SECTION 7
SYSTEM STATUS MONITORING

Introduction

Functions are available for monitoring the status of the K-Pos DP
operator stations, process stations and IO system.

During normal operation you can:

• View the operational status of the Operator Stations, History Stations and Process Stations

• View information and status indications for every IO driver, IO block and IO point configured in the system.

System architecture

A K-Pos DP system consists of one or more operator stations (OS) and one or more process stations (PS). A history station (HS) may also be included.

The K-Pos DP control software is implemented in one, two or three K-Pos DP process stations (DpPSs) (the **Main** controller PS group) depending on the redundancy level of the system. The process stations are implemented in computers located in the K-Pos DP Controller Cabinet.

The DpPSs in the **Main** controller group are interconnected via a dedicated redundancy net (RedNet).

Communication between operator stations, history stations and process stations is via a single or dual communication net (Net A and Net B).

Communication with thrusters and sensors is performed by the IO system, which is an integrated part of the DpPS. If additional IO is required for sensors or thrusters, additional dedicated IO process stations can be implemented.

The process stations themselves provide no permanent storage of programs and data. When a process station starts up, all its programs and data are loaded from its PS servers, which are located either on one or more operator stations or in the flash memory of the PS itself.

Operator stations

The following standard names are used to identify the operator stations and history stations in K-Pos DP systems:

OS name	OS description
DP-OS1	Main K-Pos DP Operator Station
DP-OS2	Main K-Pos DP Operator Station
DP-OS3	Main K-Pos DP Operator Station
DP-OS4	Fire Backup K-Pos DP Operator Station
DP-OS6	Stand-alone Simulator K-Pos DP Operator Station
DP-HS1	Main K-Pos DP History Station
cPos-OS1	cPos Operator Station
cPos-OS2	cPos Operator Station
cJoy-OT1	cJoy Operator Terminal
cJoy-OT2	cJoy Operator Terminal
WT1	cJoy (cWing) Wing Terminal
WT2	cJoy (cWing) Wing Terminal
WT3	cJoy (cWing) Wing Terminal
WT4	cJoy (cWing) Wing Terminal

Process stations

The process stations are implemented in Remote Control Units (RCU).

The RCU unit contains a real-time single board computer and IO interfaces in the same unit.

Redundancy

In single systems, the K-Pos DP Controller Cabinet contains a single DpPS.

In dual systems, the K-Pos DP Controller Cabinet contains two DpPSs which operate with a master/slave relationship. Switching between master and slave can be performed manually, or the switching can be performed automatically by the system.

In triple systems, the K-Pos DP Cabinet contains three DpPSs. The concept of majority voting is used to detect and isolate faults in the sensors and in theK-Pos DP system itself.

WinPS

A WinPS is a Process station that runs on an OS computer, as opposed to a standard PS. AWinPS provides full PS functionality,
except that it cannot communicate with the IO system.

WinPSs are used for development purposes and in simulators.

PS names and numbers

The following standard names and numbers are used to identify process stations and redundancy groups in K-Pos DP systems.

Redundancy group	Redundancy type	PS description
DpMain	Single, DpDual or DpTriple	Main K-Pos DP Controller PS A Main K-Pos DP Controller PS B Main K-Pos DP Controller PS C
DpM_IO1	Single, DpDual or DpTriple	Main Input/Output 1
DpM_IO2	Single, DpDual or DpTriple	Main Input/Output 2
DpM_Sim	Single	Main - Simulator (WinPS)
DpM_Vrm	Single	Main - Built-in Trainer - Vessel Reference Model (WinPS)
DpFS_Vrm	Single	Field Simulator - Vessel Reference Model (WinPS
DpBackup	Single	Backup K-Pos DP Controller PS A
DpB_IO1	Single	Backup Input/Output
DpB_IO2	Single	Backup Input/Output 2
DpB_Sim	Single	Backup - Simulator (WinPS)
DpB_Vrm	Single	Backup - Vessel Reference Model (WinPS)

The Vessel Reference Models run in WinPS and provide simulator and built-in trainer functions.

IO system

The IO system provides the communication interface for exchange of IO signals between the field devices (thrusters and sensors) and the process station.

The main elements of the IO system are:

• **IO drivers**

IO drivers are responsible for the communication with the field device. The IO driver provides conversion between field values and IO raw values.

The following driver types are supported:
– RBUS for discrete analog and digital IO
– NetIO for communication between PSs
– Dedicated sensor and interface drivers for serial line devices such as Artemis, GPS, Fanbeam and HPR
– ComAs for generic serial line IO

• **IO blocks**

An IO block represents a group of identifiable IO signals from an IO device in the field. For example:
– For IO cards belonging to the RBUS driver, an IO block represents an IO card in the IO rack.
– For NetIO communication between process stations, an IO

block may represent all the signals related to a particular sensor or thruster.

• **IO points**

IO points are the connection points for IO signals. An IO point may provide signal conditioning elements for conversion between the IO raw value on the driver side and the engineering value on the K-Pos DP system side.

Monitoring functions

The following monitoring functions are available:

• Viewing of status information for the Operator Stations, History Stations and Process Stations in your system, using the **Equipment - System Status** dialog box.

• Viewing of status information for all PSs in the system, using the **Station Explorer** dialog box.

• Viewing of overview information for all IO drivers, IO blocks and IO points, using the **IO Manager** dialog box.

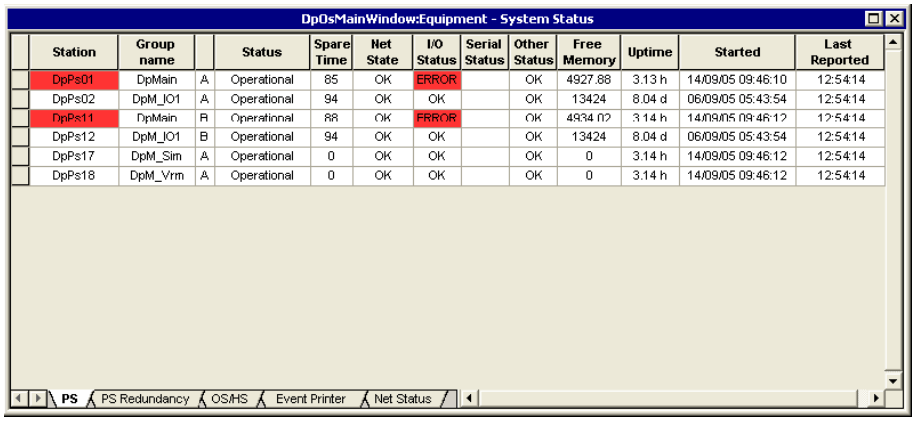
• Viewing of information for selected IO Points using the **IO Point Browser** dialog box. See *IO Point Browser* on page 259.
• Viewing of information displayed for each IO Block, related to each IO Point and its contents, using the **IO Terminal Block** dialog box

• Viewing of information for selected DP PS Serial ports using the **Properties — DpPs Serial port** dialog box.

