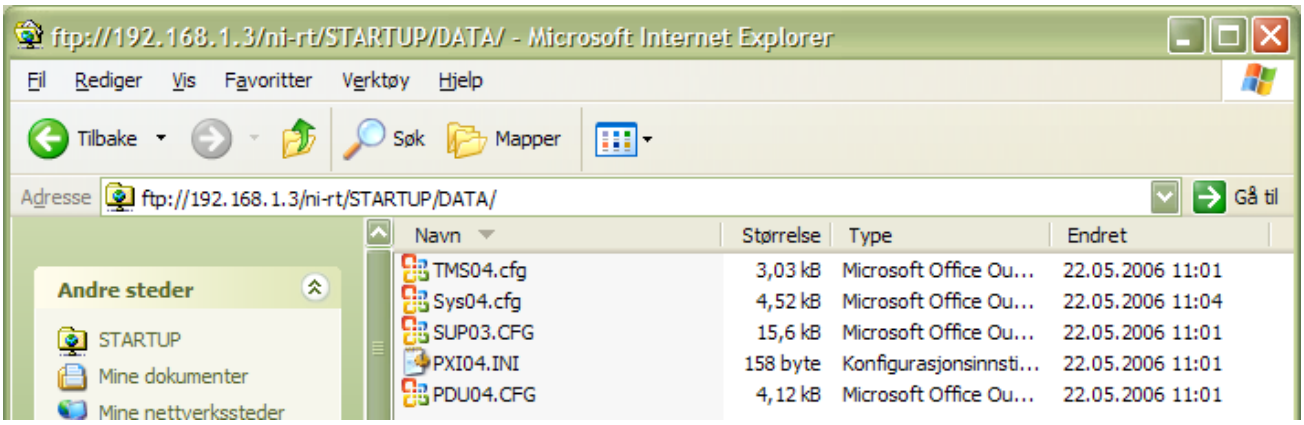
3.8 PXI Configuration files

The PXI controller has an “ftp” server that can be used. This means that it possible to use the Windows Internet Explorer or the standard Windows File Explorer to explore the PXI hard disk.

WARNING

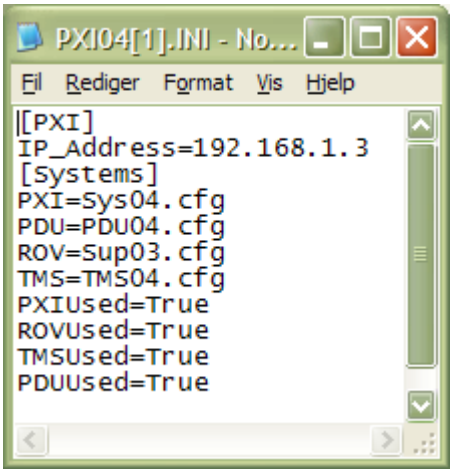
Only qualified personnel should use the ftp server.
Changes made may produce system errors.

The ftp server can be used to make backups of configuration files. Copy the files and store them on a pilot PC or CD. When needed, the fies can be moved back to the PXI to reinstall the backup made.



There is a configuration file for each subsystem like the Supporter 3 (SUP03.cfg), container (Sys04) etc. The configuration files contain all settings made for each subsystem. Note that there are some parameters which are linked between configuration files.

The ”ini” file links the different configuration files together and are read at start-up to decide which configuration files the system shall read.



To edit the ini file it has fist to be copied to a PC, edited and moved back to the PXI system. If not, an unreadable ini file can be produced.

The system will search in alphabetic order for the ini file on start-up. The first one found will be used.

