CySCAN
POSITION REFERENCE SENSOR

# Operator's Guide

GUIDANCE
NAVIGATION

# CyScan Operator's Guide

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# Introduction

This section contains the following pages:


- *Welcome* (page 6)
- *System Overview* (page 7)
- *CyScan Sensor Part Names* (page 8)

# Welcome

Welcome to the CyScan Operator's Guide. It has been written for operators of the CyScan system.

The Getting Started section (see page 10) explains the basics that you'll need to know before using the CyScan system for the first time.

The CyScan console can be configured at installation for either a single-console serial system or a multi-console Ethernet system.

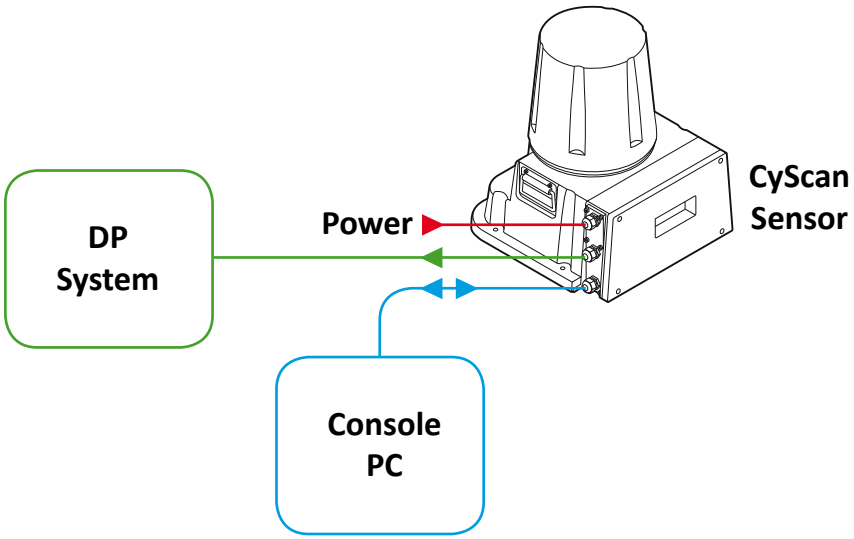
The majority of the sections in this guide apply equally for serial or Ethernet configured systems and explain how to perform the various tasks necessary to operate the system and use it for navigation. These include Navigation Basics (see page 22) and Single and Multi-target Navigation (see page 29), Support Information (see page 60) and Troubleshooting (see page 68). The section titled Ethernet (Multi-Console) CyScan Systems on page 57 gives information specific to an Ethernet configured system.

# System Overview

CyScan is a high accuracy laser sensor which provides positional information to allow automated approach and/or station keeping relative to a structure or vessel. The system requires one or more reflective targets to be attached to the sides of the structure or vessel.

CyScan is designed to be semi-portable and straightforward to operate. In use, the CyScan system key elements are:

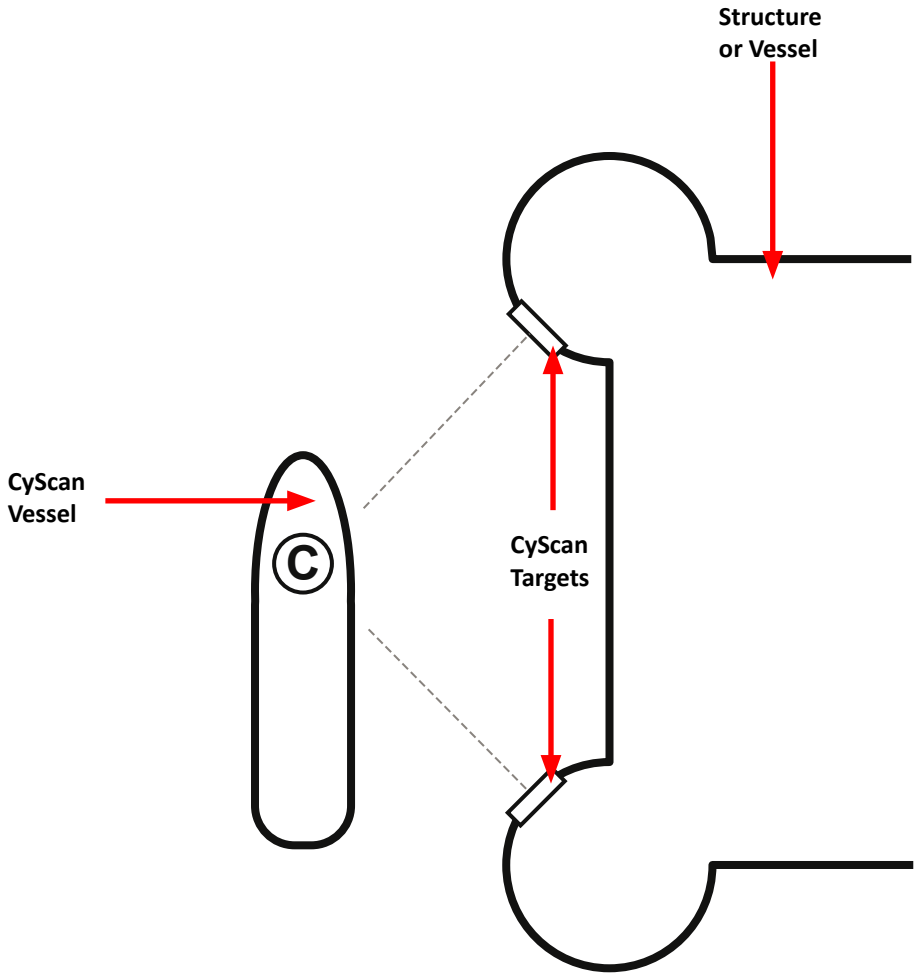
- The **CyScan Sensor**, with integrated Power Supply Unit, which is mounted on the vessel (typically on the wheel-house) as required.
- The **CyScan Console**. A monitoring and control software application running within Microsoft Windows™ on a marine PC.
  This provides the DP operator with full status information and control of the system and the data stream being fed to the DP system.




**The key elements of the CyScan system**

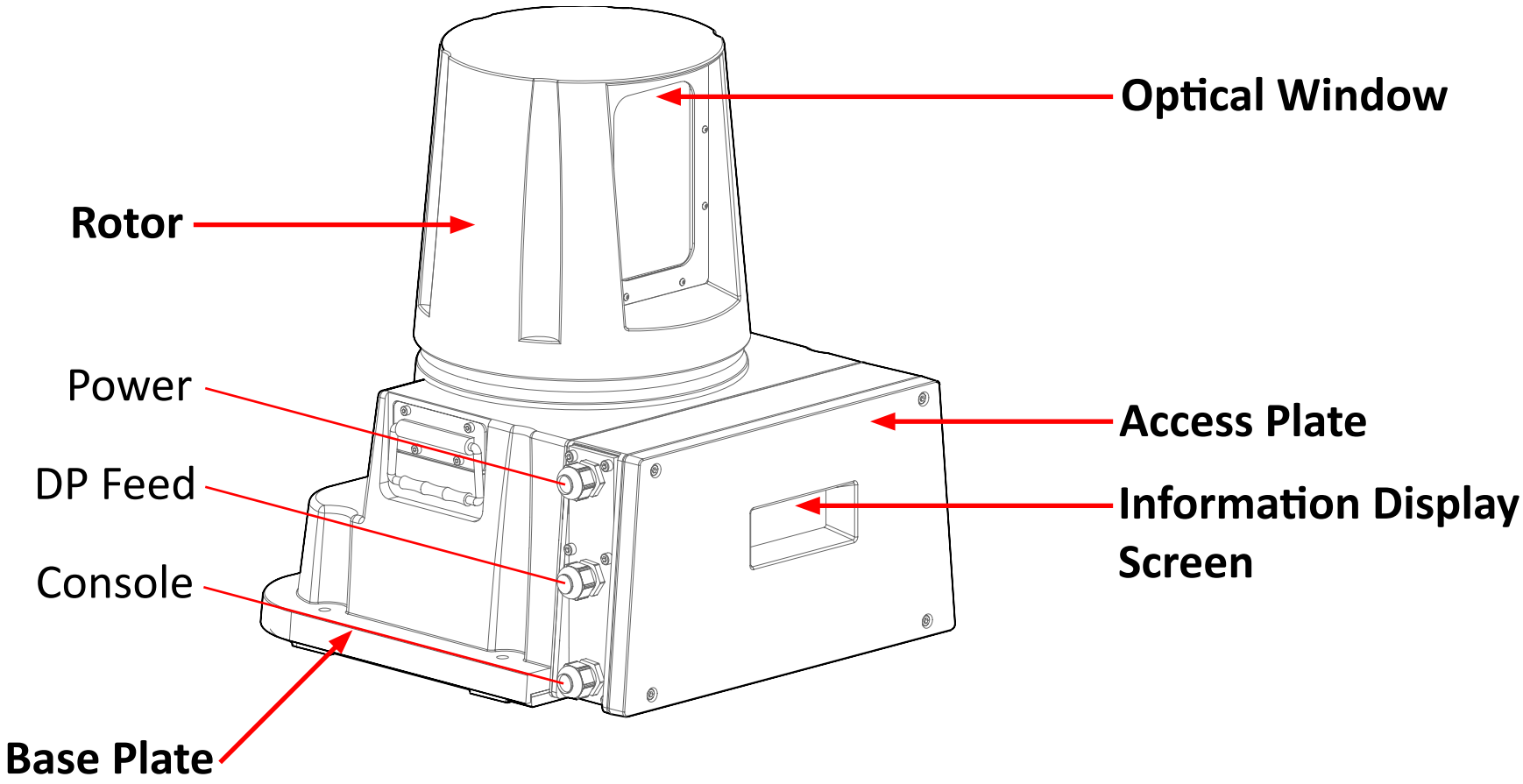
CyScan emits eye-safe infra-red light and detects the reflections back from retro-reflective targets. Targets are mounted on designated structures or vessels. They consist of strips of a high performance reflective tape mounted on a flat or a cylindrical support.

The accurate range and bearing of one or more targets is measured by CyScan and used to calculate the exact position of the CyScan vessel relative to the target structure or vessel. This positional information is displayed on the console screen and automatically transmitted to the vessel's DP system.

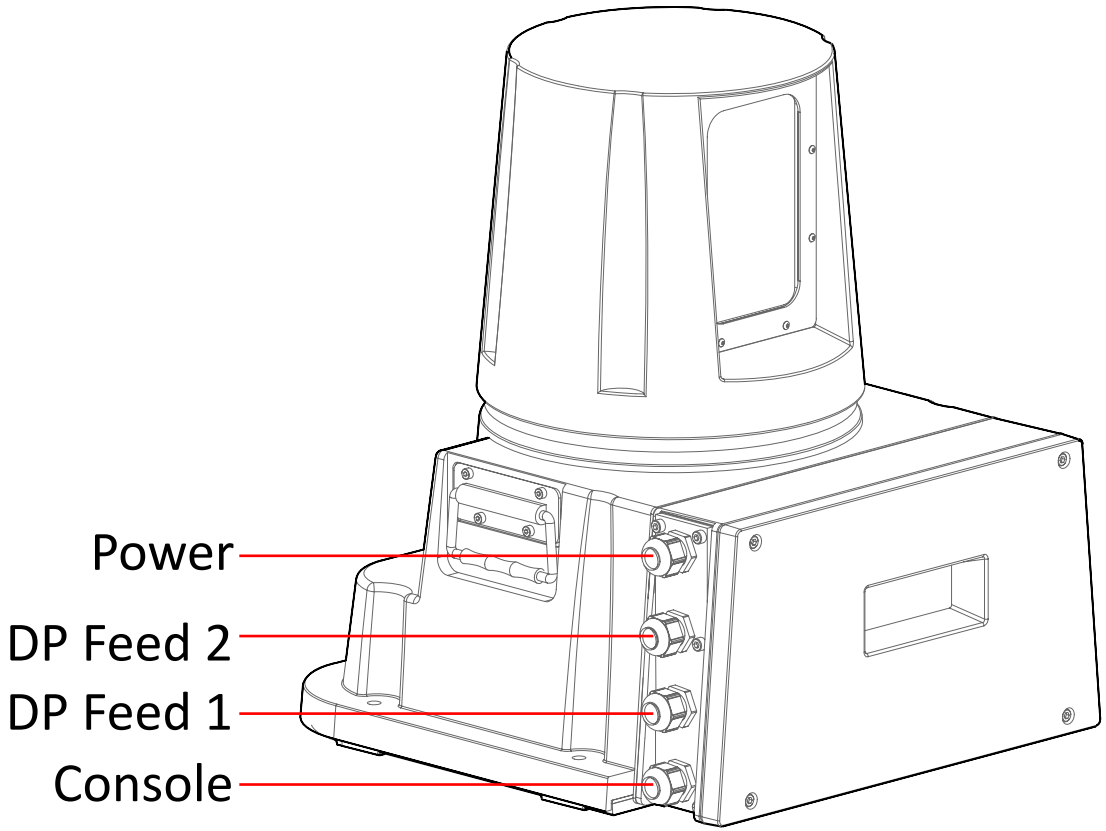


# CyScan Sensor Part Names

The diagram below shows the key parts of the sensor unit and the various names that are used throughout this guide:



# CyScan Sensor Part Names (Continued)




**Alternative model with 4 cable glands.**

# Getting Started

This section contains the following pages:


- ***Start Up and Shut Down*** (page 11)
- ***Screen Layout*** (page 12)
- ***Navigational Information Quality*** (page 20)
- ***Day and Night Views*** (page 21)


You may also find the following sections of the Appendices useful at this stage:


- ***Setting the Date and Time*** (page 80)
- ***Using the On Screen Keyboard*** (page 81)
- ***Working with Alarms*** (page 82)

# Start Up and Shut Down

## Start Up

### To Start CyScan User Console

1. Ensure that the CyScan sensor is powered on and running correctly.
2. Double-click on the CyScan User Console icon.
   (Or run the CyScan User Console application from **Start > Programs > CyScan > CyScan User Console x.xx**).
3. The Console display screen will appear.
   After a brief initialization period the sensor will begin operation and its scanning results will be displayed on screen.

**An Ethernet Console will always launch in Slave mode. Switch to Master mode to enable all the navigational and sensor-related controls.** ***(See Ethernet (Multi-Console) CyScan Systems on page 57).***

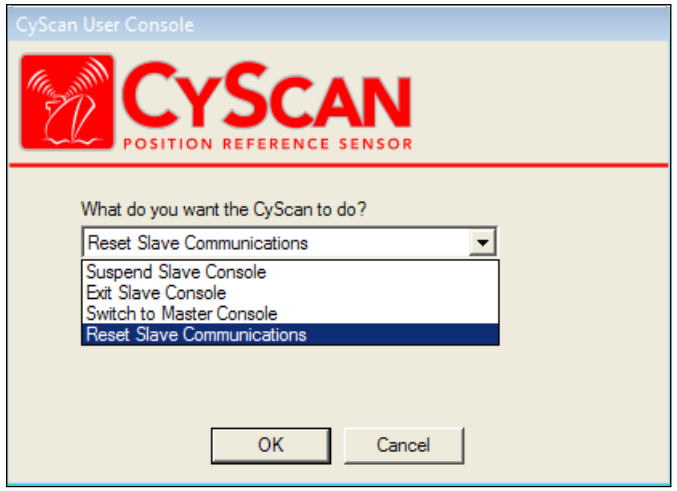
## Shut Down

### To Suspend, Exit or Reset Communications

1. Click on the CyScan button in the lower left corner of the screen

   A dialog box will be displayed (see right).
2. Click on the down-arrow. Select one of the following options and click on the **OK** button.

- **Suspend**—Places the sensor into a 'sleep mode'. The rotor ceases spinning and the scanner tilt returns to a fixed state. However, upon command from the Console application, the unit will return to full operation. This mode is suitable for use when travelling between locations.
- **Suspend & Exit**—Places the sensor into the same 'sleep mode' as the suspend command (discussed above) and also closes the CyScan Console program.
- **Reset Communications**—Re-initialises the communication links between the Console computer and the CyScan sensor.

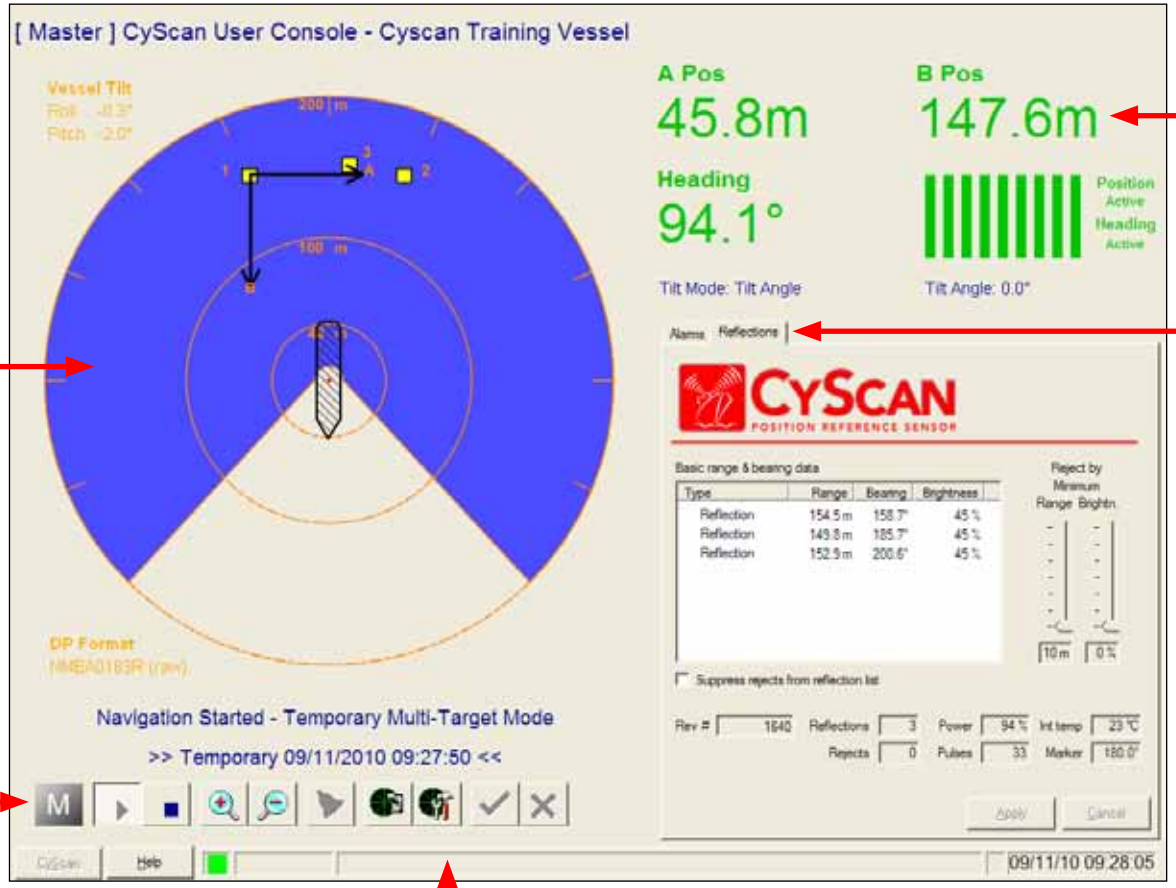



**The CyScan button is disabled on a Master Console while navigating or during *manual logging*. (See page 67). The button is enabled on a Slave Console while navigating, but manual logging is only possible from a master console.**

# Screen Layout

The CyScan User Console screen has five key areas:

- ***Sensor Display*** (page 13)
- ***Navigation Section*** (page 14)
- ***Status Bar*** (page 14)
- ***Button Bar*** (page 15)
- ***Property Tabs*** (page 18)




## Sensor Display

This circular area displays the relative positions of the CyScan vessel and any reflections that have been picked up by the sensor. (See page 13).

## Navigation Section

The Navigation Section displays positional data when the system is in navigation mode. (See page 14).

## Property Tabs

The Alarms and Reflections tabs are always displayed. (See page 18).

Additional tabs can be accessed by clicking on the Sensor Operations button. (See page 15).

## Button Bar

A collection of buttons that provide, or control, a range of functions. (See page 15).

## Status Bar

Provides important feedback information on various topics and displays the date and time that the situation was first reported. (See page 14).

# Screen Layout (Continued)

## Sensor Display

The circular Sensor Display shows the relative positions of the CyScan vessel and any detected reflections. By clicking on the Sensor Display Options button you can configure how some of the following elements are displayed. (See page 15).

### CyScan Vessel

The CyScan vessel image can be displayed as either an outline or a solid filled shape, with a distinct bow and stern. The vessel image may be switched off if required.

Depending upon the chosen display option, the centre of the Sensor display will either represent the CyScan vessel, or the origin of the current multi-target group. (See ***Sensor Display Options*** on page 16).

### Blanking Zone

The Blanking Zone is the segment within each revolution of the sensor rotor where the laser is switched off. It is typically set to correspond with the area where the beam would strike portions of its own vessel. The blanking zone can be adjusted to suit different situations. (See ***Blanking Zones*** on page 23).

### Range Circles

The Range Circles act as a visual guide to show the distance between the CyScan vessel and the detected reflections. Distances are shown in metres from the CyScan vessel.

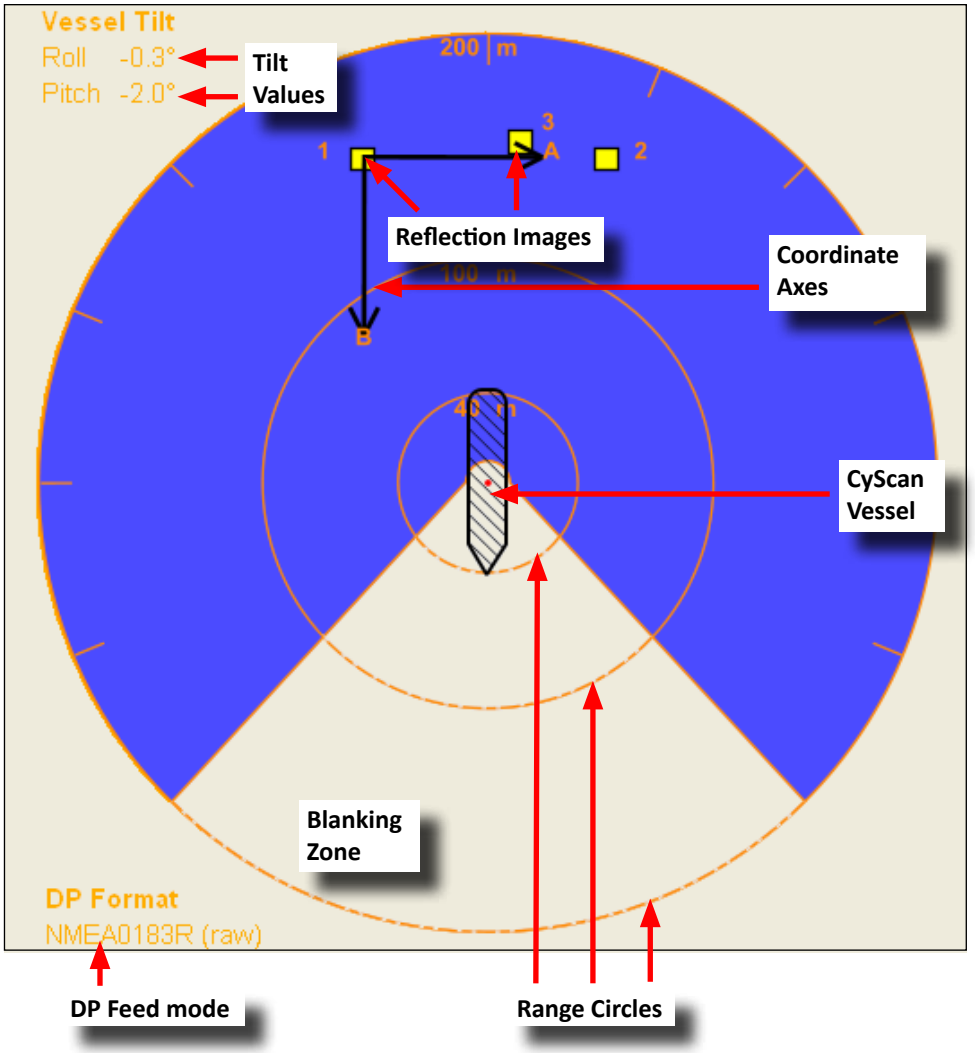
Use the Zoom In and Zoom Out buttons on the ***Button Bar*** to change the scale of the display. (See page 15).

### Coordinate Axes

The Coordinate Axes indicate the A-B axis that the CyScan system uses to define the positions of each reflection, relative to the origin of the multi-target group. The axes can be included or excluded from the display as required. (See ***Sensor Display Options*** on page 16 and ***Positional Display Modes*** on page 33).

