OS-650-KM05 Deep Line Operator Station

Maintenance Manual

Document history

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Rev. A	November 2007	First version.
Rev. B	July 2010	New document format, updated with comments from the Product Department. Text regarding the computer made more generic, and descriptive text and procedures amended.

Comments

To assist us in making improvements to the product and to this manual, we welcome comments and constructive criticism.
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Table of contents

Glossary

AC	Alternating Current
ALC	Alarm and Command
AUT	Automation
BU	Business Unit
CAN	Controller Area Network
DC	Direct Current
DP	Dynamic Positioning
ECDIS	Electronic Chart Display and Information System
GEN	General
HiPAP	High Precision Acoustic Positioning
HPR	High Precision, or Hydro acoustic Position Reference
HS	History Station
I/O	Input/Output
KM	Kongsberg Maritime
LAN	Local Area Network
LED	Light Emitting Diodes
LVS	Low Voltage Sense
NAV	Navigation
NDU	Network Display Unit
OS	Operator Station
PI	Power Interface
PSU	Power Supply Unit
RIU	Remote Interface Unit
SINT	Sensor Integrator
TFT	Thin Film Transistor
TC	Thruster Control
UPS	Uninterruptible Power Supply
USB	Universal Serial Bus
VDU	Vessel Display Unit

Hardware description

This section describes the OS-650-KM05 Deep Line hardware configuration for the part numbers listed on the front page of this document.

The Operator Station (OS) console comprises a Colour Monitor, an Operator Panel, a Door section with computer attached, a Keyboard section and a Console base.

Access to the computer is obtained by turning the door lock and opening the OS door. The hardware modules (Rear mounting plate and Side plate) are located inside the OS. The Keyboard section is located on the front of the Operator panel (see Figure 1).

Access to the console base is from inside the computer compartment.

Figure 1   Typical Operator Station, OS-650-KM05 Deep Line console

Colour Monitor
Monitor controls
Operator Panel
Panel section
Keyboard section
Door Lock
Door section
Console Base
Cd090901c
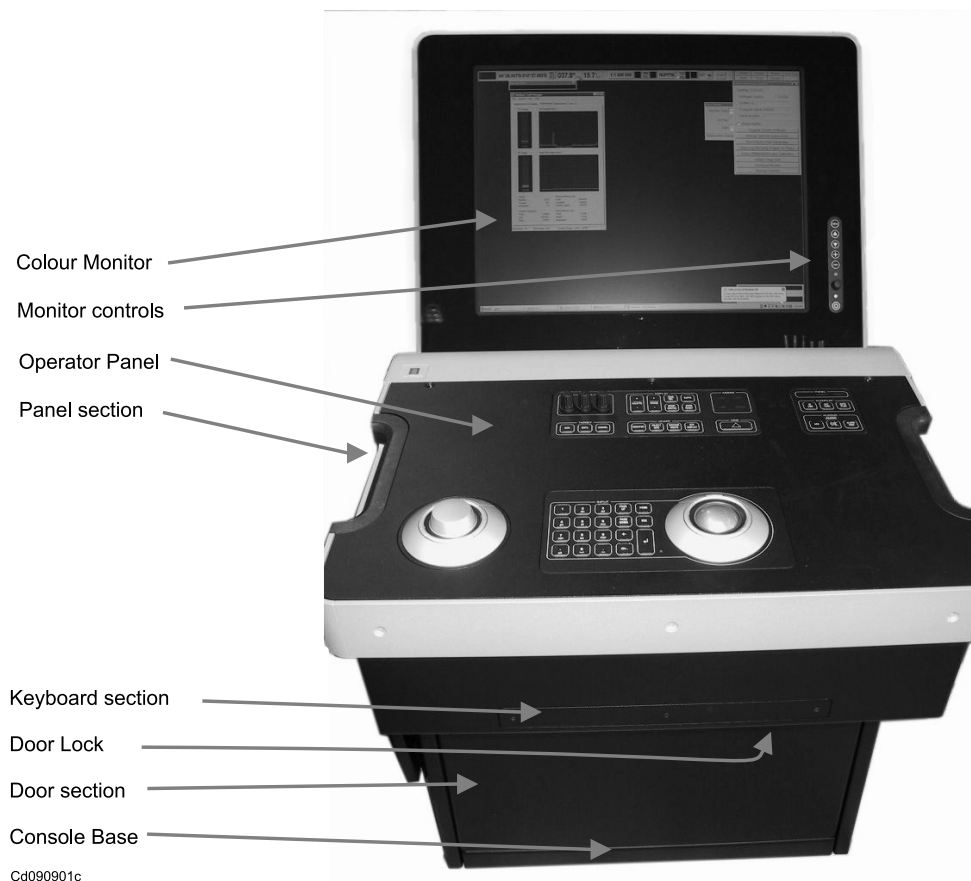
Operator interfaces

Colour monitor

A high-resolution 23" TFT colour monitor provides the main graphic display for presentation of data. The signal cable is connected to the graphic interface (VGA port) of the computer.

Operator panel

The Operator panel provides several controls and functions for the different console types. Depending on configuration, the content of the panel system may vary; i.e. different Panel types, alphanumeric keyboard, Heading Wheel panel or Joystick panel. When installed they are all interfaced via the Input panel in the Operator panel. The Input panel is connected to the computer via an USB cable.

Available panel groups are described in the following sections.

BU-xxx panels

Note ───

The xxx identifies the system, i.e. DP, TC, NAV, AUT etc.

───

The Business Unit (BU) panel is dedicated to each system, contains different buttons and lamps, and is located in the Operator panel. The BU-xxx panel is connected to the Input panel.

ALC panels

The Alarm and Command (ALC) panel is dedicated to each system, contains buttons and lamps, and is located in the Operator panel. There is a special version for K-Bridge called: ALC NAV panel. Both ALC panel versions are connected to the Input panel.

Heading Wheel panel

The Operator panel may provide a heading wheel with associated buttons, depending on the system supported, to increase or decrease the heading setpoint. The Heading Wheel panel is connected to the Input panel.

Input panel

The Input panel is dedicated to each system, contains buttons and is located in the Operator panel. The Input panel is the interface for the Panels and alphanumeric keyboard located in the Operator panel. The Input panel is connected to the computer via an USB serial line.

Joystick panel

The Operator panel may provide a three-axis joystick control to control the thrust demand in the surge, sway and yaw axes when these axes are under manual control. The Joystick panel is connected to the BU-DP or the BU-TC panel.

Drop in kits

An optional Drop in kit contains the following:

• Terminals (one of the options to the left in Figure 10 on page 18)

• Drop in panel (an example shown in Figure 2)

• A set of cables between the Terminals and the Drop in panel

The Drop in panels are located in the Operator panel of the OS for K-Pos OS-650-KM05 (see Figure 4 on page 11) and HiPAP-501 OS-650-KM05 (see Figure 7 on page 14).

The following optional Drop in kits are available:

• Drop in panel on Operator panel, 2-position switch

• Drop in panel on Operator panel, 3-position switch

• Drop in panel on Operator panel, 4-position switch

• Drop in panel on Operator panel, Fire backup switch

• Drop in panel on Operator panel, Alert switch

• Drop in panel on Operator panel, HPR Transducer Control

An example of a typical Drop in panel is shown in Figure 2 which shows a 3-position mode switch used for K-Pos.

Figure 2   Example of Drop in panel, 3-position mode switch

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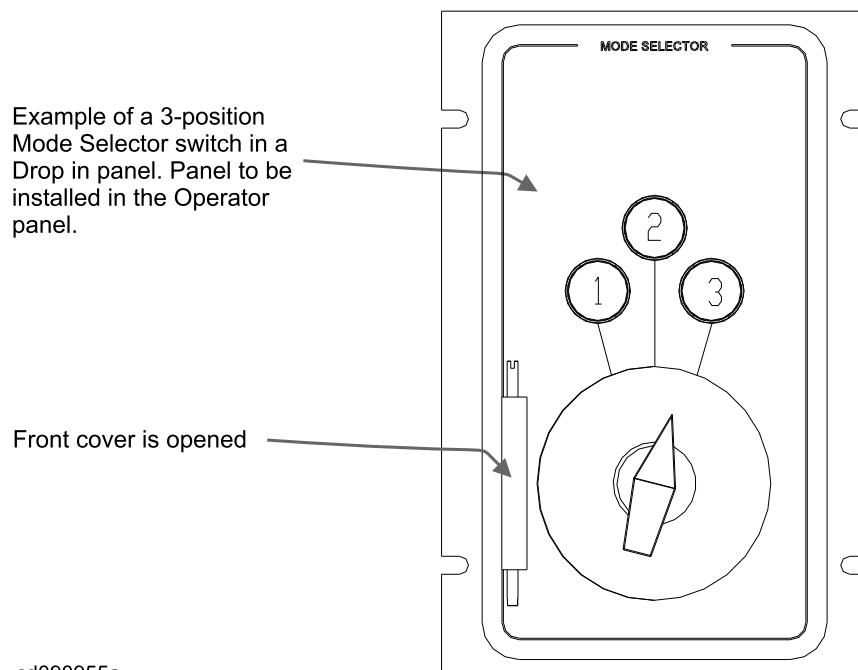
Operator panel types

The Operator panel types are as follows:

- K-Bridge OS-650-KM05 Operator panel (for Navigation systems)
- K-Pos OS-650-KM05 Operator panel (for Dynamic Positioning systems)
- K-Thrust OS-650-KM05 or K-Pos OS-650-KM05 Operator panel (for Thruster Control systems)
- K-Chief OS-650-KM05 Operator panel (for Automation systems)
- General OS-650-KM05 Operator panel (for General use and HiPAP systems)

The different layouts are described in the following sections.

K-Bridge OS-650-KM05 Operator panel

For K-Bridge OS-650-KM05 systems the following panel types are used as shown in Figure 3.

Figure 3   Layout of K-Bridge OS-650-KM05 Operator panel
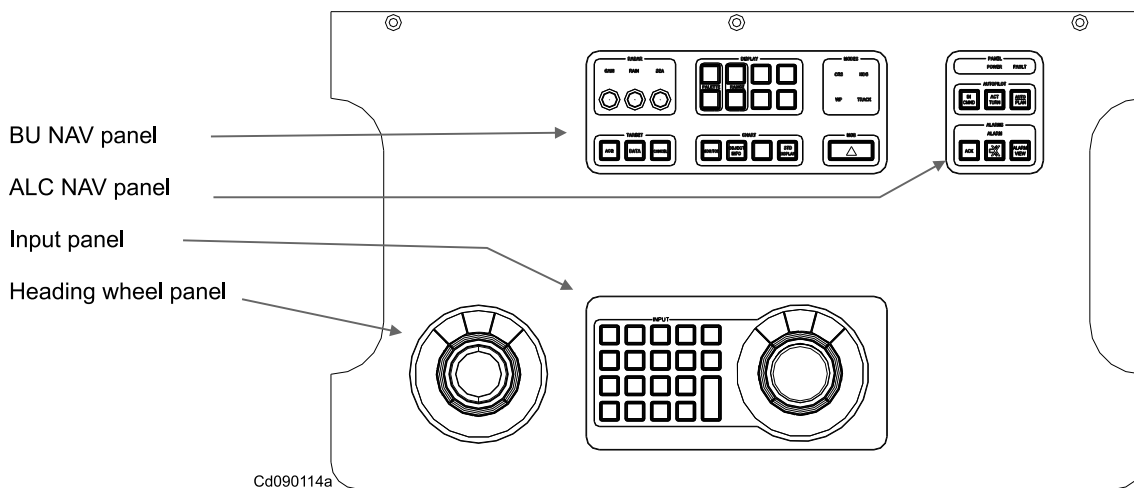
BU-NAV panel

The BU-NAV panel is a status and command panel module. It provides buttons and lamps for commands in Navigation systems and contains the following groups; Display, Chart, Radar, Target, Modes and MOB for K-Bridge commands.

ALC NAV panel

The ALC NAV panel is a status and command panel module. It provides buttons and lamps for autopilot commands, and buttons, lamps and buzzers for handling alarms. It contains the following groups; Panel, Autopilot and Alarms and are used for fault indication, autopilot command transfer, and alarm and administration.

Heading Wheel panel

The Heading Wheel panel comprises a heading wheel with seven buttons. It is mainly used for setting or changing new course for K-Bridge systems.

Input panel

The Input panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the OS screen. In addition a five port USB hub is provided connecting all panel modules to the computer. It is a general panel for VDU navigation on bridge systems, using an alphanumeric keypad and trackball.

For details on each panel type described above, refer to appropriate *Hardware Module Description*.

K-Pos OS-650-KM05 Operator panel

For K-Pos OS-650-KM05 systems the following panel types are used as shown in Figure 4.

Figure 4   Layout of K-Pos OS-650-KM05 Operator panel
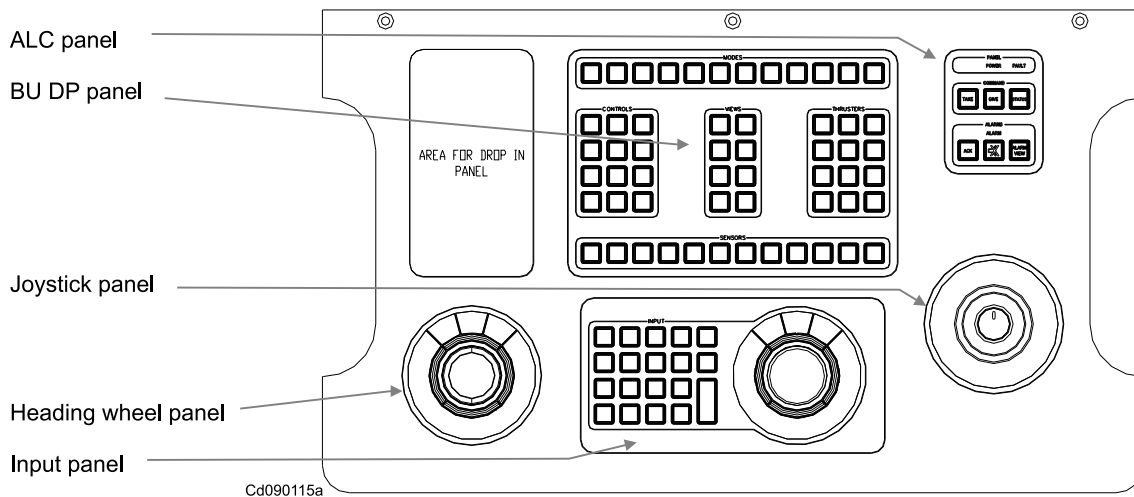
BU-DP panel

The BU-DP panel is a status and command panel module. It provides buttons and lamps for commands in DP systems and contains the following groups; Modes, Control, Views, Thrusters, Sensors for DP commands.

ALC panel

The ALC panel is a status and command panel module. It provides buttons and lamps for command control, and buttons, lamps and buzzers for handling alarms. It contains the following groups; Panel, Command and Alarms and are used for fault indication, command transfer, and alarm and administration.

Heading Wheel panel

The Heading Wheel panel comprises a heading wheel with seven buttons. It is mainly used for setting or changing new heading for DP systems.

Input panel

The Input panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the OS screen. In addition a five port USB hub is provided connecting all panel modules to the computer. It is a general panel for VDU navigation on bridge systems, using an alphanumeric keypad and trackball.

Joystick panel

The Joystick panel contains a three-axis joystick used as a joystick control for the DP system. The joystick has three potentiometers that work in the three axis.

For details on each panel type described above, refer to the appropriate *Hardware Module Description*.

K-Thrust OS-650-KM05 Operator panel

Dynamic Positioning operations in conjunction with K-Thrust OS-650-KM05 may be performed by use of either the BU-TC panel or the BU-DP panel.

For K-Thrust OS-650-KM05 systems the following panel types are used as shown in Figure 5. However, the BU-DP panel may also be used as shown in Figure 4 on page 11.

Figure 5   Layout of K-Thrust OS-650-KM05 Operator panel (example with BU-TC panel)
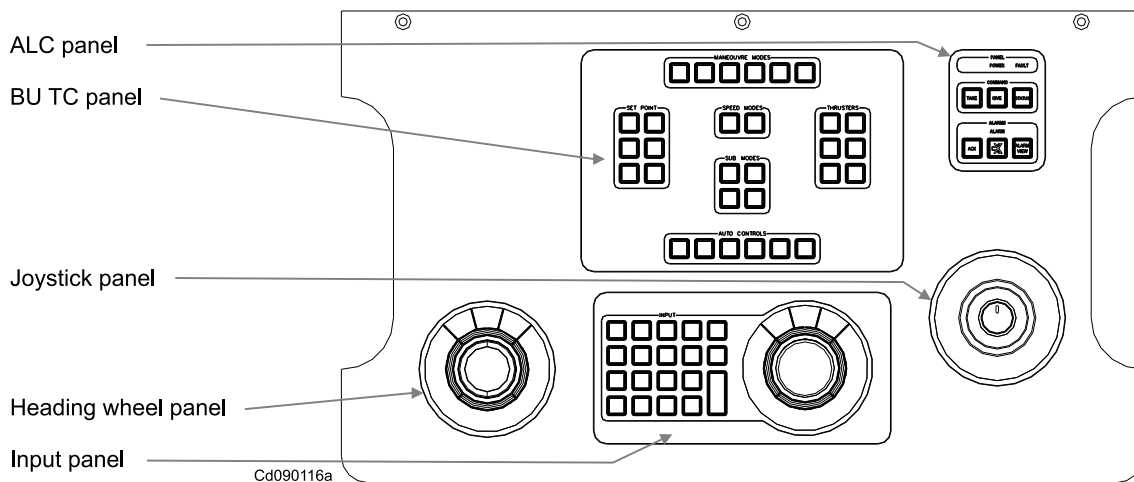
BU-TC panel

The BU-TC panel is a status and command panel module. It provides buttons and lamps for commands in Thruster Control systems. It contains the following groups; Manoeuvre Modes, Set Point, Speed Modes, Sub Modes, Thrusters, Auto Controls for DP commands.