Note
Many of the features provided by these dialog boxes are related to configuring the system. These features require OS Configuration Mode and/or PS Configuration Mode and therefore are not described in this manual. This manual only describes features that are available in normal operation mode.

Equipment

The **Equipment - System Status** dialog box shows operational status information about the Operator Stations, History Stations and Process Stations in your system.



This dialog box has five pages:

- **PS**
- **PS Redundancy**
- **OS/HS**
- **Event Printer**
- **Net Status**

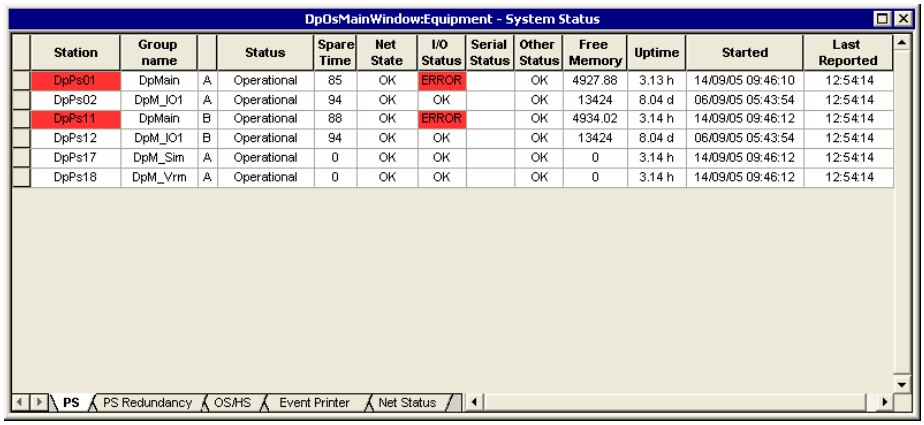
In each line of each page, the background colour of certain fields are changed to indicate alarm conditions.

When a system or process alarm condition occurs, the background
of the field changes colour and starts to flash. It will continue to flash until the applicable alarm is acknowledged.

PS page

The **PS** page shows the current status of all process stations defined in the system.

To display this page, select **System→Equipment**.



Station

Identification of the PS.

Group name

Displays the name of the redundancy group to which this station belongs.

(No column title)

Identification of the PS within the redundancy group. For example: Controller PS A, B or C within the DpMain group.

Status

Shows the current status of the PS:
• **Operational** — PS is operational.
• **Booting** — PS is booting (loading configuration).
• **Rebooting** — PS is rebooting due to an error.
• **Not Communicational** — PS has reported a status, but no communication with the PS is possible.
• **Not Reported** — PS has not reported any status.
• **Halt** — PS has stopped due to an error condition.

Spare Time (%)

The available CPU capacity, expressed as a percentage of total CPU capacity.

Net State

Indicates the state of the A and B network interfaces:
• **OK** — Both network interfaces are OK.
• **A-ERROR** — Error on network interface A.
• **B-ERROR** — Error on network interface B.
• **AB-ERROR** — Error on both network interfaces.

I/O Status

Shows the status of the IO system for this PS:
• **OK** — No errors reported.
• **ERROR** — Errors reported.

Serial Status

Not relevant for K-Pos DP systems.

Other Status:

Shows the status of other sub-systems reported by this station (typically system self-test and monitoring):
• **OK** — No errors reported.
• **ERROR** — Errors reported.

Free Memory

Available memory (or largest continuous block) in kB. (Not applicable for WinPSs.)

Uptime

The accumulated uptime of the station. Shown as a number followed by a character indicating the period. For example: 3.06 d indicates 3.06 days (m = minutes, h = hours, d = days, y = years).

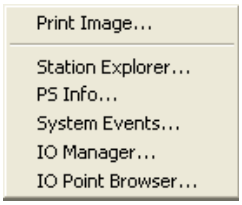
Started

Time stamp when the PS was started.
Format: day/month/year hour:min:sec

Last reported

Time stamp of last communication.
Format: hour:min:sec

The **PS** page has a shortcut menu. Right-click anywhere on the page to display the following menu:

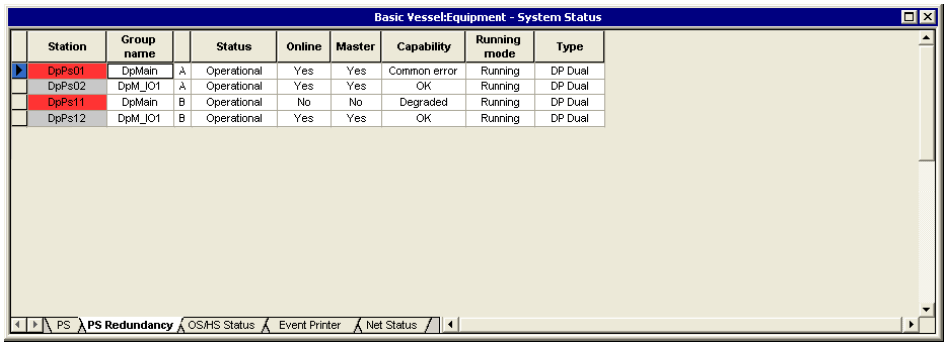


Print Image.. see *Print Image*.
Station Explorer... see *Station Explorer*.
PS Info... not relevant for K-Pos DP systems during normal operation.
System Events... see *Presentation of messages*.
IO Manager... see *IO Manager*.
IO Point Browser... see *IO Point Browser*.

PS Redundancy page

The **PS Redundancy** page shows redundancy information for all process stations.

To display this page, select **System→Equipment** and then click the **PS Redundancy** page tab.



Station

Identification of the PS.