### Reflection Images

Reflections received by the sensor are displayed as yellow squares. To navigate you must select the reflection(s) that correspond to the physical target(s) to be used. During navigation yellow boxes are drawn around the selected reflections to indicate a strong association with the target (i.e. the system is receiving good data and is confident of the target position). A red box appears around a selected reflection during navigation if the system has lost sight of the target, or there is insufficient data being received to use it for navigation.




### DP Feed Mode

Displays the current DP Feed mode. (See ***DP Feed Format & Message String*** on page 63).

### Tilt Values

Displays the current Roll and Pitch values for the vessel.

# Screen Layout (Continued)

## Navigation Section

The upper right corner of the screen displays positional information while the system is navigating.

### Positional display - Range, Bearing and Heading

Positional Information is displayed in different formats, depending on the type of DP Feed, and whether the system is navigating on single or multiple targets. (See ***Positional Display Modes*** on page 33).

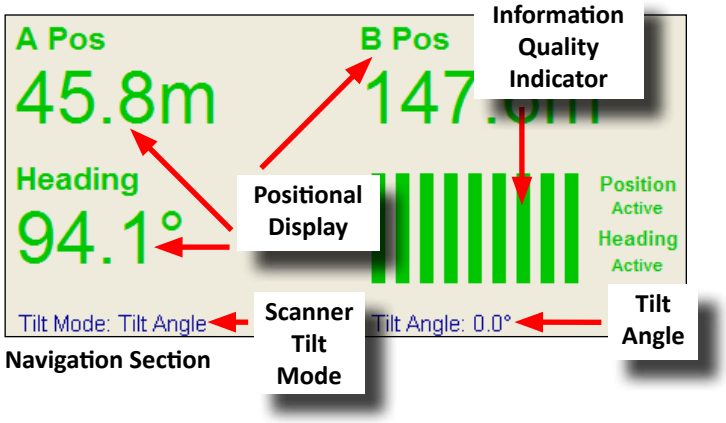
### Information Quality Indicator

This graph indicates the confidence that the system has in the quality of the position data that is being generated. The more bars shown, the better the information. The height of the bars indicates the brightness of the reflections returned by the target.

The colour of the bars and the display read-out also changes according to the quality of the information. (See ***Navigational Information Quality*** on page 20).

### Tilt Mode and Tilt Angle

Show the status of the ***Scanner Tilt Mode*** (see page 27) and the current ***Tilt Angle*** (see page 28).




**Navigation Section**

## Status Bar

Provides important feedback information on various topics and displays the date and time that the situation was first reported. A flashing green icon indicates that communication between the User Console and the CyScan sensor is OK.

Double click on the ***Time and Date*** portion of the status bar to set the current system date and time. (See page 80).

A letter 'E' will be shown to the left of the date and time if Service Access mode is currently enabled. This may be either an uppercase 'E' or a lowercase 'e', depending on how the Service Access was obtained (See ***Entering Service Access Mode*** on page 64).

**Status Bar**

### Status Bar Buttons

There are two buttons to the left of the status bar - **CyScan** and **Help**.

**Status Bar Buttons**

### CyScan Button

Click on the **CyScan** button to suspend or exit CyScan Console or to switch an Ethernet Console between Master and Slave mode. (See ***Start Up and Shut Down*** on page 11 and ***Ethernet (Multi-Console) CyScan Systems*** on page 57 for more information).

### Help Button

Click this button to view the online CyScan User Console operator's guide using Acrobat Reader.

**The CyScan button is disabled on a Master Console while navigating or during *manual logging*. (See page 67). The button is enabled on a Slave Console while navigating, but manual logging is only possible from a Master Console.**

# Screen Layout (Continued)

## Button Bar

The Button Bar contains a set of buttons providing the following range of functions.
When a function is not available, the button image is greyed-out.

**Master/Slave Switch**

Displays an 'M' when the Console is in Master mode and an 'S' when in Slave mode. Double-click the 'S' to switch a Slave console to Master mode.
**(This button is not present in the Serial version of the CyScan Console).**

**Stop Navigation**

Click to stop navigating

The system will stop sending live positional data to the DP system.

**Zoom Out**

Click to zoom out from the display.

**Sensor Display Options**

See page 16

**Sensor Operations**

See page 17

**Cancel Sensor Changes**

Click to abandon any changes and revert to the previous setting.

**Start Navigation**

Click to start navigating

After clicking on this button, you will need to select either a single-target, temporary multi-target group, or a preset multi-target group to navigate with.

**Zoom In**

Click to zoom in on the display.

**View New Alarms**

Click to view the Alarms Tab.

(This option only becomes available when one or more fatal or error alarms have occurred).

**Apply Sensor Changes**

Click to apply the current changes.

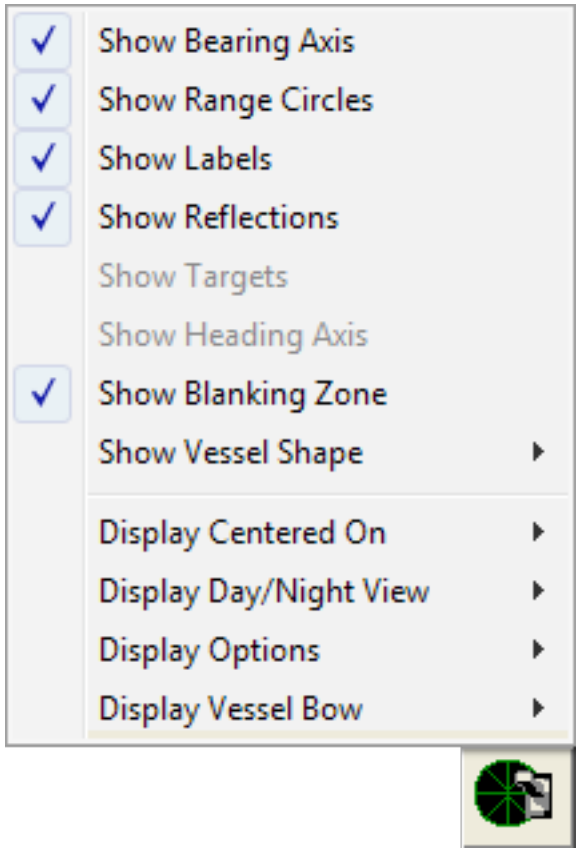
# Screen Layout (Continued)

## Sensor Display Options

Click on the Sensor Display Options button to override the options set in the ***Configuration Tab*** (See page 62).

- **Show Bearing Axis**—Display/hide the tick marks around the outer circle of the sensor display.
- **Show Range Circles**—Display/hide the concentric distance circles of the sensor display.
- **Show Labels**—Display/hide the numbering of targets within a multi-target group under navigation.
- **Show Reflections**—Display/hide the markers representing the reflections received by the CyScan sensor.
- **Show Targets**—Display/hide the range and bearing vector or coordinate axes, if selected, and the association boxes that are superimposed on the reflection squares.
- **Show Heading Axis**—Display/hide the heading axis line (***multi-target groups*** with NMEA0183R/P DP message formats only, see page 29).
- **Show Blanking Zone**—Display/hide the angular area within each rotor revolution where the laser is switched off.
- **Show Vessel Shape**—Determines how the CyScan vessel is represented on the sensor display – the options are: Off, Outline and Filled.
- **Display Centred On**—When navigating on a multi-target group, this option determines if the scanner display is centred on the target or on the vessel. (***multi-target groups*** with NMEA0183R/P DP message formats only, see page 29).
- **Display Day/Night View**—Switches between ***day/night display modes***. (See page 21).
- **Display Options**—Selects the ***Extended Dialogs*** (see page 63) and ***Range and Bearing Only*** see page 35 options.
- **Display Vessel Bow**—Selects the orientation of the vessel's bow displayed on the screen, either: Top, Left, Bottom or Right.

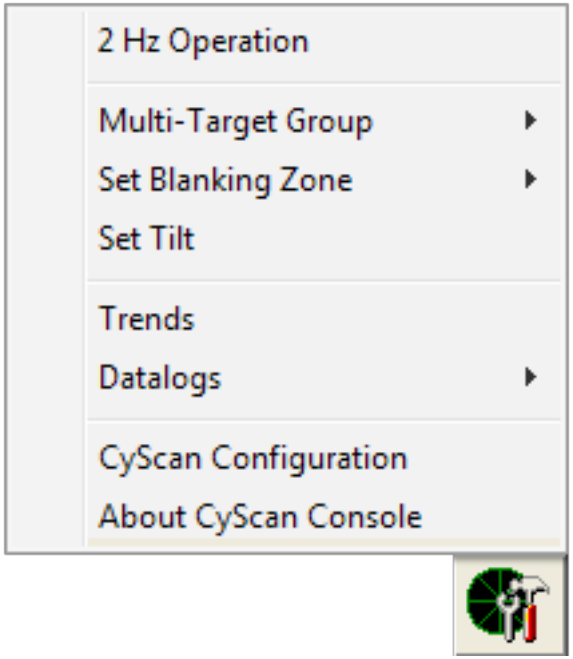
**Sensor Display Options are temporary and only apply to the current session.**



# Screen Layout (Continued)

## Sensor Operations

Click on the Sensor Operations button to view the following configuration options.




- **2Hz Operation**—When this option is enabled the rotor on the sensor spins at a rate of 2Hz (120rpm), rather than the standard 1Hz (60rpm). (Data is always output to the DP system at 1Hz).
  **Note:** the rotor speed will reset to 1Hz after the sensor is suspended and resumed.
- **Multi-Target Group**—Choose between either Align, Create or Edit:
  **Align**— Allows the Heading Axis to be rotated so that it aligns with true North. This enables the reported position to be given in true Northings and Eastings. (See ***Aligning a Multi-Target Group to a Given Vessel Heading*** on page 45).
  **Create**—Used to create ***preset multi-target groups***. (See page 55).
  **Edit**—Used to edit preset multi-target groups.
- **Set Blanking Zone**—Used to select the required ***blanking zone***. (See page 23).
- **Set Tilt**—Opens the ***Scanner Tilt Controls*** (see page 27).
- **Trends**—Opens the Trends tab, where you can choose data from a range of groups, view and analyse the data (See page 19).
- **Datalogs**—Choose between either Log data now, Take screen shot, Copy log files to USB or Delete all log files:
  **Log data now**—Starts system logging. (See page 67).
  **Take screen shot**—Captures an image of the current screen. (See page 67).
  **Copy log files to USB**—Offers several options for copying log files to a USB memory stick. (See page 67).
  **Delete all log files**—Deletes all log files immediately, without confirmation. (See page 67).
- **CyScan Configuration**—Opens the ***CyScan Configuration*** window. (See page 62).
- **About CyScan Console**—Opens the ***About CyScan*** tab, which displays software version, licence and contact details. (See page 64).

# Screen Layout (Continued)

## Property Tabs

The Alarms and Reflections tabs are always displayed. Other tabs appear when you select an option from the Sensor Operations button. (See page 17).

### Alarms Tab

Alarm messages are classified into four types, in increasing order of severity:

- Information—grey symbols
- Warning—orange symbols
- Error—red symbols
- Fatal—red symbols

A filter is available to suppress the display of particular alarm types. As standard, the filter is activated and grey information messages are hidden from the list.

The arrow symbol indicates the start of an entry that persists, while the square symbol indicates the end of an entry. The pause symbol indicates an entry that does not persist.

Accepting alarms in the Current list moves them to the Historic list. (See page 83).

Deleting alarms from the Historic list will delete them permanently.

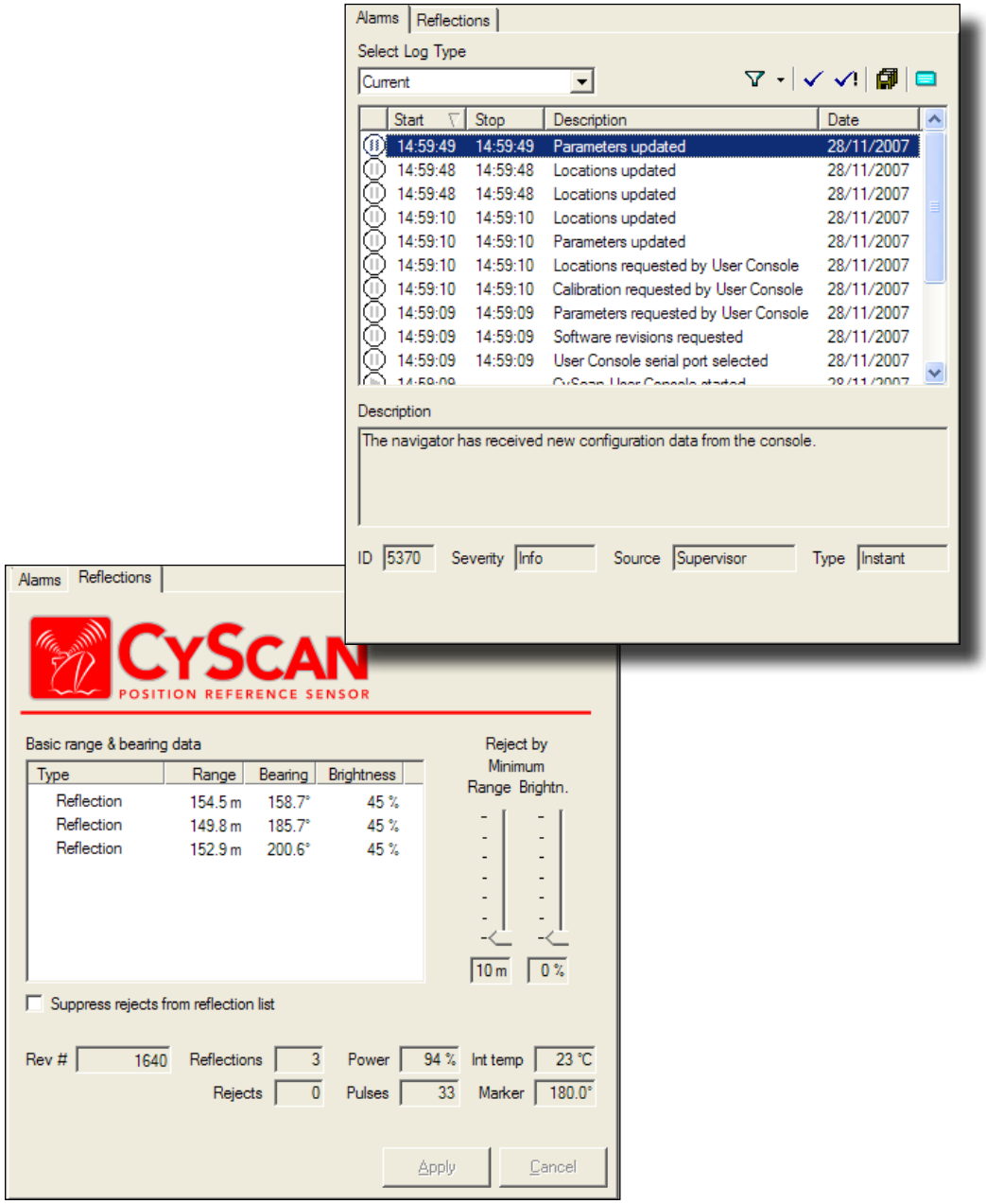
### Reflections Tab

Provides a numeric list of the reflections received during the last complete revolution of the sensor rotor. This screen can be used to verify the graphical representation of reflections shown within the Sensor display.

As a new revolution is started, the list is cleared and starts again. For each verified reflection the list provides: Range, Bearing and Brightness values. The two sliders allow you to filter out unwanted reflections that might adversely affect navigation.
(See ***Rejecting Unwanted Reflections*** on page 26).

Extra information is displayed on the Reflections Tab when the Extended Dialogs option is selected on the Configuration tab. (See page 63).

**If an arrow is appended to a reflection entry, this indicates that the reflection may be improved by tilting the sensor either upwards (up arrow) or downwards (down arrow). Please refer to the Scanner tilt adjustment section (See page 28).**

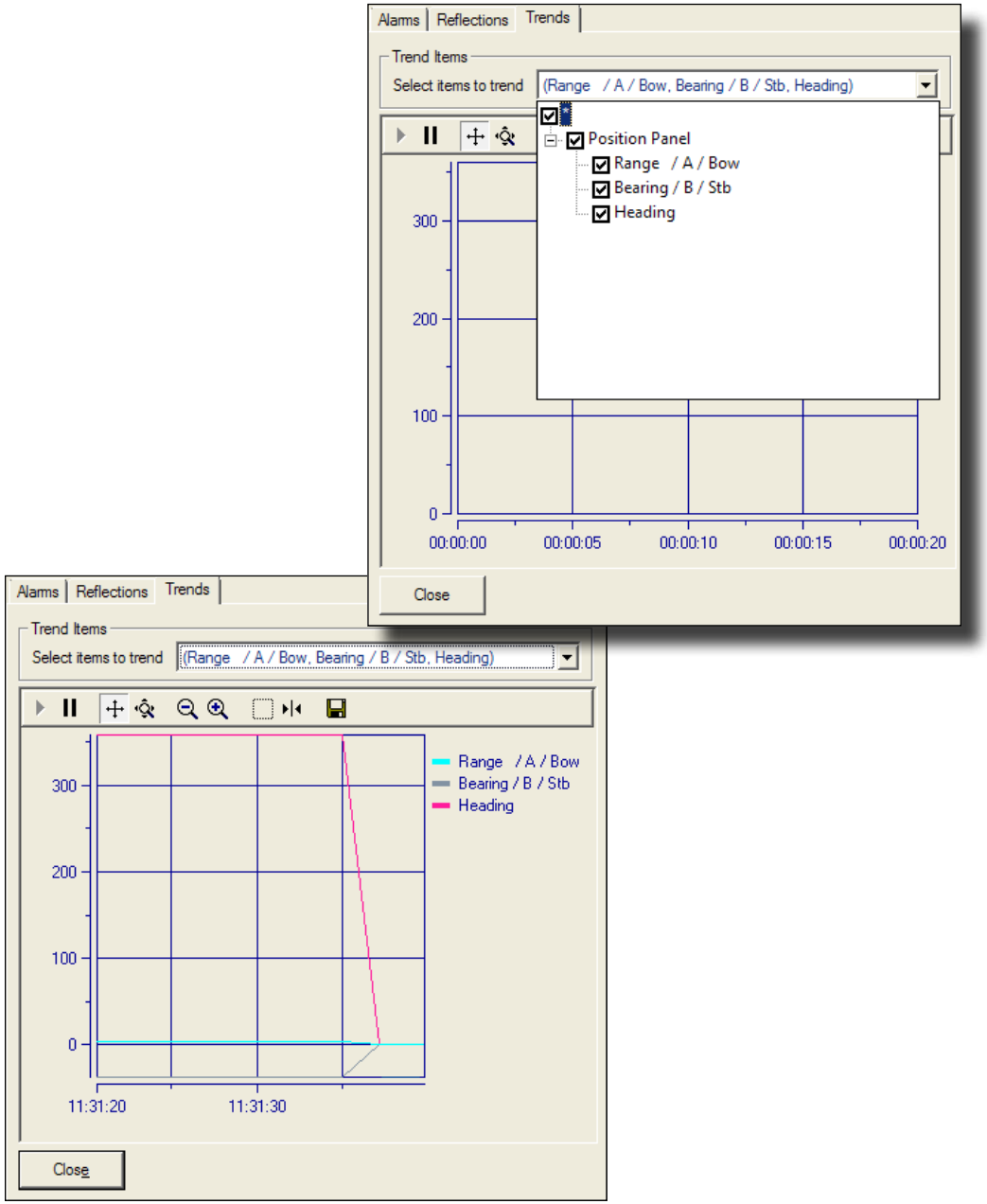


# Screen Layout (Continued)

## Property Tabs (Continued)

### Trends Tab

The Trends tab allows you to select from a range of items and view a plot of their trends. There are also several buttons on this tab enabling you to control and adjust the display of the trends, copy and save it:




**Resume All (Tracking)** — Resumes tracking of all selected items when paused.

**Pause All (Tracking)** — Pauses tracking of all selected items.

**Scroll (Axes)** — Scrolls either axis (click the axis and drag with the mouse).

**Zoom (Axes)** — Zooms either axis in/out (click the axis and drag with the mouse).

**Zoom Out All Axes** — Zooms out both axes each time the button is clicked.

**Zoom In All Axes** — Zooms in both axes each time the button is clicked.

**Zoom Box** — Zooms in on an area defined by dragging a box with the mouse.

**Cursor** — Drag the vertical line to view the values at a point of interest on the plot.

**Save to File** —Saves a snapshot of the trends plot to a bitmap (.bmp) file.

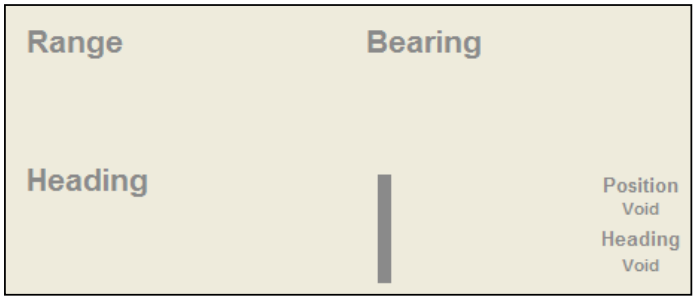
# Navigational Information Quality

The CyScan Sensor rotates anti-clockwise. On each rotation, the sensor emits a beam of infrared laser light and analyses the position of any reflections that it receives.

After several rotations, the sensor is able to compare the reflections received on the last rotation with those received during previous rotations. This enables CyScan to recognise the reflections from the intended targets and to ignore any unwanted reflections.

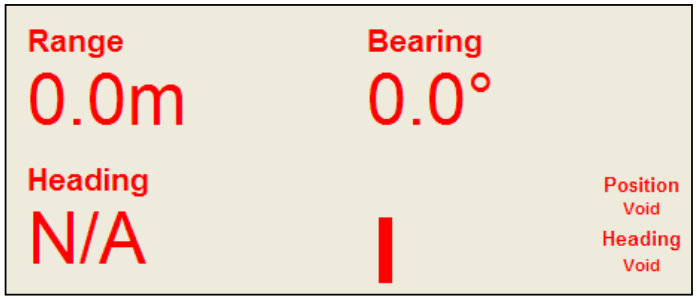
1. Before navigation is started, the positional display readings in the top right hand corner of the screen are grey.

   This indicates that the system is not currently navigating.



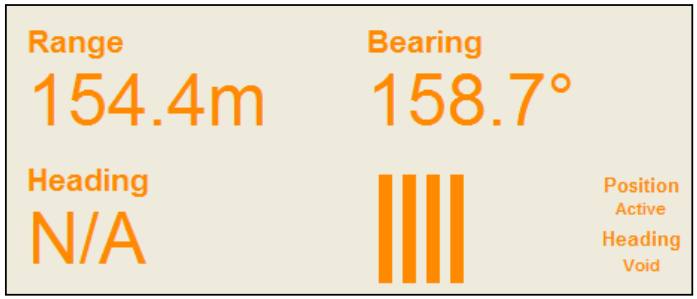

2. When navigation is started, the positional display readings in the top right hand corner of the screen will go red.

   This indicates that there have not been enough rotation scans to calculate the vessel's position.



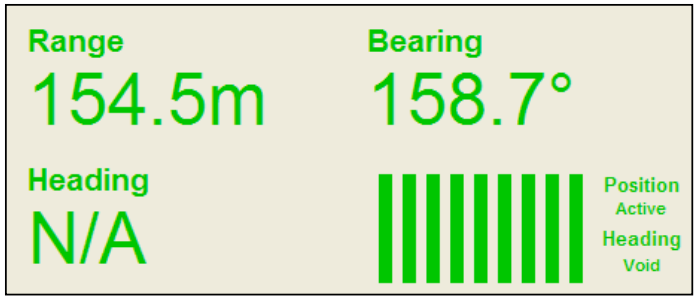

3. After a few seconds, as the scanner gathers more information, the display readings should turn amber and then green.

   This indicates that the vessel's position can now be calculated accurately.




4. The number of bars displayed on the Information Quality Graph (up to a maximum of 9) indicates the confidence that the system has in tracking the targets.

   The height of the bars indicates the brightness of the reflections received by the sensor.