ALC panel

The ALC panel is a status and command panel module. It provides buttons and lamps for command control, and buttons, lamps and buzzers for handling alarms. It contains the following groups; Panel, Command and Alarms and are used for fault indication, command transfer, and alarm and administration.

Heading Wheel panel

The Heading Wheel panel comprises a heading wheel with seven buttons. It is mainly used for setting or changing new heading for DP systems.

Input panel

The Input panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the OS screen. In addition a five port USB hub is provided connecting all panel modules to the computer. It is a general panel for VDU navigation on bridge systems, using alphanumeric keypad and trackball.

Joystick panel

The Joystick panel contains a three-axis joystick used as a joystick control for the DP systems. The joystick has three potentiometers that work in the three axis.

For details on each panel type described above, refer to the appropriate *Hardware Module Description*.

K-Chief OS-650-KM05 Operator panel

For K-Chief OS-650-KM05 systems the following panel types are used as shown in Figure 6.

Figure 6   Layout of K-Chief OS-650-KM05 Operator panel
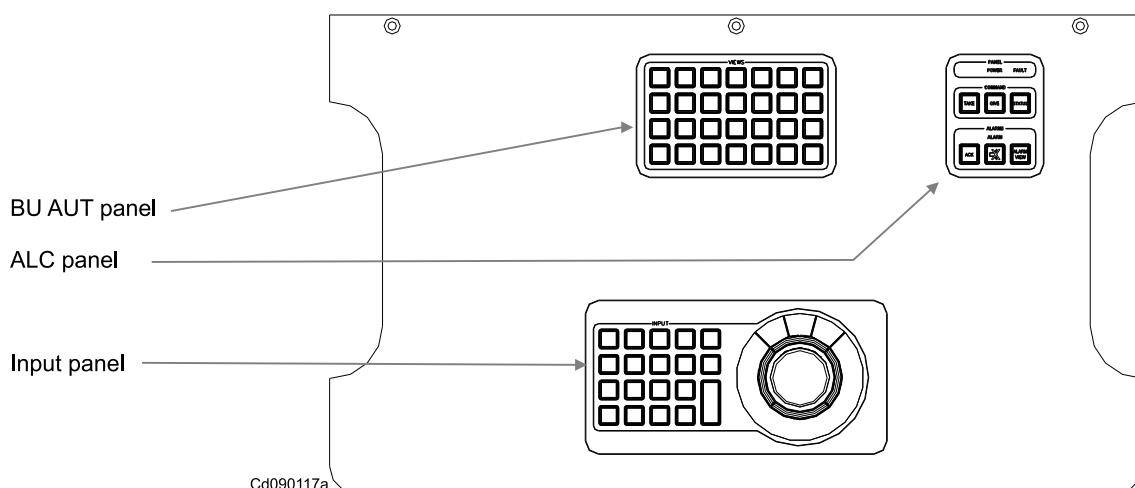
BU-AUT panel

The BU-AUT panel is an input panel module. It provides buttons and lamps for Automation systems and contains the View group as alarm panel for K-Chief systems.

ALC panel

The ALC panel is a status and command panel module. It provides buttons and lamps for command control, and buttons, lamps and buzzers for handling alarms. It contains the following groups; Panel, Command and Alarms and are used for fault indication, command transfer, and alarm and administration.

Input panel

The Input panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the OS screen. In addition a five port USB hub is provided connecting all panel modules to the computer. It is a general panel for VDU navigation on bridge systems, using an alphanumeric keypad and trackball.

For details on each panel type described above, refer to the appropriate *Hardware Module Description*.

General OS-650-KM05 and HiPAP-501 OS-650-KM05 Operator panel

For General OS-650-KM05 and HiPAP-501 OS-650-KM05 systems the following panel types are used as shown in Figure 7.

Figure 7   Layout of General OS-650-KM05 and HiPAP-501 OS-650-KM05 Operator panel
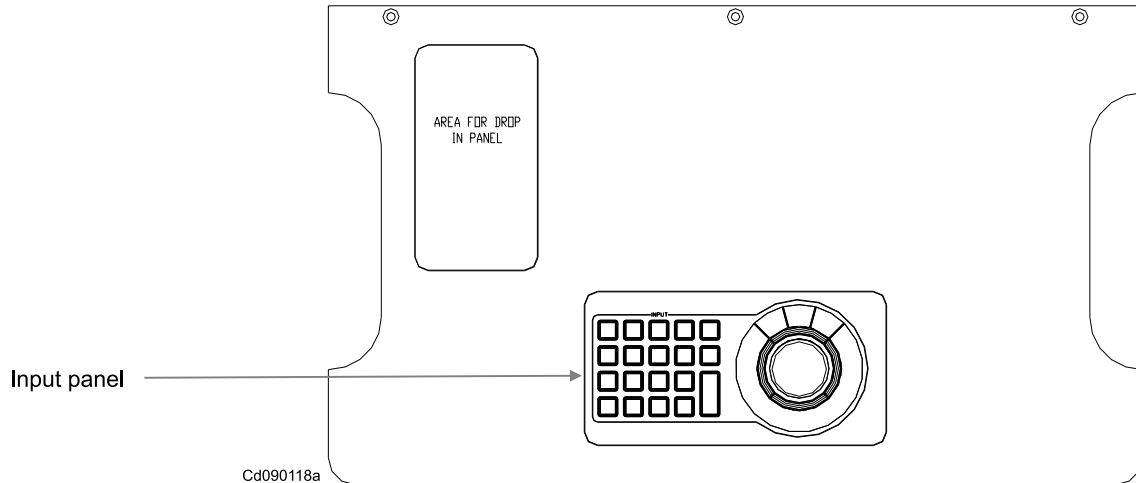
Input panel

The Input panel comprises a keypad for entering numbers and letters into the system and a trackball for controlling cursor position on the OS screen. In addition a five port USB hub is provided connecting all panel modules to the computer. It is a general panel for VDU navigation on bridge systems, using an alphanumeric keypad and trackball.

For details on the panel type described above, refer to the appropriate *Hardware Module Description*.

Panel section

Layout of the panel section located underneath the Operator panel is as shown in Figure 8.

Figure 8   Layout of panel section
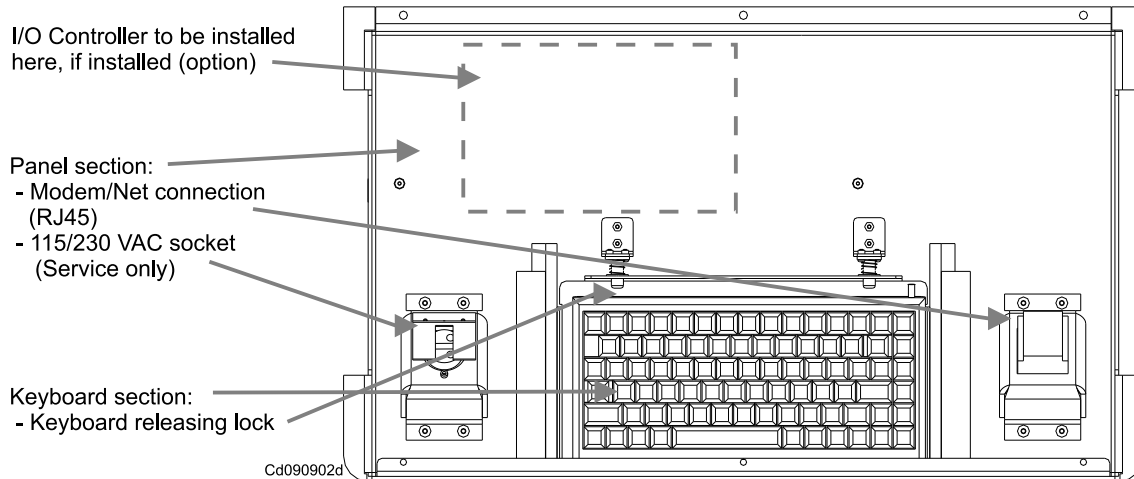
For all systems (except K-Bridge), the panel section contains modem/net connection and 115/230 VAC mains socket (for service purposes only).

If a I/O Controller is to be installed in the system, it is installed in the panel section (see Figure 8). The I/O Controller is intended to be used for additional I/O signals coming from or going to the field.

Note

For Modem/Net connections and 115/230 VAC socket connections, different versions are available. When the Modem/Net connection is mounted (at the right side), only one 115/230 VAC socket is mounted (at the left side). See project specific drawings for exact layout.

Keyboard section

For all systems, a standard alphanumeric keyboard is available in a drawer in front of the Operator panel. It is accessed from the front by pushing the drawer, thus releasing the locks behind the keyboard, making the drawer open automatically outwards. The keyboard may then be pulled out and laid down on the upper part of the Operator panel. Input from the keyboard is interfaced through the Input panel. The keyboard is for service use only.

Rear mounting plate and Side plate configurations

The following internal configurations are available for OS-650-KM05 Deep Line configurations:

- The General OS-650-KM05, K-Pos OS-650-KM05, K-Thrust OS-650-KM05 and K-Chief OS-650-KM05 Rear mounting plate configuration is shown in Figure 9 on page 17.

  For K-Pos OS-650-KM05 the following options are available:

  – Side plate as shown in Figure 10 on page 18.

  – Drop in kits as listed in *Joystick panel* on page 9.

  For K-Chief OS-650-KM05 the following kits are available:

  – Alarm Output kit as shown in Figure 11 on page 19.

  – CANbus to Ethernet kit as shown in Figure 12 on page 20.

  – Dual Power Input kit as shown in Figure 13 on page 21.

  – Fibre Net kit as shown in Figure 14 on page 22.

  – Network Net-A or Net-B kit as shown in Figure 15 on page 23.

  – Network Net-C kit as shown in Figure 16 on page 24.

- The HiPAP-501 OS-650-KM05 Rear mounting plate configuration is shown in Figure 17 on page 25.

  For HiPAP-501 OS-650-KM05 the Side plate shown in Figure 18 on page 26 is available.

- The K-Bridge OS-650-KM05 Rear mounting plate configuration is shown in Figure 19 on page 27.

  For K-Bridge OS-650-KM05 the Side plate shown in Figure 20 on page 28 is available.

Rear mounting plate layout for General OS-650-KM05, K-Pos OS-650-KM05, K-Thrust OS-650-KM05 and K-Chief OS-650-KM05

Figure 9   Rear mounting plate layout for General OS-650-KM05, K-Pos OS-650-KM05, K-Thrust OS-650-KM05 and K-Chief OS-650-KM05
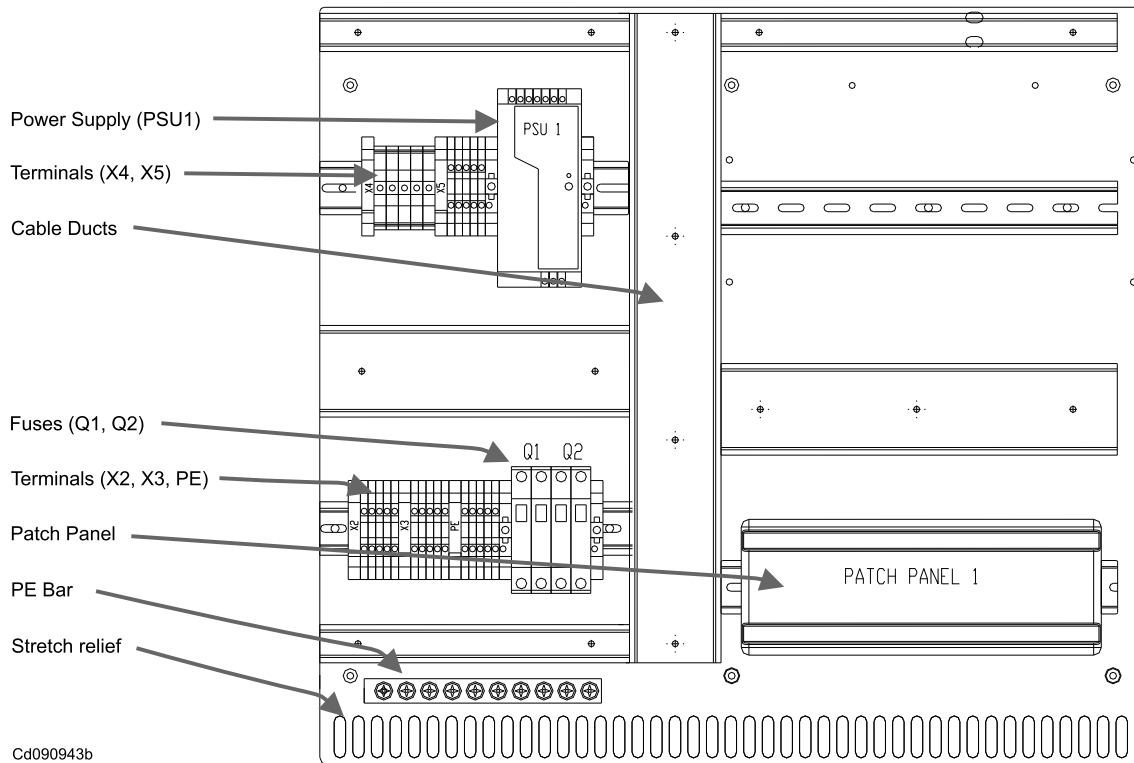
The following main items are located on the Rear mounting plate:

Power Supply Unit (PSU1)	Converts 115/230 VAC to 24 VDC.
Terminals (X4 and X5)	Main terminals for 24 VDC and 0 VDC (Gnd).
Cable ducts	are used for collecting and feeding the interface cables on the Rear mounting plate.
Circuit breakers (Q1 and Q2)	Main fuses for the main supply voltage and the main outlet sockets (service purpose only).
Terminals (X2, X3 and PE)	Main terminals which are used as connection points for the ships supply voltage (115/230 VAC) to the console.
Patch Panel	is used for patching the interface cables from the Rear mounting plate and to the field (LAN cables).
PE Bar	used for connection the equipment to P.E. earth (ground).
Stretch relief	used for collecting and relieving the patch and interface cables.

Side plate layout for K-Pos OS-650-KM05

Figure 10   Side plate layout for K-Pos OS-650-KM05

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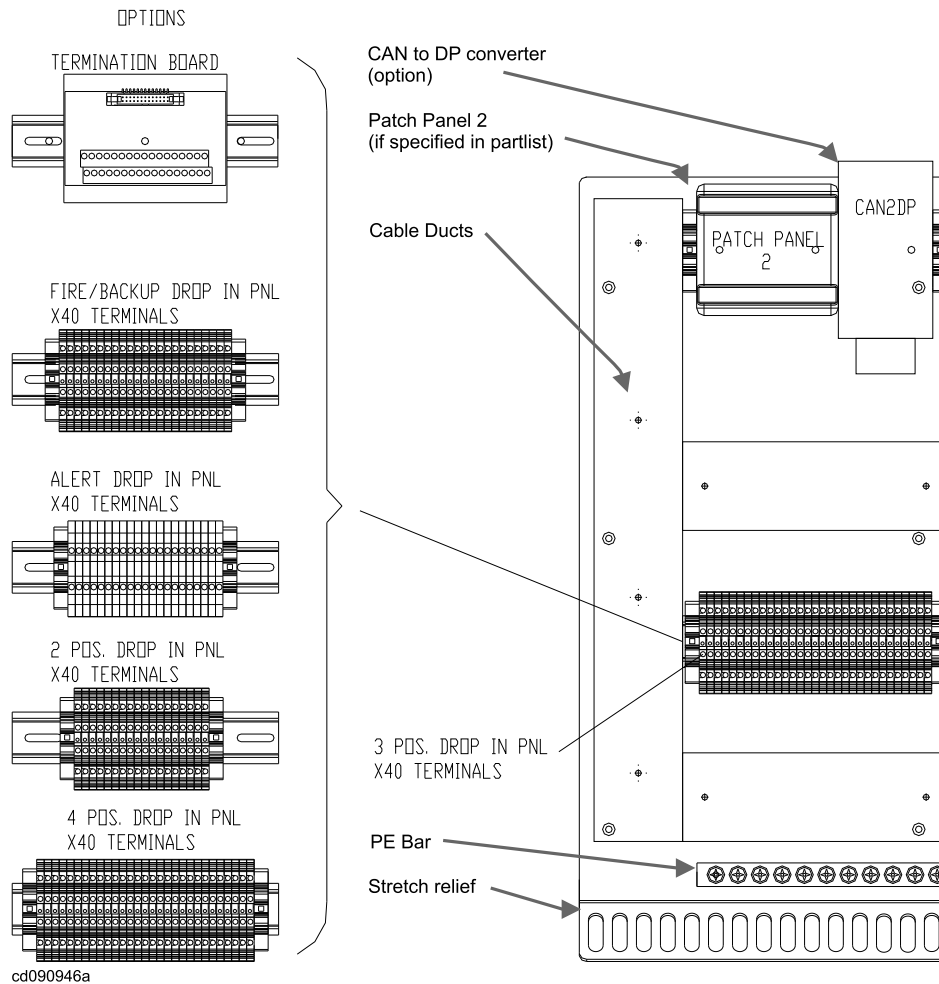
The following main items are located on the Side plate:

CAN to DP Converter	is used for converting the CAN signals to RS232 format.
Patch Panel	is used for patching the interface cables from the Side plate and to the field (LAN cables).
Cable duct	are used for collecting and feeding the interface cables on the Side plate.
Terminals	Main terminals for connecting field signals to terminals. Different options for the terminals are shown at the left of Figure 10.
PE Bar	used for connection the equipment to P.E. earth (ground).
Stretch relief	used for collecting and relieving the patch and interface cables.

K-Chief OS-650-KM05 kits

Alarm Output kit

In addition to the General OS-650-KM05 Rear mounting plate configuration (see Figure 9 on page 17) extra items are located on the Rear mounting plate by the Alarm Output kit as shown in Figure 11.