Group name

Displays the name of the redundancy group to which this station belongs.

(No column title)

Identification of the PS within the redundancy group. For example: Controller PS A, B or C within the DpMain group.

Status

Shows the current status of the PS:

- **Operational** — PS is operational.
- **Booting** — PS is booting (loading configuration).
- **Rebooting** — PS is rebooting due to an error.

• **Not Communicational** — PS has reported a status, but no communication with the PS is possible.
• **Not Reported** — PS has not reported any status.
• **Halt** — PS has stopped due to an error condition.

Online

Displays whether the PS is online or not. See *Redundant systems* on page 120.

Master

Displays whether the PS is master or not. See *Redundant systems* on page 120.

Capability

Displays the Capability status, indicating to what extent the PS is technically capable of fulfilling its intended purpose:
• **OK** — No errors.
• **Common Error** — Errors that are common to all PSs in the redundancy group.
• **Degraded** — Errors that related to only this PS in the redundancy group.
• **Incapable** — The PS is in a state where it should not be used as the master or online computer.

Running mode

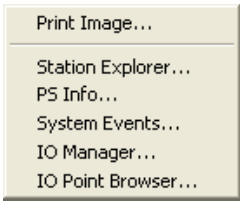
Displays the Running mode:
• **Running** — The PS is communicating and has finished all start-up preparations.
• **Starting** — The PS is communicating, but more startup preparation is needed.
• **Inactive** — The PS is not communicating. It may be initializing or loading, or not executing at all.

Type

Displays the redundancy type for the redundancy group.

For the DpMain and DpM_IO groups, the following types are relevant: **Single**, **DPDual** and **DPTriple**.

The **PS Redundancy** page has a shortcut menu. Right-click anywhere on the page to display the following menu:

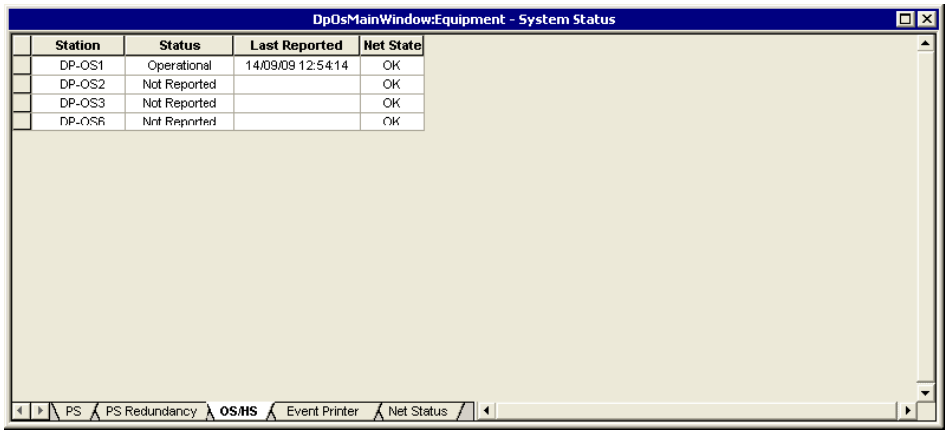


Print Image.. see *Print Image* on page 246.
Station Explorer... see *Station Explorer* on page 247.
PS Info... not relevant for K-Pos DP systems during normal operation.
System Events... see *Presentation of messages* on page 90.
IO Manager... see *IO Manager* on page 251.
IO Point Browser... see *IO Point Browser* on page 259.

OS/HS page

The **OS/HS** page shows the status of the operator stations and history stations that are defined in the system.

To display this page, select **System→Equipment** and then click the **OS/HS** page tab.



Station

Identification of the OS or HS.

Status

Shows the current status of the OS or HS:
• **Operational** — OS or HS is operational.
• **Not Communicational** — OS or HS has reported a status, but no communication with the OS or HS is possible.
• **Not Reported** — OS or HS has not reported any status.
• **Stopped** — OS or HS is not switched on.

Last Reported

Time stamp of last communication.
Format: day/month/year hour:min:sec

Net State

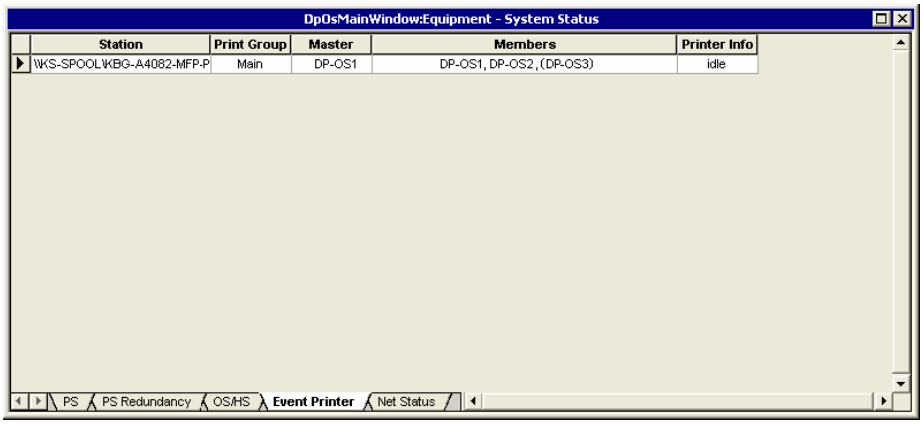
Indicates the state of the A and B network interfaces:
• **OK** — Both network interfaces are OK.
• **A-ERROR** — Error on network interface A.
• **B-ERROR** — Error on network interface B.
• **AB-ERROR** — Error on both network interfaces.

The **OS/HS** page has a shortcut menu. Right-click anywhere on the page to display the following menu:

Event Printer page

The **Event Printer** page shows the status of the event printers that are configured in the system.

To display this page, select **System→Equipment** and then click the **Event Printer** page tab.



The operator stations in the K-Pos DP system are grouped into **Print Groups** - usually either **Main** or **Backup** - where each group has one event printer. Only one of the operator stations (the **Master**) within a print group will print alarm messages to the event printer. If the **Master** operator station becomes inactive for any reason, the role of event printer **Master** passes automatically to another active **Master** of the **Print Group**.

Station

The address of the event printer.

Print Group

The name of the group of operator stations that can print to this printer.

Master

The current master operator station in this print group.