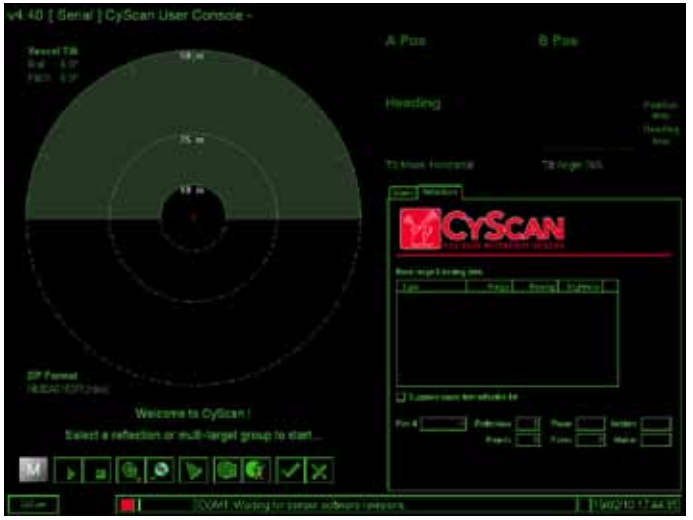
# Day and Night Views

To provide maximum visibility during daytime operation and minimal glare during night shifts, CyScan User Console offers two display modes: '**Day View**' and '**Night View**'. By default the colour scheme for Day View is "grey", and for Night View it is either "green" or "orange". Alternative colour schemes can be configured when the CyScan Console is installed. The colour scheme used when you select Day View or Night View will be set when the Console is installed.

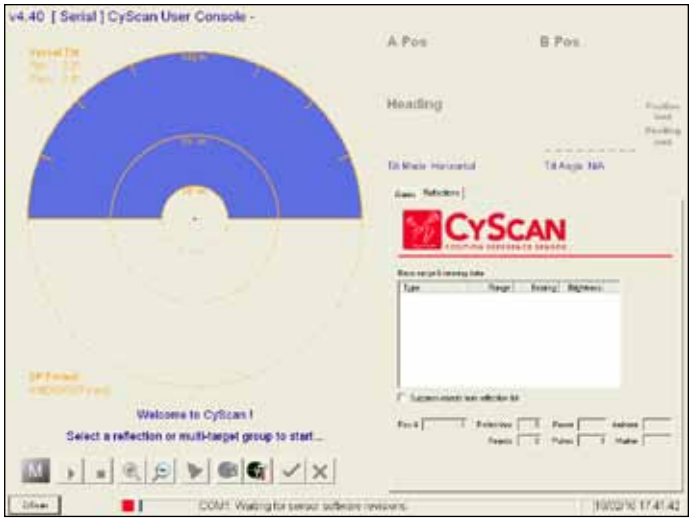
The default option (Day or Night) is set in the ***Configuration Tab*** (see page 62), but this setting can be overridden from the Sensor Display Options menu.

## To change the day/night view mode:

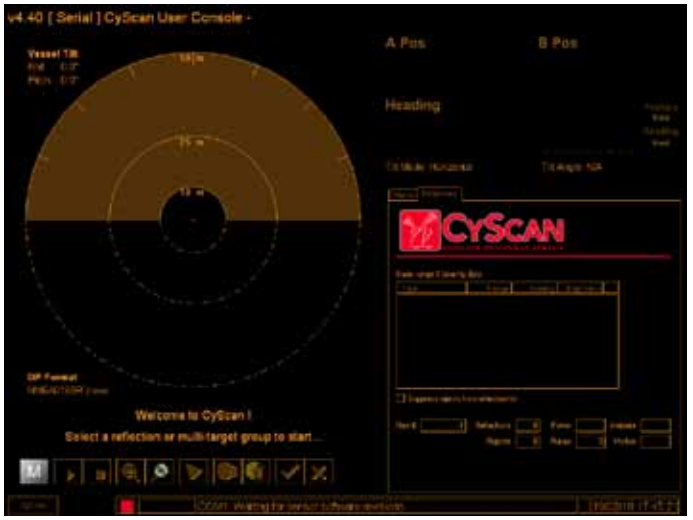
1. Click on the **Sensor Display Options** button.
2. Click on **Display Day/Night View**.
3. Click on either **Day View or Night View**.




**Night View "green" colour scheme**




**Day View "grey" colour scheme**




**Night View "orange" colour scheme**

# Navigation Basics

This section contains the following pages:


- *Blanking Zones* (page 23)
- *Working with Reflections* (page 25)
- *Scanner Tilt Controls* (page 27)

# Blanking Zones

The Blanking Zone is used to mask the segment of the scan rotation that is obscured by the vessel's superstructure. While the scanner passes through the blanking zone, the laser is switched off to prevent any unwanted reflections from interfering with the target data.

(Even if the sensor has a clear 360° view, there must be a blanking zone of at least 45°).

Generally, once the blanking zone has been set, it will not need to be changed. However, there may be occasions when it is necessary to adjust the blanking zone, for example if the target is on the opposite side of the vessel to normal.

**Changing the blanking zone whilst navigating will interrupt the data sent to the DP system.**

**If the blanking zone is adjusted while navigating, the new values are applied only to the active multi-target group. However, if the blanking zone is adjusted while out of navigation mode, the new values are not applied to any existing multi-target groups but instead form a new baseline setting.**

## Setting the Blanking Zone

There are two ways to set a blanking zone:

- ***Selecting a preset blanking zone*** (see below).
- ***Creating a custom blanking zone*** (see page 24).

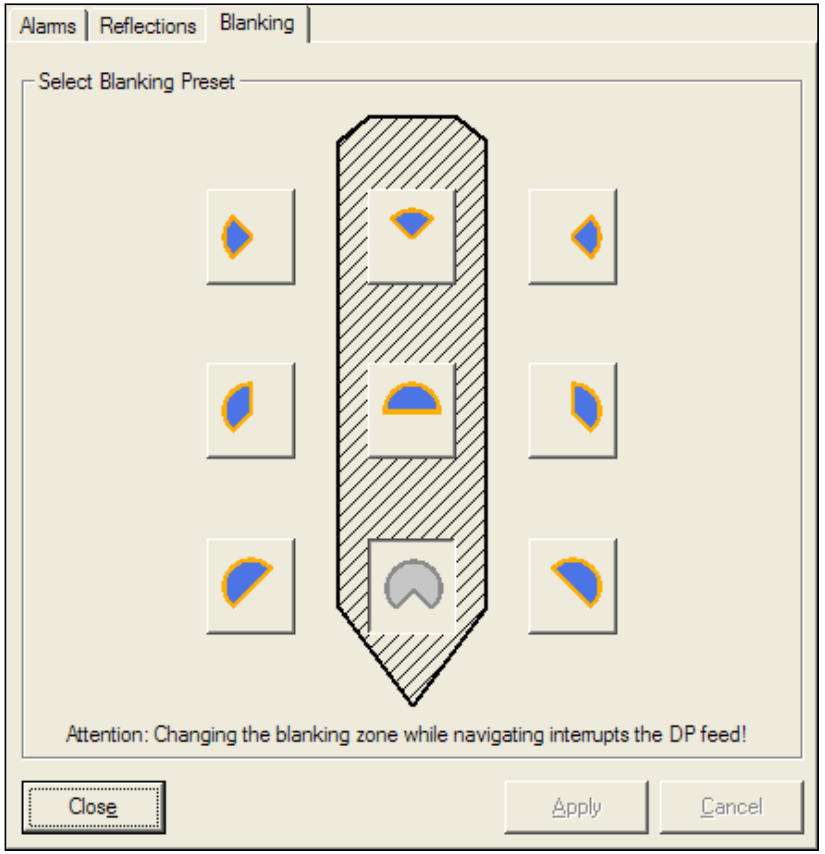
## Selecting Preset Blanking Zones

The orientation of the vessel displayed in the Blanking tab automatically matches the **Display Vessel Bow** settings (Top, Left, Bottom and Right) accessed from the Sensor Display Options button.

### To select a preset blanking zone

1. Click on the **Sensor Operations** button.
2. Click on **Set Blanking Zone > Use Presets**.

   The Blanking tab is opened (see right).
3. Click on the **blanking zone shape** that best suits the current CyScan installation and its field of view.
4. Click on the **Apply** button to confirm the changes.



# Blanking Zones (Continued)

## Creating Custom Blanking Zones

In custom blanking mode, you can manually select the segments of the display that make up the blanking zone.

### To Create a Blanking Zone

1. Click on the **Sensor Operations** button.
2. Click on Set **Blanking Zone** > **Manually**.

### Drawing the Blanking Zone

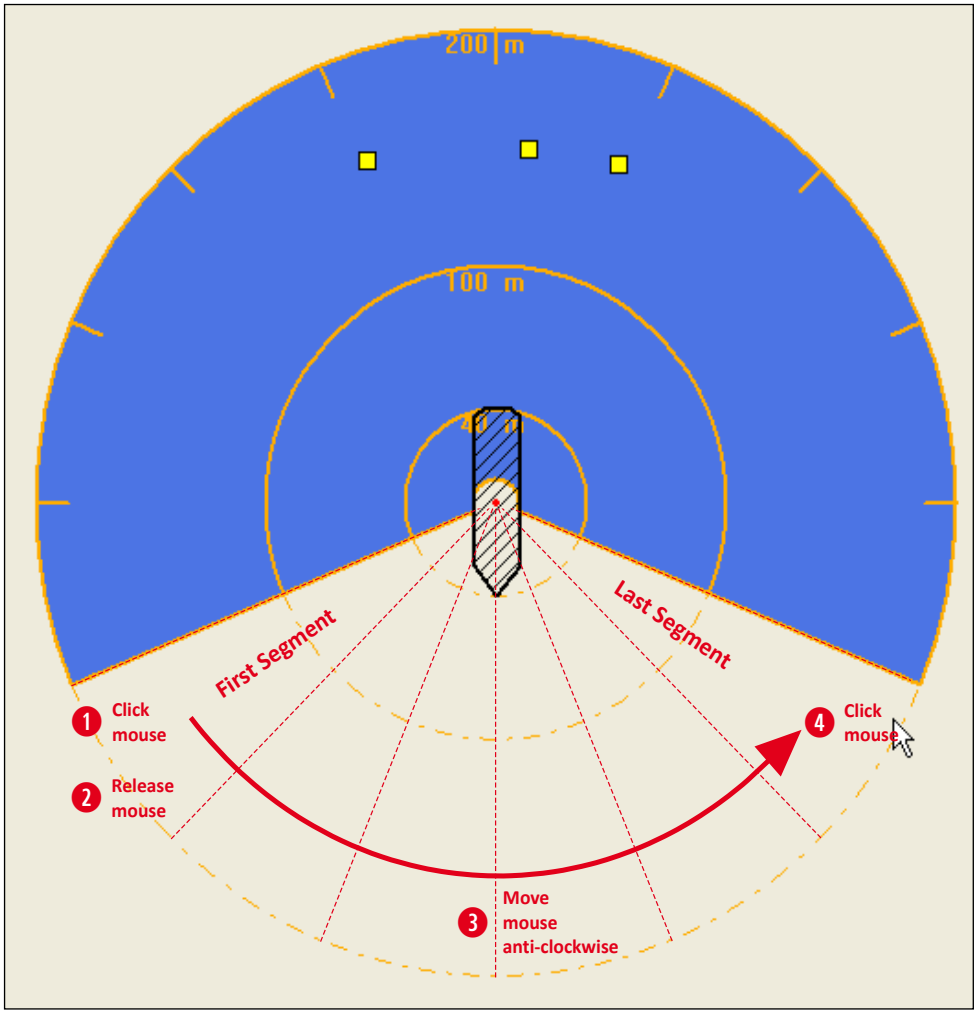
1. Click on the **first segment** of the blanking zone.
2. Release the mouse button.
3. Drag the mouse in an **anti-clockwise** direction around the display circle.

   (When you hover over a segment it will turn grey, showing that it will become part of the blanking zone).
4. Click on the **last segment** of the blanking zone.
5. Click on the **Apply Sensor Changes** button to confirm the changes.

### To Show or Hide the Blanking Zone

1. Click on the **Sensor Display Options** button.
2. Click on **Show Blanking Zone**.

   If this option is ticked, the blanking zone (if set) will be displayed.

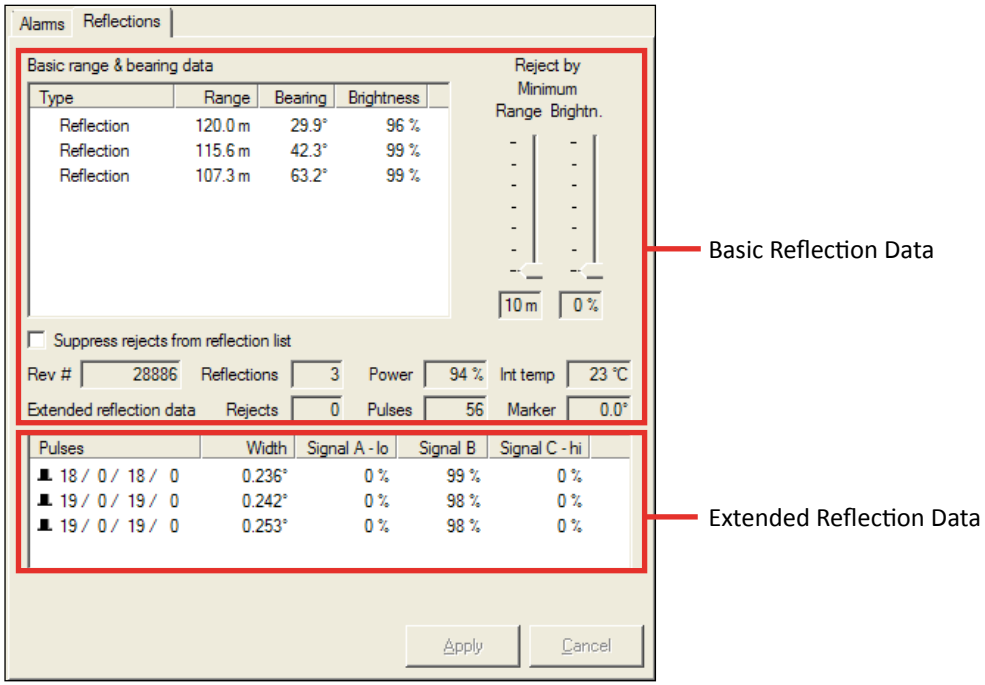



**The 360° sweep of the sensor display is split into sixteen segments.**
**The blanking zone must cover at least two segments.**

**When selecting the start and stop segments for the blanking zone, you must always work in an anti-clockwise direction.**

# Working with Reflections

By default, only basic reflection data is displayed on the Reflections tab.
Extended information is displayed when the ***Extended Dialogs*** option (see page 63) on the Configuration tab is ticked.




## Basic Reflection Data

**Rev#**—The total number of revolutions made by the scanner rotor since CyScan was last powered up or resumed.

**Reflections**—The number of detected reflections.

**Rejects**—The number of manually ***rejected reflections***. (See page 26).

**Power**—The relative output power of the laser. CyScan automatically adjusts the output power of the laser to receive an adequate reflection from the brightest target without saturating the scanner. The maximum value is 100%.

**Pulses**—The total number of pulses received during the last revolution of the scanner rotor.

**Int temp**—The temperature inside the scanner unit.
(See ***Low Temperature Operation*** on page 78).

**Marker**—The Marker displays the orientation of the scanner in relation to the vessel:
0° indicates that the scanner has been mounted with its information display facing the stern.
180° indicates that the scanner has been mounted with its information display facing the bow.

## Extended Reflection Data

### Pulses

The Pulses column displays the number of laser pulses that have been received back from each target in the following format:

**USING/BAD/TOTAL/REJECTED**

For example, if the pulses column was displaying 9/1/11/1, it would indicate that CyScan was using 9 laser pulses for the position calculation, and had discarded 1 bad pulse and rejected 1 pulse out of a total of 11.

In general, the larger the target the more pulses that will be returned.
This value will increase as the distance to the target reduces.

The following icons indicate that the scanner is operating correctly:

***A black cross*** *indicates that* the reflection has been ***manually rejected*** using the minimum Range and Brightness sliders.

***A red icon*** indicates that the reflected pulse was too bright and has blinded the scanner.

### Width

The Width column shows the horizontal width of each target, measured in degrees.

### Signal A, B and C Levels

The **Signal A-lo**, **Signal B**, and **Signal C-hi** columns can indicate that the scanner is pointing too low or too high in relation to the detected reflections.

This can occur when the CyScan Vessel is working close to a rig and the targets are mounted high above the scanner. (See ***Manually Tilting the Scanner*** on page 28).

**High readings in either the A or C sectors can also be caused by unwanted reflections and do not always necessarily indicate that the scanner is pointing too low or too high in relation to the intended target.**

# Working with Reflections (Continued)

## Rejecting Unwanted Reflections

The Range and Brightness sliders on the Reflections tab can be used to reject any unwanted reflections that may be interfering with the CyScan system. For example, reflections from a different vessel to the one you are keeping station with.

Unwanted reflections can be rejected at any time, even during navigation.

Use the sliders to set the minimum thresholds for range and brightness.

The **Range Slider** allows you to reject reflections that are closer than the threshold range. For example, if you set the range threshold to 40m, any reflections less than 40m away will be rejected. The range threshold can be adjusted between 10 and 70 metres.

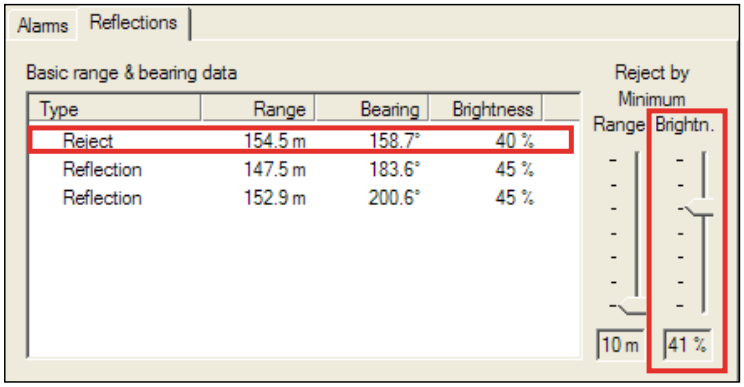
The **Brightness Slider** allows you to reject reflections that are below the threshold brightness level. For example, if you set the brightness threshold to 30%, any reflections that have a brightness of 29% or less will be rejected. The brightness threshold can be adjusted between 0% and 60%. (Reflection brightness is measured as a percentage value of the brightness of the light initially emitted by the laser.)

Once set, any reflections that do not meet the specified range or brightness values will be marked in red on the scanner display, listed as a reject on the property page and omitted as a navigation reference.

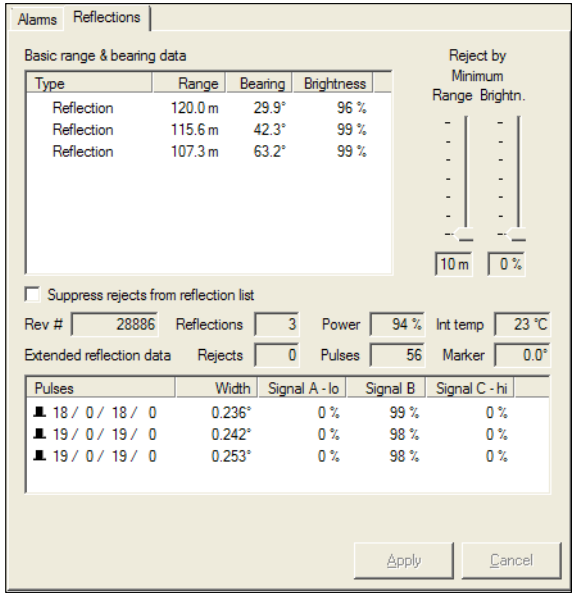
To hide rejected reflections on the Reflections tab,
tick the **Suppress rejects from reflection list** option.

### To reject unwanted reflections:

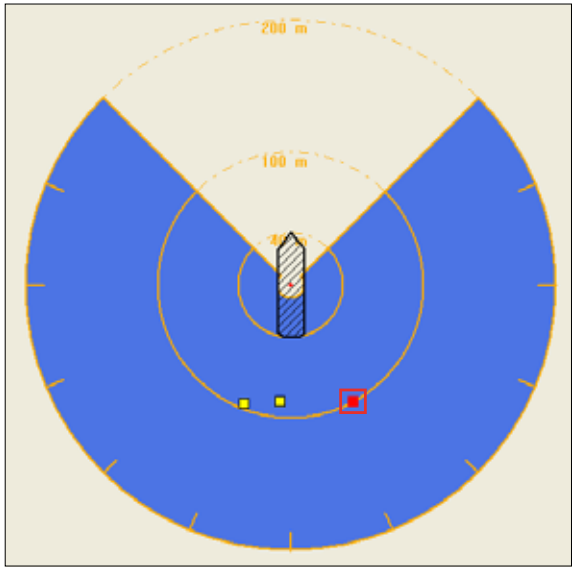
1. Click and drag the range and/or brightness sliders to the required threshold settings.
2. Click on the **Apply** button.




The minimum brightness setting of 41% has caused the first reflection in the list to be rejected and to be marked in red on the scanner display.



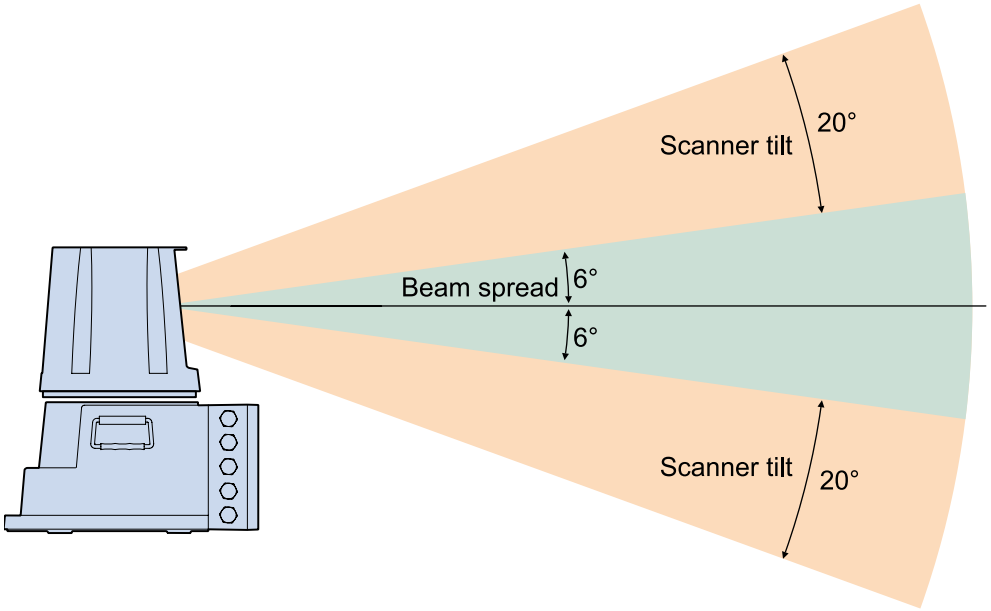

**Reflections Tab**




**Rejected Reflection**

# Scanner Tilt Controls

The scanner tilt mechanism automatically compensates for the pitch and roll of the vessel. Motion sensors and a tilting optics mechanism ensure that the scanning optics remain at the correct level to see the target.




## Scanner Tilt Modes

The scanner can be operated in one of three tilt modes:

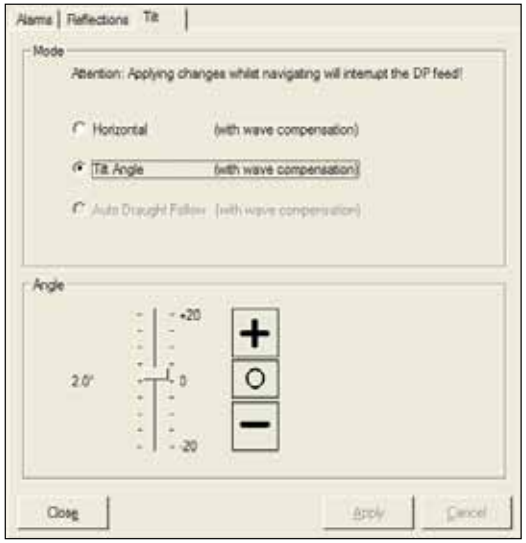
- **Horizontal**—The scanner tilt automatically maintains the optics in a horizontal position by compensating for the pitch and roll of the vessel.
- **Tilt Angle**—This mode is used when it is necessary to manually tilt the optics to reach the target. For example, when station-keeping close to a platform where the targets are mounted high up and the CyScan optics must be tilted up at them. (See *Manually Tilting the Scanner* on page 28).
- **Auto Draught Follow**—The scanner tilt automatically adjusts to compensate for draught changes as the vessel loads or unloads.

The current tilt mode and tilt angle are displayed above the top left corner of the property tab.

### To change the scanner tilt mode

1. Click on the **Sensor Operations** button.
2. Click on **Set Tilt** to open the Tilt tab - see right.
3. Select the required tilt **Mode**.
4. Set the required tilt **Angle**, if applicable, using the slider and/or the +/- buttons.
5. Click on the **Apply** button to confirm your changes.