Figure 11   Rear mounting plate layout for Alarm Output kit
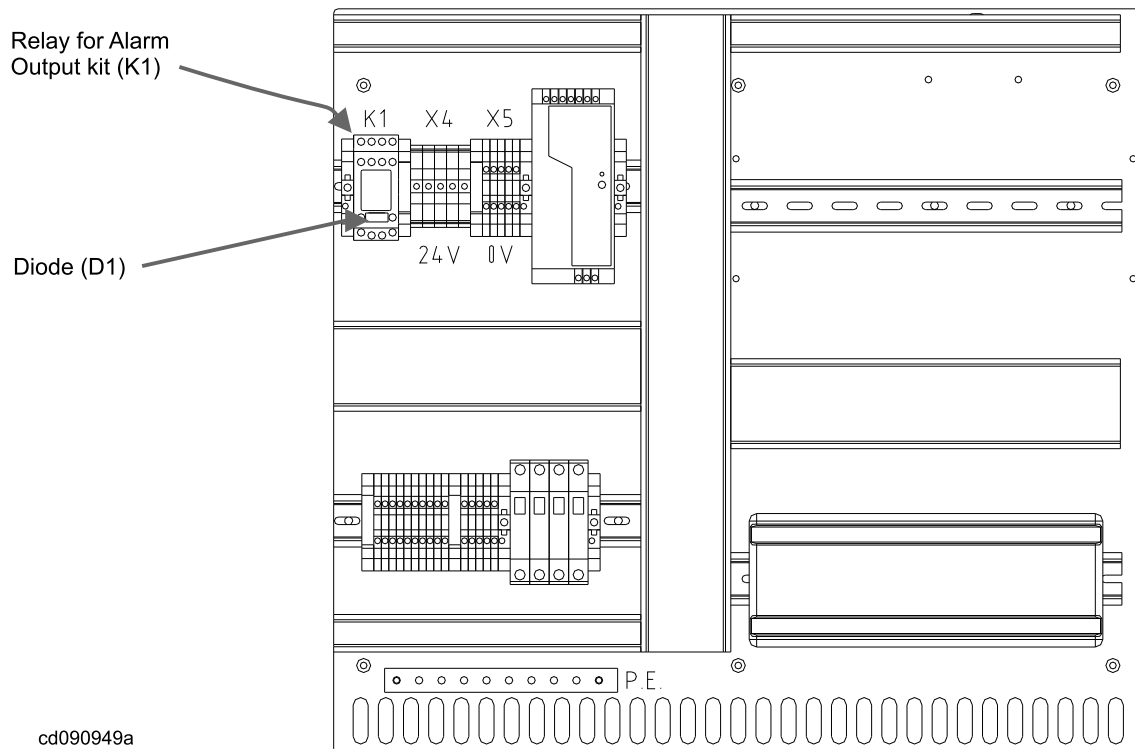
The following extra items are located on the Rear mounting plate by the Alarm Output kit:

| Relay (K1) for Alarm kit | The relay is connected to the Input Panel and gives alarm messages. |
| Diode (D1) for Alarm kit | Diode for the relay. |

CANbus to Ethernet kit

The following Side plate is added by the CANbus to Ethernet kit as shown in Figure 12.

Figure 12   Side plate layout for CANbus to Ethernet kit
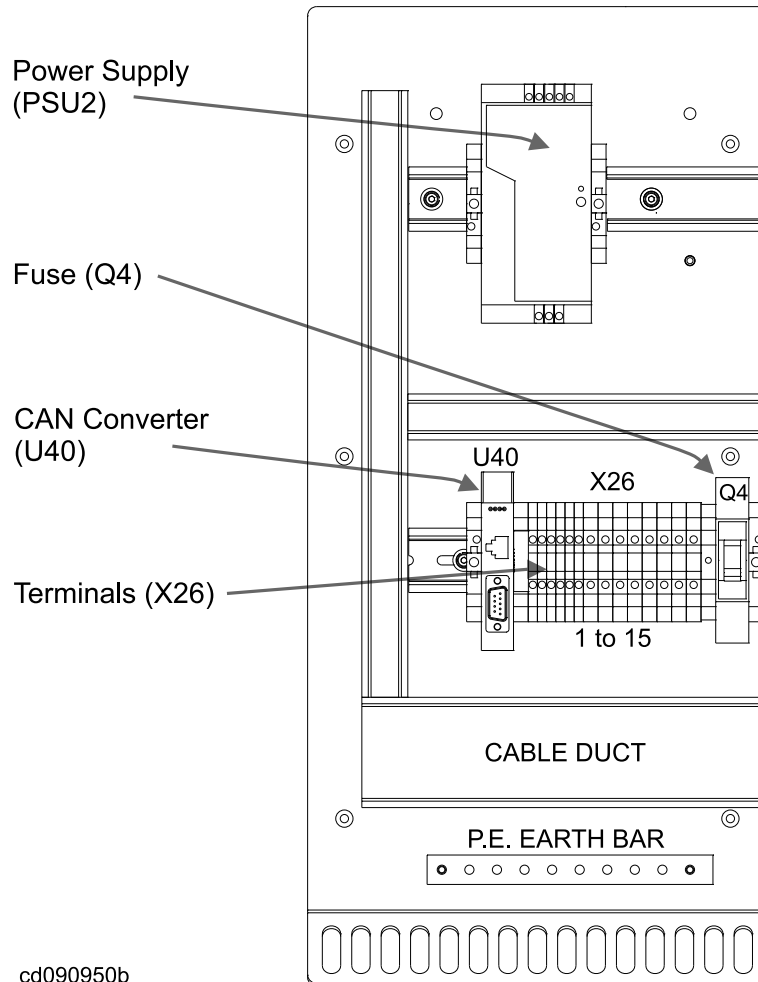
The following main items are located on the Side plate:

Power Supply Unit (PSU2)	24 VDC and 115/230 VAC supplying the CANbus to Ethernet kit.
Circuit breaker (Q4)	24 VDC/10A fuse for the CANbus to Ethernet kit.
CAN Converter	is used to convert CAN signals to ethernet signals to be connected to the computer.
Terminals	Terminals for input voltage and signals.

Dual Power Input kit

In addition to the General OS-650-KM05 Rear mounting plate configuration (see Figure 9 on page 17) extra items are located on the Rear mounting plate by the Dual Power Input kit as shown in Figure 13.

Figure 13   Rear mounting plate layout for Dual Power Input kit
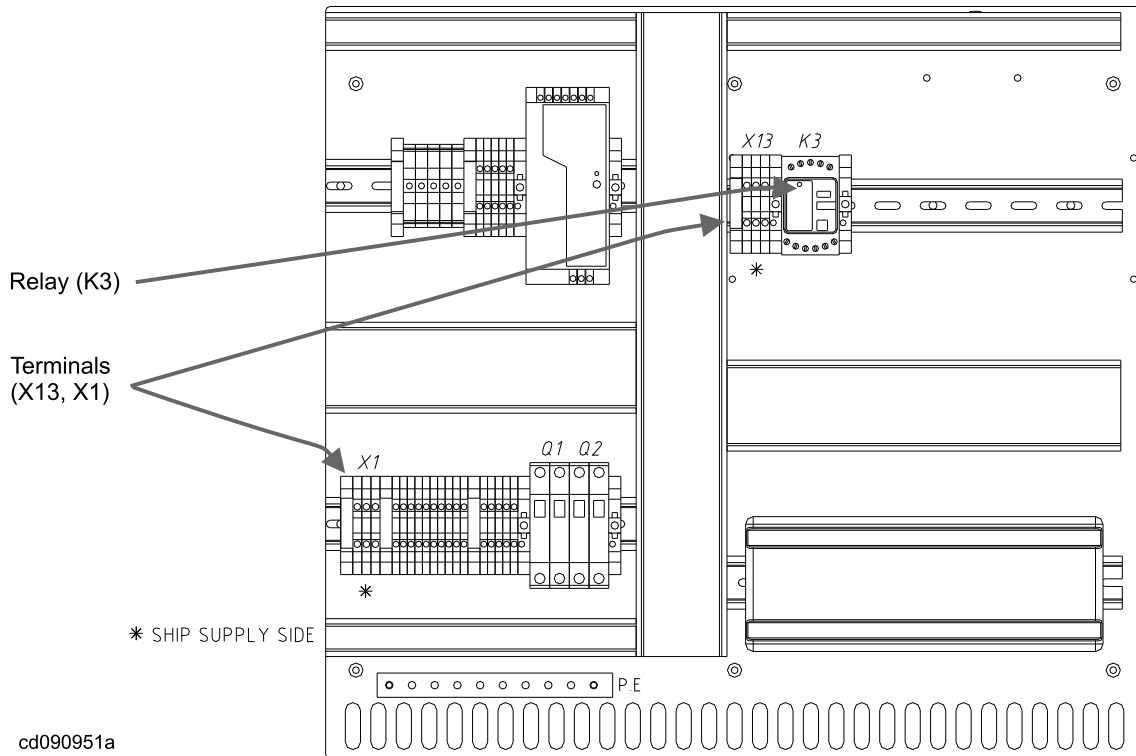
cd090951a

The following extra items are located on the Rear mounting plate by the Dual Power Input kit:

Relay (K3)	The relay senses and switches the mains voltage to circuit breaker Q1.
Terminals	Terminals for Ships supply (X1) and for Emergency Supply UPS (X13).

Fibre Net kit

In addition to the General OS-650-KM05 Rear mounting plate configuration (see Figure 9 on page 17) extra items are located on the Rear mounting plate by the Fibre Net kit as shown in Figure 14.

Figure 14   Rear mounting plate layout for Fibre Net kit

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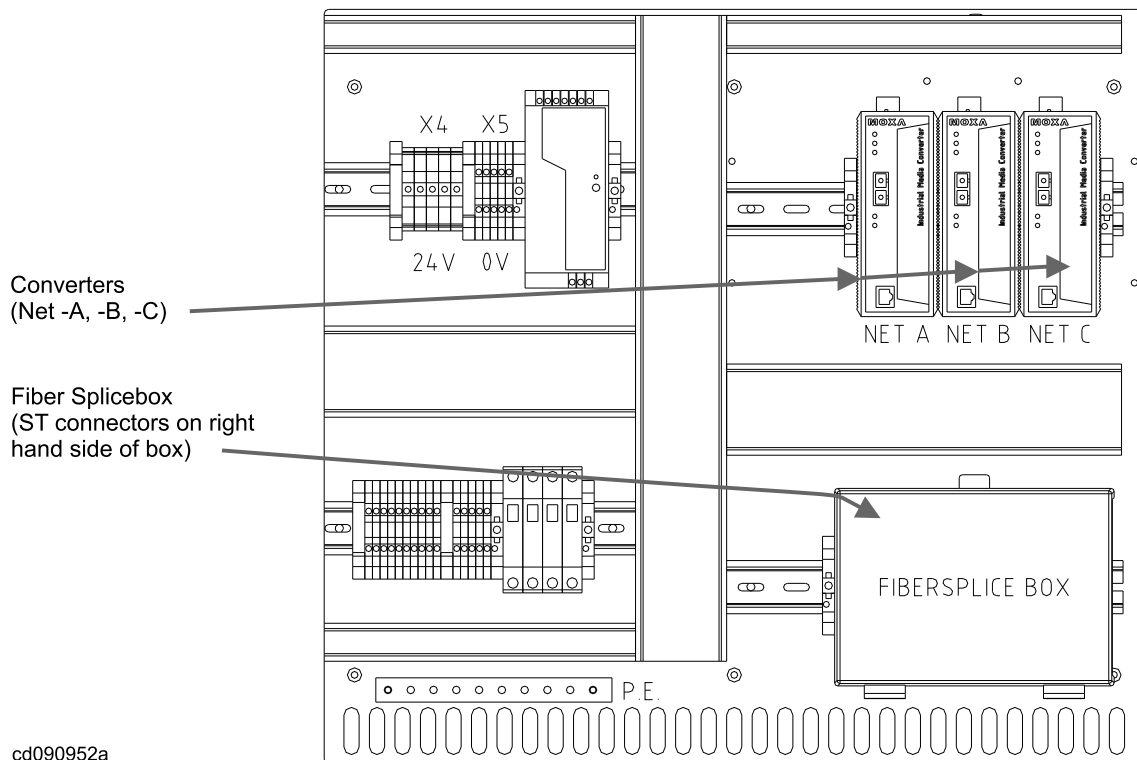
The following extra items are located on the Rear mounting plate by the Fibre Net kit:

Converters (Net A, B and C)	are used to convert to/from Fibre signals from/to ethernet on twisted pair signals.
Fibre Splice Box	is used as connection box for 8 fibre cables.

Network Net-A or Net-B kit

In addition to the General OS-650-KM05 Rear mounting plate configuration (see Figure 9 on page 17) extra items are located on the Rear mounting plate by the Network Net-A or Net-B kit as shown in Figure 15.

Figure 15   Rear mounting plate layout for Network Net-A or Net-B kit
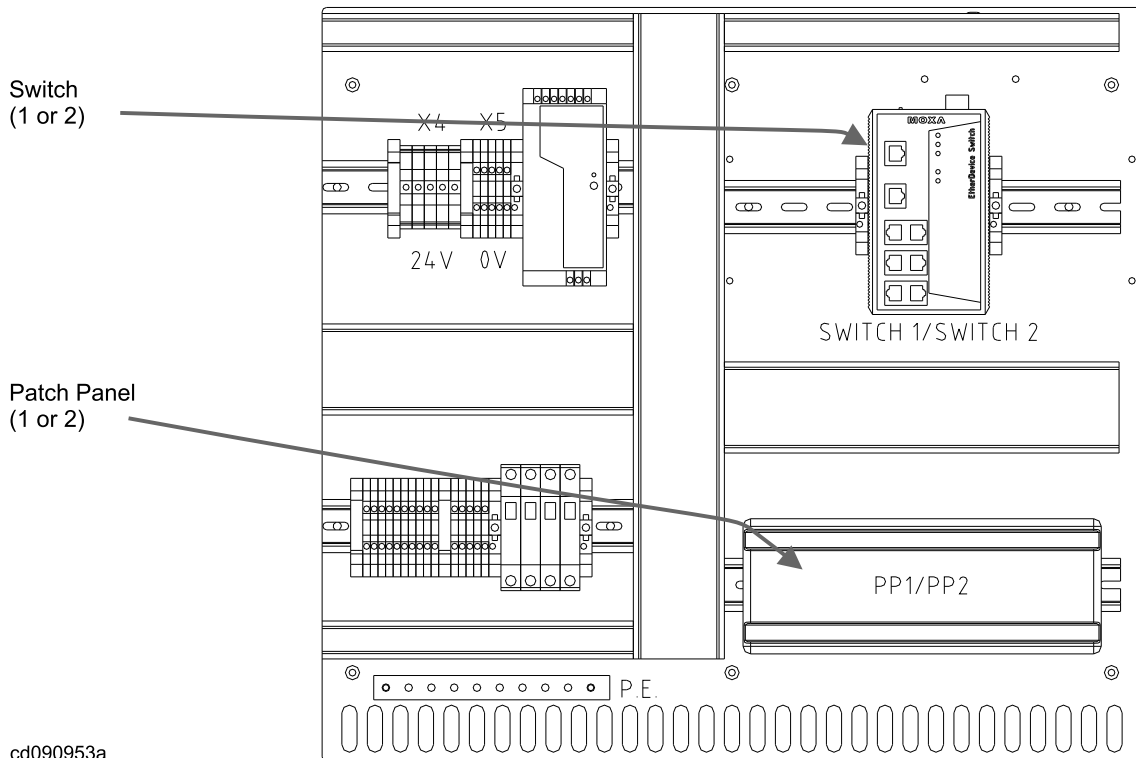
The following extra items are located on the Rear mounting plate by the Network Net-A or Net-B kit:

Network Switch 1 or 2	are used as switches for Net A (switch 1) or Net B (switch 2).
Patch Panel 1 or 2	are used as patch panel for Net A (patch panel 1) or Net B (patch panel 2).

Network Net-C kit

In addition to the General OS-650-KM05 Rear mounting plate configuration (see Figure 9 on page 17) extra items are located on the Rear mounting plate by the Network Net-C kit as shown in Figure 16.