Members

The operator stations that are members of this print group. If an operator station is not active, its name is shown in parentheses.

Printer Info

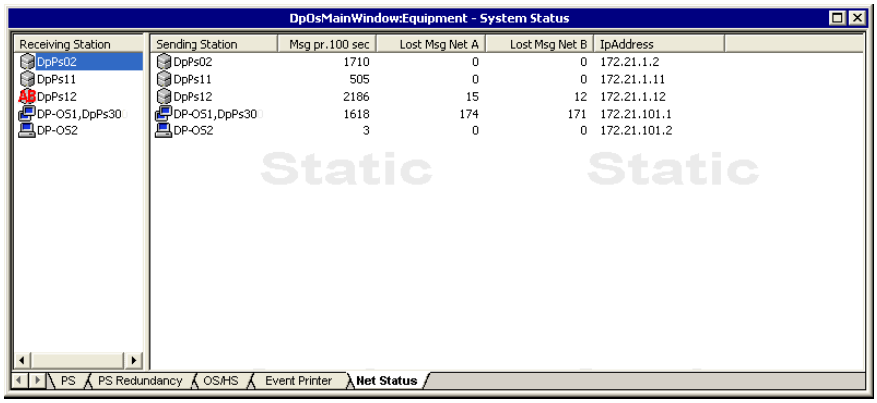
Information on the printer status such as Idle or Printing. This information is provided by the printer interface.

The **Event Printer** page has a shortcut menu. Right-click anywhere on the page to display the following menu:

Net Status

The **Net Status** page shows the status of the communication network for all OSs, HSs and PSs in the system.

To display this page, select **System→Equipment** and then click the **Net Status** page tab.



This page contains a window that is divided into two panes. The left-hand pane lists all stations in the communication network by means of icons and names. Clicking any icon or name displays in
the right-hand pane the status of the communication network as seen from the receiving station in the left-hand pane.

If a red **A**, **B** or **AB** is displayed superimposed on an icon, this indicates that the station has a network communication error on net A, B or both.

Sending Station

Identification of the OS, HS or PS sending messages to the receiving station.

Msg pr. 100 sec

The total number of messages being received every 100 seconds on both networks.

Lost Msg Net A

The number of lost messages on network A.

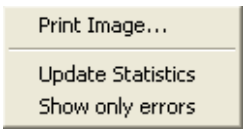
Lost Msg Net B

The number of lost messages on network B.

IpAddress

The Internet Protocol (IP) address of the sending station.

The right-hand pane is static and once information has been displayed it is not updated. You can update the information either
by reselecting the **Net Status** page or by right-clicking anywhere on the page to display the following shortcut menu:



Select **Print Image** to print the content of the current page.

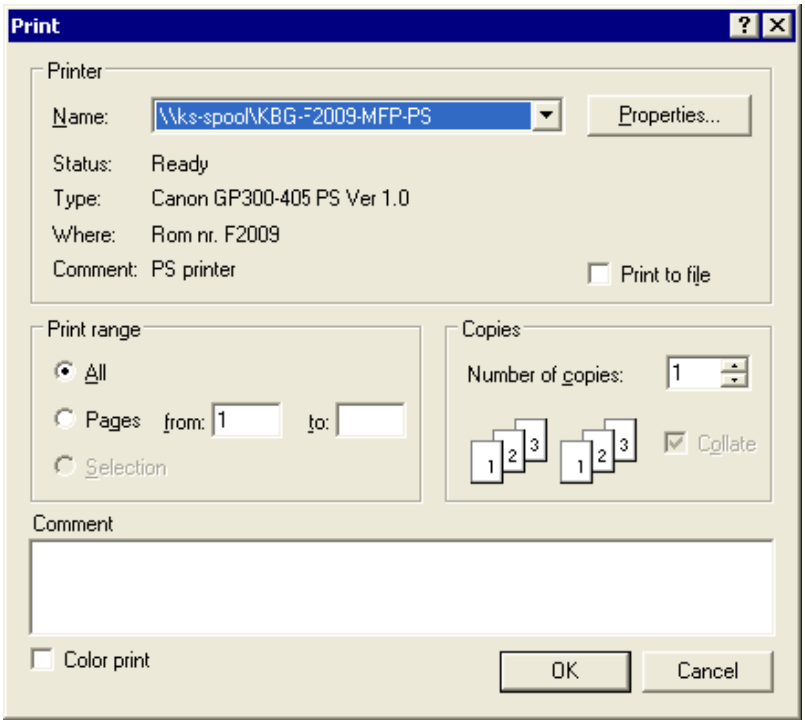
Select the **Update Statistics** command to update the statistical information for the selected station in the right-hand pane.

Select the **Show only errors** command to filter the information displayed in the right-hand pane so that only the stations with lost messages are displayed.

Print Image

The **Print Image** command on the shortcut menu of the **PS**, **PS Redundancy**, **OS/HS** or **Net Status** page allows you to print the content of the current page on your printer.

Selecting this command displays the **Print** dialog box.



Select the appropriate printer from the **Name** drop-down list box.

Use the **Properties** button to select the printout format.

Comment

The text that you type in the Comment text box is printed in a separate box on the top right corner of the printout.

Color print

Select this check box if a printout in colour is required.

Station Explorer

The Station Explorer provides system status information for all system components in a selected process station, such as:

• For the basis system: applicable PS system information, self-tests and environment checks (such as temperature check, fan alarm).
• For the IO Manager: information on all nodes and subnodes of all configured IO parts.
• For the Network: information on the redundant networks - Net A and Net B.

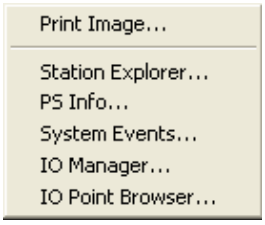
All nodes in the process station are represented by graphical symbols showing their current alarm status.