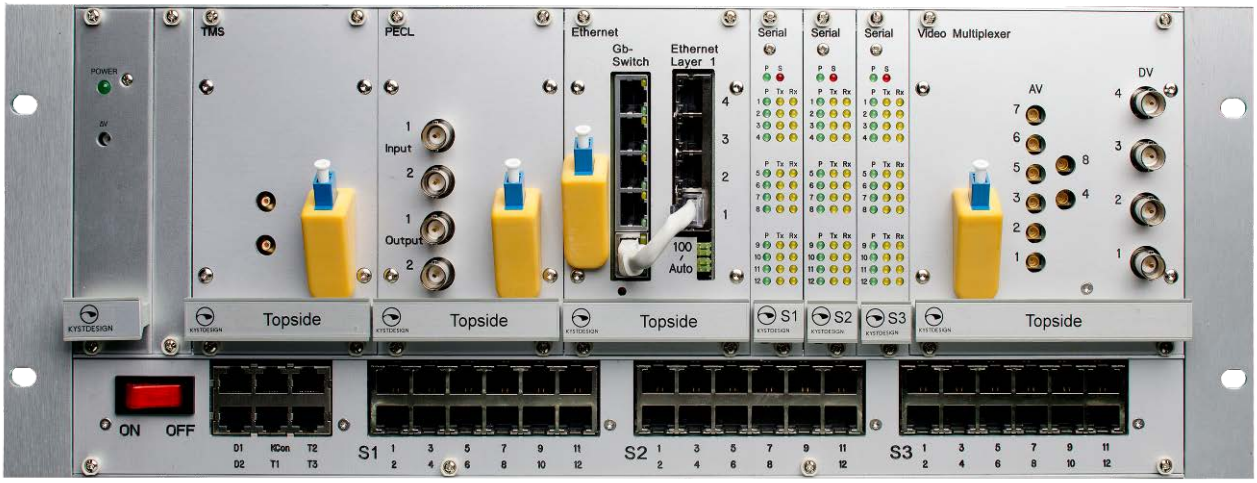
As mention earlier, the IP address given here must not be mixed with the actual IP address used. The PXI system IP address must first be set by the “MAX” program supplied by National Instruments and then the same IP address has be in the ini file as well, this to make it possible for the ROV Setup program to link to the PXI.

xxxUsed etc. ini file section makes it possible to disable subsystems, like running the system without the TMS.

4 Topside HW Units

4.1 KD Con Fibre Optics

The topside fibre optic rack is a 4U rack with backplane to accommodate several different ROV setups. It can hold 7 different modules/cards such as Video Multiplexer, Serial card, Ethernet module, PECL module, TMS module and more.
As a minimum the rack is set up with one Serial card and one Video Multiplexer.



In the lower part of the rack, there are four sets of RJ45 contacts. The left most (6 ports) are for diagnostics (D1 and D2), TMS (T1-T3) and KD control (Future use). The next 3 sets (12 RJ45 each) are connected to the corresponding Serial card in the rack (S1, S2, S3).
LEDs in the front panel of the Serial cards indicate traffic on the serial ports (RJ45) and are useful for fault finding/diagnostics. The pin out of the RJ45 is: pin4 – ref, pin5 – up, pin6 – down.
Some ports are reserved for ROV control, and some are pre-defined:

S1 port 1	Main link (ROV multiplexer)
S1 port 2	TCU link
S1 port 3	ACU link
S1 port 4	GFVP 1 link
S1 port 5	GFVP 2 link
S1 port 6	Light Box link
S1 port 7	Skid Connector (in light box)
S1 port 8	Gyro Repeater (default, can be changed)
S1 port 9	Gyro port A (default, can be changed)
S1 port 10	Gyro port B (default, can be changed)
S1 port 11	Gyro Puls A (default, can be changed)
S2 port 4	Pan & Tilt 1 (default, can be changed)
S2 port 5	Pan & Tilt 2 (default, can be changed)
S2 port 6	Depth sensor (default, can be changed)
S2 port 7	Altimeter (default, can be changed)
S2 port 8	Sonar (default, can be changed)
S2 port 9	Responder (default, can be changed)
S2 port 12	T4 Manip. (default, can be changed)

All fibres are connected through the front, using LC connectors, single mode only. Always clean the LC connector before mating.