**If the tilt angle is adjusted while navigating, the new values are applied only to the active multi-target group. However, if the tilt angle is adjusted while out of navigation mode, the new values are not applied to any existing multi-target groups but instead form a new baseline setting.**




**Tilt Tab**

**Current Tilt Mode and Tilt Angle**

# Scanner Tilt Controls (Continued)

## Manually Tilting the Scanner

The **Tilt Angle** mode is used to tilt the scanner optics manually so that centre of the fanned beam is pointing at the target. This may be necessary when the CyScan Vessel is close to a platform and the targets are positioned above the sensor.

When a target is in view of CyScan but is not central within the fanned beam, indicator arrows are displayed in the Reflections tab to show that tilting the sensor towards the target(s) will improve the brightness and stability of the reflection (see right).

An upward pointing arrow shows that the sensor should be tilted up.

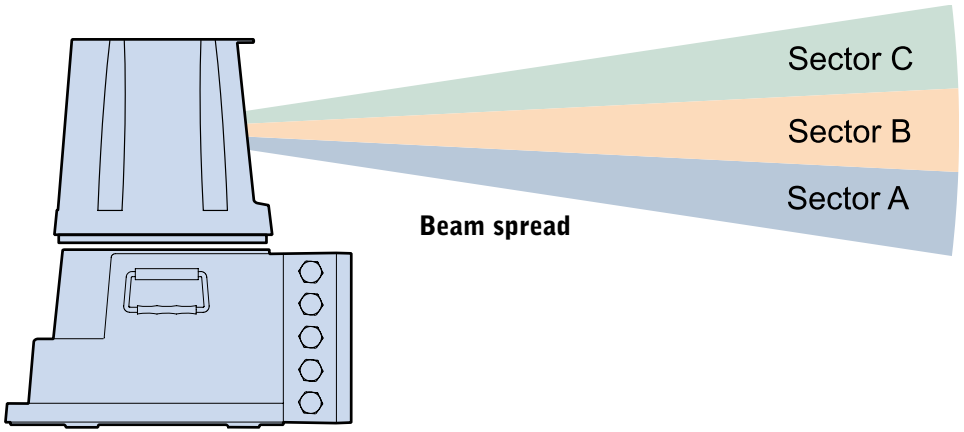
A downward pointing arrow shows that the sensor should be tilted down.

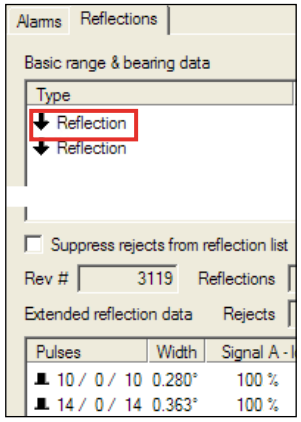
Start with a small amount of tilt, say 3° to judge the optimum setting. (See ***To change the scanner tilt mode*** on page 27).

CyScan divides the beam spread into 3 vertical sectors; A, B and C.

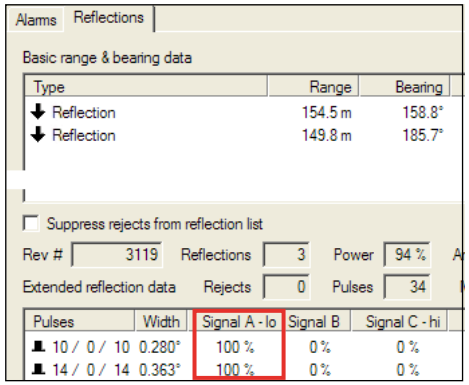
The amount of signal being received in each sector is displayed on the Reflections tab (when the ***Extended Dialogs*** option is selected - see right).

Generally, most of the signal should be in the middle Sector B. If the sensor is pointing too low then most of the signal will be in Sector C. If the sensor is pointing too high, most of the signal will be in Sector A.

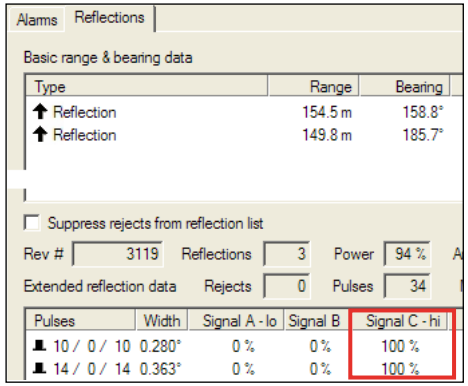



**Indicator Arrows show which tilt direction will improve the brightness and stability of the reflection.**




**All of the reflection signal is being received in sector A – the sensor is pointing too high.**




**All of the reflection signal is being received in sector C – the sensor is pointing too low.**

**High readings in either the A or C sectors can also be caused by unwanted reflections and do not always necessarily indicate that the scanner is pointing too low or too high in relation to the intended target.**

# Single and Multi-Target Navigation

This section explains how multi-target groups work in CyScan, and how to set up and configure them. It does not provide advice on how to set up multi-target groups for a specific DP system or application.

The information contained in this section is for general guidance only. This section does not provide an exhaustive explanation of multi-target navigation using CyScan, nor does it form the basis of a contract. Implementation of the material covered in this section will vary according to the type of DP system used in conjunction with the CyScan system. The use of, or reliance on, anything in this section is therefore entirely at the user's own risk and should only be undertaken after assessment of its accuracy, completeness and suitability for the proposed use.

This section contains the following pages:


- ***Introduction to Single and Multi-Target Navigation*** (page 30)
- ***Positional Display Modes*** (page 33)
- ***Selecting Targets for Multi-Target Groups*** (page 36)
- ***Axis Orientation and Vessel Heading*** (page 39)
- ***Rotational Offsets*** (page 41)
- ***A Pos and B Pos Offsets*** (page 48)
- ***Using Single and Multi-Target Navigation*** (page 53)

# Introduction to Single and Multi-Target Navigation

## Single and Multi-Target Modes

CyScan can operate in 'Single-Target Mode' or 'Multi-Target Mode':

### Single-Target Mode

During Single-target Navigation, CyScan uses a single flat, cylinder, prism or prism cluster target.

Single-target Navigation is quick and easy to use, but has the following limitations:

- Tracking stability is affected if the target reflection is temporarily lost, as there is no redundancy.
- If the true target reflection is obscured by vessel operations, there is a possibility that the sensor track could jump to another reflection.
- Relative vessel heading cannot be calculated.

### Multi-Target Mode

In Multi-Target Mode, CyScan uses between two and five targets. Guidance Navigation recommends using a minimum of three targets. Multi-Target Mode has the following advantages compared to Single-Target Mode:

- Improved tracking stability.
- Increased immunity to false reflections.
- Redundancy allows navigation to continue even if a target is temporarily lost.
- Preset multi-target groups can be saved and used again.
- The vessel’s heading in relation to the Multi-Target Group can be calculated.

# Introduction to Single and Multi-Target Navigation (Continued)

## Multi-Target Group Types

There are two types of multi-target group—'temporary' and 'preset'.
Preset groups can either be 'Fixed' or 'Mobile'.

### Temporary Groups

Temporary multi-target groups are set up in a similar way to single-target mode, except that two or more targets are selected. CyScan automatically calculates its coordinate axes from the target selection and begins navigating.

Temporary groups cannot be saved. If you stop navigating you must set up another temporary group when you restart navigation.

### Preset Groups

When you create a 'preset' group, you can manually adjust the direction and position of the coordinate axes. Preset Groups can be configured to be either 'Fixed' or 'Mobile'. (Temporary groups are always fixed).

Preset groups can be saved and used again when the vessel revisits the same target-group location.

### Fixed and Mobile Groups

The default 'fixed' mode refers to a target group mounted on a static, fixed structure. All relative position and heading changes are caused by movements of the CyScan vessel.

'Mobile' mode refers to a target group mounted on a another mobile vessel.
Relative position and heading changes can be caused by movements of either the CyScan vessel or the target vessel.

In mobile mode, CyScan sends an enhanced message string to the DP system. The positional and heading data remain the same as in fixed mode, but The **'F'** on the end of the status bit is replaced with a **'7':**
(See *NMEA 0183R Message Format* on page 32).

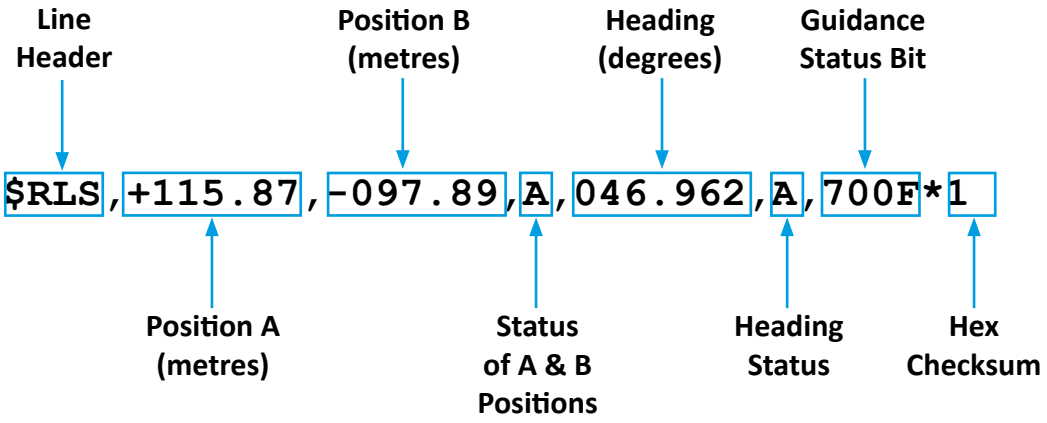
| Mode | Example DP Feed String |
|---|---|
| Fixed | `$RLS,+115.92,-097.87,A,046.980,A,700F*1E` |
| Mobile | `$RLS,+115.92,-097.87,A,046.980,A,7007*1E` |

**The selection of fixed or mobile multi-target groups should be made at the DP workstation/console to be effective. However, the CyScan Console should also be set up for mobile multi-target navigation in order for the system to operate correctly.**

# Introduction to Single and Multi-Target Navigation (Continued)

## NMEA 0183R Message Format

The examples in this document assume that CyScan has been set up to use the NMEA 0183R message format to send positional data to the DP system:




CyScan can use two variants of NMEA 0183; NMEA 0183R and NMEA 0183P:

**NMEA 0183R (Raw)** is the default message format. This mode requires at least 2 targets. With 3 or more targets, CyScan can continue to calculate a position fix if any one target is lost.

**NMEA 0183P (Primary)** bases all position fixes on one 'Primary' target. Additional targets can be used but are not essential. However, the CyScan system cannot continue to calculate a position fix if the primary target is lost.

You can change CyScan's DP message format on the Configuration tab. (See the CyScan Operator's Guide for more details).

For more detail on this message format refer to document **94-0090-4 DP Message Types Technical Specification**.

# Positional Display Modes

The relative positions of the CyScan vessel and single or multiple targets can be expressed either as Range and Bearing values, or as 'x' and 'y' positions on a rectangular coordinate frame.

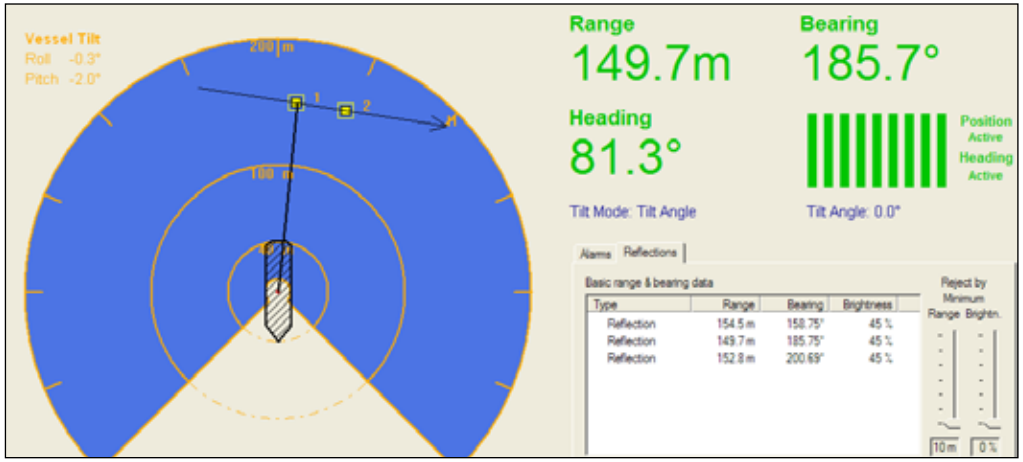
Coordinate axes are only displayed if the DP feed format is set to either NMEA0183P or NMEA0183R.

CyScan can also display Range and Bearing data when using these formats, if required. (See ***Displaying Range and Bearing Only*** on page 35).

| DP Mode | Navigation Type | Coordinate Axes |
|---|---|---|
| NMEA0183P (Primary) | Single-target | Bow and Starboard Axes |
| | Multi-Target | |
| NMEA0183R (Raw) | Single-target | Bow and Starboard Axes |
| | Multi-Target | A and B Axes |
| All other DP modes display Range and Bearing data only. | | |

## Range & Bearing

Range and Bearing mode displays the distance and the bearing of the primary (or only) target from the sensor vessel.



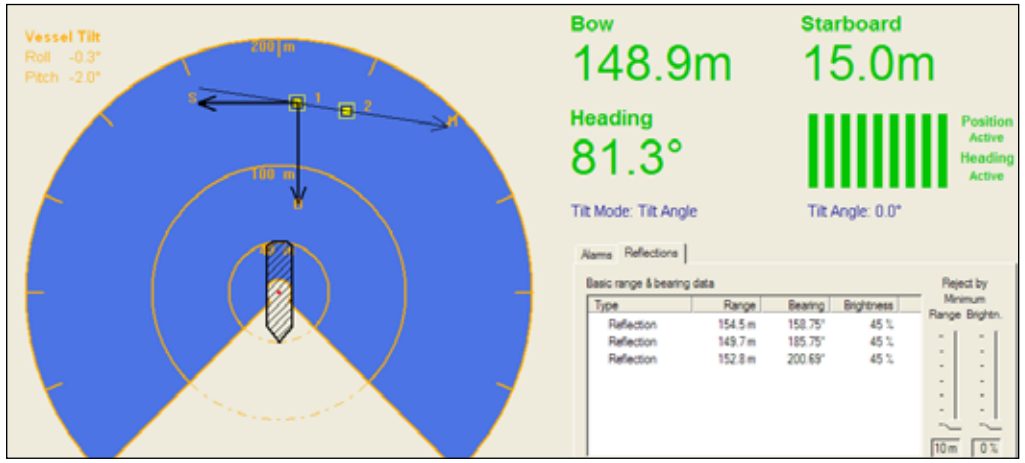
# Positional Display Modes (Continued)

## Bow and Starboard Axes

This mode is available for single-target navigation, and for multi-target navigation where the DP feed messages are sent in **NMEA0183P** (primary) format.

In this mode, the position of the sensor vessel is expressed in metres from the target along Bow (B) and Starboard (S) axes which have their origin at the primary (or only) target. The B and S coordinate axes are always parallel with the vessel's own axes.

The vessel's relative heading (H) is indicated by a third line passing through the primary target. By default, the heading line is drawn between targets 1 and 2 but can be realigned if required.



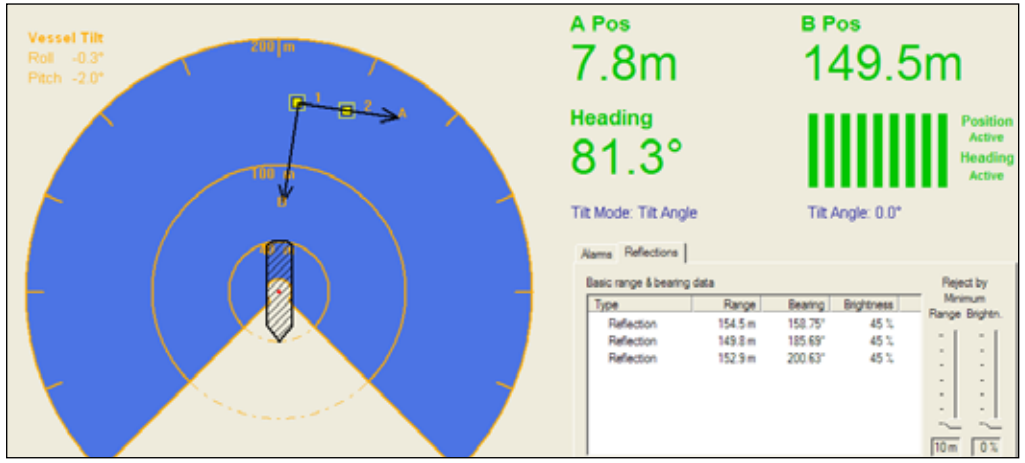

**Bow and Starboard Axes**

## A and B Axes (A Pos and B Pos)

This mode is only available for multi-target navigation where the DP feed messages are sent in **NMEA0183R** (raw) format.

In this mode, the position of the sensor vessel is expressed in metres from the target along A and B axes which have their origin at the primary target.

The axes are initially aligned with the multi-target group, with the A axis passing through the secondary target. The vessel's relative heading is measured clockwise from the A axis. If required, the axes can be manually realigned to correspond with the DP system or another sensor's coordinate axes.




**A and B Axes**

# Positional Display Modes (Continued)

## Displaying Range and Bearing Only

The default display mode for range and bearing is set in the **Configuration Tab** (see right) but this setting can be overridden from the **Sensor Display Options** menu.

**Selecting either option has no effect on the message strings sent to the DP system.**

### To Display Range and Bearing:

1. Click on the **Sensor Display Options** button.

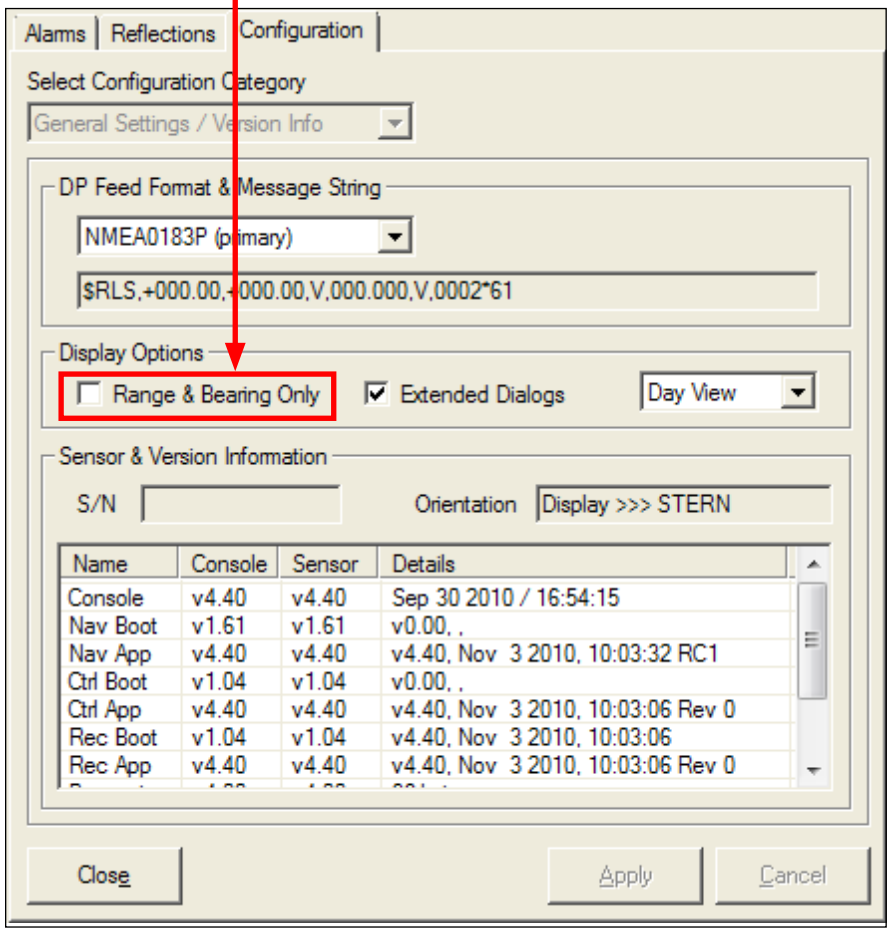

**Override setting (Sensor Display Options Menu)**

The **Sensor Display Options Menu** is opened.

2. Click on **Display Options > Range & Bearing Only**.

   If the **Range & Bearing** option is ticked, only range and bearing will be displayed. If the option is un-ticked, either Bow and Starboard or A and B axes information will be displayed, depending on the current DP feed mode.

**Default display setting (Configuration Tab)**



# Selecting Targets for Multi-Target Groups

## Selecting Reflections

When you select a reflection as a target, make sure that it corresponds to the actual target that you wish to navigate against. You can select up to 5 reflections to form a multi-target group.

The first reflection that you select (target 1) becomes the primary target, which forms the origin of the A and B coordinate axes.

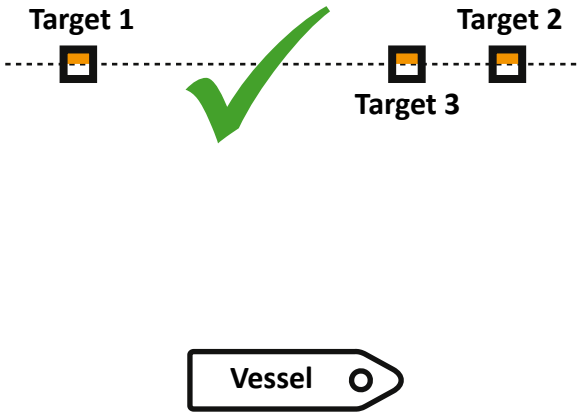
The second reflection that you select (target 2) sets the default orientation of the A and B coordinate axes. If there are more than 2 reflections, select the reflection furthest away from target 1. (See ***Target Selection Order*** on page 37).

A further 3 reflections (targets 3, 4 and 5) can be added to give redundancy to the group if targets 1 or 2 are temporarily lost or obscured.

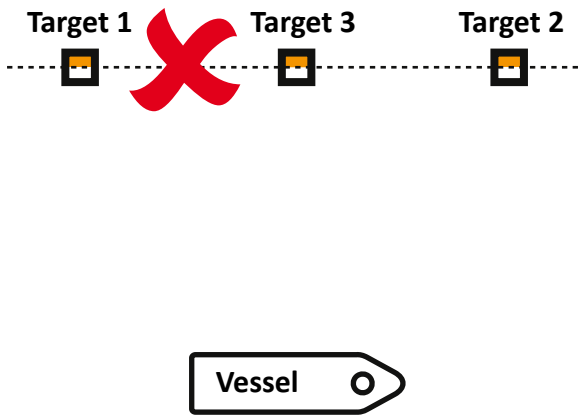
If more targets are mounted on the rig, then the superfluous ones should be physically removed and not just omitted from the multi-target group.