To display the **Station Explorer** dialog box:

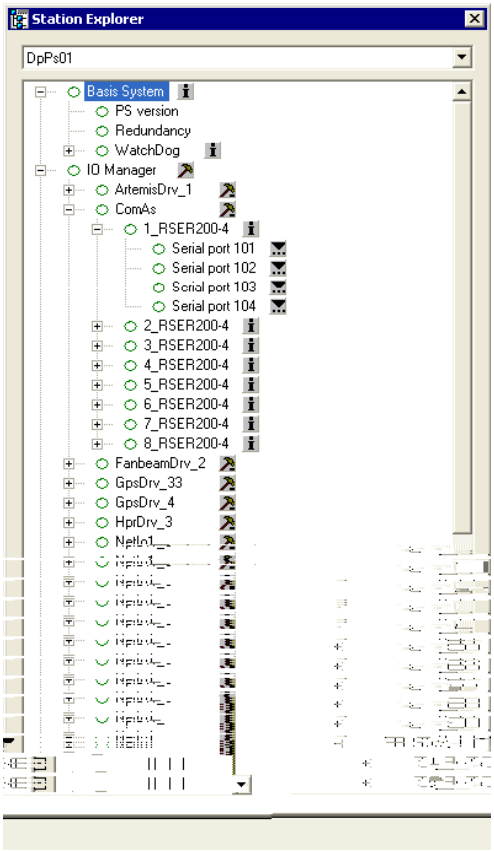
1 Select **System→Equipment**.
• The**Equipment - System Status** dialog box is displayed.

2 Right-click on a PS line anywhere on the **PS** or **PS Redundancy** page of the **Equipment - System Status** dialog box.

• The following shortcut menu is displayed:



3 Select **Station Explorer...**.
• The**Station Explorer** dialog box is displayed, showing the PS that you right-clicked in step 2.

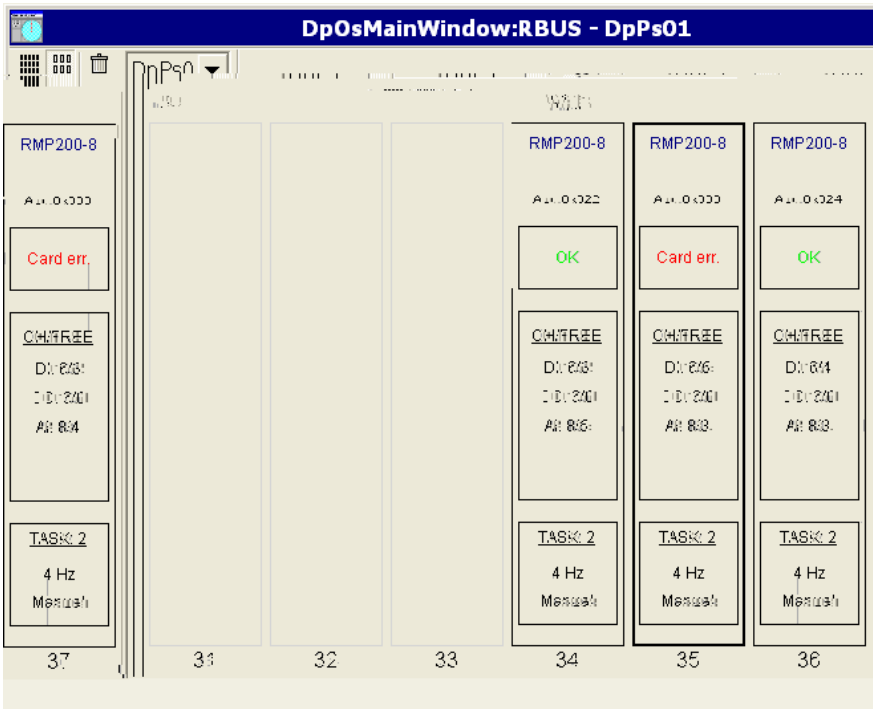


Appears when an IO card is clicked.

Hides/shows the **IO Terminal Block** dialog box for the selected IO card.

Detailed level

Example RBUS IO Image at Detailed level for an RCU-based PS is shown below.



Rack positions containing PSs and power supply units are not shown on the Detailed level.

The information provided on the Detailed level is intended primarily for Kongsberg Maritime personnel.

IO Terminal Block

The **IO Terminal Block** dialog box displays information about a selected IO block and its IO points. This is intended as an aid to fault finding in the IO system.

To display this dialog box, either:

1 Start the **Station Explorer**
2 Select the required PS from the drop-down list.
3 Expand the appropriate driver to locate the required IO block.

4 Either click on the block icon ( ), or click on the sub-menu

the driver, alarm status and the block tag of the selected IO block.

Tag

Displays the name of the selected IO block.

Description

Displays descriptive text for the selected IO block.

Task

Shows the scan rate for the selected IO block:
• **Task 1** — Normal
• **Task 2** — Quick
• **Task 3** — Rapid

Auto

Not relevant for K-Pos DP systems.

Upper-right list box

The upper-right list box displays the IO block properties represented by parameters and values. When you point at a parameter, a tool-tip is displayed, providing more explanatory text.

IO Points

This area displays information about the IO points for the selected IO block.

Direction
The direction of the data flow:
• Output data flow
• Input data flow

IO tag
The name of the IO signal.

(IO point parameter symbol)

P Clicking this symbol displays the **IO Point Parameters** section in the lower part of the dialog box.

Status
The status of the sensor value:
• **OK**
• **Error**
• **SIM**

Sensor value
The sensor value and its units.

(signal conditioning elements)

Symbols representing the signal conditioning elements used, in order of execution.

Note

When the cursor is positioned over one of the bitmaps representing an IO signal conditioning element, the name and parameters of the element are displayed in a tool-tip window.

Eng. value
The engineering value and its units.

(Eng. status)
The status of the engineering value:

- **OK**
- **Error**
- **SIM**

Connection
For signals that are to be transferred between process stations, this field displays the name of the NetIO tag that corresponds to this IO point.

Note

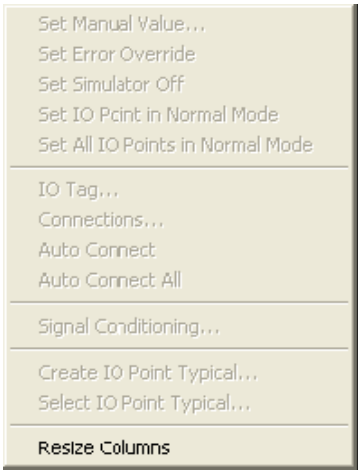
*If you click a cell in the **Connection** column, the C**onnect/ Disconnect Terminal** dialog box is displayed for the selected IO point. This dialog box has no function during normal operation.*

Details

Clicking the **Details** button displays or removes the **IO Point Parameters** and **Eng. Signal Conditioning** sections in the lower part of the dialog box.