4.1.1 Video Multiplexer

The Video Multiplexer module has 6 analogue video channels and optional 4 digital video (HD-SDI). It has a built in CWDM with the following wavelengths (red-band):

1471	RX – From ROV
1491	TX – To ROV
1511	RX - HD video 1 (option)
1531	RX - HD video 2 (option)
1551	RX - HD video 3 (option)
1571	RX - HD video 4 (option)
1591	Spare
1611	Spare

The analogue video channels have MCX connectors, and the DV channels have BNC.

4.1.2 Ethernet module (optional)

The Ethernet module has 4 independent 1gb/auto selectable ports (layer 1), and a 5 port switch. Any of the four layer 1 ports can be connected to the switch to provide more available Ethernet ports. It has a built in CWDM with the following wavelengths (red-band), and applies only to the layer 1 ports.

1471	RX – From ROV port 1
1491	TX – To ROV port 1
1511	RX – From ROV port 2
1531	TX – To ROV port 2
1551	RX – From ROV port 3
1571	TX – To ROV port 3
1591	RX – From ROV port 4
1611	TX – To ROV port 4

4.1.3 TMS module

The intelligent Kystdesign TMS topside fibre mux module has built in fibre diagnostic which is polled on the same serial link as the subsea driver card and subsea fibre mux. Hence, the control system has complete control of the TMS and the fibre link diagnostics.
The module has 6 piggyback configurable serial ports and 2 video channels, Pal or HD. The first 3 serial ports are T1 - T3 positioned in front of rack. T4 - T6 are positioned in front of module. Video is handled by a removable Pal or HD video SFP with two Din 1.0/2.3 type connectors. The module has a built-in 4-ch CWDM; 1470/1490/1510 & 1530nm. See TMS manual for more details.
Serial ports are typically mapped:

T1	TMS link
T2	TMS Pan & Tilt
T3 –T6	Spare

4.1.4 PECL module (optional)

The PECL module has a built-in CWDM (red band), 1471 and 1491 used. See PECL manual for operational information.

4.2 MultiViewer System

4.2.1 MultiView System General

A Kaleido X-16-D MultiView (MV) system generates a multi-video screen onto two 46`` LCD monitors, left and right ROV pilot screens. Different screen layouts can be loaded independently to fit current operation mode. The MV system has 16 inputs which can take both Pal and HD-SDI video. (3G-SDI is a MV system SW option.) See “Video Distribution” drawing “-6021E01” to get a video system overview.

The MV system has two MV outputs, one for each pilot. The video screen layouts can be loaded simply using a MV mouse and select a wanted layout through a “right click” menu.

The MV “right click menu” can also temporally change which camera a screen monitors.

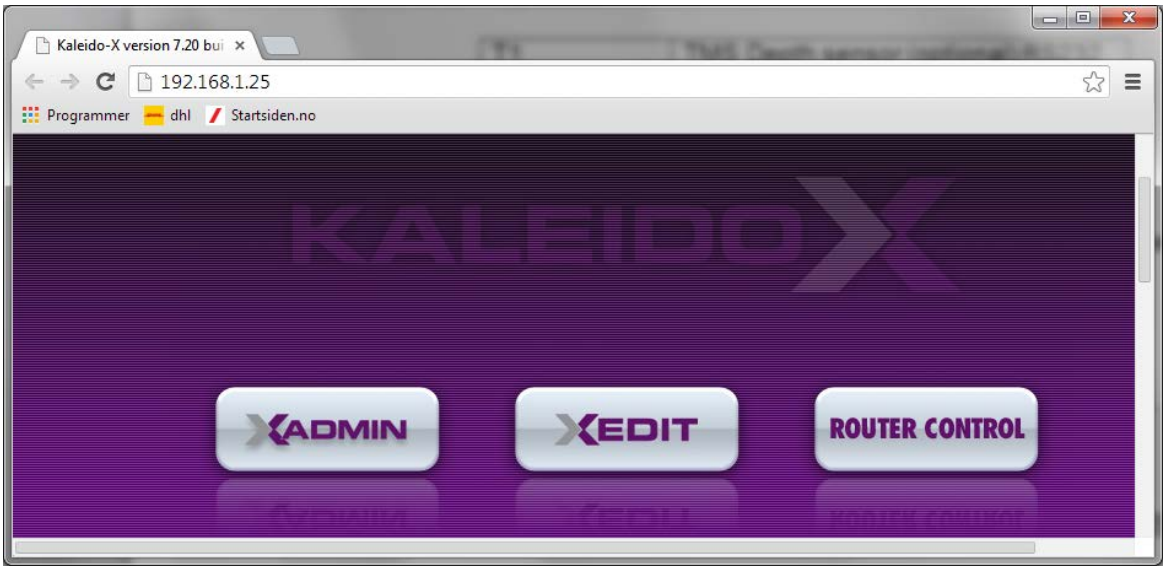
To make one off video screen to cover the complete MV screen, simply double click the video screen wanted. Click again and the system goes back to a multi layout.