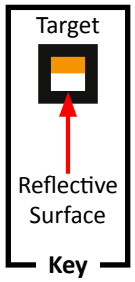
**CyScan navigates more accurately when multiple targets are spaced asymmetrically (see right). If the targets are not spaced asymmetrically, it is better to operate with fewer (i.e. 2) targets.**

**Correct Asymmetrical Target Spacing**



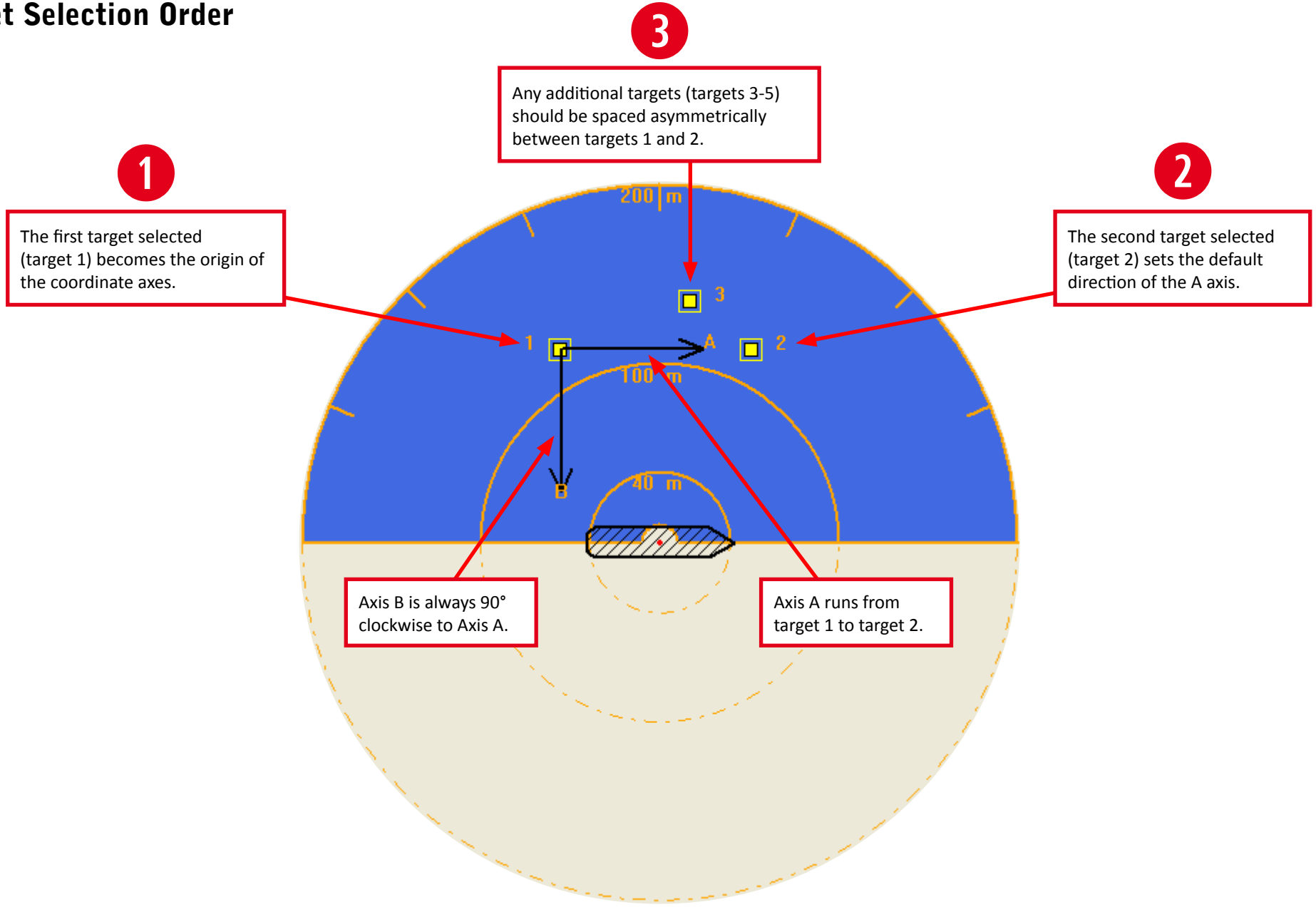

**Incorrect Symmetrical Target Spacing**



# Selecting Targets for Multi-Target Groups (Continued)

## Target Selection Order

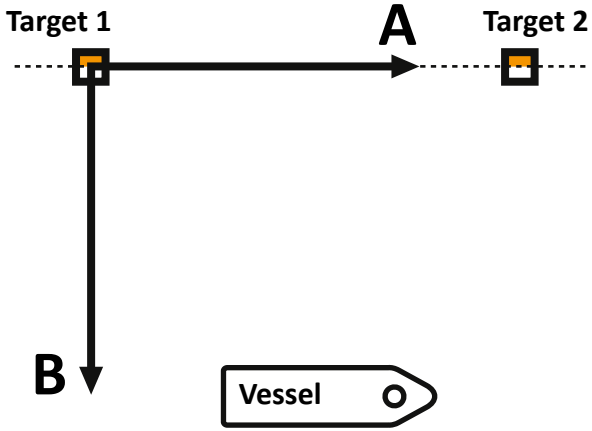


# Selecting Targets for Multi-Target Groups (Continued)

## Target Selection Order and Coordinate Axes Direction

The A and B coordinate axes point in different directions according to the order in which targets 1 and 2 are selected.

By default, axis A runs from target 1 to target 2, and axis B is always drawn 90° clockwise from axis A.



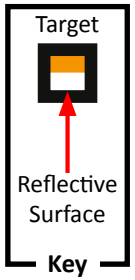

### Target 1 on Left

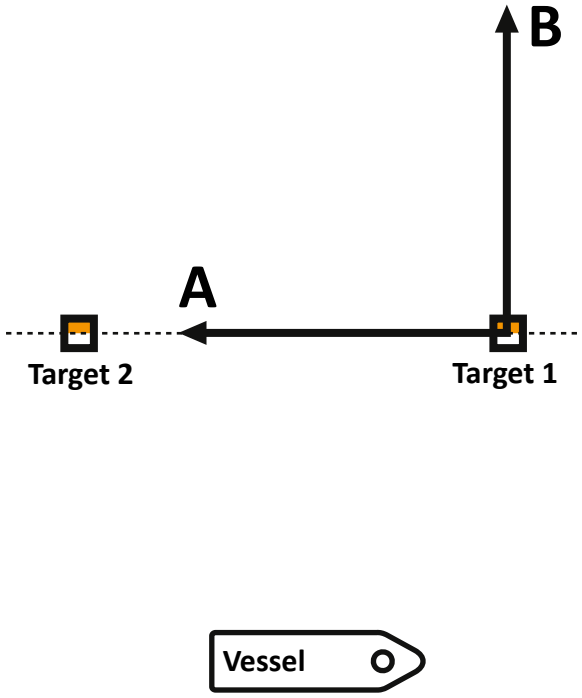
- Axis A runs from left to right.
- Axis B points towards the CyScan vessel.

The left-most reflection is selected as target 1 and the right-most reflection as target 2.

Axis A runs from left to right on the display.

Axis B is drawn 90° clockwise from axis A, and points towards the CyScan vessel on the display.




### Target 1 on Right

- Axis A runs from right to left.
- Axis B points away from the CyScan vessel.

The right-most reflection is selected as target 1 and the left-most reflection as target 2.

Axis A runs from right to left on the display.

Axis B is drawn 90° clockwise from axis A, and points away from the CyScan vessel on the display.

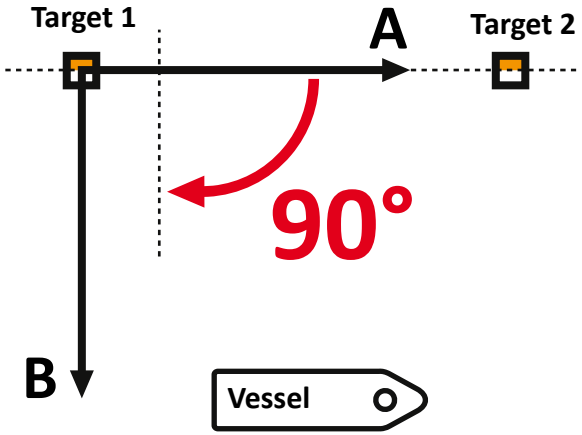
# Axis Orientation and Vessel Heading

## Target Orientation in Respect to Axis A

The orientation of the reflective surface of the targets is measured clockwise from the origin of the A axis to the perpendicular of a line passing through targets 1 and 2.

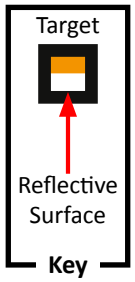
The default orientation value depends on the relative positions of the targets:

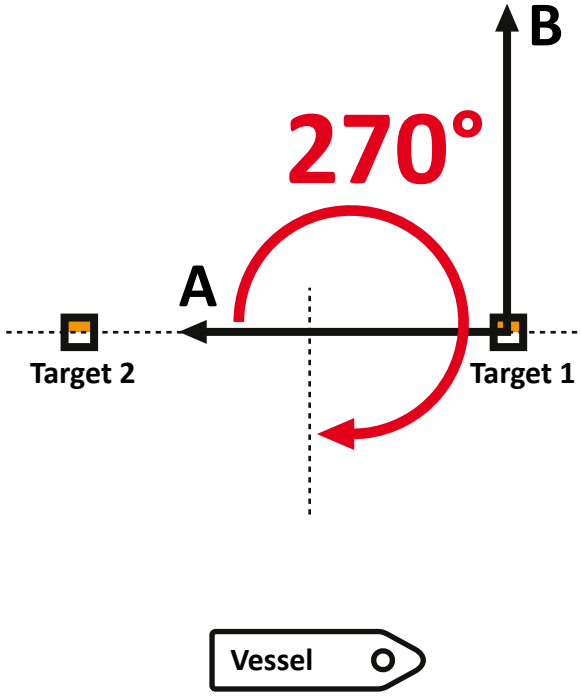
- If **target 1** is on the **left** when viewed from the CyScan vessel, the default target orientation value is **90°**.
- If **target 1** is on the **right** when viewed from the CyScan vessel, the default target orientation value is **270°**.




### Target 1 on Left

Default target orientation in respect to axis A = 90°.




### Target 1 on Right

Default target orientation in respect to axis A =270°.

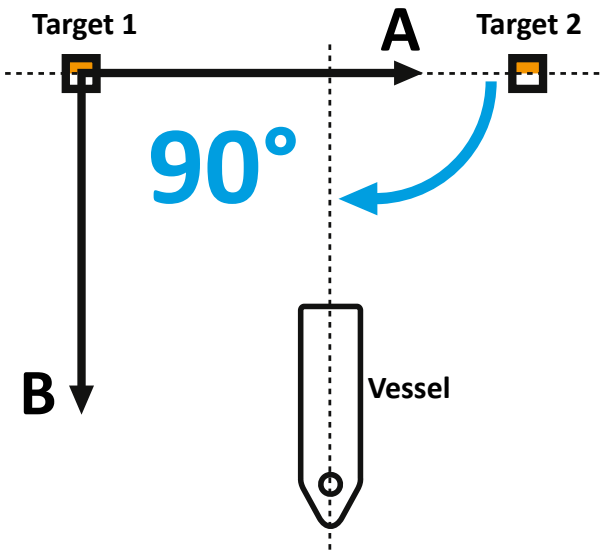
# Axis Orientation and Vessel Heading (Continued)

## Vessel Heading

Vessel Heading is measured clockwise from the origin of the A axis to the CyScan vessel's centre-line. The vessel's relative heading value depends on the orientation of the coordinate axes. Changing the orientation of the A axis also changes the vessel's relative heading.

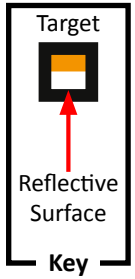
In the examples below, the vessel's heading relative to the targets remains constant. However, the system measures different heading values according to the different orientation of the A and B coordinate axes.

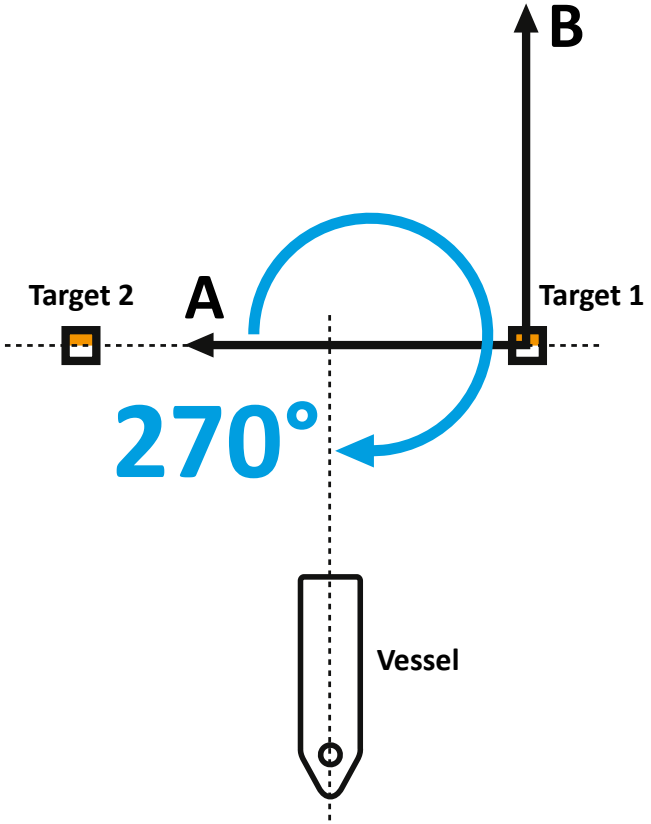
(The reported 'A Pos' and 'B Pos' values will also change, as the coordinate axes from which they are measured have moved.)




**Target 1 on Left**

Vessel heading 90°.




**Target 1 on Right**

Vessel heading 270°.

# Rotational Offsets

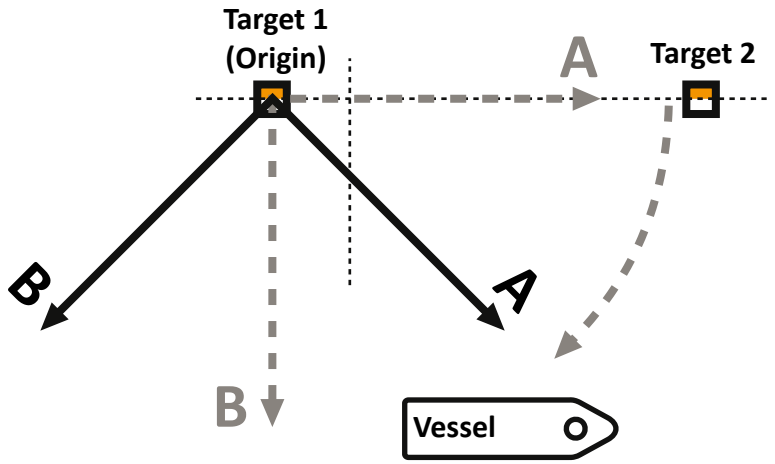
Some DP systems and applications may require the A and B coordinate axes to be rotated to match a different heading. For example, to line-up with the DP System's own co-ordinate axes, the axes of another sensor, the vessel's gyrocompass, or any other heading value.

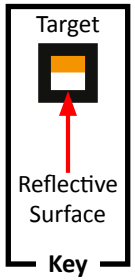
When the axis orientation is adjusted manually, both the A and B axes are rotated about their origin in the centre of target 1.

Vessel heading is measured in a clockwise direction from the A axis, so changing the orientation of the coordinate axes also changes the vessel's relative heading value.

The orientation of the A and B coordinate axes can be adjusted in two ways:

- By aligning the multi-target group to a given vessel heading. (Temporary and preset multi-target groups).
  (See ***Aligning a Multi-Target Group to a Given Vessel Heading*** on page 45).
- By applying a rotational offset to a multi-target group. (Preset multi-target groups only).
  (See ***Rotating the A and B Coordinate Axes*** on page 46).



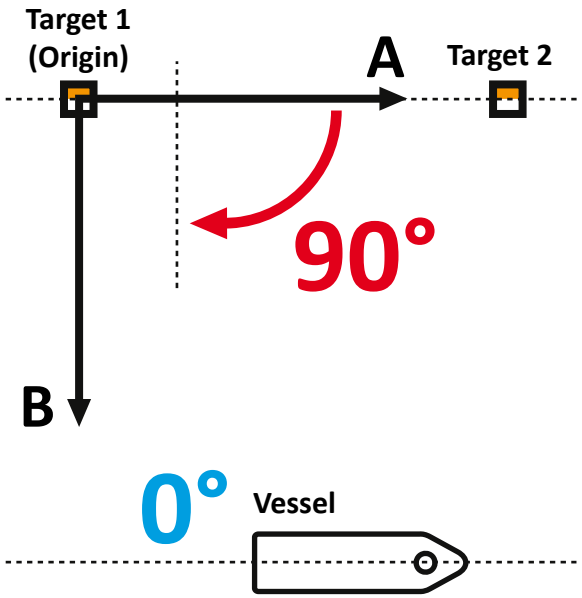
# Rotational Offsets (Continued)

## Axis Orientation and Vessel Heading Examples

In the following examples, the CyScan vessel's relative heading to the multi-target group remains constant, and the coordinate axes are rotated clockwise about their origin (target 1). (See ***Rotating the A and B Coordinate Axes*** on page 46).

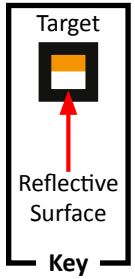
The orientation of the targets with respect to the A axis is measured clockwise from the origin of the A axis to the perpendicular of a line passing through targets 1 and 2.

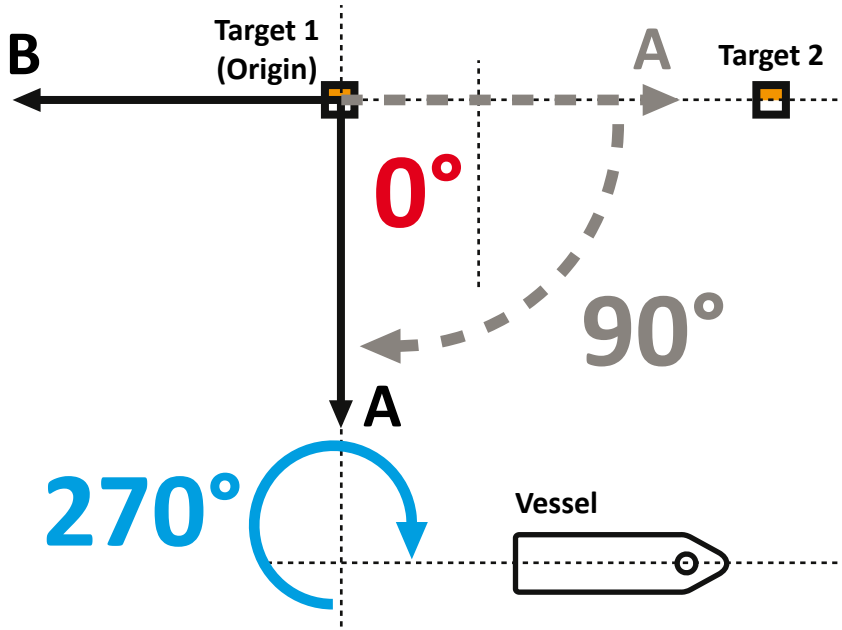
Vessel Heading is measured clockwise from the A axis to the vessel's centre-line.




**Default position (Target 1 on Left)**

- Rotational Offset = 0°
- Target Orientation with respect to axis A = **90°**
- Vessel Heading = **0°** (parallel with A axis).



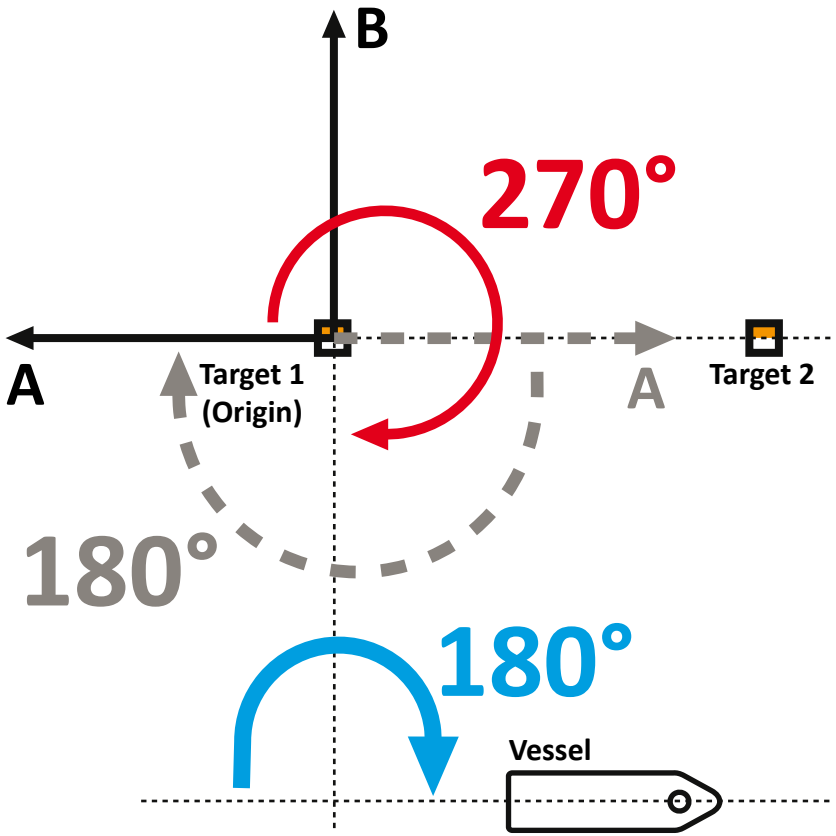




**Coordinate axes rotated 90° clockwise from default position.**

- Rotational Offset = 90°
- Target Orientation with respect to axis A = **0°**
- Vessel Heading = **270°**

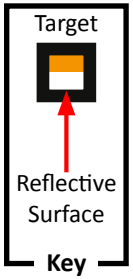
# Rotational Offsets (Continued)

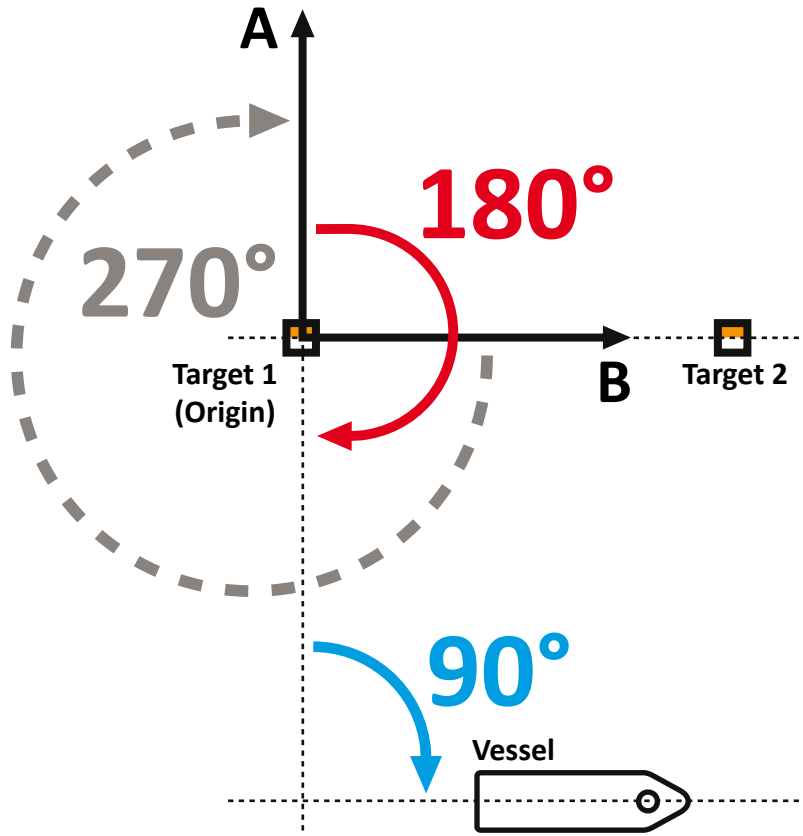
## Axis Orientation and Vessel Heading Examples (Continued)




**Coordinate axes rotated 180° clockwise from default position.**

- Rotational Offset = 180°
- Target Orientation with respect to axis A = **270°**
- Vessel Heading = **180°** (parallel to A axis)



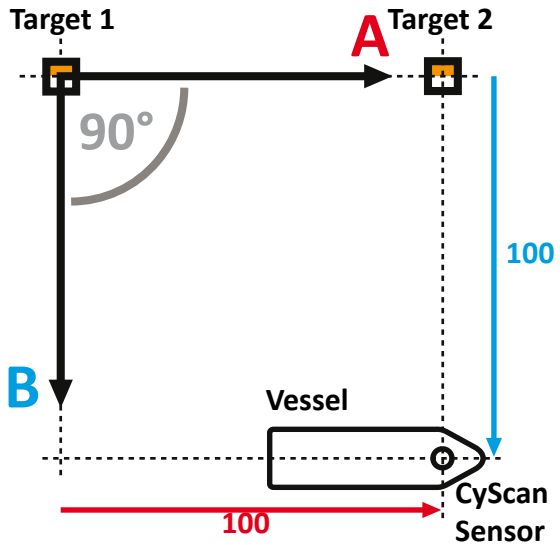

**Coordinate axes rotated 270° clockwise from default position.**

- Rotational Offset = 270°
- Target Orientation with respect to axis A = **180°**
- Vessel Heading = **90°**

# Rotational Offsets (Continued)

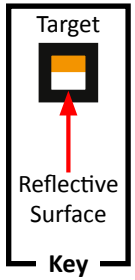
## Axis Orientation and A Pos and B Pos Coordinates

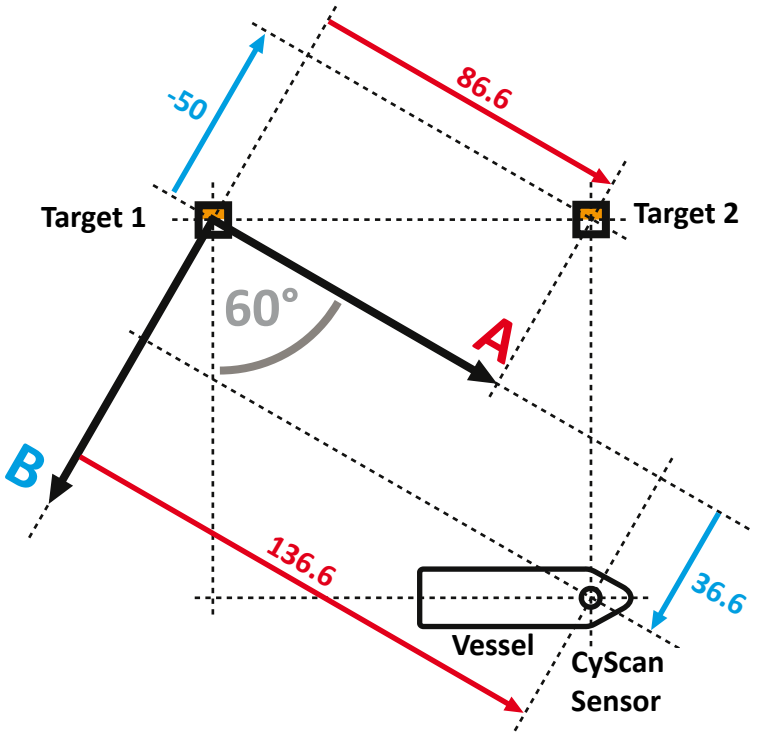
Changes to the orientation of the A and B axes affect the A Pos and B Pos coordinates of the targets and the CyScan Sensor. In the following examples, the vessel's relative position to the multi-target group remains constant, but the reported 'A Pos' and 'B Pos' values change as the coordinate axes are rotated:




| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 0 | 0 |
| Target 2 | 100 | 0 |
| CyScan Sensor | 100 | 100 |

**Target Orientation with respect to Axis A = 90° (default 0° offset)**




| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 0 | 0 |
| Target 2 | 86.6 | -50 |
| CyScan Sensor | 136.6 | 36.6 |

**Target Orientation with respect to Axis A = 60° (manual 30° offset)**

# Rotational Offsets (Continued)

## Aligning a Multi-Target Group to a Given Vessel Heading

When you manually align a multi-target group to a given heading, the A and B axes orientation and position coordinates are recalculated so that they correspond with the new vessel heading value.