Shortcut menu

If you right-click on any displayed IO point tag, the following shortcut menu is displayed:



Resize Columns

Resizes the columns displayed in the **IO Points** area to fit the content of the columns.

Signal Conditioning elements

Signal conditioning elements are used in the IO points of an IO block to parameterize the input/output process signals and to scale the signals.

All signal conditioning elements are bidirectional, and may be used both on input and output signals, but some elements are meaningful on input signals only.

The symbols are displayed between the **Sensor value** and **Eng. value** columns in the **IO Points** area.

The signal conditioning includes elements for:
- Scaling
- Inversion
- Filtering
- Fail-safevalue
- Compensation for wire resistance.

The available signal conditioning elements are as follows:

Icon	Element name	Analogue	Digital	Input	Output	Description
	Scale	X		X	X	Sensor scale maximum
						Sensor scale minimum
						Sensor unit
						Engineering scale maximum
						Engineering scale minimum
						Engineering unit
	Multi Scale	X		X	X	Number of points
						(For each point) Sensor point
						(For each point) Engineering Point
						Sensor unit
						Engineering unit
	PT 100	X		X		Wire resistance
						Sensor unit
						Engineering unit
	Engineering unit	X		X	X	Engineering scale maximum
						Engineering scale minimum
						Engineering unit

FS	Fail-safe	X		X		Fail-safe value Freeze (check box): Checked: Last usable value Not checked: Fail-safe value
	Filter	X		X		Filter time (seconds)
	Limit check	X		X	X	Gain Bias Use negative input value
N	Invert		X	X	X	None
FS	Fail-safe		X	X		Fail-safe value Freeze (check box): Checked: Last usable value Not checked: Fail-safe value
T	Filter		X	X		On delay (seconds) Off delay (seconds)

IO Point Browser

The IO Point Browser allows you to search for IO points for a selected PS, and to display information about them. This is intended as an aid to faultfinding in the IO system.

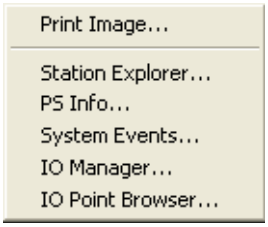
IO Point Browser dialog box

To display the **IO Point Browser** dialog box:

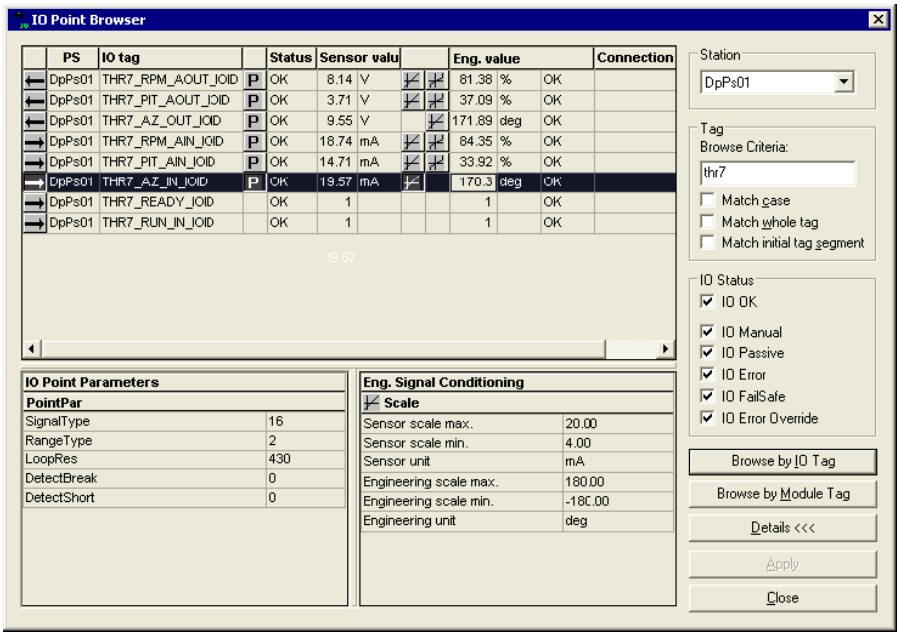
1 Select **System→Equipment**.
• The**Equipment - System Status** dialog box is displayed.

2 Right-click on a PS line anywhere on the **PS** or **PS Redundancy** page of the **Equipment - System Status** dialog box.

• The following shortcut menu is displayed:



3 Select **IO Point Browser**.
• The**IO Point Browser** dialog box is displayed.



Station

Use this drop-down list box to select either all PSs, or the PS within which you want to browse.

Tag

Browse Criteria
Use this text box to enter the browse criteria. Wildcard characters
can be used.

Match case
Use this check box to make the **Browse Criteria** case sensitive.

Match whole tag
Use this check box if the **Browse Criteria** text is the entire name of the required IO point.

Match initial tag segment
Use this check box if the **Browse Criteria** text is the beginning of the name of the required IO points.

IO Status

Use these check boxes to restrict the search to IO points which have the specified status:

- **IO OK**
- **IO Manual**
- **IO Passive**
- **IO Error**
- **IO FailSafe**
- **IO Error Override**

Browse by IO Tag

Use this command button to search for IO points whose name satisfies the specified **Browse Criteria**.

Browse by Module Tag

Not relevant for K-Pos DP systems.

Details

Clicking the **Details** button displays or removes the **IO Point Parameters** and **Eng. Signal Conditioning** sections in the lower part of the dialog box.

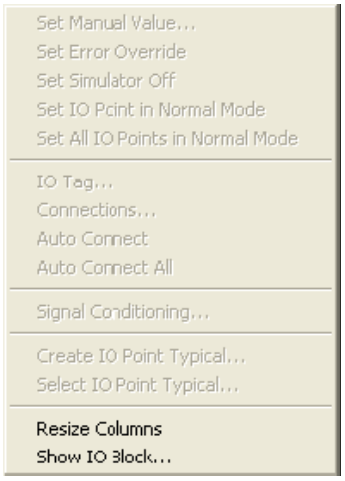
Browse results

The upper-left area displays information about the IO points that satisfy the search criteria. This is the same information as displayed on the **IO Terminal Block** dialog (see *IO Terminal Block*), with one additional column:

• **PS** — The name of the PS that contains the IO point.