The MV system has an optional 16:2 **HD** router built into it. To route a HD signal, simply use the mouse right click menu and right click a screen that monitors the HD video signal and send it to the router output one or two.

OBS!
The MV router does not handle Pal video signals, only HD. To route a Pal video signal, first select the wanted Pal video camera using the analog 16:16 switch “SL-V1616”, and convert the signal to HD using a Pal to HD converter. See “Video Distribution” drawing “-6021E01” for more details.

4.2.2 MultiView Setup

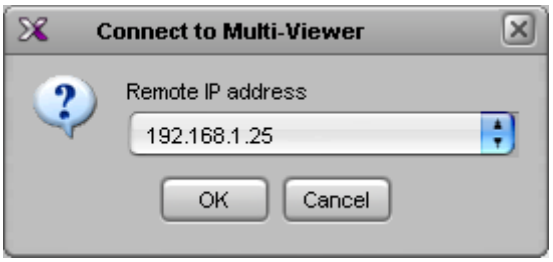
The layouts are designed and modified using Java, through the “XEdit” program. (Shortcut on sonar PC)
To start XEdit, start Windows Explorer and type 192.168.1.25, the MultiViewer IP address. The below window will open.



Press “XEdit” to open the MultiView setup program.

Make sure you connect the XEdit program to the MultiViewer before any changes are made.

Select main menu option “Configure”, and then “Connect…”



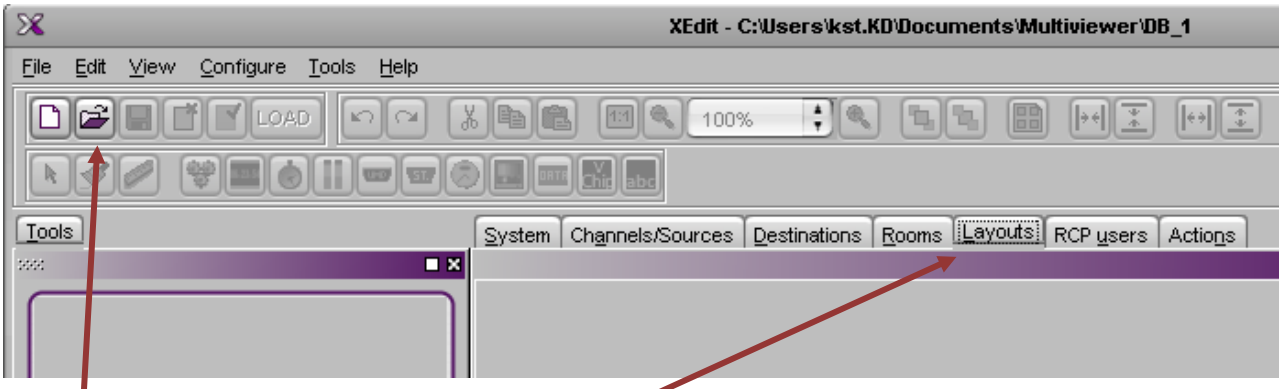
This will open a new dialog window. Press “OK”

The above procedure makes sure that any changes made are done to the actual MultiViewer database and not to a local copy of the database stored on the PC running the XEdit program.

See Service Bulletin about Database “17d” included in the Data Sheet section for more database details.