Figure 16   Rear mounting plate layout for Network Net-C kit

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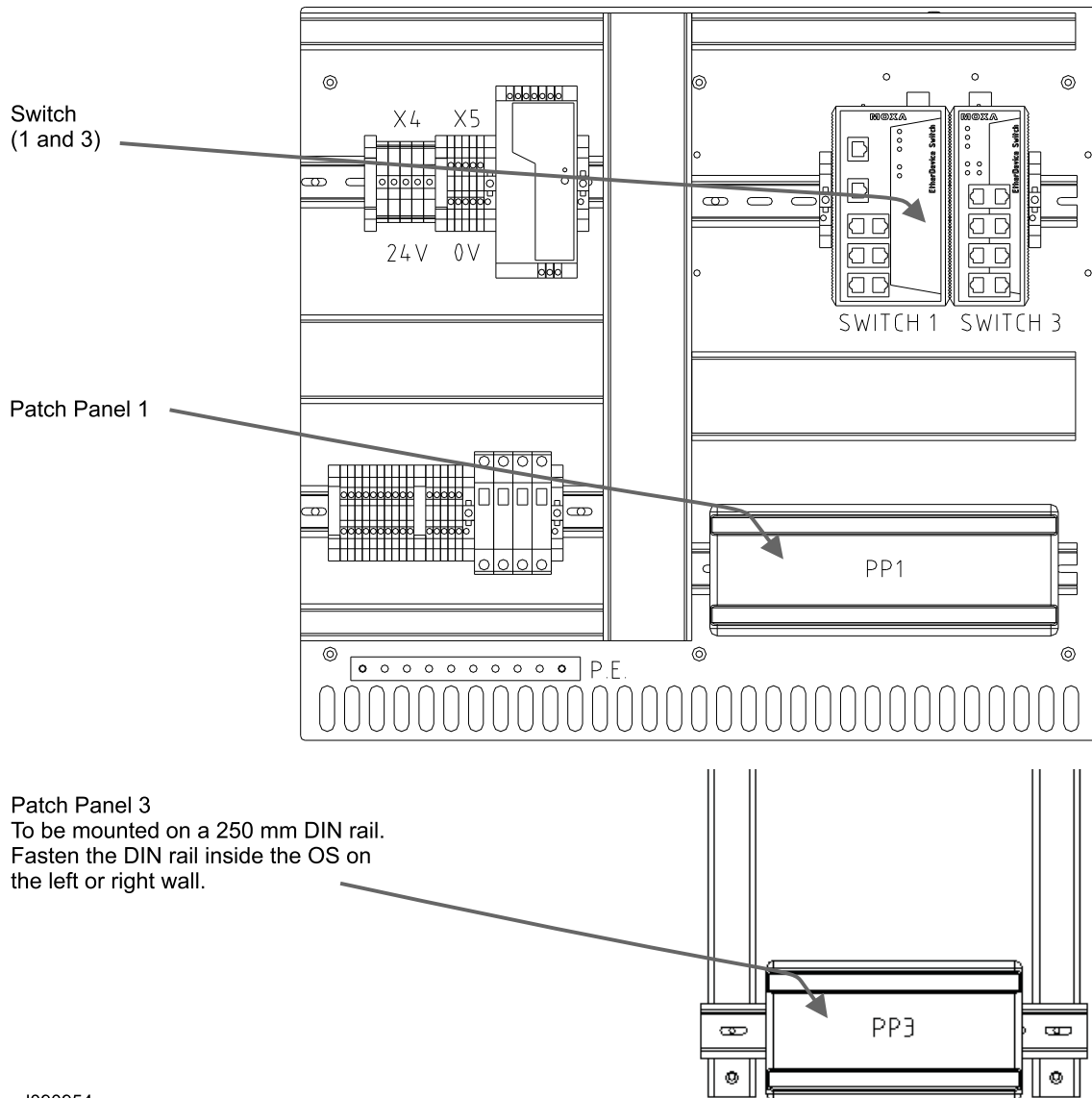
The following extra items are located on the Rear mounting plate by the Network Net-C kit:

Network Switch 1 and 3	are used as switches for Net A (switch 1 managed) and Net C (switch 3 unmanaged).
Patch Panel 1 and 3	are used as patch panel for Net A (patch panel 1) and Net C (patch panel 3).

Rear mounting plate layout for HiPAP-501 OS-650-KM05

Figure 17   Rear mounting plate layout for HiPAP-501 OS-650-KM05

General configuration
with the following
additional equipment:

- HPR Serial Line Kit
  (COM3, COM4, COM5
  and COM6)

- Loose cables inside
console (COM7, COM8,
COM9 and COM10)

- Smaller Patch Panel

- HPR Transducer Kit

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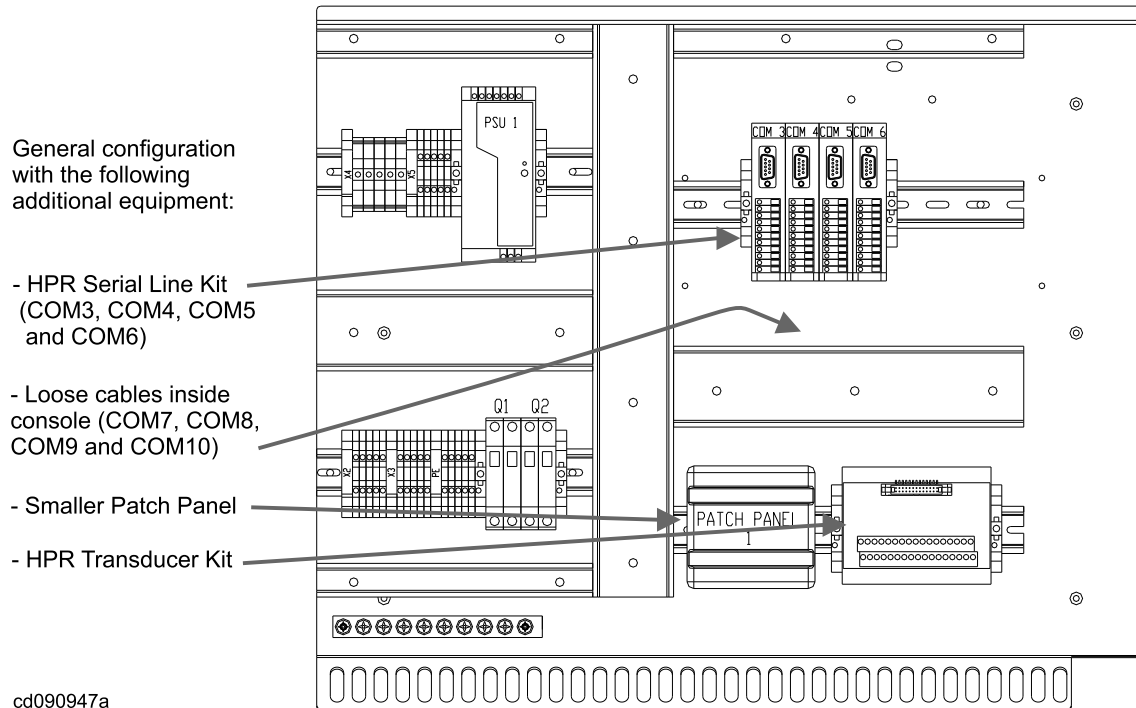
The following main items are located on the Rear mounting plate:

HPR Serial line kit	Kit for Hydro-acoustic Position Reference (HPR) system. Kit for RS232; COM1 to COM4 ports.
Loose cables inside console	Loose cables for RS485/422; COM7 to COM10.
Patch Panel	is used for patching the interface cables from the Rear mounting plate and to the field (LAN cables).
HPR Transducer kit	Termination board for HPR Transducer kit.

Side plate layout for HiPAP-501 OS-650-KM05

Figure 18   Side plate layout for HiPAP-501 OS-650-KM05

Cable Duct

Switch

Ethernet Adapter

Fibre Splice Box

PE Bar

Stretch relief

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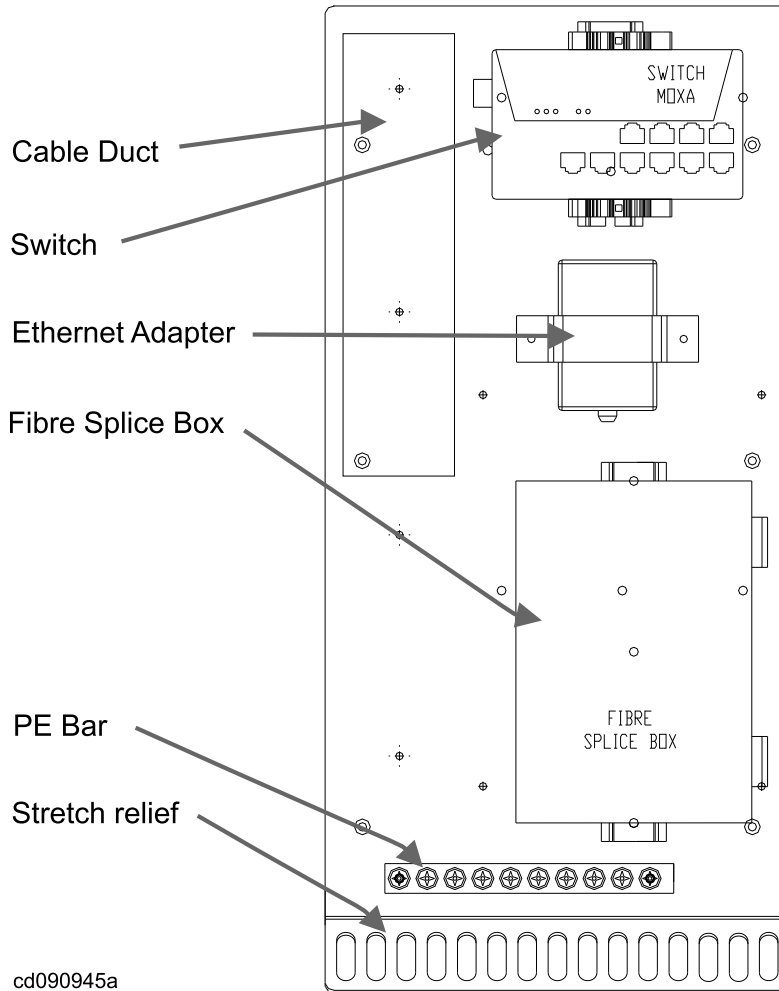
The following main items are located on the Side plate:

Cable duct	is used for collecting and feeding the interface cables on the Side plate.
Network Switch	is used for converting the fibre signals to ethernet.
Ethernet adapter	USB Ethernet adapter.
Fibre Splice Box	is used as connection box for 8 fibre cables.
PE Bar	used for connection the equipment to P.E. earth (ground).
Stretch relief	used for collecting and relieving the patch and interface cables.

Rear mounting plate layout for K-Bridge OS-650-KM05

Figure 19   Rear mounting plate layout for K-Bridge OS-650-KM05

Rear mounting plate
K-Bridge configuration:

Cable ducts

Power Interface (PI10K):
- Switch/Fuse
- Power Filter
- Power Supply
- Terminals

Remote Interface Unit
(RIU):
- RS232/RS422 converter
- Terminals

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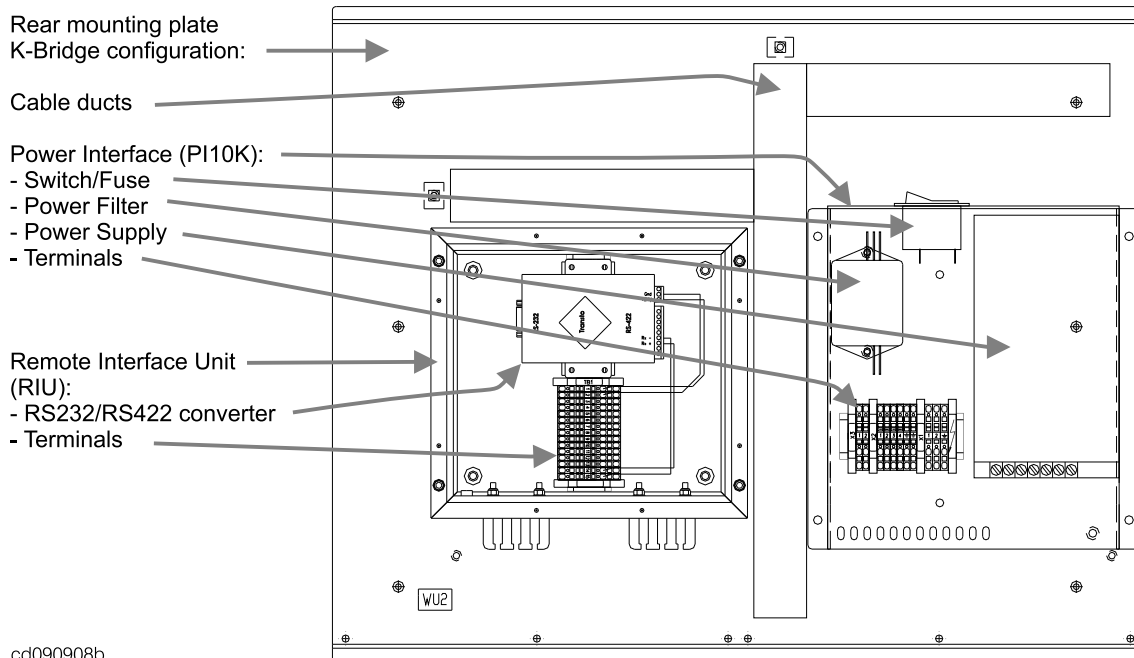
The Power Interface (PI10K) and Remote Interface Unit (RIU) are located on the Rear mounting plate for K-Bridge OS-650-KM05.

Cable ducts	are used for collecting and feeding the interface cables on the Rear mounting plate.
Power Interface	is used as power supply for the Computer, Display and Panel system. The Switch/Fuse, Power Filter, Power Supply and Terminals are all parts of the PI10K.
Remote Interface Unit	is used as interface for the Radar Interswitch. The RS232/RS422 converter and Terminals are parts of the RIU.

Side plate layout for K-Bridge OS-650-KM05

Figure 20   Side plate layout for K-Bridge OS-650-KM05
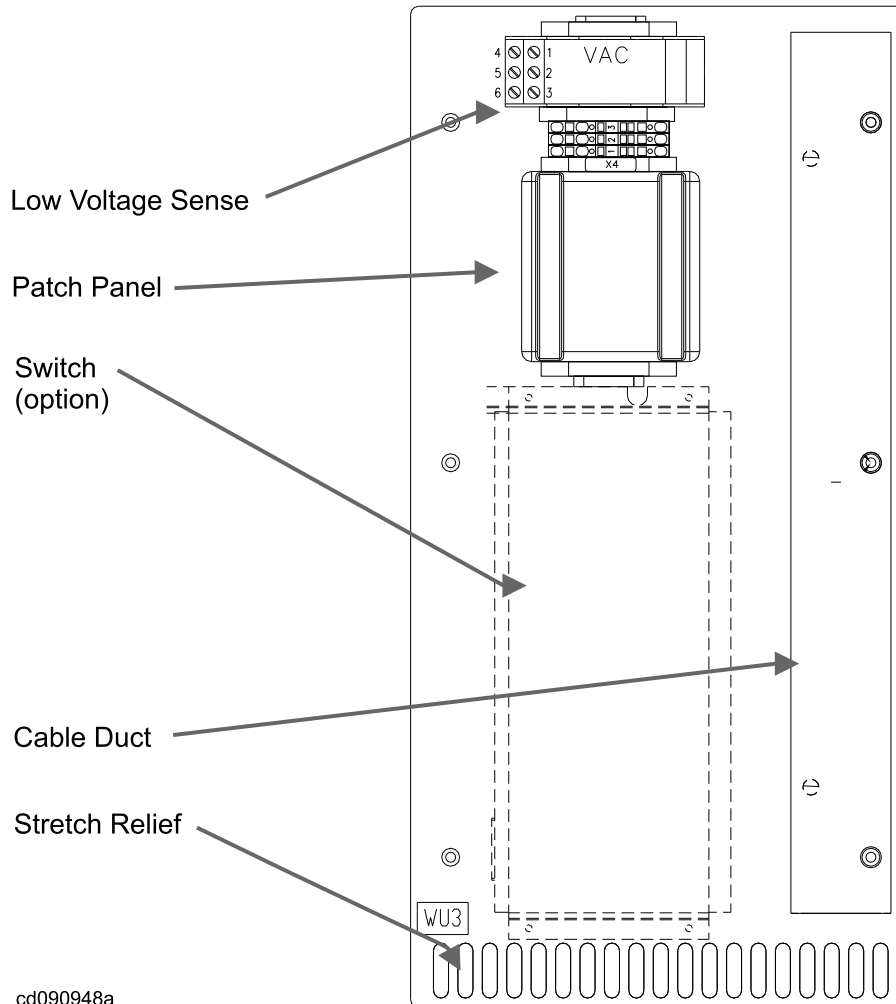
The following main items are located on the Side plate:

Low Voltage Sense	Low Voltage Sense (LVS) is monitoring the input AC voltage (115/230 VAC) and triggers an alarm if the input voltage falls 13% (approximately) below the nominal voltage.
Patch Panel	is used for patching the interface cables from the Side plate and to the field (LAN cables).
Network Switch	Navigation configuration with LAN network switch.
Cable ducts	are used for collecting and feeding the interface cables on the Side plate.
Stretch relief	used for collecting and relieving the patch and interface cables.

Power supply and signal wiring

All OS systems (except K-Bridge and HiPAP)

Figure 21   OS-650-KM05 Deep Line equipment and interconnections
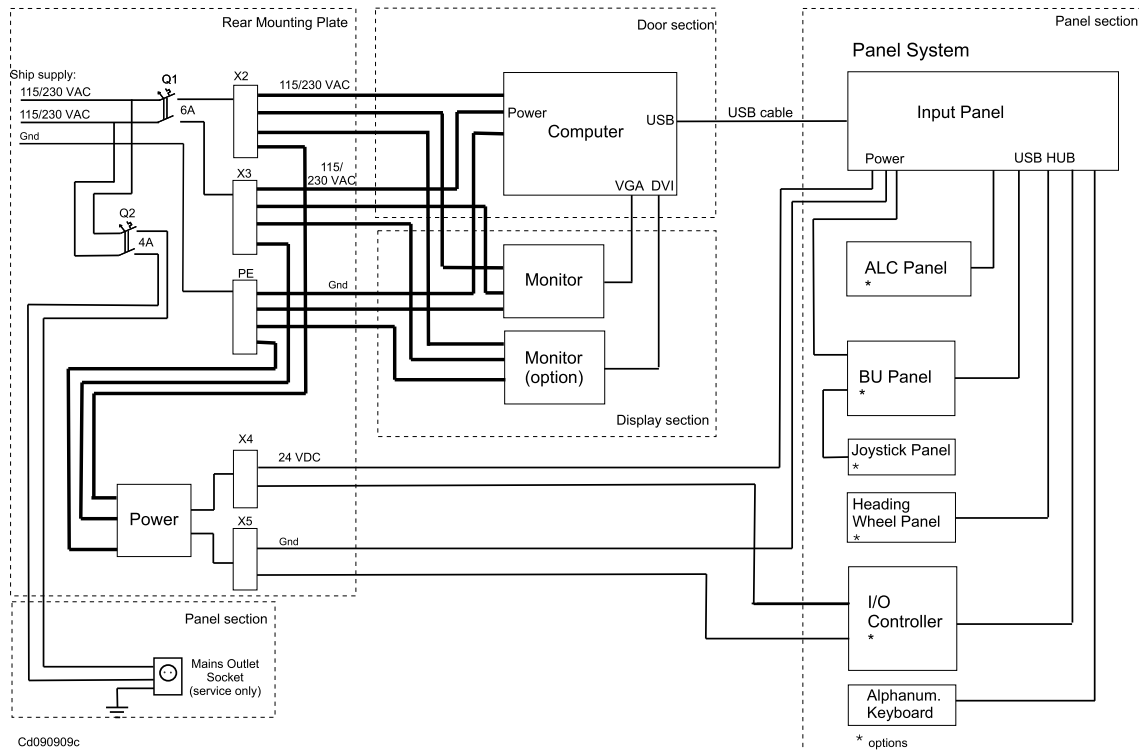
See Figure 21 for block diagram.