Shortcut menu

If you right-click on any IO point tag displayed in the browser window, the following shortcut menu is displayed:



Resize Columns

Resizes the columns displayed in the **IO Point Browser** dialog box to fit the content of the columns.

Show IO Block

Allows you to view configuration information for the selected IO
Block by displaying the corresponding **IO Terminal Block** dialog box.

Properties — DpPs Serial port

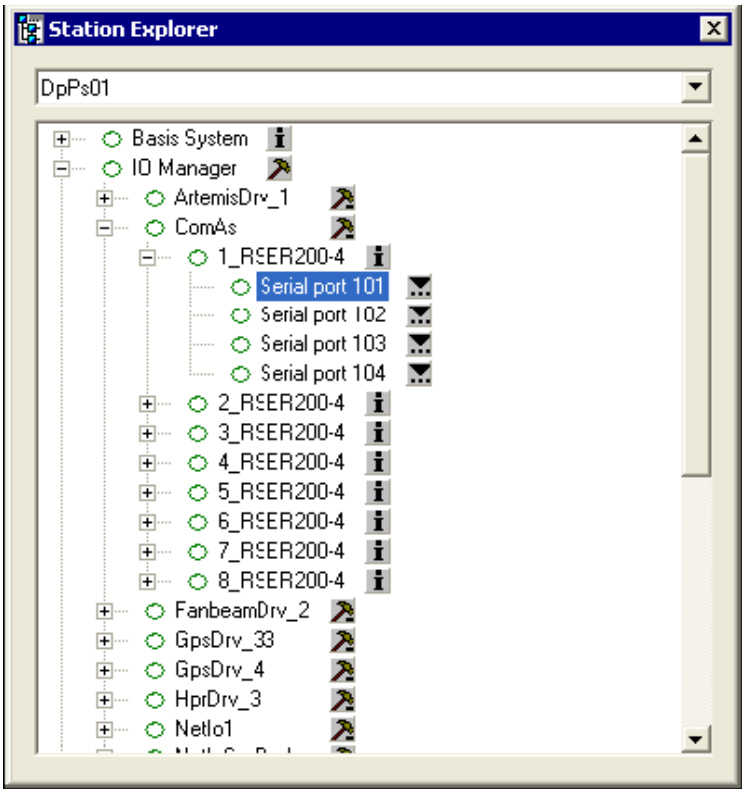
The **Properties—DpPs Serial port** dialog box shows the properties and configuration of a selected serial port.

To display the **Properties — DpPs Serial port** dialog box:

1 Start the **Station**

2 Select the required PS from the drop-down list.

3 Expand **IO Manager**, **ComAs** and the required serial line to locate the required serial port (in the example below **Serial port 101**).



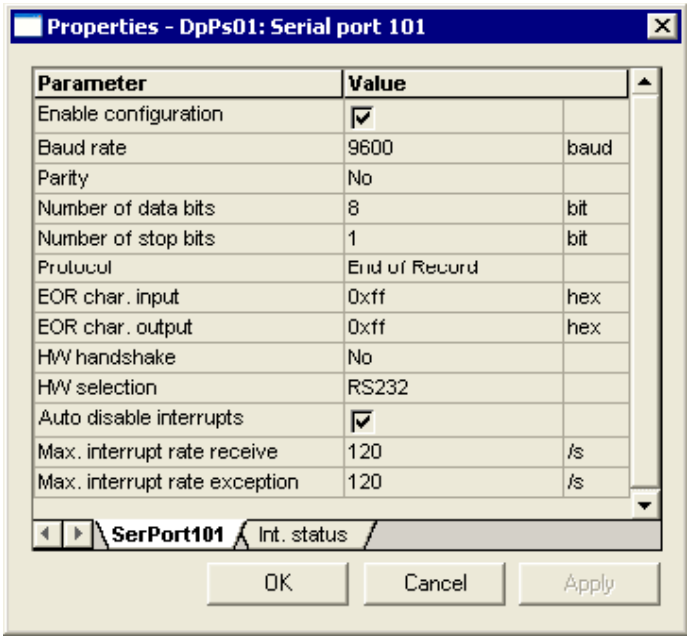
4 Click on the sub menu icon ( )
• A shortcut menu is displayed.

5 Select **Properties** on this shortcut menu.

• The**Properties—DpPs Serial port** dialog box is displayed.

The information provided on the **Properties — DpPs Serial port** dialog box is intended primarily for Kongsberg Maritime personnel.

SerPort page



Enable configuration

When selected, the configuration shown is enabled.

Baud rate

Shows the baud rate (110, 300, 600, 1200, 2400, 4800, 9600, 19200, 38400 baud).

Parity

Shows the parity (No, Even, Odd).

Number of data bits

Shows the number of data bits (5, 6, 7, 8 bit).

Number of stop bits

Shows the number of stop bits (1, 2 bit).

Protocol

Protocols available; Ecma24, Kos100, End of File, End of Record, Raw, Xon/Xoff, Siemens 3946L, 3946H, 3946RL, 3946RH, Measurex, UniTelWay, SMC, Polled raw, End of Record/Raw, Kos 150, Inter Frame Gap, Time sync.

EOR char. input

Shows the End of Record character input in hexadecimal.

EOR char. output

Shows the End of Record character output in hexadecimal.

HW handshake

Shows the Hardware handshake (No, RTS@Send, RTS@Receive) - (RTS is short for Request To Send).

HW selection

Shows the Hardware selection (Default, RS232, RS422, RS485).

Auto disable interrupts

To automatically disable interrupts, select this check box and click the **OK** or **Apply** button.

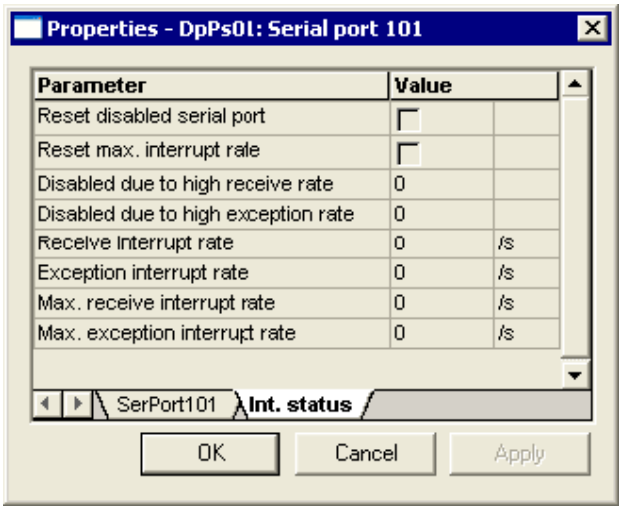
Max. interrupt rate receive

Shows the highest recorded receive interrupt rate for this serial port (since startup or reset).