To be able to load independent layouts for the left and the right pilot, the MV system operates with two “Rooms”; “Room 1” and “Room 2” Each “Room” has a separate set of layouts. Hence, when new layouts are made or layout changes are done to existing layouts, it has to be performed to both “Rooms” layouts to make them available for both pilots. Easiest way to achieve this is to do one “Room” first and then simply copy the new/modified layout to the other “Room”.

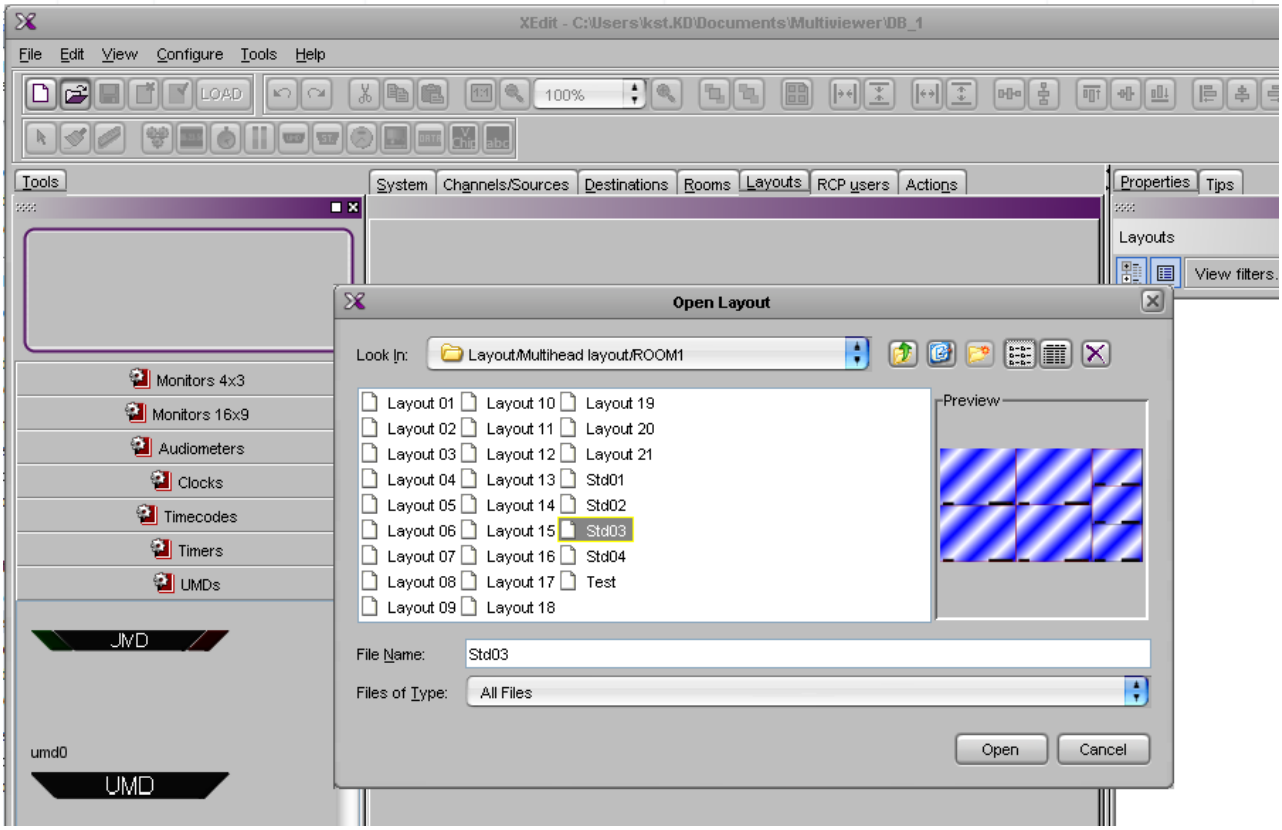
To edit a layout first select the “Layout” folder and then open a layout