This procedure can be carried out on both temporary and preset multi-target groups.

Aligning a multi-target group to a given heading overrides any rotational offsets that may have been applied to a preset group.

The heading and position coordinate data sent to the DP system will change instantly when you confirm the new alignment.

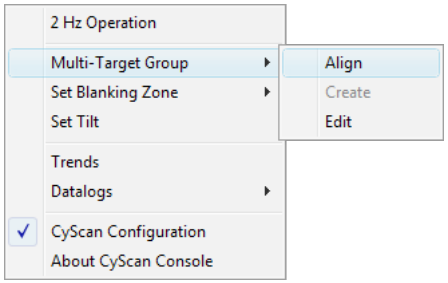
**You must deselect the CyScan sensor at the DP Console BEFORE commencing this operation.**

### To Align a Multi-Target Group to a Given Heading:

Whilst navigating against a multi-target group:

1. Click on the **Sensor Operations** button.

   The **Sensor Configuration** menu is opened:

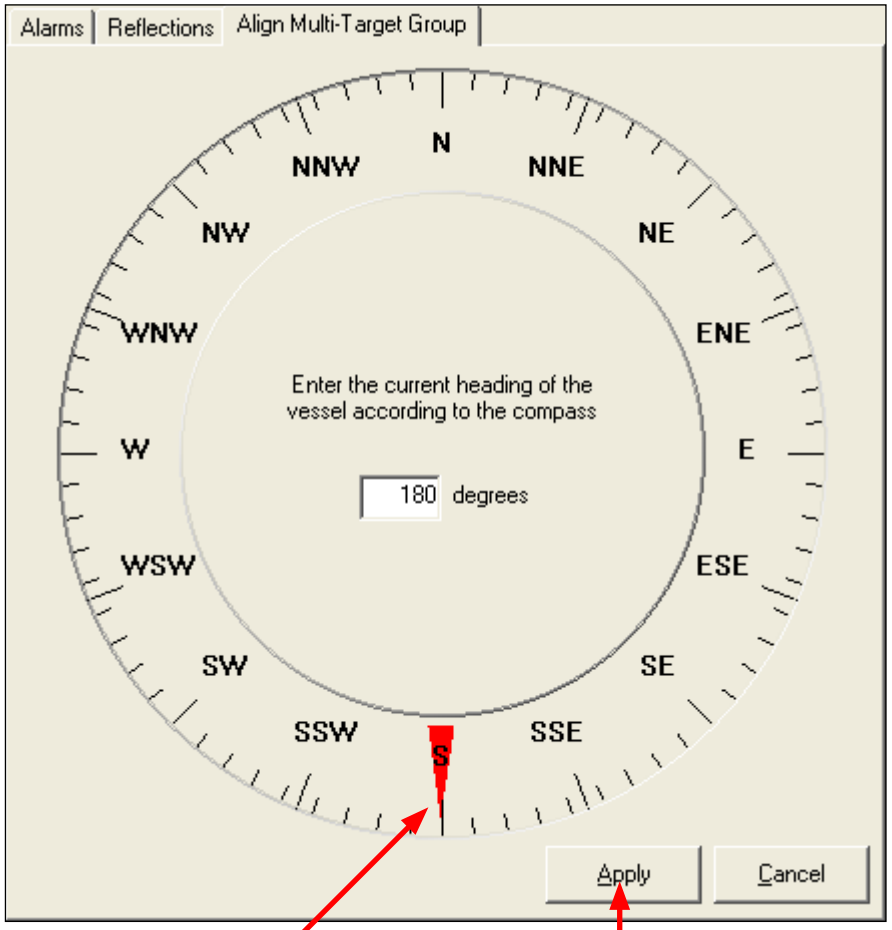



2. Click on **Multi-Target Group > Align.**

   The **Align Multi-Target Group** tab is opened (see right).

3. Either click and drag the red compass needle to the required heading, or enter the required heading value in the centre of the compass.

4. Click on the **Apply** button.




Drag the **compass needle** to the required heading.

Click on the **Apply** button.

# Rotational Offsets (Continued)

## Rotating the A and B Coordinate Axes

When you rotate the A and B axes, the vessel's relative heading and position coordinates are recalculated.

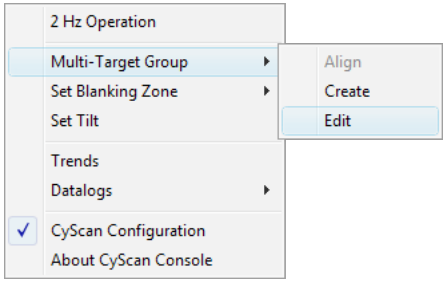
This procedure can only be carried out on preset multi-target groups.

### To Manually Rotate the A and B Axes:

1. Stop Navigating.

2. Click on the **Sensor Operations** button.

   The **Sensor Configuration** menu is opened:



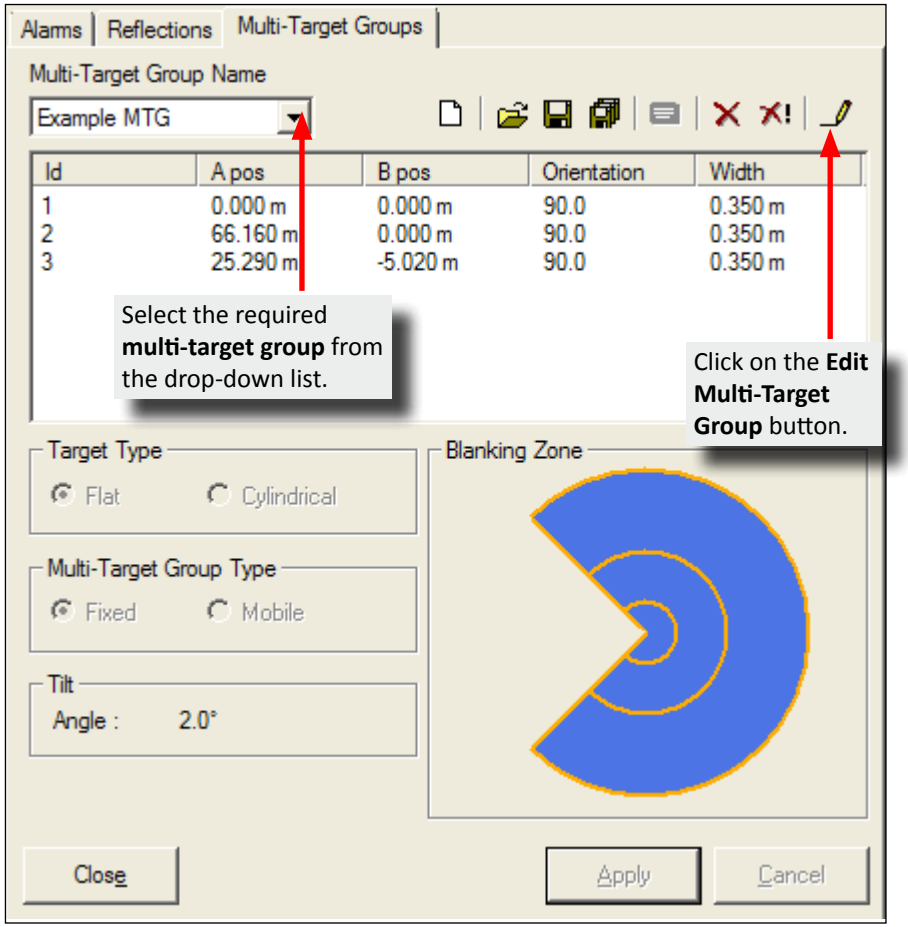

3. Click on **Multi-Target Group > Edit.**

   The **Multi-Target Groups** tab is opened (see right).

4. Click on the drop-down arrow and select the multi-target group that you want to edit.

5. Click on the **Edit Multi-Target Group** button.

   The **Multi-Target Groups** tab switches to edit mode (see next page).



# Rotational Offsets (Continued)

## Rotating the A and B Coordinate Axes (Continued)

Having clicked on the **Edit Multi-Target Group** button, (see previous page) the Multi-Target Groups tab switches to edit mode (see right).

1. Enter a rotational offset in degrees. (Enter a positive value to rotate the axes clockwise, enter a negative value to rotate the axes anti-clockwise).

2. Click on the **Rotate Multi-Target Group** button.

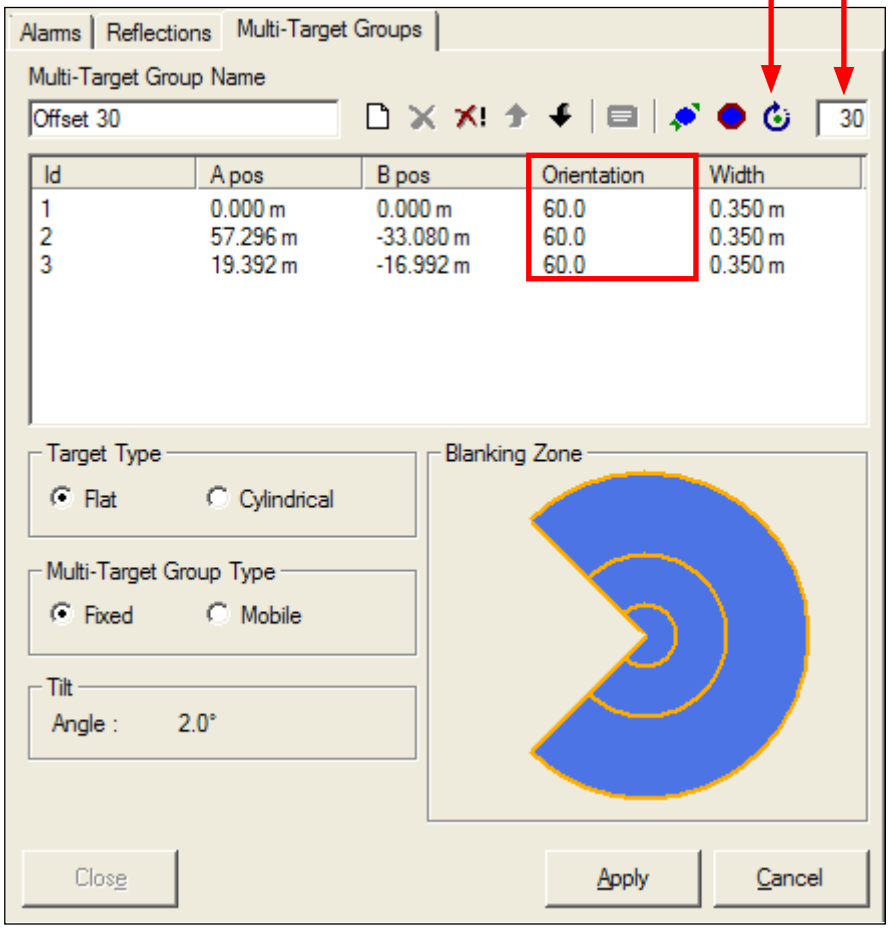
   The **Orientation** column for all of the targets in the group is updated.

   The entered offset value will be applied incrementally every time that you click on the **Rotate Multi-Target Group** button. For example, if you enter 90° and click on the button twice, a 180° offset will be applied.

   The offset value is not the same as the orientation value. For example, applying a clockwise offset of 30° to the default 90° orientation gives a new orientation of 60°. (See *Axis Orientation and Vessel Heading Examples* on page 42).

Enter the **offset amount** in degrees.

Click on the **Rotate Multi-Target Group** button.



# A Pos and B Pos Offsets

## Default A and B Axes Position

In NMEA 0183R DP-Feed mode, CyScan uses a coordinate grid to calculate the vessel's position relative to the multi-target group (A Pos and B Pos).

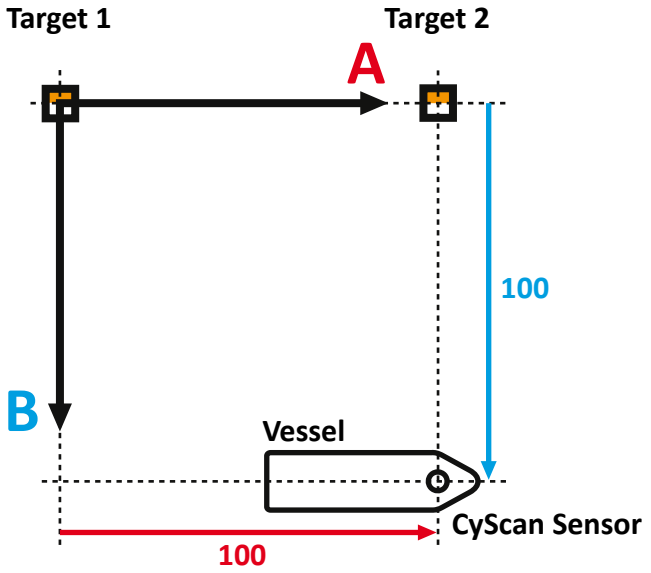
By default, CyScan uses Target 1 as the origin of the A and B axes and Target 2 lies on the A axis (see right).

Some DP systems and applications may require the origin of the A and B axes to be moved to a different position.

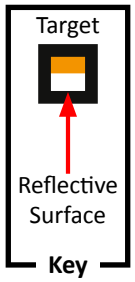
The coordinate axes can be moved towards the vessel by adding a negative offset to the targets' B Pos coordinates, or away from the vessel by adding a positive offset to the targets' B Pos coordinates. (See ***B-Axis Offset Examples*** on page 49).

The coordinate axes can be moved towards Target 2 by adding a negative offset to the targets' A Pos coordinates, or away from Target 2 by adding a positive offset to the targets' A Pos coordinates. (See ***A-Axis Offset Examples*** on page 50).

**Any manual offset must be applied to ALL TARGETS within the group.**




| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 0 | 0 |
| Target 2 | 100 | 0 |
| CyScan Sensor | 100 | 100 |

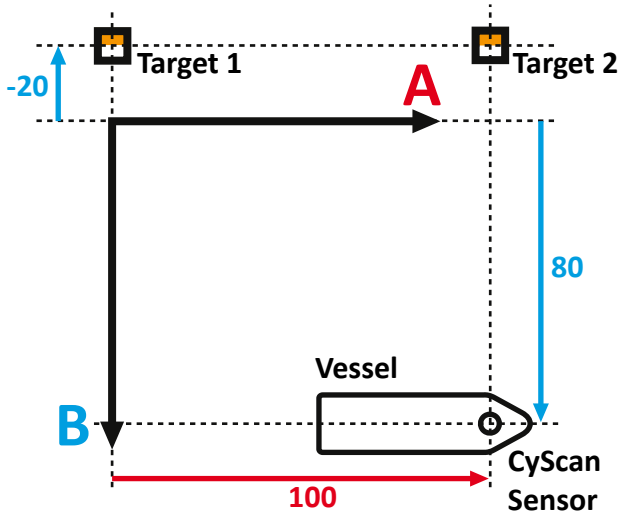


# A Pos and B Pos Offsets (Continued)

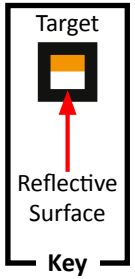
## B-Axis Offset Examples

### Negative Offset

Adding a negative offset to the targets' B coordinates moves the A axis forwards—in front of the targets and towards the vessel.

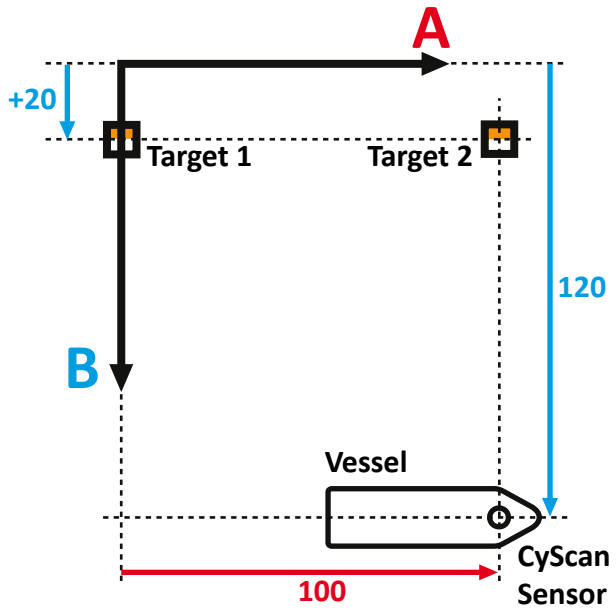



| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 0 | -20 |
| Target 2 | 100 | -20 |
| CyScan Sensor | 100 | 80 |




### Positive Offset

Adding a positive offset to the targets' B coordinates moves the A axis backwards—behind the targets and away from the vessel.




| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 0 | 20 |
| Target 2 | 100 | 20 |
| CyScan Sensor | 100 | 120 |

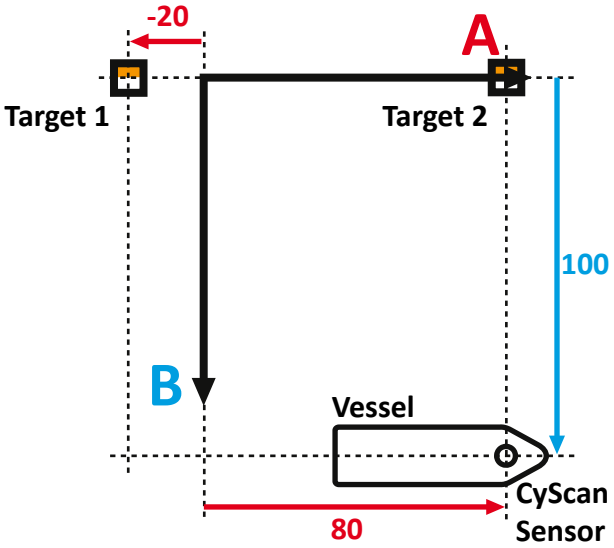
# A Pos and B Pos Offsets (Continued)

## A-Axis Offset Examples

### Negative Offset

Adding a negative offset to the targets' A coordinates moves the B axis towards Target 2.

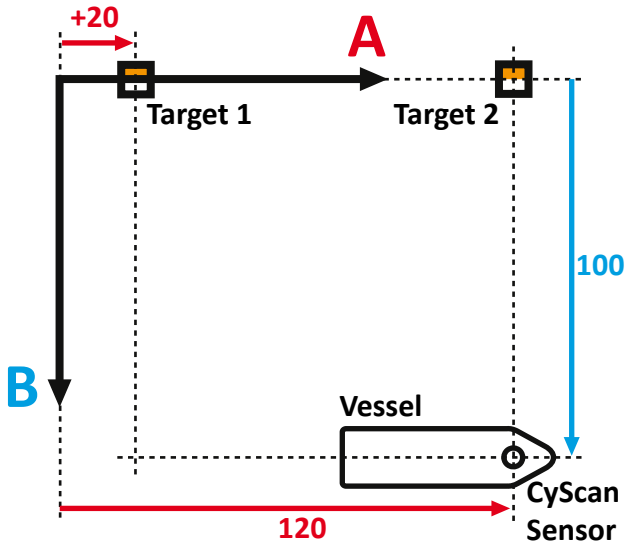
| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | -20 | 0 |
| Target 2 | 80 | 0 |
| CyScan Sensor | 80 | 100 |

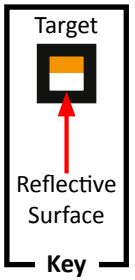



### Positive Offset

Adding a positive offset to the targets' A coordinates moves the B axis away from Target 2.

| Target/Sensor | A Pos | B Pos |
|---|---|---|
| Target 1 | 20 | 0 |
| Target 2 | 120 | 0 |
| CyScan Sensor | 120 | 100 |



# A Pos and B Pos Offsets (Continued)

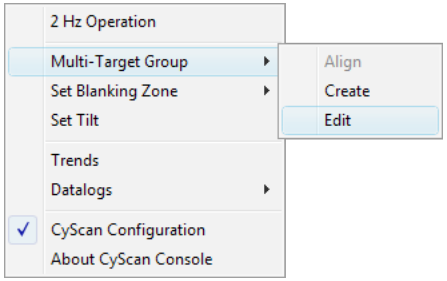
## Adding Positional Offsets to a Multi-Target Group

The position of the A and B axes' origin for preset multi-target groups can be manually adjusted.

### To Add a Positional Offset to a Multi-Target Group:

1. Stop Navigating.
2. Click on the **Sensor Operations** button.

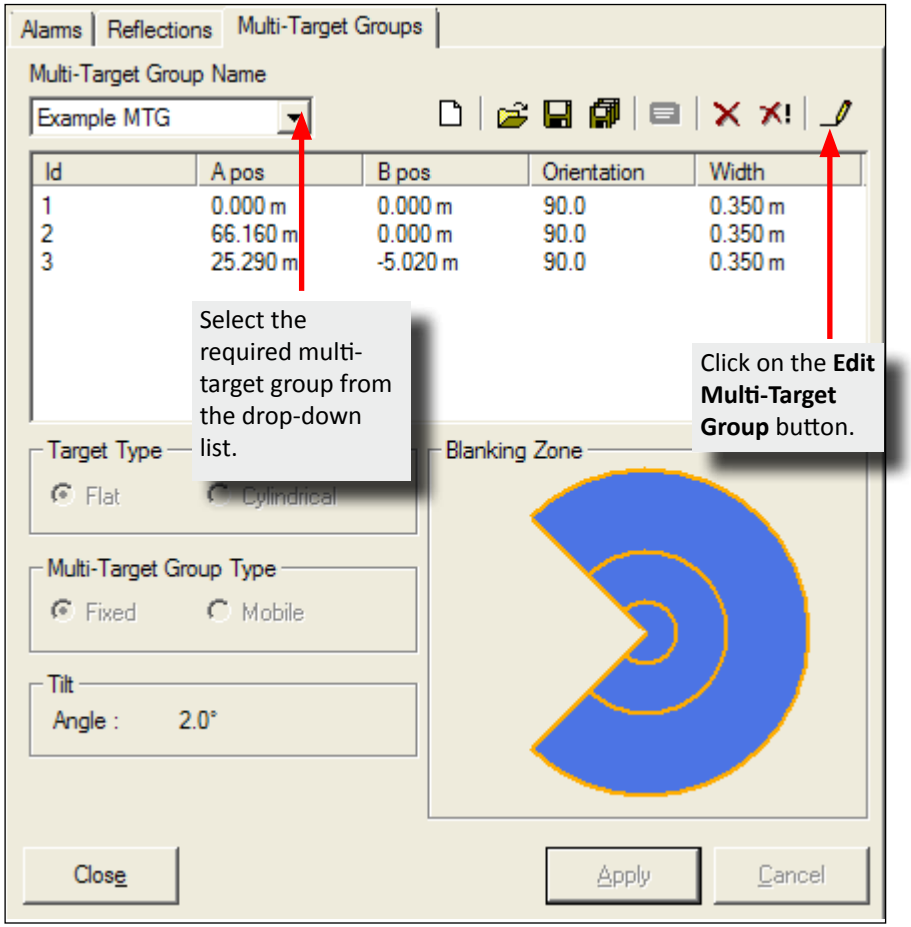
   The **Sensor Configuration** menu is opened:




3. Click on **Multi-Target Group > Edit.**

   The **Multi-Target Groups** tab is opened (see right).
4. Click on the drop-down arrow and select the multi-target group that you want to edit.
5. Click on the **Edit Multi-Target Group** button.