The OS handles both 115 VAC and 230 VAC as mains supply. The AC voltage is usually fed from an Uninterruptible Power Supply (UPS) and is terminated on circuit breaker Q1 located on the Rear mounting plate inside the console.

Two circuit breakers (Q1 and Q2) are located on the Rear mounting plate, which function both as fuses and power switches.

The mains voltage passes the circuit breakers, Q1/Q2 and trips and breaks the circuits if the mains current exceeds the rated Q1/Q2 current.

The UPS/AC ship supply is distributed, via circuit breaker Q1 and row terminals X2 and X3 (and PE for ground), to supply the computer and monitor(s).

The Panel system gets its mains supply from terminals X2, X3 and PE, via a power supply unit (PSU1) which supplies the Panel system with 24 VDC. The 24 VDC is entered at the Input panel of the Panel system and supplies the system panels, keyboard and heading wheel via USB connections. The I/O Controller (option) gets it supply voltage directly from the 24 VDC power supply unit (PSU1). The Joystick, if used is supplied via the BU-DP or the BU-TC panel.

The UPS/AC ship supply also passes the circuit breaker Q2 before it is passed to 115/230 VAC Mains outlet socket. The outlet socket is used for service purpose only.

Caution

Do not use the mains outlet for other purposes than servicing the system. Heavy or noisy loads connected here may damage the system.

K-Bridge systems

Figure 22   OS-650-KM05 Deep Line K-Bridge systems
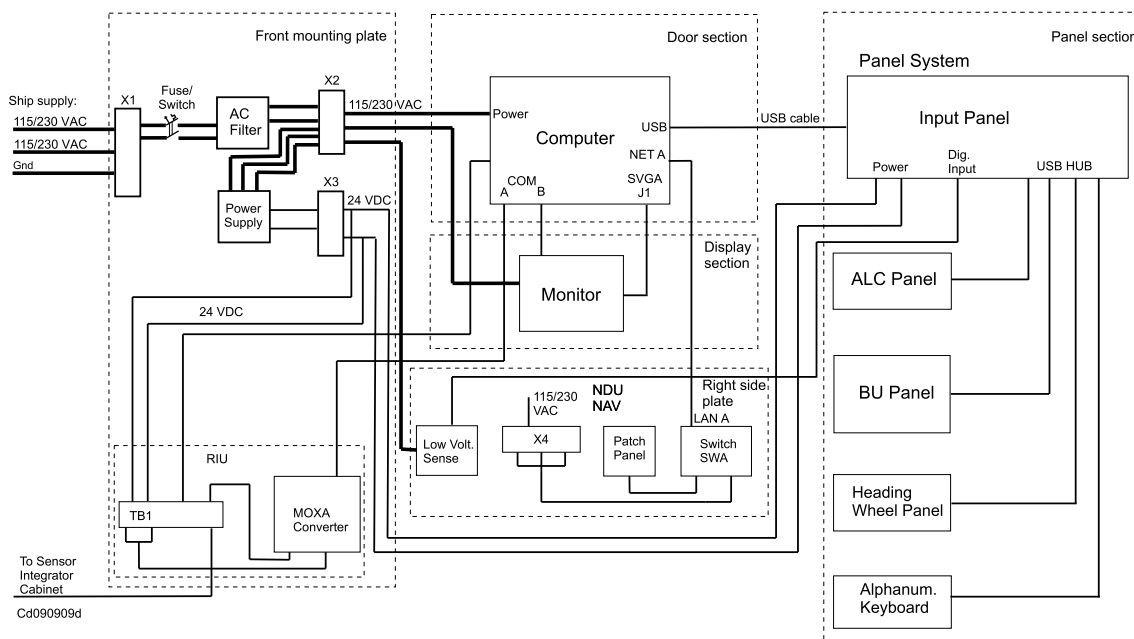
Some differences apply for the K-Bridge version compared with the other OSes (see Figure 21 on page 29 and Figure 22).

The filter and power supply are located on the dedicated Rear mounting plate inside the OS (see Figure 19 on page 27).

In addition, the following equipment is added:

- A circuit breaker, located on the Rear mounting plate, functions both as a fuse and a power switch.

- A Remote Interface Unit (RIU) with a Moxa Converter, located on the Rear mounting plate (see Figure 19 on page 27) converts signals to/from the Sensor Integrator Cabinet (SINT) from RS422 to RS232 signals which are fed to the COM A port of the computer.

- In the Network Display Unit (NDU) located in the right side plate (see Figure 20 on page 28), a Low Voltage Sense (LVS) is mounted for sensing the 115/230 VAC used for driving the computer and panel system.

The K-Bridge OS-650-KM05 version does not have the mains outlet socket for service purposes and the I/O controller is not applicable.

HiPAP systems

Figure 23   OS-650-KM05 Deep Line HiPAP systems
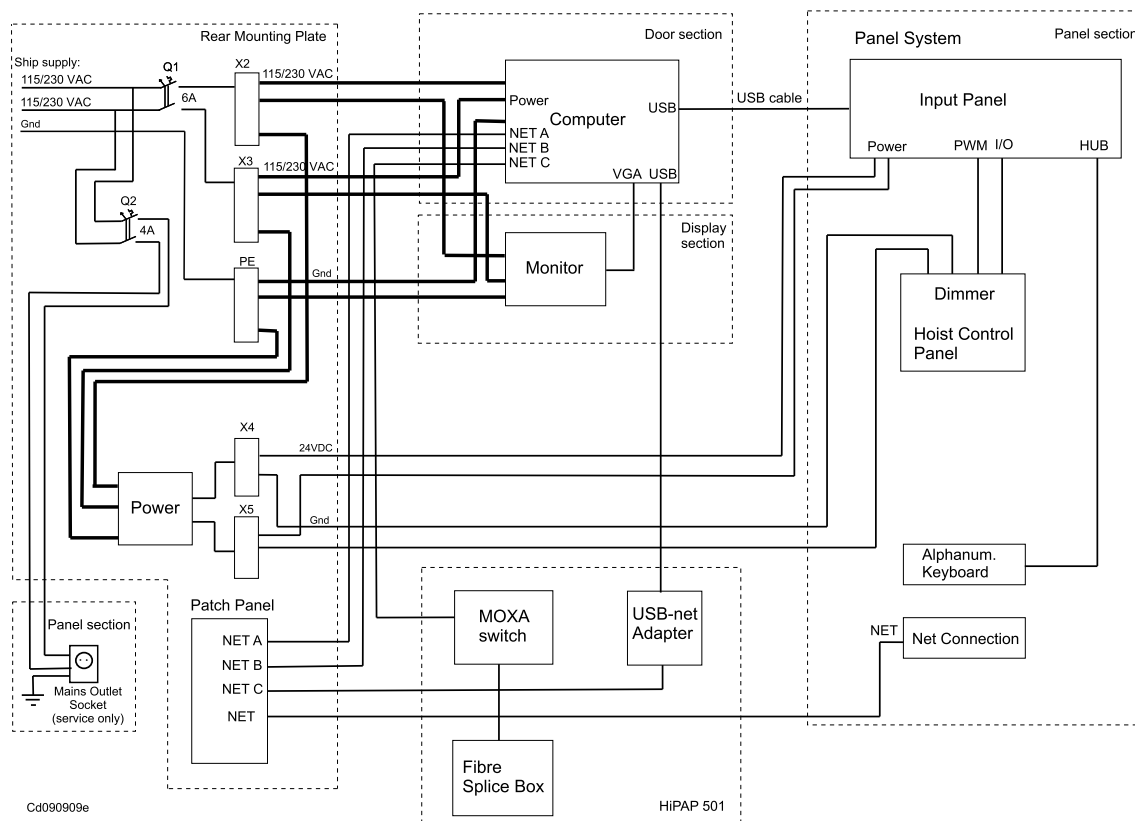
Some additions apply for the HiPAP version compared with the other OSes (see Figure 21 on page 29 and Figure 23).

In addition to a standard version, a Side plate is added with the following equipment:

• A Fibre Splice Box

• A Moxa Switch

These two components splice and switch the incoming field signals to ethernet and connects them to the computer.

• An USB Net Adapter - This is an adapter that converts from ethernet to USB on the computer.

Network connections

Figure 24   Example of network connection (OS without switch)
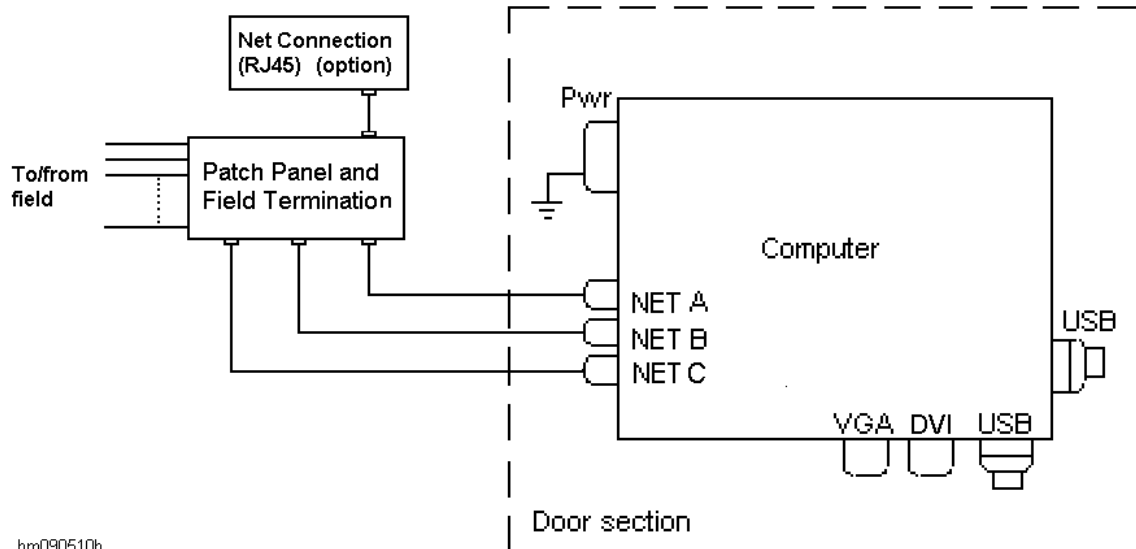
The MPxxxx computer

The MPxxxx computer is mounted on shock absorbers on the computer compartment door (see Figure 25).

Figure 25   Computer attached to console compartment door
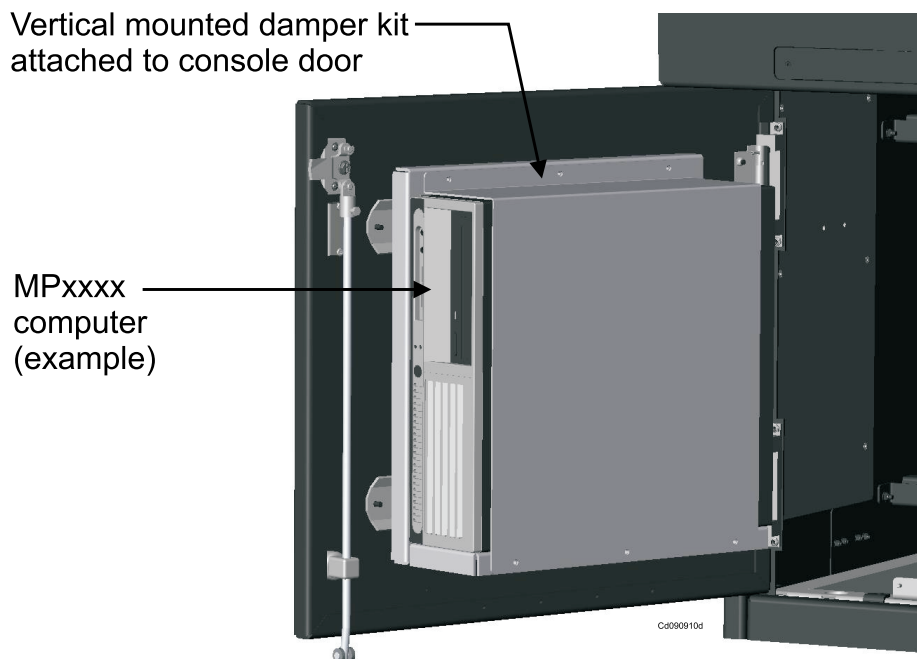
Computer versions

Different computer versions are available, depending on the OS-650-KM05 Deep Line system it is supporting.

The following computer versions are available:

- MPxxxx Base model

- MPxxx NAV model

- MPxxx with 8 channel serial interface (Blue Storm) model

For a detailed description of the different computer types, refer to the *MPxxxx Maintenance Manual*.

Fault finding

This section presents the fault finding principles for the OS-650-KM05 Deep Line.

Panel and Alarm lamps and buttons

The Panel and Alarm lamps and buttons are located in two groups on the ALC and ALC NAV panel (see Figure 3 on page 10 and Figure 4 on page 11).

The Panel group comprises two lamps:

- **POWER** - The lamp is lit green when power is OK.

- **FAULT** - The lamp is lit red when lost contact with the computer, else it is off.

The Alarms group comprises one lamp and three buttons without status lamp:

- **ALARM** - The lamp is flashing red when an alarm has been detected. The lamp is steadily lit when the **ACK** button has been pressed and the alarm is still active.

- **ACK** - The button, when activated, provides a signal to the computer.

- **"Silence"** - The button, when pressed, silences the buzzer locally and provides a signal to the computer.

- **ALARM VIEW** - The button, when activated, provides a signal to the computer.

General fault finding and repair

If an error situation has occurred you will need a combination of the following information items to correct the system:

- Power LEDs and other status lamps (LEDs) on hardware items. Refer to the appropriate *Hardware Module Description* for details.

- Status of power voltages and fuses in the system. Refer to the appropriate *Hardware Module Description* for details.

- System-specific diagrams, lists and drawings. Refer to the appropriate *Drawing File* for details.

- Replacement procedures for replaceable modules. Refer to *Corrective Maintenance* on page 47, the appropriate *Hardware Module Description* or the appropriate *Maintenance Manual* for details.

Reading power LED status and measuring supply voltages

For all systems, the mains voltage can be measured, where appropriate, using a multimeter with AC-range.

All OS systems (except K-Bridge)

The power supply unit (QUINT-PS/1AC/24DC/10) is a 115/230 VAC to 24 VDC converter. The status of this power supply unit is shown by a green LED on front of the unit, which when lit green corresponds to an OK state.

The power supply unit is located on the Rear mounting plate inside the OS (see Figure 9 on page 17).

K-Bridge systems

The Power interface (PI10K), supports 115/230 VAC via a AC filter and 24 VDC via power supply/converter (MWS-150-24ME). It is mounted on the Rear mounting plate inside the operator console (see Figure 19 on page 27).

The message system

The OS-650-KM05 Deep Line systems contain self tests that continually check for faults while the system is running. System messages are generated to inform you of any incorrect system operation or to bring any other relevant information to your attention.

The OS-650-KM05 Deep Line related system messages are displayed at the OS and/or on the event/alarm printer to inform the operator about controller/process station faults or to bring any other relevant information to the operator's attention.

For detailed information concerning system messages, refer to the appropriate *Operator/User Manual* for detailed information on reading the equipment status.

Online help

When system is running, the Message Line in the display layout or Event Window shows the most recent warning, alarm or emergency message that has not yet been acknowledged. Right-clicking the message text opens the System Messages Help with the relevant message explanation displayed online on the OS.

For detailed information concerning online help information, refer to applicable *Operator/User Manual*.

Fault finding flowchart

Start

No picture on Monitor or no Panel lights.

Check input voltage on X1

Is the input voltage on X1 OK? — No / Yes

Check status of circuit breaker (Q1)

Is the Circuit breaker (Q1) closed? — No / Yes

Close circuit breakers and wait for Computer to come up

Is panel system OK? — No / Yes

Does the circuit breaker trip again? — Yes / No

Is panel system power OK? — No → Check/repair panel system power / Yes

Is Computer Power LED lit ? — No / Yes

Are any panel lights lit? — No / Yes

No mains voltage present. Repair the Mains/UPS. Restart system

Repair computer and the colour monitor as appropriate

Is the OS OK? — No / Yes

Repair or replace failing BU xxx as appropriate

Is the OS / Panel system OK? — Yes / No

Contact Kongsberg Maritime for recommended action

End

(Vis090502a)

Note _____

If you are not able to correct the error situation yourself, you should contact your nearest Kongsberg Maritime service office for advice or to request for service.

Preventive Maintenance

This section provides the preventive maintenance for the OS-650-KM05 Deep Line.

How to tighten screws in the field termination blocks

Use a screwdriver with isolated handle to tighten any loose screws on patch panel and field termination.

How to check connector locks

Use a screwdriver to tighten locking screws on the D-sub connector houses.

Check if the RJ45 network connector plugs are locked by pushing them into the connector. If the lock flip is not in lock position, a click will be heard when pushed.

Flat-cable connector locks should be checked by visual inspection only. Ensure that the locks are in correct position.

How to check buttons, lamps and panels

Note

For all panels, the light intensity of the backlighting and status lamps can be dimmed from the OS of which the panel is a part.

BU-NAV panel

Figure 26 on page 39 shows the front layout of the BU-NAV panel. It contains 16 buttons, three knobs and four lamps.

Note

At the moment there is no lamp test for the BU-NAV panel, however the lamps are lit during the start up of the K-Bridge application and may be seen here.