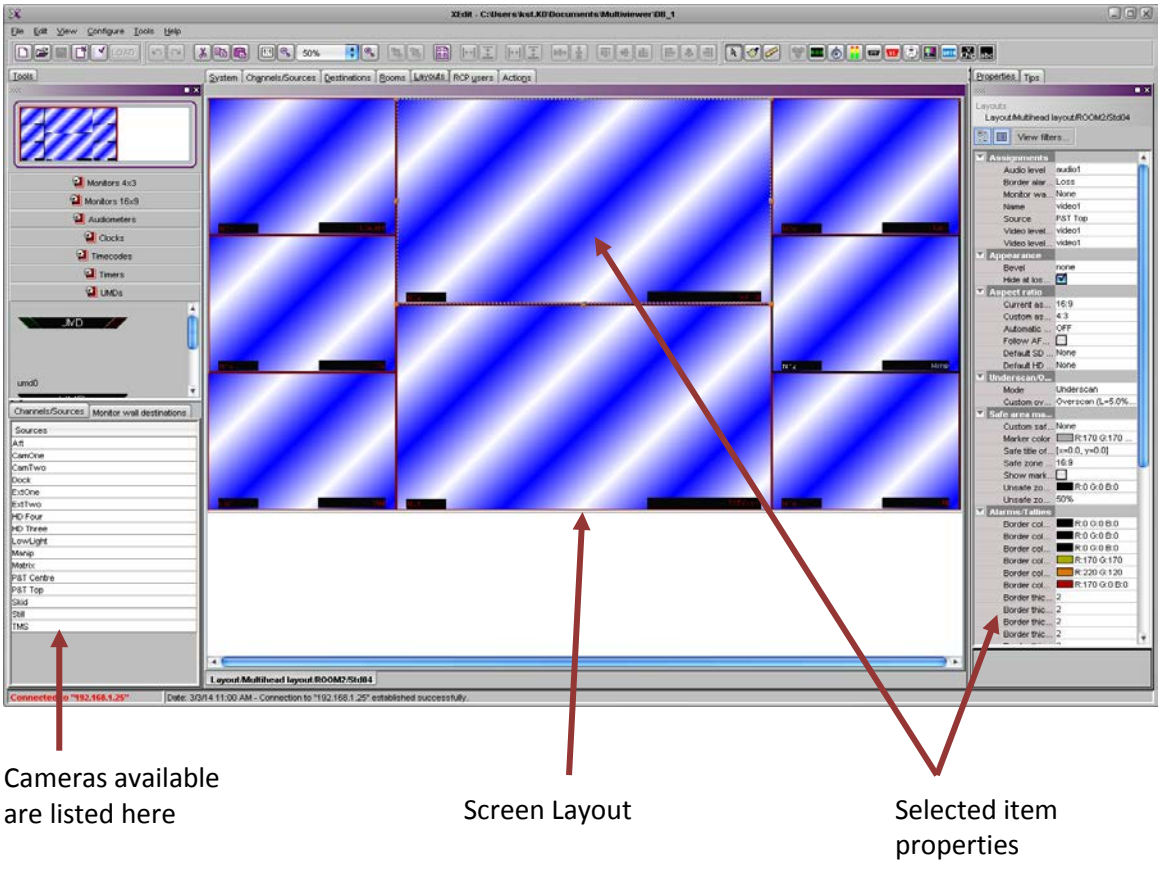
First “Click” here

Then open layout here

Select “MultiHead” layout folder and then Room1 (or Room2) See below.