Max. interrupt rate exception

Shows the highest recorded exception interrupt rate for this serial
port (since startup or reset).

Int status page



The **Int. status** page of the **Properties — DpPs Serial port** dialog for the ComAs driver displays the interrupt status of a selected serial port.

Reset disabled serial port

To reset a disabled serial port, select this check box and click the **OK** or **Apply** button.

Reset max. interrupt rate

To reset the displayed values for **Max. receive interrupt rate** and **Max. exception interrupt rate**, select this check box and click the **OK** or **Apply** button.

Disabled due to high receive rate

Indicates whether the selected port is disabled due to high receive
rate (0 = enabled, 1 = disabled).

Disabled due to high exception rate

Indicates whether the selected port is disabled due to high exception rate (0 = enabled, 1 = disabled).

Receive interrupt rate
Shows the current receive interrupt rate for this serial port.

Exception interrupt rate
Shows the current exception interrupt rate for this serial port.

Max. receive interrupt rate
Shows the highest recorded receive interrupt rate for this serial port (since startup or reset).

Max. exception interrupt rate
Shows the highest recorded exception interrupt rate for this serial port (since startup or reset).

Resetting a disabled serial line

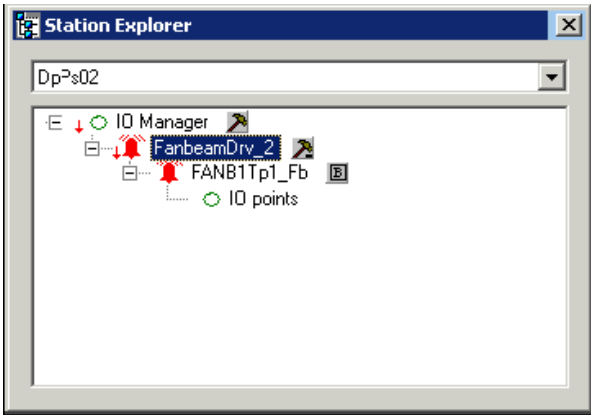
A serial port may be automatically disabled by the system to protect the K-Pos DP controller computer system from high traffic caused by an excessively high number of interrupts.

If an automatic disable of interrupt has been performed when reading serial line data from, for example, a position-reference system, a timeout alarm is issued. The message includes the relevant driver tag.

This section describes how to manually reset a disabled serial line so that the process station can continue reading input on that serial line. This procedure can be performed without restarting the controller computer.

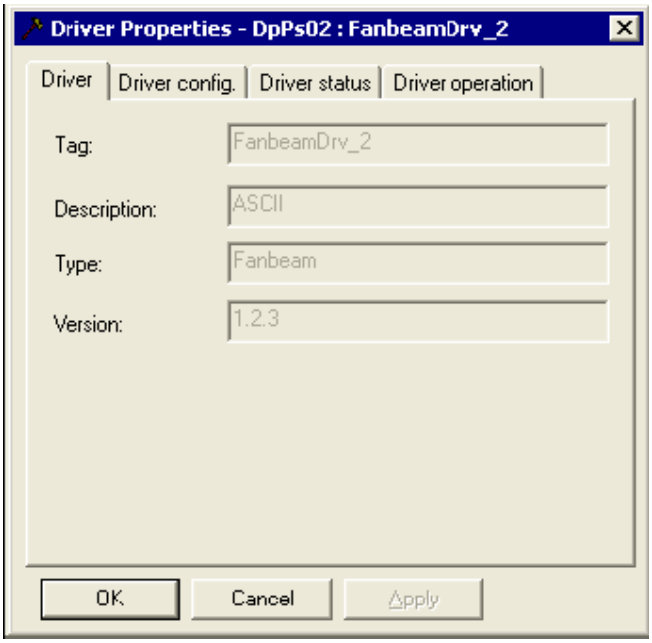
1 In the **Dynamic Alarm Page** of the **Event List** window, right-click the relevant message.
• A shortcut menu is displayed.

2 Select **Station Explorer** on this shortcut menu.
• The**Station Explorer** dialog box for the serial line that has an error is displayed.

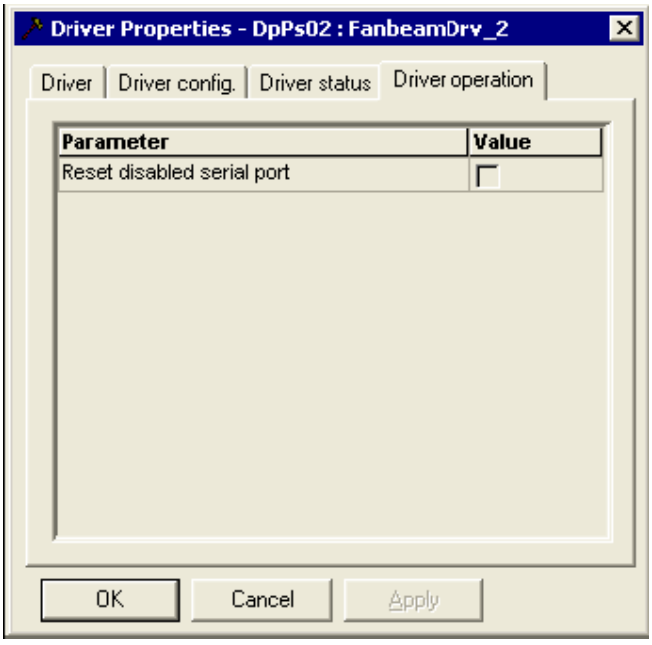


3 Click the Driver Properties hotspot (the indicator to the right of **FanbeamDrv_2** in this example).

• The**Driver Properties** dialog box is displayed.



4 Click the **Driver operation** page tab.
• The**Driver operation** tabbed page is displayed.



5 Select the **Reset disabled serial port** check box.

6 Click the **OK** button.

• The serial line is reset.