Figure 26   Front layout of the BU-NAV panel

(CD90122a)
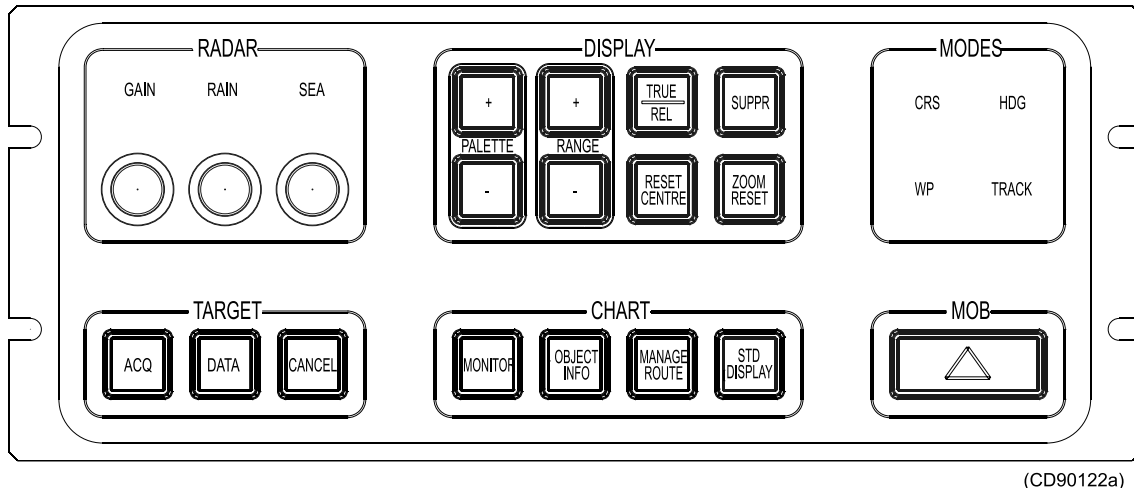
A more detailed description of the BU-NAV panel can be found in the *COP-05 BU-NAV Panel Hardware Module Description*.

BU-DP panel

Figure 27 on page 40 shows the front layout of the BU-DP panel. It contains 56 buttons. All buttons except for those in the **VIEWS** group are provided with status lamps.

To perform lamp test the application must be running. Then click the following from the menu bar: **View →Panel →Lamp Test**. In the displayed **Panel Lamp Test** dialog box, click **Start Lamp Test** button and all the panel button status lamps should be lit.

Press in turn, each button that has a status lamp. Each status lamp should extinguish when its associated button is pressed.

Figure 27   Front layout of the BU-DP panel
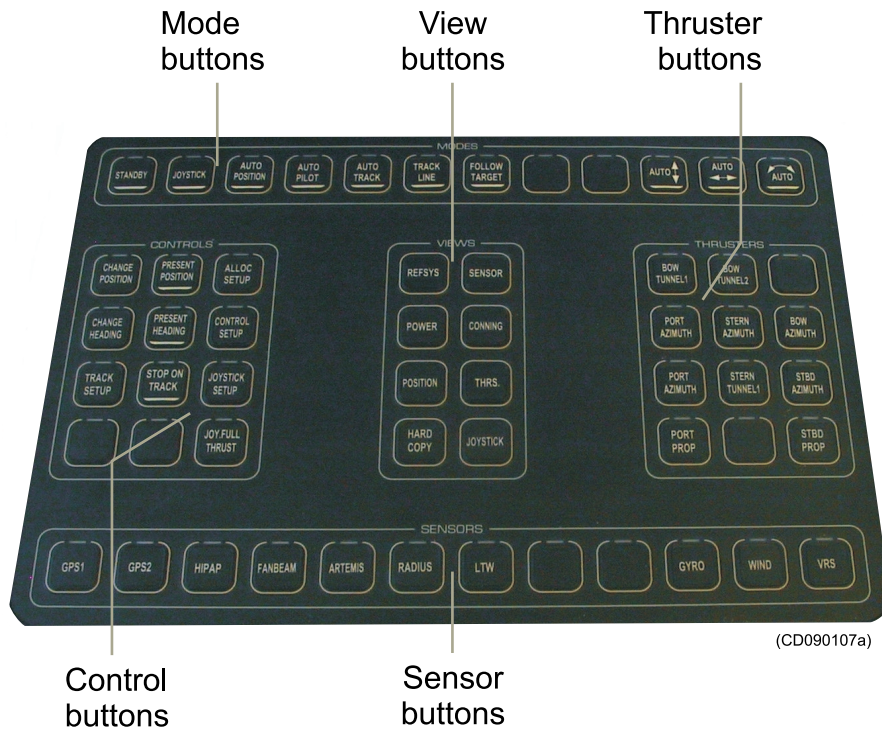
A more detailed description of the BU-DP panel can be found in the *COP-05 BU-DP Panel Hardware Module Description*.

BU-TC panel

Figure 28 on page 41 shows the front layout of the BU-TC panel. It contains 30 buttons and lamps. All buttons group are provided with status lamps.

To perform lamp test the application must be running. Then click the following from the menu bar: **View →Panel →Lamp Test**. In the displayed **Panel Lamp Test** dialog box, click **Start Lamp Test** button and all the panel button status lamps should be lit.

Press in turn, each button that has a status lamp. Each status lamp should extinguish when its associated button is pressed.

Figure 28   Front layout of the BU-TC panel
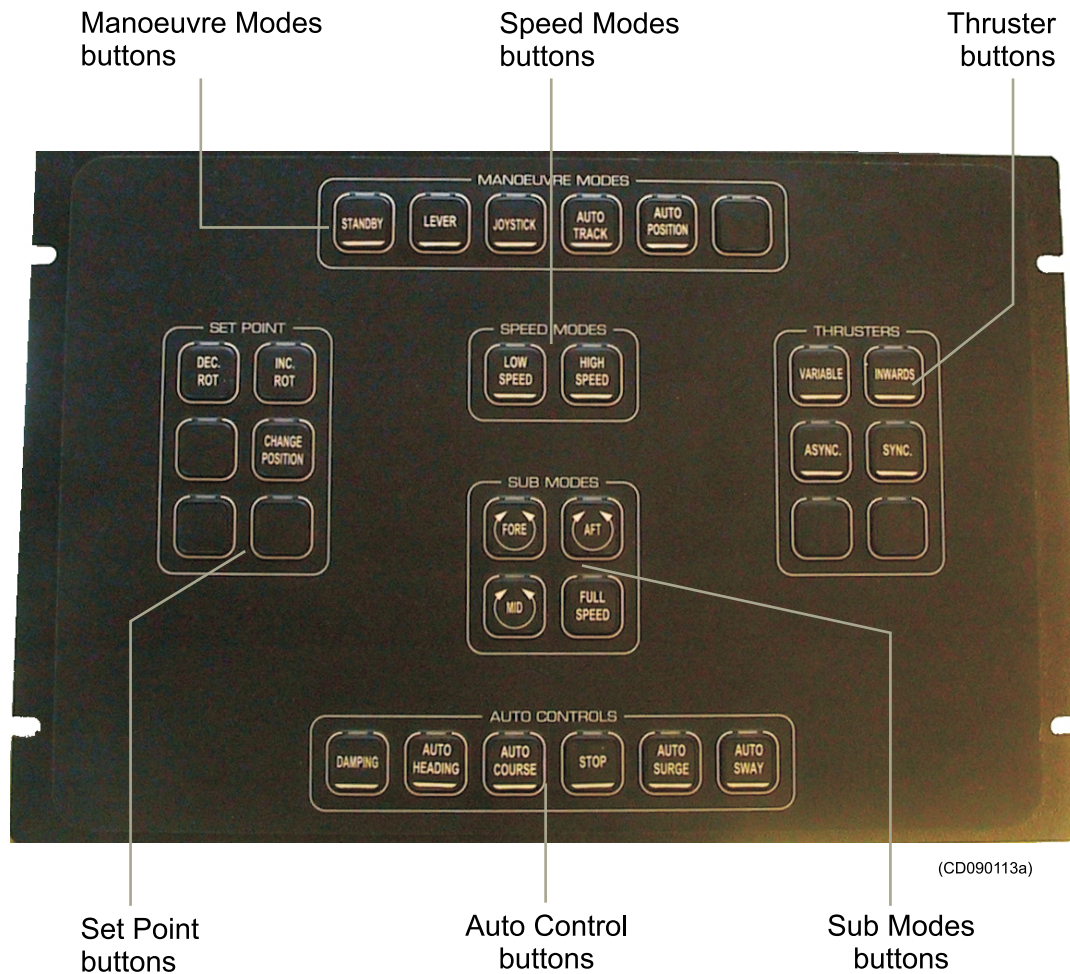
A more detailed description of the BU-TC panel can be found in the *COP-05 BU-TC Panel Hardware Module Description*.

BU-AUT panel

Figure 29 on page 42 shows the front layout of the BU-AUT panel. It contains 28 buttons and lamps. All buttons are provided with status lamps.

To perform lamp test the application must be running. Then click the following from the menu bar: **View →Panel →Lamp Test**. In the displayed **Panel Lamp Test** dialog box, click **Start Lamp Test** button and all the panel button status lamps should be lit.

Press in turn, each button. Each status lamp should extinguish when its associated button is pressed.

Figure 29   Front layout of the BU-AUT panel
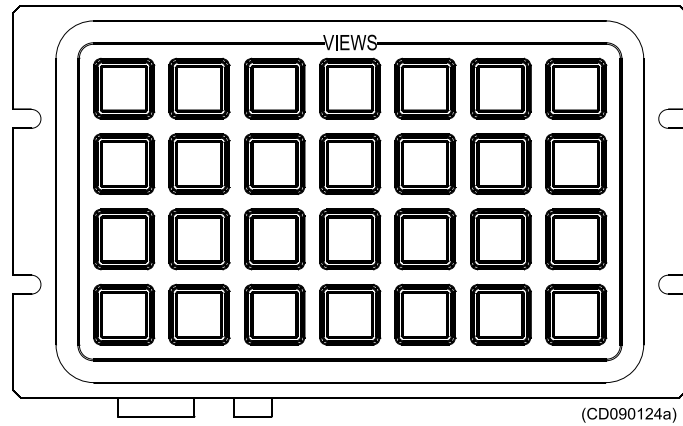
A more detailed description of the BU-AUT panel can be found in the *COP-05 BU-AUT Panel Hardware Module Description*.

Input panel

Figure 30 shows the front layout of the Input panel. It contains a 19 buttons keypad for screen navigation, entering numbers and text into the system and a Trackball with seven buttons integrated in the circular Trackball cover.

Figure 30   Front layout of the Input panel
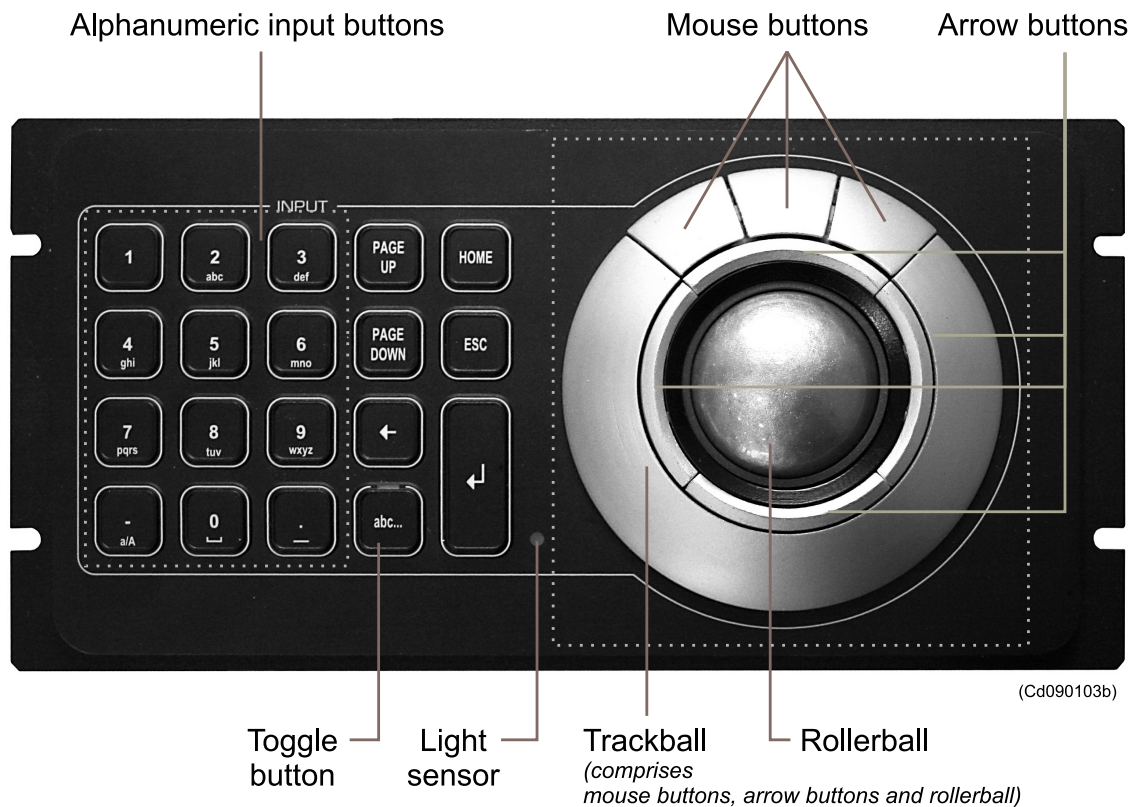
Note _____

The 'abc...' button act as a toggle button between letters and numbers, and the 'a/A' button acts as CapsLock.

_____

A more detailed description of the Input Panel can be found in the *COP-05 Input Panel Hardware Module Description*.

All OS systems (except K-Bridge, K-Chief, K-Thrust and K-Pos DP)

A function test may be performed via Note Pad. Click the following : **Microsoft Start** →**Programs** →**Accessories** →**Note Pad**.

The alphanumeric input buttons acts as a keyboard. Press in turn, each button on the Input panel, which is reflected in Note Pad.

The Trackball with Rollerball, mouse buttons and arrow buttons may also be checked in Note Pad.

Close the **Note Pad** dialog after test.

K-Bridge systems

A function test may be performed via dialogs in Radar or ECDIS menu system. Click the following : **Main Menu** →**Note(s)** →**Edit Notes**→**Edit**. This opens the **NAV Note** dialog. Then press in turn, each button on the Input panel, which is reflected in the **Comment** field.

The Trackball with Rollerball, mouse buttons and arrow buttons may also be checked here (see also *How to clean the buttons, panels and rollerball* on page 45).

Note _____

The sign of a contaminated Rollerball is when the cursor does not follow the movement of the Rollerball, but stops for short periods.

_____

Close the **NAV Note** dialog after test.

Refer to the *K-Bridge Radar Operator Manual* or *K-Bridge ECDIS Operator Manual*, for details.

K-Chief, K-Thrust and K-Pos DP systems

A function test related to numeric input may be tested when doing ordinary operation interactions.

The Trackball with Rollerball, mouse buttons and arrow buttons may also be checked here (see also *How to clean the buttons, panels and rollerball* on page 45).

Note _____

The sign of a contaminated Rollerball is when the cursor does not follow the movement of the Rollerball, but stops for short periods.

_____

How to clean the console housing

Use a lint-free, non-abrasive cloth and a neutral or mild soap solution for best result. Use only moistened cloth. Do not use a dripping wet cloth when cleaning.

How to adjust the colour monitor settings

Adjust the appropriate settings in accordance with the colour monitor, refer to the appropriate colour monitor *Hardware Module Description* and/or sub-supplier *User Manual*.

How to clean colour the colour monitor screen surface

Use a lint-free, non-abrasive cloth and a neutral cleaner based on a non-abrasive cleaning solution or a glass cleaner for best result.

How to access the alphanumeric keyboard

Caution

Use of the alphanumeric keyboard for maintenance purposes is restricted to Kongsberg Maritime service personnel.

The alphanumeric keyboard is located in a drawer in front of the OS.

1   Push the drawer to release the lock behind the keyboard and make the drawer automatically open outwards.

2   Lift out the keyboard from the drawer.

   The keyboard has sufficient cable length to allow it to be placed on the top of the Operator panel.

How to maintain the MPxxxx computer

For Preventive Maintenance of the MPxxxx computer, refer to the *MPxxxx Maintenance Manual*.

How to clean the buttons, panels and rollerball

Use a vacuum cleaner with a soft brush to avoid damage to the buttons and panels. If required, clean the buttons and panel with a non-abrasive cloth.

Note

The sign of a contaminated Rollerball is when the cursor does not follow the movement of the Rollerball, but stops for short periods.

If the rollerball has been contaminated with dust particles or similar, it should be cleaned using the procedure given in the *COP-05 Input Panel Hardware Module Description*.

How to clean the Heading Wheel panel

If the heading wheel has been contaminated with dust particles and grease, it should be cleaned using a vacuum cleaner with a soft brush to avoid damage to the buttons and the panel. If required, clean the buttons and panel with a non-abrasive cloth.

How to clean the Joystick panel

If the Joystick panel has been contaminated with dust particles and grease, it should be cleaned using a vacuum cleaner with a soft brush to avoid damage to the buttons and the panel. If required, clean the panel with a non-abrasive cloth.

OS preventive maintenance intervals

Note

Local evaluation should be made to determine site-specific maintenance intervals.

Table 1   Recommended OS maintenance intervals

Action	Interval recommended
Clean the colour monitor screen.	One week.
Clean the console housing.	One month.
Check the computer.	One month.
Clean the buttons and panels.	One month or as required.
Adjust the colour monitor settings.	Three months or as required.

Table 1   Recommended OS maintenance intervals (cont'd.)

Action	**Interval recommended**
Clean the rollerball.	Three months or as required.
Tighten the termination block screws.	Six months.
Clean the heading wheel.	Six months or as required.
Clean the Joystick panel.	Six months or as required.
Check the connector locks.	Twelve months.

For preventive maintenance for the computer MPxxxx, refer to the *MPxxxx Maintenance Manual* and for the colour monitor, refer to the sub-supplier *User Manual* supplied with the monitor.

Corrective Maintenance

This section presents the corrective maintenance procedures for the OS-650-KM05 Deep Line.

Corrective maintenance procedures not described in this section are to be found in the appropriate *Hardware Module Description* for the part numbers referred to in the replaceable parts and recommended spare parts list. Corrective maintenance of parts not provided by any of the above should be performed by Kongsberg Maritime service personnel only.