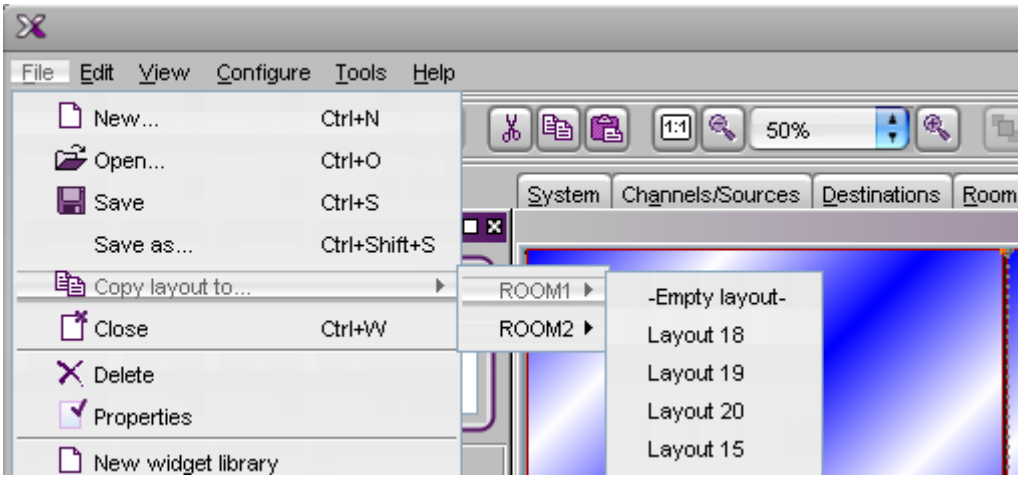
A list of current layouts for this “Room” are shown. Select the one to edit.



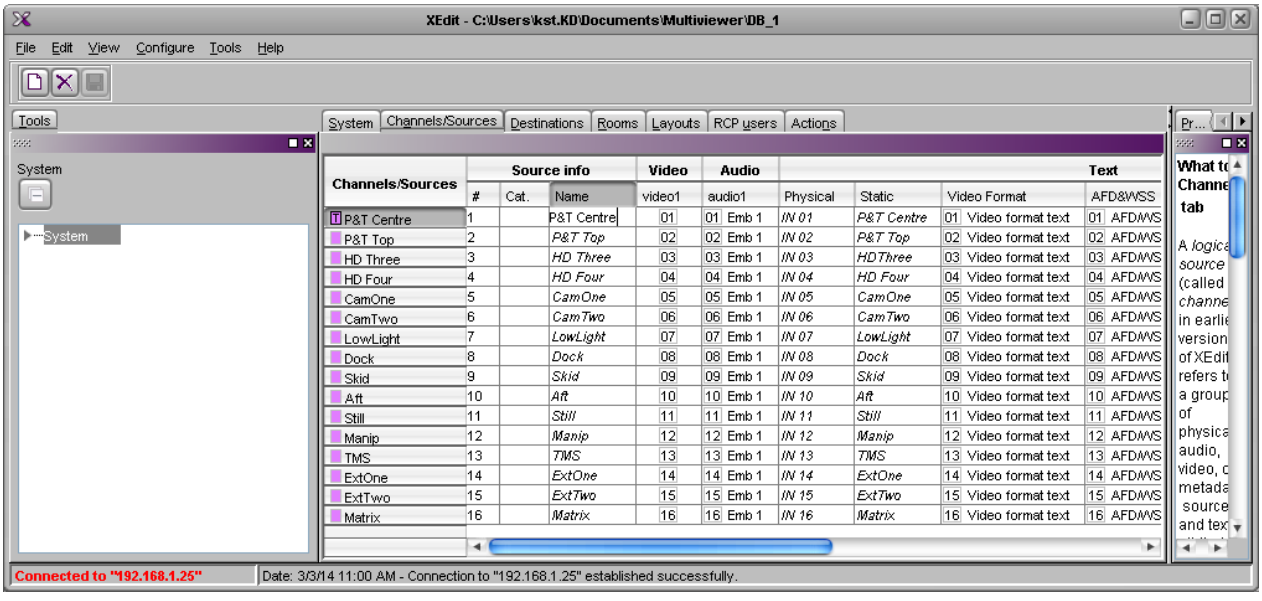
To change a screen camera source, simply drag and drop from the camera list to the screen wanted.

To edit e.g. a screen properties, select the screen and its properties are shown on the right column. You may have to double click to get to the item wanted.

To copy a layout to the other room, press file and then “Copy layout to…”



To edit camera names, select the “Channel/Sources” folder



Tip:
Right click the “Physical” coloum and select “sort” to sort the rows.