   The Multi-Target Groups tab switches to edit mode (see next page).

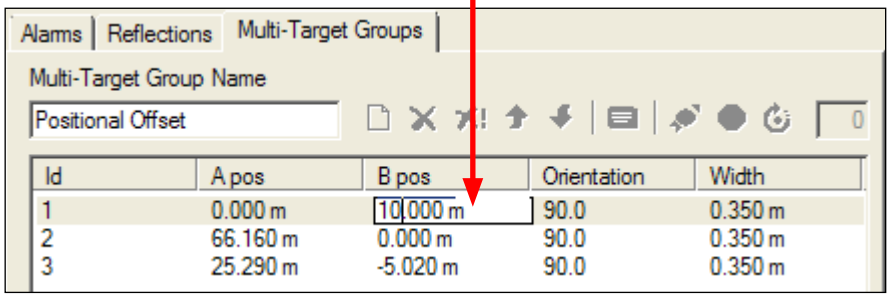


# A Pos and B Pos Offsets (Continued)

## Adding Positional Offsets to a Multi-Target Group (Continued)

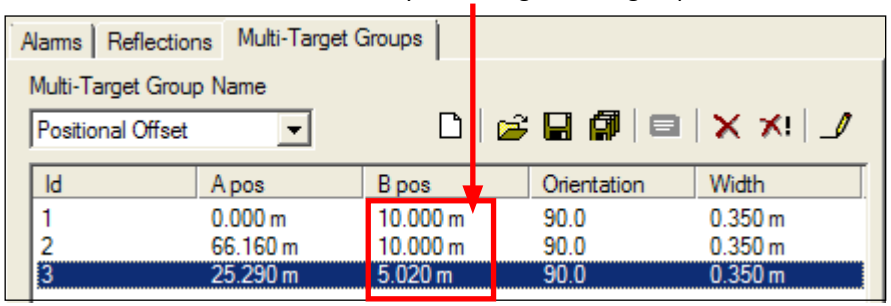
Having clicked on the **Edit Multi-Target Group** button, (see previous page) the Multi-Target Groups tab switches to edit mode (see right).

1. Double-click on the **A Pos** or **B Pos** coordinate for Target 1 and enter the new offset coordinate value.



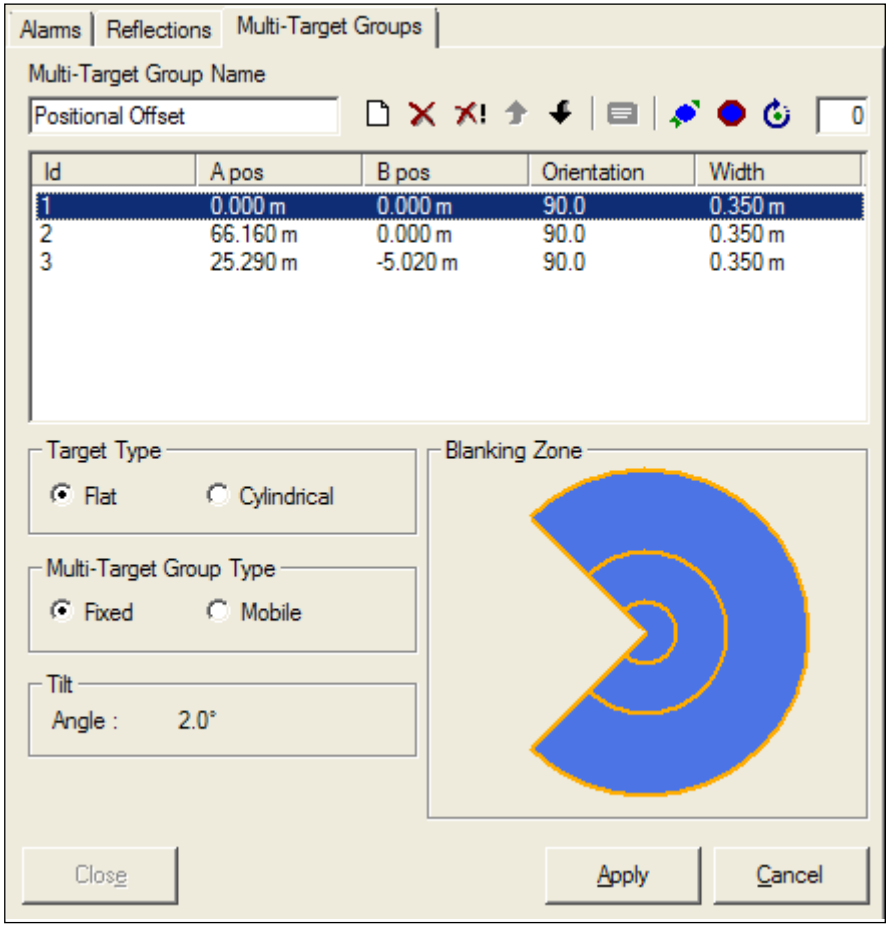

In this example, an offset of **+10m** has been added to the **B Pos** coordinate.

2. Add the same offset amount to every other target in the group.




3. Click on the **Apply** button.

**You must apply the same offset to ALL TARGETS in the group.**



# Using Single and Multi-Target Navigation

## Single-Target Navigation

### Starting Single-target Navigation

Single-target navigation can be started when the CyScan vessel is within range of the platform or vessel, and a target is visible on the console sensor display.

**The most common targets are flat or cylindrical.**

1. Click on the ▶ button.
2. Select either:

   **[Single Cylinder or Flat Target]**
   (if the vessel/platform targets are flat or cylindrical)

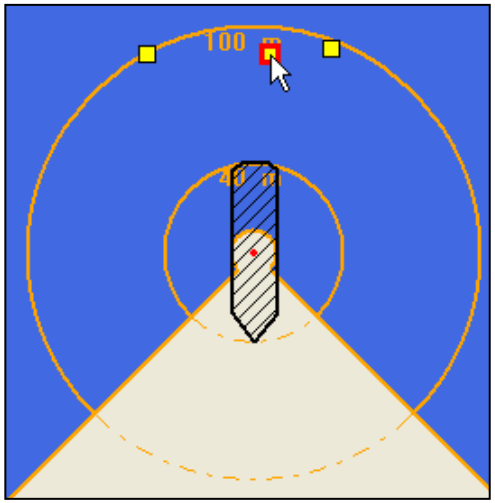
Or:

   **[Single Prism or Prism Cluster]**
   (if the vessel/platform targets are prism style).

3. Select a reflection to use as a target by clicking on one of the yellow squares shown on the sensor display.

   After a short delay, the navigation data will be determined and displayed.

   **Only 'Range and Bearing' or 'Bow and Starboard' values will be shown because single-targets cannot provide heading information.**



**Starting Single-Target Navigation**

### Ending Single-target Navigation

1. Click on the ■ button.
2. In the subsequent dialog, click **OK** to confirm your action.
   The readouts in the navigation section will become inactive and turn grey.

# Using Single and Multi-Target Navigation (Continued)

## Multi-Target Navigation

**It is recommended that you read all the material on Multi-Target Navigation (starting from page 29), and ensure you understand it all clearly, before you begin using Multi-Target Navigation.**

### Starting Temporary Multi-Target Group Navigation

A new temporary multi-target group can be created when the CyScan vessel is within range of the platform or vessel, and two or more targets are visible on the console sensor display.

1. Click on the ▶ button.
2. Select **[Temporary Multi-Target Group]**
3. Click on two or more of the yellow reflections shown on the sensor display. (Up to a maximum of five).

   Consider the following when selecting reflections to use as targets:

- The first reflection that you click on will form the origin point for the multi-target group. The positions of the other reflections will be calculated relative to this origin point.
- If more than two reflections are used, select either the far right or far left one as the origin.

  (See *Selecting Targets for Multi-Target Groups* on page 36).

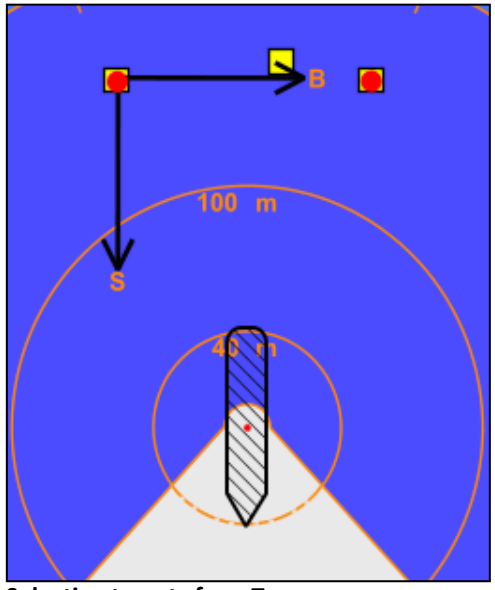
4. After a short delay, the system will start to use the selected reflections as targets and the system will start to send navigational data to the DP system.

### Starting Preset Multi-Target Group Navigation

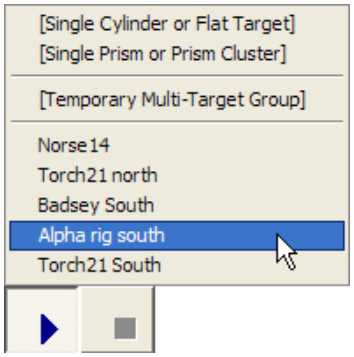
Navigation using a preset group can be started when the CyScan vessel is within range of the platform or vessel, and the group's reflections are visible on the console sensor display.

1. Click on the ▶ button.
2. Select the preset group that matches the object that you are approaching.
3. After a short delay, the system will start to use the preset reflections as targets and navigational data will start to be sent to the DP system.

**When a multi-target group is selected for navigation, the scanner tilt bearing and the blanking zone defined for that multi-target group are applied.**




**Selecting targets for a Temporary Multi-Target Group**




**Selecting a Preset Multi-Target Group**

### Ending Multi-Target Group Navigation

1. Click on the ■ button.
2. In the subsequent dialog, click on **OK** to confirm your action.
   The readouts in the navigation section will become inactive and turn grey.

**Once navigation stops, the baseline scanner tilt and blanking zone defined for single-target mode will be re-applied.**

# Using Single and Multi-Target Navigation (Continued)

## Creating Preset Multi-Target Groups

Preset multi-target groups can be used to store the targets, tilt details and blanking zones used at a particular location. They are created using two or more targets located on a platform or target vessel, that the CyScan vessel will regularly approach and/or station-keep.

A new multi-target group can be created when the CyScan vessel is within range of the platform or vessel, and two or more targets are visible on the console sensor display.

**Navigation accuracy is improved when using multiple, asymmetrically spaced targets. This helps CyScan to differentiate between targets with greater precision. (Please refer to *Technical Note 2, Targets—Installation and Position on page 75*).**

**If multiple targets are not spaced asymmetrically, it is better to operate with fewer (e.g. 2) targets. If more targets are mounted on the rig, then the superfluous ones should be physically removed and not just omitted from the multi-target group.**

**If there are other targets in the vicinity that cannot be removed (i.e. on a neighbouring rig) try to adjust the blanking zone to obscure them from view. *(See Blanking Zones on page 23).***

Consider the following when selecting targets:

- Use the zoom in or zoom out buttons to select an appropriate view where you can see all of the targets.
- The first target that you click on will form the origin point for the multi-target group. The positions of the other targets will be calculated relative to this origin point.
- If more than two targets are used, select either the far right or far left one as the origin.

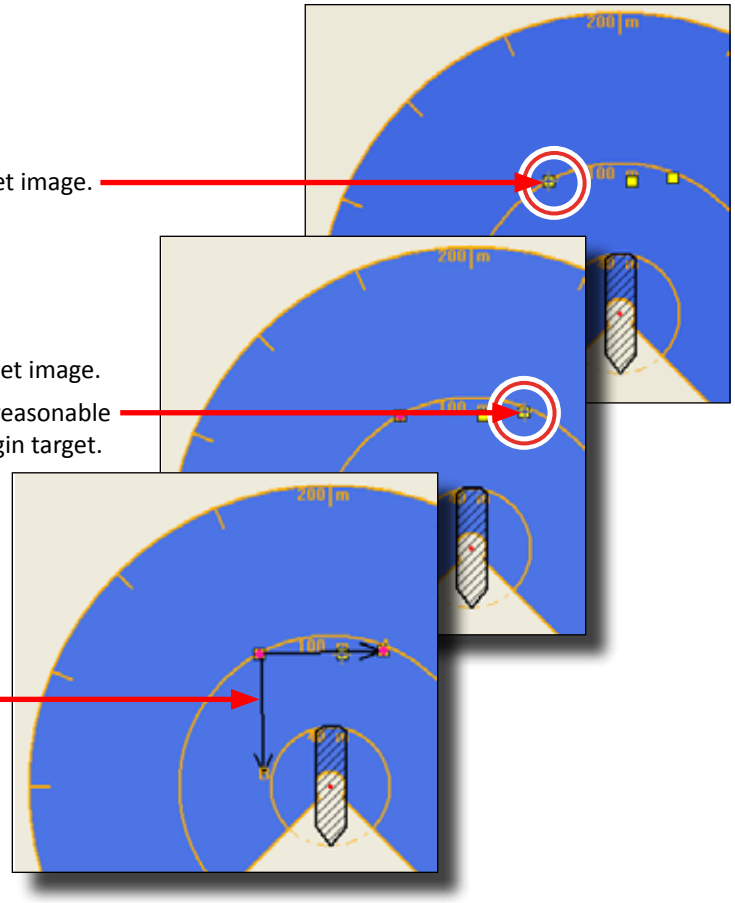
  (See ***Selecting Targets for Multi-Target Groups*** on page 36).

i. Click on a yellow target image.

ii. Click on a second target image.

Choose one that is a reasonable distance from the origin target.

iii. An A–B axis will be superimposed on the sensor display, relative to the chosen targets.



# Using Single and Multi-Target Navigation (Continued)

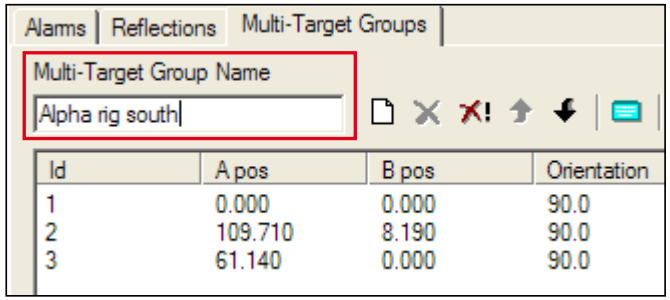
## To create a new preset multi-target group:

**New multi-target groups cannot be created while CyScan is navigating.**

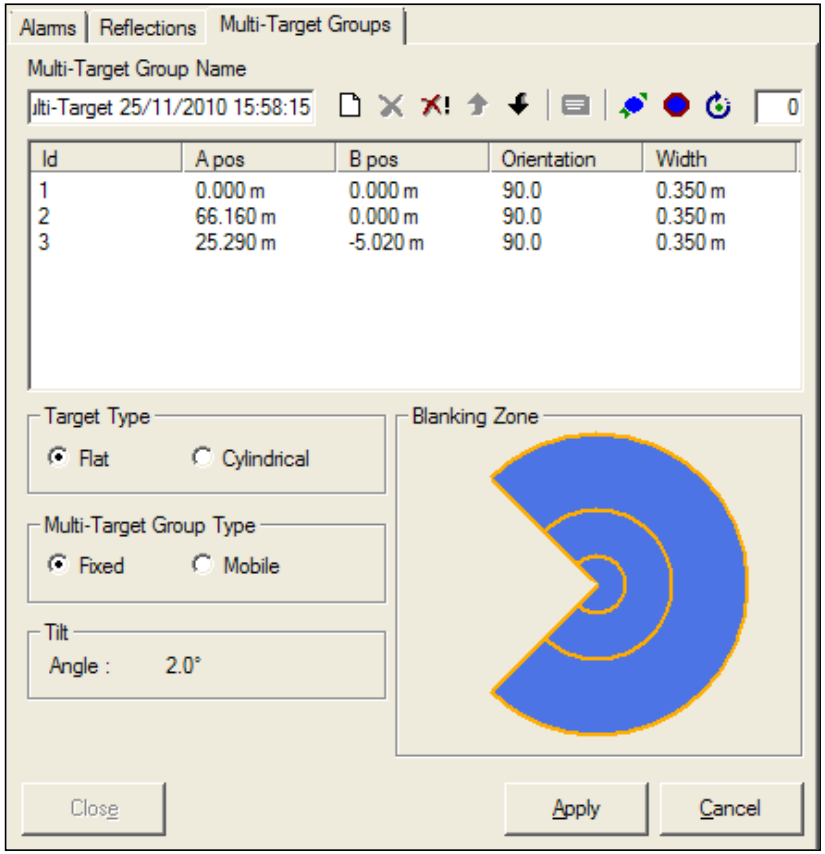
1. Click on the **Sensor Operations** button.
2. Click on **Multi-Target Group > Create.**
3. Within the sensor display, click on two yellow target images.
4. If required/available, up to three more targets can be selected in turn.
   (See ***Selecting Targets for Multi-Target Groups*** on page 36).
5. When all required targets have been selected, (up to a maximum of five) click on the **Apply Sensor Changes** 'tick' button.
6. The New group's details will be displayed on the Multi-Target Groups tab, with a placeholder name.
7. Click in the **Multi-Target Group Name** box and enter a meaningful name for the new group, e.g. the name of the current rig/location (see right).
8. Change the **Multi-Target Group Type** from Fixed to Mobile, if applicable.

   Use a fixed multi-target group for targets attached to a shore structure or a fixed platform. Use a mobile multi-target group for targets attached to a moving vessel.
9. Click on the **Apply** button to save the new multi-target group.

   The new group will now appear on the navigation menu, and can be selected as a ***Preset multi-target group***. (See page 54).
10. Align the new group with the vessel's compass, if required.
    (See ***Aligning a Multi-Target Group to a Given Vessel Heading*** on page 45).




**Enter a meaningful Multi-Target Group name.**



# Ethernet (Multi-Console) CyScan Systems

This section contains the following pages:


- *CyScan Ethernet Console - Slave Mode* (page 58)
- *CyScan Ethernet Console - Master Mode* (page 59)

# CyScan Ethernet Console - Slave Mode

The CyScan Ethernet console software can operate with 1 master console and multiple slave consoles running on the same system simultaneously.

If a system has been configured for Ethernet during installation the CyScan console will default to slave mode whenever it is launched. When the console is running in slave mode the controls available from the Sensor Display Options menu will be active but all the controls relating to the CyScan sensor will be disabled.

If there is a master console running on the system the reflections and data from the master will be displayed on the screens of any slave consoles.

## To switch a console from slave mode to master mode:

1. Double-click the Master/Slave switch button on the toolbar

   **OR**

   Click on the CyScan button in the lower left corner of the screen

   The **CyScan User Console** dialog box will be displayed.
2. Click on the down-arrow. Select the **Switch to Master Console** option.
3. Click on the **OK** button.

**If there is already a master console on the system this will automatically switch to slave mode when the current console is switched to master mode.**

## To switch a console from master mode to slave mode:

1. Click on the CyScan button in the lower left corner of the screen

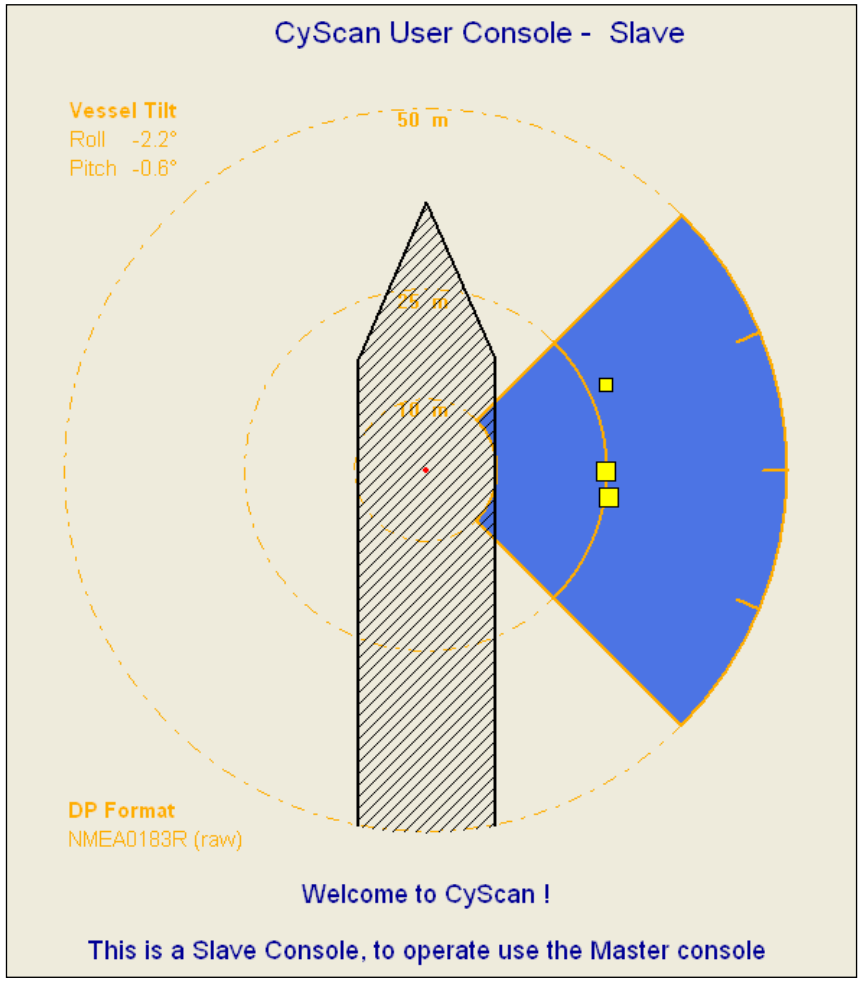
   The **CyScan User Console** dialog box will be displayed.
2. Click on the down-arrow. Select the **Switch to Slave Console** option.
3. Click on the **OK** button.

When a console is switched from master mode to slave mode it will still receive multicast feedback updates but these will be received at a reduced rate - every 3-4 seconds - rather than every 1 second. These updates are sent to all clients and include server information, including the server states.

**Datalogs are stored on whichever console is the master at the time the logs are taken. If the master console is changed the location of the datalogs from that point forward will also change.**

**Double-click the Master/Slave switch button to switch to Master mode.**

**Double-click the Master/Slave switch button to switch to Slave mode.**



# CyScan Ethernet Console - Master Mode

The CyScan Ethernet console software can operate with 1 master console and multiple slave consoles running on the same system simultaneously.

If a system has been configured for Ethernet during installation the CyScan console will default to slave mode whenever it is launched.

## To switch a console from slave mode to master mode:

1. Double-click the Master/Slave switch button on the toolbar.

   **OR**

   Click on the CyScan button in the lower left corner of the screen.

   The **CyScan User Console** dialog box will be displayed.

2. Click on the down-arrow. Select the **Switch to Master Console** option.
3. Click on the **OK** button.

**If there is already a master console on the system this will automatically switch to slave mode when the current console is switched to master mode.**

When a console is running in master mode it has full control of the CyScan system. Any changes made to the navigation or sensor-related settings at the master console will be visible on the screens of the slave consoles. Sensor Display Options are specific to each individual console, whether it be a master or slave console.

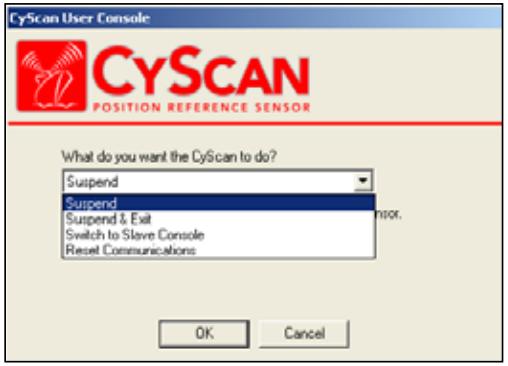
When the master console is used to suspend the CyScan sensor a message will appear on the screens of the slave consoles indicating that the sensor is suspended.

When the sensor is suspended, clicking the **RESUME** button on any slave console will automatically make that console the master console. Clicking **EXIT** will close the CyScan Console application on that individual console only.

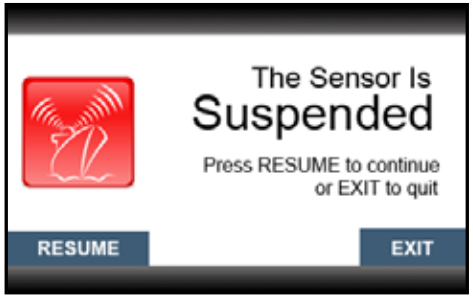
The Communications/Display Options dialog on the Configuration tab displays the Sensor Server Settings (for information only), as shown on the right. See page 65 for more details on Configuration Settings.