Precautions and requirements before replacing a Module

Caution

Be careful not to strain the cables between the Operator panel and Operator panel frame.

Switching off the OS

All OS systems (except K-Bridge system)

Before performing corrective maintenance on the OS, power must be turned off as follows:

1 Run the standard shut-down procedure, as described in the applicable *Operator Manual*.

2 When the shut-down procedure has been completed and the application has closed down, open the front door by turning the door lock.

3 Turn off circuit breaker Q1 (see Figure 9 on page 17).

Note _____

Circuit breaker Q2 must be turned off, if power to the main outlet socket (for service) is to be turned off.

K-Bridge systems

Before performing corrective maintenance on the OS, power must be turned off as follows:

1   Run standard shut-down procedure, as described in applicable *Operator Manual*.

2   When the shut-down procedure has been completed and the application has closed down, open the front door by turning the door lock.

3   Turn off the fuse/switch on top of the Power Interface, on the Rear mounting plate (see Figure 19 on page 27).

Note _____

K-Bridge systems do not have service sockets.

Replacing the colour monitor

The following steps must be done before performing this procedure:

• Ensure that the new colour monitor is the recommended spare part for OS-650-KM05 Deep Line.

• Check which gasket for the new colour monitor is to be used as two versions of cabinets exists:

– For an OS **with** two umbraco screws at each end of the top of the frame, use the 6 mm gasket that comes with new colour monitor (see Figure 31 on page 49).

– For an OS **without** two umbraco at each end of the top of the frame, use a 4 mm gasket (part number 2101546).

The colour monitor is replaced as follows:

1   Shut-down and turn off power to the OS (see *Switching off the OS* on page 47).

2   Disconnect the VGA cable (J1) and Power cable from back of the defective colour monitor.

3   Remove the three 4 mm umbraco screws (in the middle of the top of the defective colour monitor) that secure the colour monitor to the OS frame (see Figure 31 on page 49).

4   Then, if present, remove the four 3 mm umbraco screws (two at each end of the top of the defective colour monitor) that secure the defective colour monitor to the OS frame.

Figure 31   Colour monitor removal

Three (4 mm)
umbraco screws

Two screws for
service hatch

If present, four (3 mm)
umbraco screws
(two at each end)
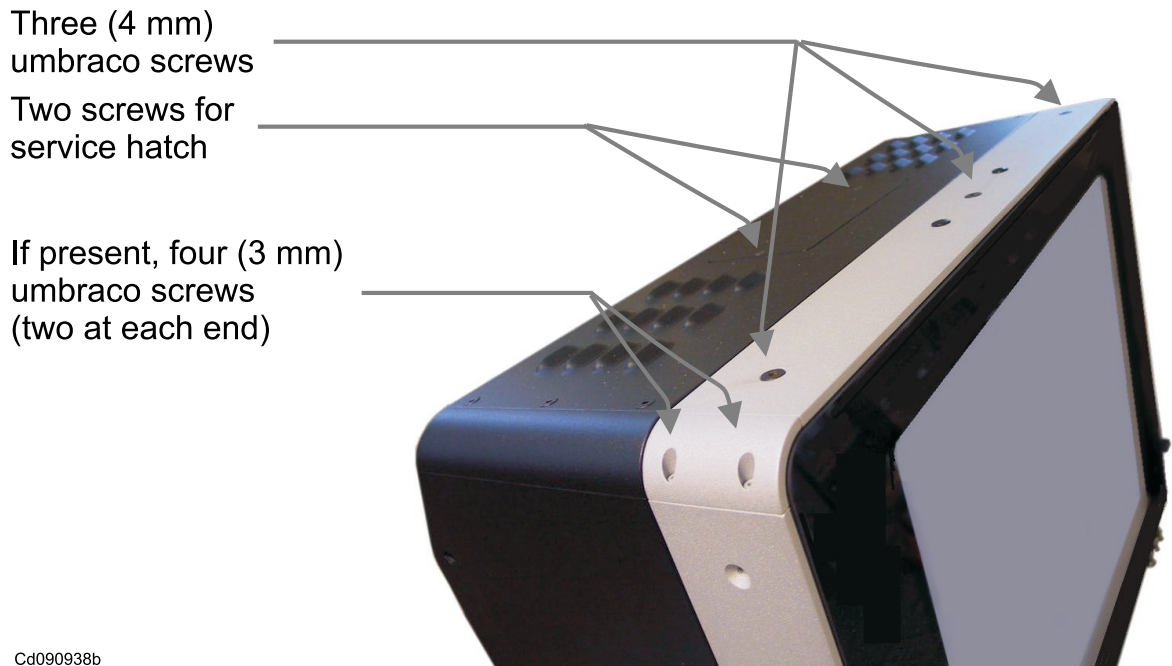
Cd090938b

5   Open the OS front door and then, inside the computer compartment, remove the
two 5 mm umbraco bolts securing the defective colour monitor to the OS frame
(see Figure 32).

Figure 32   Bolts inside the OS securing the colour monitor

Two (5 mm)
umbraco bolts
inside the computer
compartment
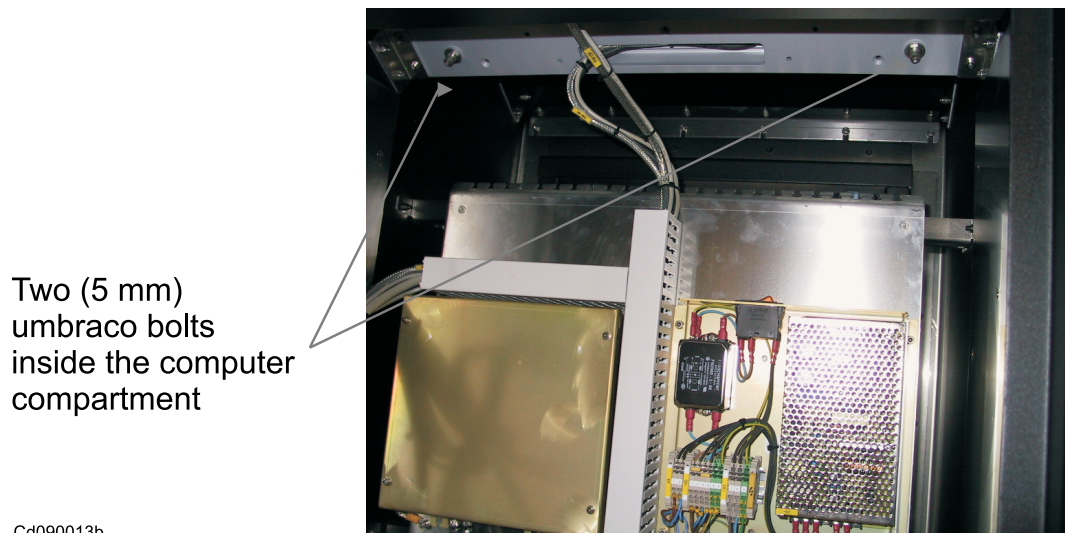
Cd090013b

Note

*This view is looking inside the OS, and in this case a K-Bridge mounting plate is
located inside the OS. The two umbraco bolts to be removed are located above
the K-Bridge mounting plate.*

6   Remove the two service hatch screws on the top of the OS and remove the service hatch (see Figure 31 on page 49).

7   With one hand through the service hatch opening, carefully push the defective colour monitor out from the OS frame and then place it aside.

8   Mark the defective colour monitor with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

9   Get the new colour monitor.

A 6 mm gasket is delivered with the new colour, but not mounted.

a   If the OS **has** two umbraco screws at each end of the top of the frame, the 6 mm gasket has to be mounted along the bottom edge of the glass at the front of the new colour monitor.

b   If the OS **does not have** two umbraco screws at each end of the top of the frame, the 4 mm gasket (part number 2101546) has to be mounted along the bottom edge of the glass at the front of the new colour monitor.

Note

Remember to remove the self-adhesive paper from the gasket, before attaching gasket to the new colour monitor.

Take care not to stretch the gasket.

10   To install the new colour monitor into the OS frame, perform the above procedure in the reverse order.

11   Switch on power to the OS by turning on circuit breaker Q1 (for K-Bridge systems, turn on the fuse/switch).

12   Close and lock the OS front door.

Replacing the MPxxxx computer

For corrective maintenance of the MPxxxx computer, refer to the *MPxxxx Maintenance Manual.*

Replacing the panels in the Operator panel

Note

Different OS configurations are available, so the Operator panel may look different than that shown in Figure 33 on page 51 and Figure 34 on page 52.

The following step must be done before performing this procedure:

• Ensure that the different panels are the recommended spare part for OS-650-KM05 Deep Line.

The panels located in the Operator panel are replaced as follows:

1 Shut-down and turn off power to the OS as described in *Switching off the OS* on page 47).

2 Remove the three 6/12 mm umbraco screws at the rear of the Operator panel (see Figure 33 on page 51).

Figure 33   Removing/attaching the Operator panel

Three (6/12 mm) umbraco screws (at the rear of the Operator panel)

Operator panel

Three (6/15 mm) umbraco screws (at the front of the Operator panel)
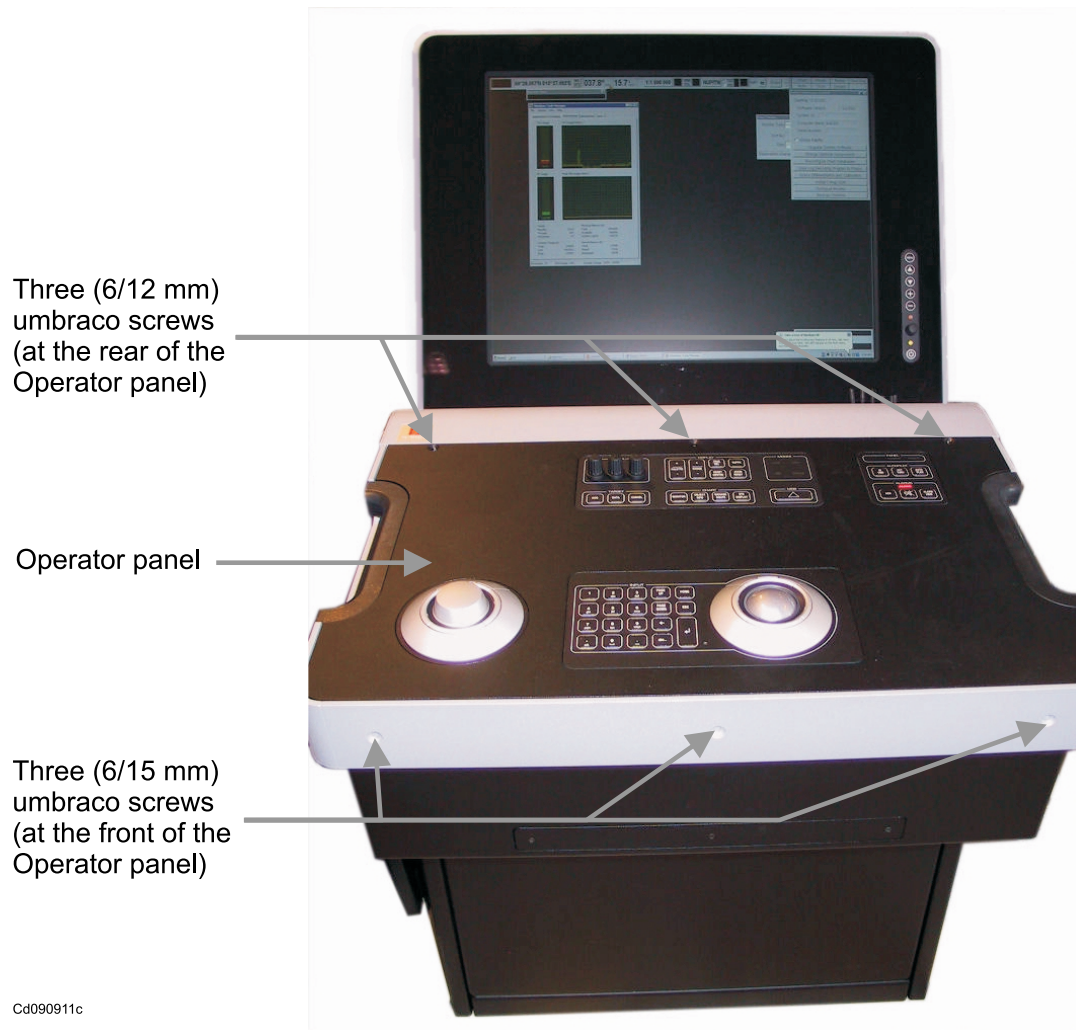
Cd090911c

3 Remove the three 6/15 mm umbraco screws at the front of the Operator panel (see Figure 33).

4 Lift the Operator panel plate by taking hold of the plate and raising it upwards about 2 cm.

   The Operator panel is now ready to be lifted and tilted up.

5 When lifting the Operator panel upwards, carefully tilt the front of the panel backwards, about 120° (see Figure 34 on page 52).

   The panels located in the Operator panel are all attached to the panel plate from underneath by 4 nuts and screws attached to the underside of the Operator panel.

Figure 34   Operator panel seen from underneath

Four nuts and screws
for each panel
(two sets at each side)

USB connector
connected to
each panel

Cd090914b
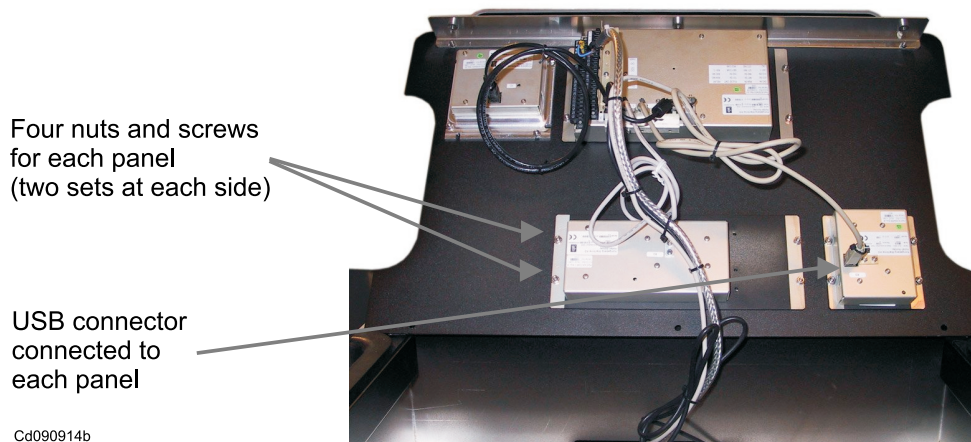
6 For the panel to be replaced, disconnect the USB cable and then remove the four nuts attaching the panel to the Operator panel.

For further details, refer to following for the different panel types:

a Replacing the **ALC panel**, refer to the *COP05 ALC Panel Hardware Module Description*.

b Replacing the **ALC NAV panel**, refer to the *COP05 ALC NAV Panel Hardware Module Description*.

c Replacing the **BU-DP panel**, refer to the *COP05 BU-DP Panel Hardware Module Description*.

d Replacing the **BU-NAV panel**, refer to the *COP05 BU-NAV Panel Hardware Module Description*.

e Replacing the **BU-TC panel**, refer to the *COP05 BU-TC Panel Hardware Module Description*.

f Replacing the **Input panel**, refer to the *COP05 Input panel Hardware Module Description*.

g Replacing the **Heading Wheel panel**, refer to the *COP05 Heading Wheel Panel Hardware Module Description*.

h Replacing the **Joystick panel**, refer to the *COP05 Hardware Module Description*.

7 Mark the defective panel with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

8 When defective panel has been replaced, connect the cables to the panel.

9 Lower the Operator panel back down into position.

10 Refit the three 6/12 mm umbraco screws to the rear and the three 6/15 mm umbraco screws to the front of the Operator panel (see Figure 33 on page 51).

11 Open the front door of the OS.

12 Switch on power to the OS by turning on circuit breaker Q1 (for K-Bridge systems, turn on the fuse/switch).

13 Close and lock the front door of the OS.

Replacing the power supply unit

For all systems (except K-Bridge systems)

The power supply unit is located on the Rear mounting plate inside the OS (see Figure 9 on page 17).

The following step must be done before performing this procedure:

• Ensure that the new power supply unit is the recommended spare part for OS-650-KM05 Deep Line.

1 Shut-down and turn off power to the OS as described in *Switching off the OS* on page 47.

2 Open the front door of the OS.

3 Locate the defective power supply unit on the Rear mounting plate.

4 Locate the cables connected to the defective power supply unit and disconnect them from the defective power supply unit.

Make sure the cables are correctly marked so they can be identified for reconnection to the new power supply unit.

5 Insert a flat-head screwdriver into the slot in the mounting plate as shown in Figure 35 on page 54.

6 Push the screwdriver handle in the direction shown in Figure 35 on page 54 to retract the lock.

7 With the lock retracted, remove the power supply unit from the DIN mounting rail.

8 Carefully unscrew the mounting plate from the power supply unit.

9 Mark the defective power supply unit with a label describing the symptoms observed, then pack it in a shielding bag and store it in a safe place.

10 Fasten the mounting plate to the new power supply unit.

11 Position the new power supply unit over the DIN rail with the mounting plate pressed against the DIN rail.

12 Repeat steps 4 and 5 while holding the new power supply unit firmly against the DIN rail.

13 Remove the screwdriver from the slot.

14 Make sure that the new power supply unit is firmly attached to the DIN rail.

15 Connect the cables to the new power supply unit.

16 Switch on power to the OS by turning on circuit breaker Q1.

17 Verify, by measuring at the **Output DC 24 V 10 A** terminals (**+** and **–**) on the new power supply unit, that the correct voltage (24 VDC) is present.