After editing the camera names, press the “Save” to store the new names to the MV system

For more detail information about the Multi View system, see attached manuals in the «6. Data Sheet section, item 17a, -b, -c & -d.

5 Drawings

Name	Drawing Type	Drawing No.
Pilot Chair	Assembly	-6015M01
Pilot Chair Right Armrest	Wiring	-6015E01
Pilot Chair Left Armrest	Wiring	-6015E02
Pilot Chair – Clear Com	Wiring	-6015E03
Surface Control Consoles	General Arrangement	-6120M01
Video Distribution	Wiring	-6021E01
UPS Power Distribution	Wiring	-6021E05
Ethernet Routing	Wiring	-6021E10
Clear Com	Wiring	-6021E15
Keyboard, Mouse & VGA Routing	Wiring	-6021E20
Serial Signal Routing	Wiring	-1050E05

6 Data Sheets

Tag	Description	Type	Supplier
1	PXI CPU	PXI-8108	National Instruments
2	Multifunction I/O	PXI-6025E	National Instruments
3	16 Ch RS232 Serial card	PXI-8430\16	National Instruments
4	Connector Block	SCB-100	National Instruments
5	PXI Rack Unit	PXI-1031	National Instruments
6	KD-Con Fibre System		Kystdesign AS
7a	Touch Screen, Transferring Data	Pro-face GP4401T	Digital Electronics Corp.
7b	Touch Screen, Data Sheet	Pro-face GP4401T	Digital Electronics Corp.
7c	Touch Screen, Hardware Manual (Soft only)	Pro-face GP4401T	Digital Electronics Corp.
8	Tracker ball	DS509174	Esterline
9	3F Joystick	HFX-44S12-034	CH-Products
10	Grabber Joystick	CSO 72 VR 1.1 UGN 1234 6L 6R 7L 7R	Spohn + Burkhardt
11	Main Joystick	DP 174-1	Daco
12	Joysticks +-5vdc power	PSU 203	Lascar
13	Pilot chair and Touch screen 12/24vdc power	DR120	RS
14a	Keyb. & Mouse Switch	A2100081	Guntermann & Drunck
14b	CrossDisplay Software	A2100081	Guntermann & Drunck
15	Ethernet Switch	GS1910-24	Dustin
16	RS232/485 converter	485SD9R	B&B Electronics
17a	Quick Start Guide	Kaleido-X16-D	Grass Valley
17b	Installation Manual (Soft Only)	Kaleido-X16-D	Grass Valley
17c	User Manual (Soft Only)	Kaleido-X16-D	Grass Valley
17d	Technical Bulletin Database	Kaleido-X16-D	Grass Valley
18a	UPS 2.2kva	NRT-U2200	Metric
18b	SNMP card (Soft Only)	CS-121BSC	Metric
18c	Quick Start Manual	CS-121BSC	Metric
19	DVI Splitter	VS162	Leteng
20a	Video Distribution SD	105VB	Leteng
20b	Video Distribution HD	VM-4HDxl	Leteng
20c	Video Distribution 12/5 vdc power	Traco TXL 035-0512D	Farnell
21	Video Matrix	SL-V1616	Video 4
22a	Quad View	SM-10002	Leteng
22b	Pal to DVI-I Converter	CM-398DI	Leteng
23	Dual Ch. Speaker Station	PS230	ASL
24a	ClearCom Handset	RS-702 (Modified by Kystdesign)	ClearCom
24b	ClearCom Main Station	MS-702	ClearCom
25	Encoder	62A22-02-060C	Greyhill
26	ClearCom Inst. Manual		ClearCom
27	NEC LCD 21.5"	EA224WMi	Video 4
28	Sony LCD 46”	FWD-46B2	Video 4
29a	Rack PC	RACK-220G	Elektronix
29b	Rack PC Motherboard (Soft Only)	RACK-220G	Elektronix
30	KD-Con HUB (optional)	101230	Kystdesign AS
31	KD-Con Kystdesign TMS Mux	101495	Kystdesign AS