18 Close and lock the front door of the OS.

Figure 35   Removing the power supply unit from the DIN rail
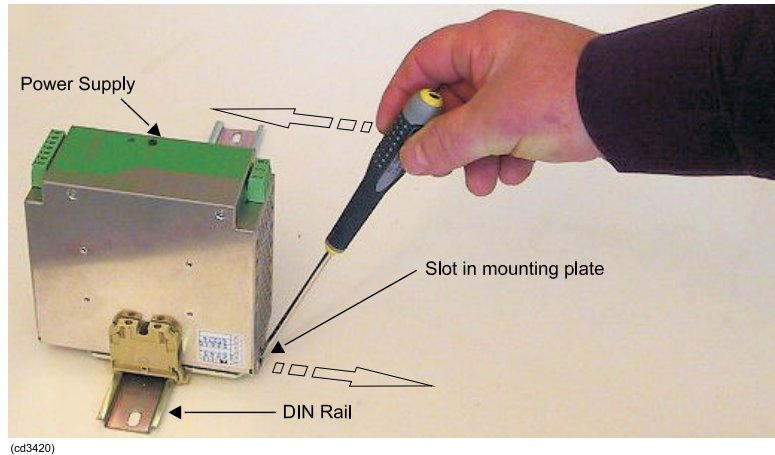
For K-Bridge systems

The Power interface (PI10K) with its power supply is located on the Rear mounting plate inside the OS (see Figure 19 on page 27).

The following step must have been performed before doing this procedure:

* Ensure that the new power supply module is the recommended spare part for OS-650-KM05 Deep Line.

1 Run the standard shut-down procedure as described in the applicable *Operator Manual*.

2 When the shut-down procedure has been completed and the application has closed down, turn off ships supply/UPS to the OS.

3 Open the front door of the OS.

4 Locate the cables to the power supply and disconnect them.

Make sure the cables are marked so they can be identified for new power supply connection.

5 Remove the four umbraco screws located in each corner of the power interface assembly.

6 Lift the power interface assembly with power supply from the Rear mounting plate and then unscrew the power supply from the power interface assembly.

7 Carefully remove the power supply from the power interface assembly and place aside.

8 Mark the defective power supply with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

9 Install the new power supply by performing the above procedure in the reverse order.

10 Turn on the ships supply/UPS to the OS.

11 Verify, by measuring on the terminals of X3 and X2, that 24 VDC is present at X3-1 and X3-2 and 115/230 VAC is present at X2-1/2, X2-3/4 and X2-5/6.

12 Close and lock the front door of the OS.

Replacing the Filter

For K-Bridge systems

The Power interface (PI10K) with its filter is located on the Rear mounting plate inside the OS (see Figure 19 on page 27).

The following step must be done before performing this procedure:

* Ensure that the new filter is the recommended spare part for OS-650-KM05 Deep Line.

1   Shut-down and turn-off power as described in *K-Bridge systems* on page 48.

2   Open the front door of the OS.

3   Locate the Rear mounting plate inside the OS (see Figure 19 on page 27).

4   Locate the cables to the filter and snap off its connectors.

> Make sure the cables are marked so they can be identified for new filter connection.

5   Remove the two umbraco screws located in the end of the filter assembly.

6   Carefully remove the filter from the assembly and then place it aside.

7   Mark the defective filter with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

8   Install the new filter by performing the above procedure in the reverse order.

9   Switch on power to the OS by turning on the fuse/switch.

10 Verify, by measuring on the terminals of X2, that 115/230 VAC is present at X2-1/2, X2-3/4 and X2-4/5.

11 Close and lock the front door of the OS.

Replacing main circuit breakers

For all systems (except K-Bridge systems)

The following step must be done before performing this procedure:

* Ensure that the new circuit breaker is the recommended spare part for OS-650-KM05 Deep Line.

1   Run the standard shut-down procedure as described in applicable *Operator Manual*.

2   When the shut-down procedure has been completed and the application has closed down, switch off the ships supply/UPS to the OS.

> Note
>
> *Safety systems have two separate supplies/UPS. Remember to turn off both supplies/UPS.*

3   Open the front door of the OS.

4   Locate the defective circuit breaker (Q1 or Q2).

5 Verify that there is no voltage on the input terminals.

6 Remove the busbar between Q1 and Q2, and then remove the wires connected to Q1.

7 Remove the defective circuit breaker (Q1 or Q2).

8 Install the new circuit breaker (Q1 or Q2).

9 Re-attach the busbar and wires to Q1 and/or Q2.

10 Turn on the new circuit breaker (Q1 or Q2).

11 Switch on the ships supply/UPS to the OS.

Note ───────────────────────────────

Safety systems have two separate supplies/UPS. Remember to turn on both supplies/UPS.

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12 Verify, by measuring at the terminals of X3, that 115/230 VAC is present at X3-1 and X3-6.

13 Close and lock the front door of the OS.

For K-Bridge systems

This procedure only applies for replacing the K-Bridge fuse/switch.

The following step must be done before performing this procedure:

- Ensure that the new fuse/switch is the recommended spare part for OS-650-KM05 Deep Line.

1 Run standard shut-down procedure as described in applicable *Operator Manual*.

2 When the shut-down procedure has been completed and the application has closed down, switch off the ships supply/UPS to the OS.

3 Open the front door of the OS.

4 Locate the Rear mounting plate inside the OS (see Figure 19 on page 27).

5 Locate the cables to the fuse/switch and snap off its connectors.

   Make sure the cables are marked so they can be identified for new filter connection.

6 Carefully remove the fuse/switch from the assembly by pulling outwards (The fuse/switch is spring-connected to the assembly and comes easily off).

7 Mark the defective fuse/switch with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

8 Install the new fuse/switch by performing the above procedure in the reverse order.

9 Turn on the fuse/switch.

10 Switch on the ships supply/UPS to the OS.

11 Verify that the appropriate voltage is present by measuring at filter (115/230 VAC at L, N and PE on the filter).

12 Close and lock the front door of the OS.

Replacing the alphanumeric keyboard

The alphanumeric keyboard is available in a drawer at front of the Operator panel (see Figure 1 on page 7 and Figure 8 on page 15).

The following step must be done before performing this procedure:

• Ensure that the new alphanumeric keyboard is the recommended spare part for OS-650-KM05 Deep Line.

1 Shut-down and turn-off power as described in *Switching off the OS* on page 47.

2 Perform steps 2 to 5 of the procedure in on page 50 to remove the Operator panel.

3 Inside the panel section, locate the cable from the alphanumeric keyboard to the Input panel.

4 Disconnect the cable and carefully remove the alphanumeric keyboard.

5 Mark the defective alphanumeric keyboard with a label describing the symptoms observed, carefully pack in a shielding bag and place on a secure place.

6 Install the new alphanumeric keyboard by performing the above procedure in the reverse order.

7 When completed, perform steps 9 to 12 of the procedure in on page 50 to attach the Operator panel to the OS.

Replaceable Parts and Consumables

This section contains lists of replaceable parts, recommended spare parts and consumables used in OS-650-KM05 Deep Line. Replacement procedures for the listed parts are described in *Corrective Maintenance* on page 47 and in the appropriate *Hardware Module Description*.

Replaceable parts and recommended spare parts

Common spare parts

Table 2   Common replaceable parts and recommended common spare parts

List ident.	Part name	Recommended as spare part	Part number
1	Colour monitor, 23"	X	703736
2	Alphanumeric keyboard		704363
3	One of the following computers: • MPxxx, Base model • MPxxxx NAV model • MPxxxx with 8 channel serial interface (Blue Storm) model	Refer to MPxxxx Maintenance Manual	
4	Power supply unit Quint-PS/1AC/24DC/10 (Not for K-Bridge)	X	326396
6	Fuse Siemens 4A, 2p (Not for K-Bridge)	X	702801
7	Fuse Siemens 6A, 2p (Not for K-Bridge)	X	702802
8	Net Switch (Not for K-Bridge)	X (if installed)	702403

K-Bridge systems

Table 3   Replaceable parts and recommended spare parts for K-Bridge systems

List ident.	Part name	Recommended as spare part	Part number
Operator panel (ECDIS and Radar)			
1	BU-NAV panel	X	603528
2	ALC NAV panel	X	603527
3	Input panel (with mechanical trackball)	X	330951
4	Heading Wheel panel		603550
5	PI10K Power Interface Unit (Includes pos. 6, 7 and 8)		301915
6	Fuse/switch 2 x 5 A.(Part of pos. 5)	X	3700655
7	Power filter 110/250V AC 3A, FN2080-3-07 (Part of pos. 5)	X	3600228
8	Power supply 230V AC/24V DC 150W, MWS-150-24ME (Part of pos. 5)	X	3800288
9	Radar Interface Unit (RIU)	X	301912
10	Low Voltage Sense (LVS), ME35 UTM	X	308920
11	Switch, 16 ports, AT-FS716L	X	301855
Radar system			
12	NA1149, RIC2 card (Radar only)	X	6200455

K-Pos systems

Table 4   Replaceable parts and recommended spare parts for K-Pos system

List ident.	Part name	Recommended as spare part	Part number
1	BU-DP panel	X	603530
2	ALC panel	X	603526
3	Input panel (with mechanical trackball)	X	330951
4	Heading Wheel panel		603550
5	Joystick panel (Lilaas)		301491
	Joystick panel (Kwant Controls)		304849

Table 4   Replaceable parts and recommended spare parts for K-Pos system (cont'd.)

List ident.	Part name	Recommended as spare part	Part number
6	Kits for Drop in Panels (if used):		
	• Drop in panel, 2-position switch		603595
	• Drop in panel, 3-position switch		603596
	• Drop in panel, 4-position switch		603697
	• Drop in panel, Fire backup switch		310771
	• Drop in panel, Alert switch		304048
	• Drop in panel, HPR Transducer Control		603591
7	CAN Kit (if used):		
	• CAN2DP Kit		312478

K-Thrust systems

Table 5   Replaceable parts and recommended spare parts for K-Thrust system

List ident.	Part name	Recommended as spare part	Part number
1	BU-TC panel	X	603531
	BU-DP (according to delivery)		603530
2	ALC panel	X	603526
3	Input panel (with mechanical trackball)	X	330951
4	Heading Wheel panel		603550
5	Joystick panel (Lilaas), or		301491
	Joystick panel (Kwant Controls)		304849

K-Chief systems

Table 6   Replaceable parts and recommended spare parts for K-Chief system

List ident.	Part name	Recommended as spare part	Part number
1	BU-AUT panel	X	603529
2	ALC panel	X	603526

Table 6   Replaceable parts and recommended spare parts for K-Chief system (cont'd.)

List ident.	Part name	Recommended as spare part	Part number
3	Input panel (with mechanical trackball)	X	330951
4	Standard kits (if used):		
	• Kit, Alarm Output		312700
	• Kit, CANbus to Ethernet		313308
	• Kit, Dual Power Input, 230 VAC		313307
	• Kit, Dual Power Input, 115 VAC		313400
	• Kit, Fibre Net		313309
	• Kit, Network Net-A or Net-B		313310
	• Kit, Network Net-C		313311

HiPAP systems

Table 7   Replaceable parts and recommended spare parts for HiPAP systems

List ident.	Part name	Recommended as spare part	Part number
1	Input panel (with mechanical trackball)	X	330951
2	For kits, see List ident. 6 in Table 4 on page 59.		

General Operator panel

Table 8   Replaceable parts and recommended spare parts for General Operator panel

List ident.	Part name	Recommended as spare part	Part number
1	Input panel (with mechanical trackball)	X	330951

Appendix A — Hardware configuration status

This manual is based on the following parts lists and drawings. The revisions listed are those that were valid when the manual was produced.

Common Installation Drawings

Installation Drawing, OS-IC 650 mm Console with Handles, Deep Line	1012662 Rev. G
Installation Drawing, OS/IC 650 Console Multiple, Deep Line	1016753 Rev. F
Installation Drawing, Cable Entrance, Typical 650 Deep Line Console	302650 Rev. A

Parts List and Drawings – K-Bridge OS-650-KM05	**303399 Rev. H**
Assembly Drawing, Mounting Plate, Power and Interface, OS-650-NAV KM05 Deep Line	347317 Rev. A
Assembly Drawing, MP7600 Navigation, Standard (2 sheets)	301948 Rev. B
Layout Drawing, Cable Kit OS NAV, Standard	301630 Rev. C
Layout Drawing, NDU NAV Assembly, Mounting Plate Right Side	308836 Rev. F
Layout Drawing, JH23T02 KMD-E1, Standard	301848 Rev. A
Layout Drawing, Mounting Plate, OS-650-NAV KM05 Deep Line	339712 Rev. B
Power and Wiring Diagram, OS-650-NAV, Standard	1016959 Rev. F

Parts List and Drawings – HiPAP-501 OS-650-KM05	**306228 Rev. E**
Layout Drawing, 115/230V Panel System, OS-650 Deep Line/Slim Line	310848 Rev. B
Layout Drawing, El. Mech. DP/IAS DeepLine, OS-650	311004 Rev. D
Layout Drawing, El. Mech. DP, Mounting Plate/Right Side, OS-650-HiPAP DeepLine/SlimLine	311043 Rev. A
Layout Drawing, El. Mech., HiPAP/DeepLine, OS-650	311044 Rev. A
Layout Drawing Drop in Panel HPR/HiPAP, COP-05 Panel System	1016318 Rev. B
Power and Wiring Diagram, HiPAP 501 Kit, Slim Line/Deep Line, KM05	314202 Rev. A
Power and Wiring Diagram, HiPAP 501 OS, Slim Line/Deep Line/Built-in, KM05	314203 Rev. C
Wiring Diagram, HPR Serial Line Kit KM05, 4xRS232 + 4xRS422	309087 Rev. C
Wiring Drawing Transducer Control, HPR with Gate Valve Status, Drop in Panel	1016321 Rev. B

See also *Common Drop in Kit Drawings* list.

Parts List and Drawings – K-Pos OS-650-KM05	**308092 Rev. F**
Layout Drawing, OS-650-DP, Navigation Line	300836 Rev. A
Layout Drawing, El. Mech. DP, Right, K-Pos, OS-650-DeepLine/SlimLine	310844 Rev. A
Layout Drawing, 115/230V Panel System, OS-650 Deep Line/Slim Line	310848 Rev. B
Layout Drawing, El. Mech. DP/IAS DeepLine, OS-650	311004 Rev. D
Power and Wiring Diagram, K-Pos, K-Thrust Panel System COP05	313401 Rev. A
Power and Wiring Diagram, K-Pos/K-Thrust OS, (SlimLine)/DeepLine/Bulit-in KM-05	313403 Rev. D

See also *Common Drop in Kit Drawings* list.

Parts List and Drawings – K-Chief OS-650-KM05	**313162 Rev. D**
Layout Drawing, 115/230V Panel System, OS-650 Deep Line/Slim Line	310848 Rev. B
Layout Drawing, OS-650-AUT, OS-650, Navigation/Slim Line	300840 Rev. B
Layout Drawing, El. Mech. DP/IAS DeepLine, OS-650	311004 Rev. D
Power and Wiring Diagram, K-Chief OS, DeepLine/Built-in	313489 Rev. A

See also *Common Kit Drawings* list.

Parts List and Drawings – General OS-650-KM05	**314216 Rev. C**
Layout drawing, OS-650-General, OS-650, Navigation/Slim Line	300842 Rev. A
Layout Drawing, 115/230V Panel System, OS-650 Deep Line/Slim Line	310848 Rev. B
Layout Drawing, El. Mech. DP/IAS DeepLine, OS-650	311004 Rev. D
Power and Wiring Diagram, General OS, SlimLine/DeepLine/Built-in, KM05	314221 Rev. C

Parts List and Drawings – K-Thrust OS-650-KM05	**314218 Rev. C**
Layout Drawing, OS-650-TC, Navigation Line	300837 Rev. A
Layout Drawing, 115/230V Panel System, OS-650 Deep Line/Slim Line	310848 Rev. B
Layout Drawing, El. Mech. DP/IAS DeepLine, OS-650	311004 Rev. D
Power and Wiring Diagram, K-Pos/K-Thrust Panel System, COP05	313401 Rev. B
Power and Wiring Diagram, K-Pos/K-Thrust OS (SlimLine)/DeepLine/Bulit-in KM-05	313403 Rev. D

Common Drop-in Kit Drawings

Layout Drawing, Drop In Panel 2 Position Switch, Deep/Slim Line KM05, Built-in	302424 Rev. B
Wiring Diagram, Drop In Panel 2 Position Switch, COP-05 Panel System	302427 Rev. C
Layout Drawing Drop In Panel 3 Position Switch, COP-05 Panel System	302428 Rev. B
Wiring Diagram, Drop In Panel 3 Position Switch, COP-05 Panel System	302431 Rev. C
Layout Drawing Drop In Panel 4 Position Switch, COP-05 Panel System	1016419 Rev. C
Wiring Diagram, Drop In Panel 4 Position Switch, COP-05 Panel System	1016400 Rev. C
Layout Drawing, Drop In Panel Alert Switch, Deep/Slim Line KM05, Built-in	302965 Rev. B
Wiring Diagram, Drop In Panel Alert Switch, Deep/Slim Line KM05, Built-in	302966 Rev. B
Layout Drawing Drop In Panel 2 Position Switch, Deep/Slim Line KM05, Built-in	302424 Rev. B
Wiring Diagram, Drop In Main/Backup DP Switch, KM05	310951 Rev. B
Layout Drawing Drop In Panel HPR/HiPAP, COP-05 Panel System	1016318 Rev. B
Wiring Diagram, Transducer Control HPR with Gate Vale Status, Drop In Panel	1016321 Rev. B

Common Kit Drawings

Power and Wiring Diagram, Alarm Output, K-Chief OS-650/Built-in	312699 Rev. B
Layout Drawing, CANbus to Ethernet, K-Chief OS-650/Built-in	313313 Rev. A
Power and Wiring Diagram, CANbus to Ethernet, K-Chief OS-650/Built-in	313299 Rev. A
Power and Wiring Diagram, Dual Power Input, K-Chief OS-650/Built-in	312682 Rev. G
Power and Wiring Diagram, Fibre Net, K-Chief OS-650/Built-in	313300 Rev. B

Common Kit Drawings

Power and Wiring Diagram, Network Distribution Net A/B, K-Chief OS-650/Built-in   313301 Rev. A

Power and Wiring Diagram, Network Distribution Net C, K-Chief OS-650/Built-in   313302 Rev. A