**Datalogs are stored on whichever console is the master at the time the logs are taken. If the master console is changed the location of the datalogs from that point forward will also change.**

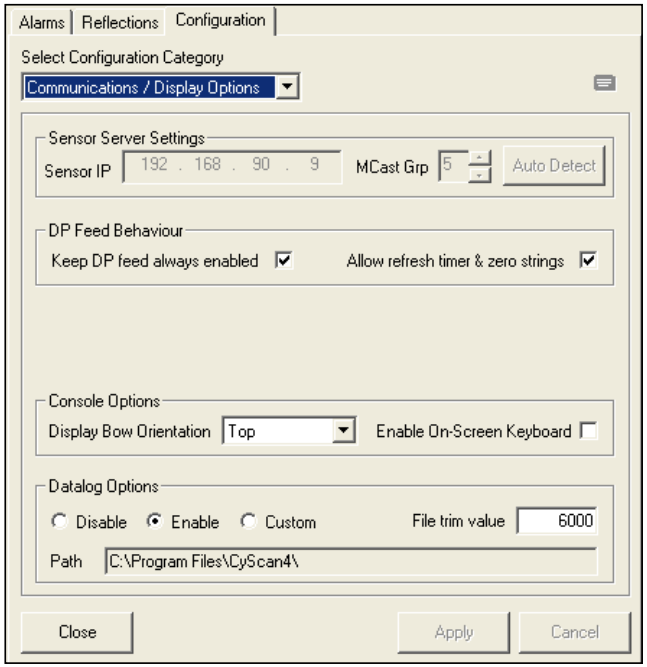
**Double-click the Master/Slave switch button**




**Select 'Switch to Master Console'**




**Click 'Resume'**




**Configuration Tab**

# Support Information

This section contains the following pages:

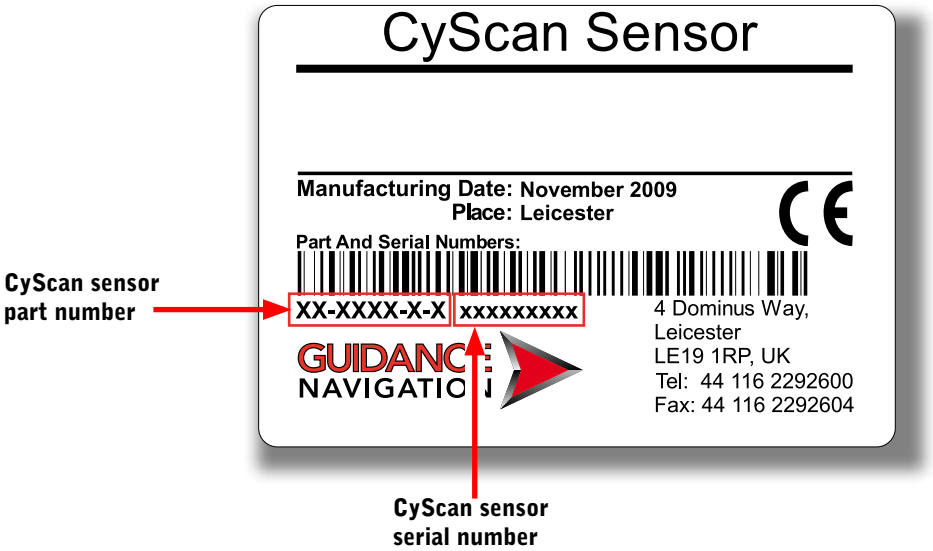

- *Serial Numbers and Software Versions* (page 61)
- *Configuration Settings* (page 62)
- *Entering Service Access Mode* (page 64)
- *Configuration Settings - Service Access Mode* (page 65)
- *Manual Power Control* (page 66)
- *System Logging Options* (page 67)

# Serial Numbers and Software Versions

These numbers identify the hardware configuration and product revision and will be requested by Guidance Navigation in the event of an application service or support call to the company.

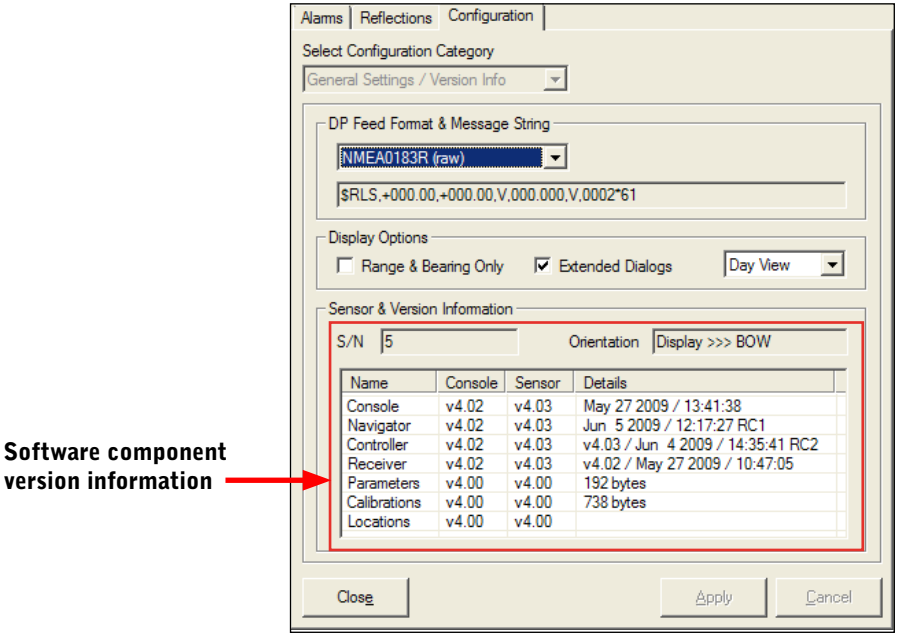
## Product Label

The Part Number and Serial Number can be found on the product label affixed to each unit.




## Software Version Information

The **Configuration tab** within the Property sheet provides version information about every software component within the Console application and the CyScan Sensor.



# Configuration Settings

The Configuration tab is used to display CyScan sensor data for troubleshooting purposes, and to set the default sensor display options.

**The default sensor display options can be overridden by clicking on the Sensor Display Options button. However, any overrides will only last for the current CyScan session.**

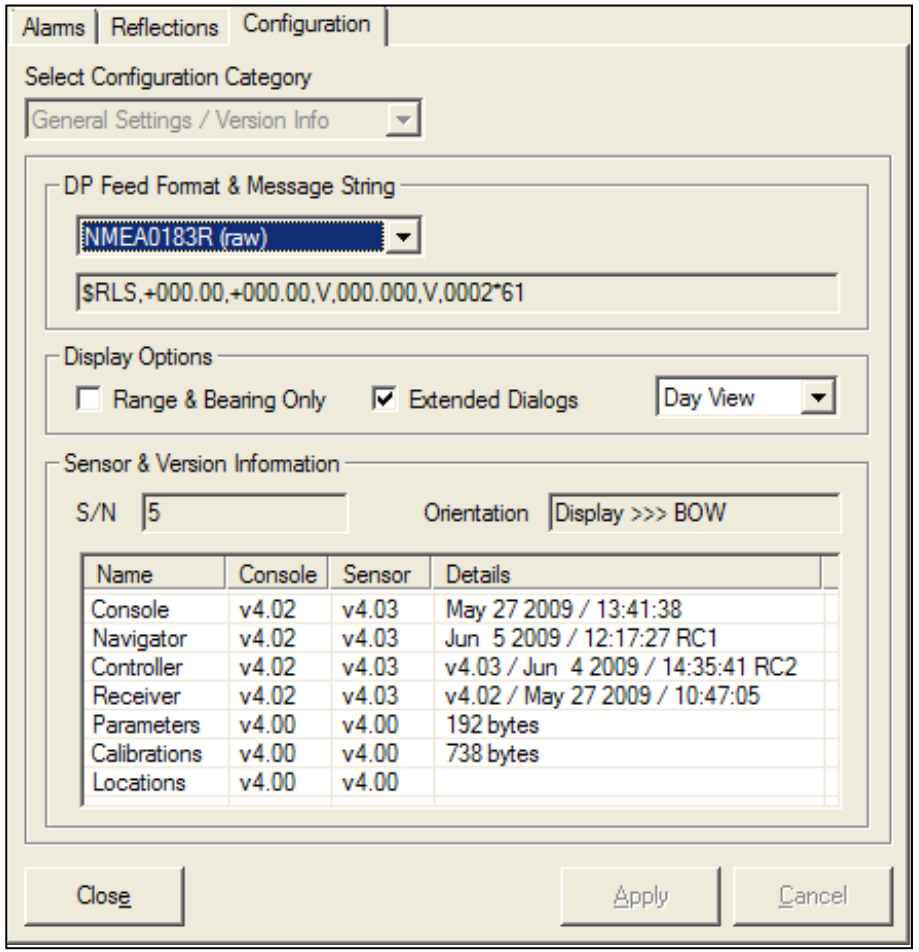
## To open the Configuration tab:

1. Click on the **Sensor Operations** button.
2. Click on **CyScan Configuration**.

   The Configuration tab will be displayed (see right).

The Configuration tab has four selectable options:

- **DP Feed Format & Message String**—This is key to correct operation but does not usually require alteration during day-to-day operations.
  (See ***DP Feed Format & Message String*** on page 63).
- **Range & Bearing Only**—Tick this option to display ***Range and Bearing*** information.
  (See page 33).
- **Extended Dialogs**—In normal user mode this option displays additional information in the ***Reflections tab.*** (See page 25).
  For more information please refer to the CyScan Engineer's Guide.
- **Day View/Night View**—Click on the drop-down arrow and select either ***Day or Night display settings***.(See page 21).



# Configuration Settings (Continued)

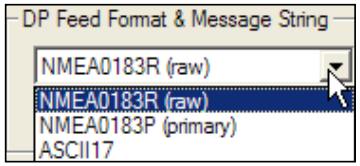
## DP Feed Format & Message String

The DP Message string field displays the current text being sent to the DP system based on the current selection of the DP Feed Format type.

The DP Feed Format option controls the format in which the positional information is packaged and sent to the vessel's DP system. The DP Feed Format may only be changed when CyScan is not navigating.

The choice of DP Feed Format can have an effect on the information displayed in the Navigation section (top right corner) of the console screen.

**Any changes to this setting MUST be carried out in conjunction with a similar change on the DP system – both systems must use exactly the same format.**

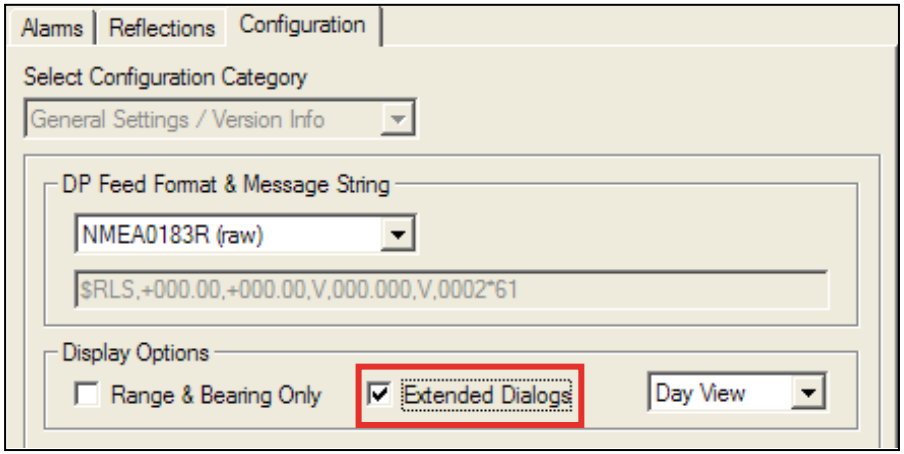



**DP Feed Format and Message String List**

### To change the DP feed format:

1. Ensure that the DP system is correctly prepared to receive the new message format.
2. Open the ***Configuration*** tab. (See page 62).
3. Click on the down arrow of the **DP Feed Format** box to reveal a drop-down list of options.
4. Select the required format and click on the **Apply** button.

**Changes in formats, other than between NMEA and ASCII, can only be carried out in *service access mode*. (See page 64).**




**Extended Dialogs Option**

## Extended Dialogs

The Extended Dialogs option displays extra information in the Alarms and Reflections tabs. (When the system is in ***Service Access*** (see page 64) or Engineer modes, extended dialogs are displayed by default and the option is greyed-out).

### To Display Extended Dialogs:

1. Open the ***Configuration*** tab. (See page 62).
2. Tick the **Extended Dialogs** option.
3. Click on the **Apply** button.

# Entering Service Access Mode

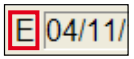
There are many settings within CyScan Console that can seriously affect system operation if they are incorrectly adjusted. For this reason they are concealed until you enter service access mode.

**Indiscriminate adjustment of parameter settings can adversely affect the operation of CyScan. It is not advisable to edit the settings unless directed to do so by Guidance Navigation Limited or a qualified technician.**

Service Access mode can be entered either by using a temporary service access code, or by using an engineer USB key.

## To Obtain and Use a Temporary Service Access Code

1. Click on the **Sensor Operations** button.
2. Select the **About CyScan** option.
   The About Tab will be displayed (see right).
3. Click on the **Service Access** button in the lower right corner of the About tab.
   A dialog will be opened, displaying a **Service request code**.
4. Send the service request code to Guidance Navigation Limited (cyscan@guidance.eu.com) or an authorised customer service representative.
5. A corresponding Service Access Code will be supplied to you. This code is nontransferable and will operate only with the current Console system for a limited period.
6. Enter the received code into the **Service access code** field and click on the **OK** button.
   Service access will be granted on this system for a maximum period of 12 hours, however, the mode will be automatically ended after 20 minutes.
   Click on the Service Access button to restart service access mode.




When Service Access mode is enabled a lowercase ‘e’ is shown in the status bar. An uppercase ‘E’ is shown when an engineer’s USB key is connected.

**The service request code is constructed as two groups of six capital letters [A-Z] separated by a + sign. There are never any numerals in a service access code.**

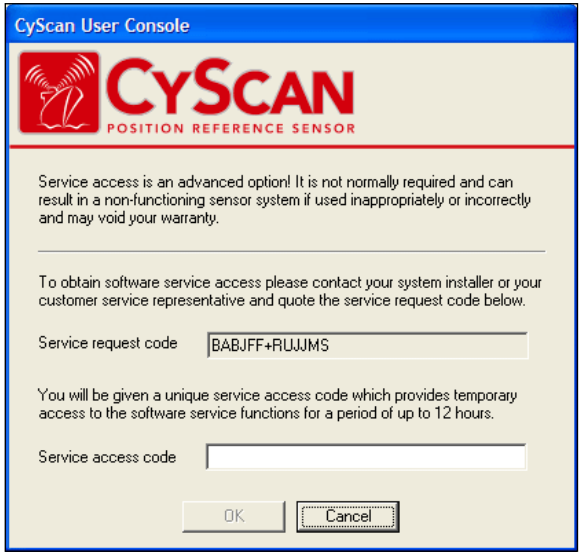
**The service access code is a 12 digit hexadecimal number [0-9, A-F] - (not case sensitive).**

## Using an Engineer USB Key

To enter Service Access mode, either start the CyScan Console with the engineer USB key already plugged into an available USB port on the console computer, or connect the USB key and click on the Service Access button on the About Tab.

**Ensure you re-start the application without the key to return to normal user mode.**

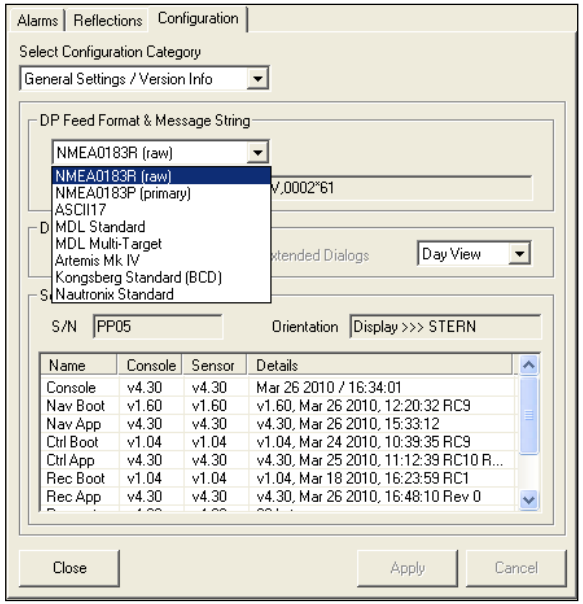
**About Tab**



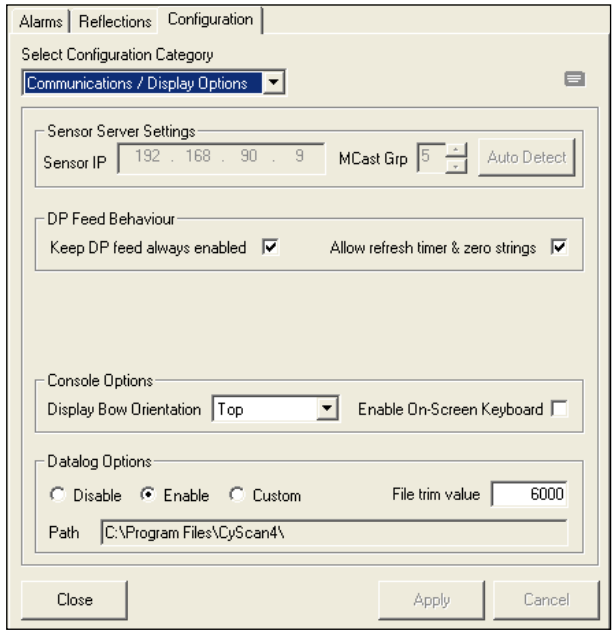

**Service access code dialog showing a request code and an area to enter the corresponding access code**

# Configuration Settings - Service Access Mode

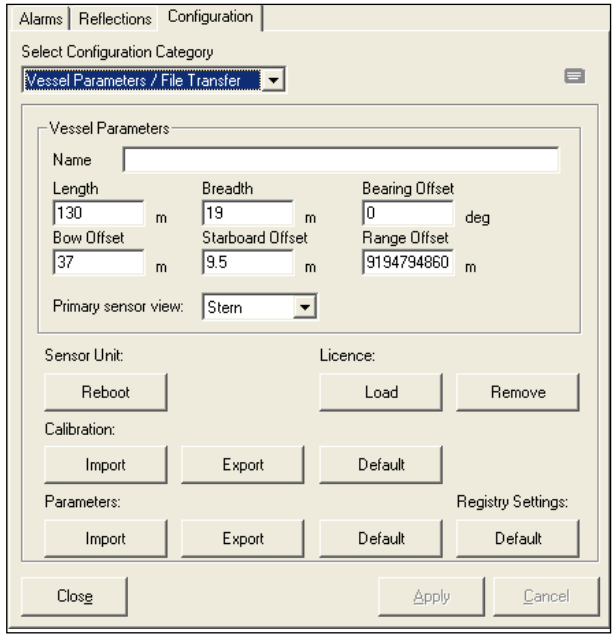
In service access mode, the full range of DP Feed types become selectable within the **General Settings/Version Info** category on the Configuration tab:




In Service Access mode, the Configuration tab also displays **Communications/Display Options**:




and **Vessel Parameter/File Transfer** options:



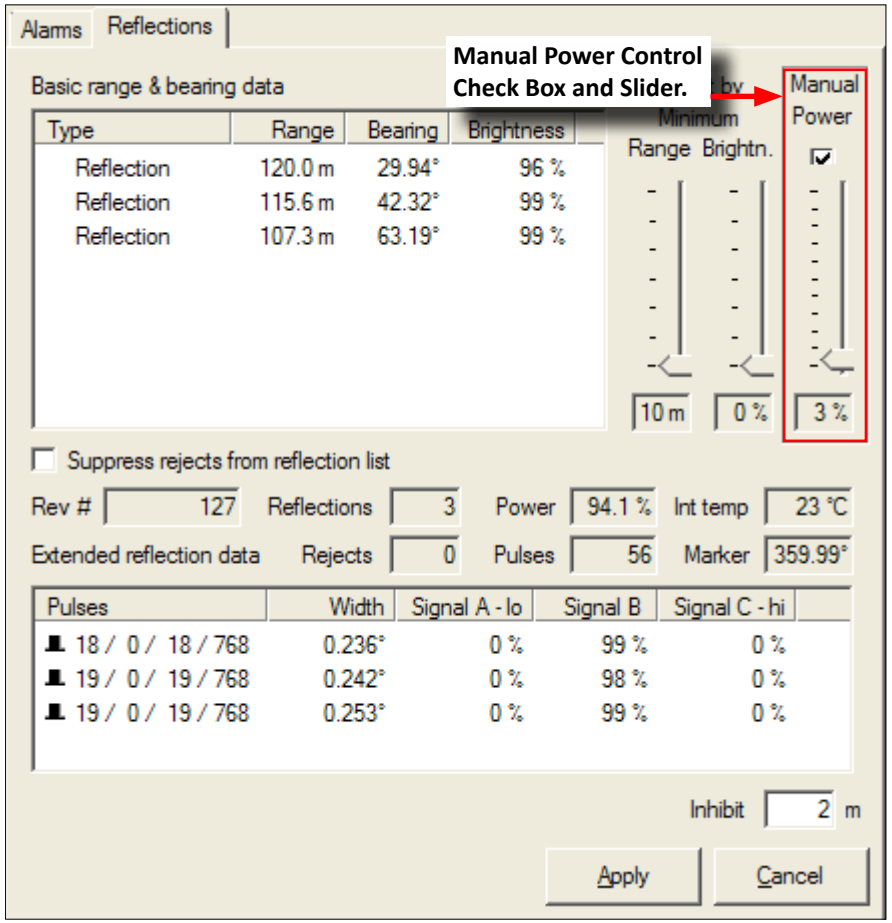
# Manual Power Control

Manual Power Control can be used to switch off the normal automatic power control for the rotor on the CyScan Sensor and to apply and adjust a fixed constant power instead.

Manual Power Control is available when any of the following conditions are met:

- Service Access Mode is enabled.
- Manual Power Control has been enabled via a configuration setting.
- The Console has been connected to a running sensor that already has Manual Power Control enabled (perhaps via another Console on an Ethernet system for example).

When Manual Power Control Mode is available, an additional check box and slider are shown on the right-hand side of the reflections tab (see right).




## To Enable Manual Power Control:

1. Ensure that at least one of the above conditions are met.
2. **Tick** the **Manual Power check box** on the right-hand side of the Reflections tab.

   The Manual Power slider will appear below the check box.

   If the Manual Power section is missing from the Reflections tab, Manual Power Control is not available. Check that at least one of the required conditions are met (see above).

## To Use Manual Power Control:

Having enabled the slider, as described in step 2 above:

1. Use the mouse to **drag the slider** up or down until the required power level is displayed in the box below.
2. Click on the **Apply** button at the bottom of the Reflections tab.

## To Disable Manual Power Control:

**Click** in the **Manual Power check box** on the right-hand side of the Reflections tab.

The check box will clear and the slider will be removed from the Reflections tab. The Manual Power heading and the check box will remain, indicating that Manual Power Control is still available but currently disabled.

**If Manual Power Control has been enabled by a Console using Service Access, which has subsequently been disconnected from the sensor, the sensor will continue running in manual power mode.**

**Other Consoles may connect to this sensor and adjust the power level or turn off manual power mode WITHOUT Service Access. Service Access will then be required to turn manual power mode on again.**

# System Logging Options

During navigation, the system automatically generates a set of operation logs that can be analysed by a service engineer to diagnose any system faults. Logging can also be started manually, when the system is not navigating (see below).

**During manual logging, the CyScan and Navigation buttons are disabled. You must stop logging before you can start navigating or exit the system.**

Logs are written to compressed folders that each contain approximately one hour's data. The folders are named according to the date and time period that they cover, and the type of navigation that was being carried out. For example, logs recorded between 1 and 2 o'clock on the 4th February 2008 during multi-target navigation would be stored in a folder named:

```
04d02m2008y 13h00m00s to 04d02m2008y 14h00m00s multi target.zip
```

Logs are stored in the **C:\Program Files\CyScan4** directory and can be copied manually and e-mailed to Guidance Limited **(cyscan@guidance.eu.com)** or your DP Supplier in the event of a problem. Logs can also be copied automatically to a USB drive or "memory-stick" (see below).

**On a CyScan Ethernet console datalogs are stored on whichever console is the master at the time the logs are taken. If the master console is changed the location of the datalogs from that point forward will also change.**

## Starting and Stopping Manual Logging

To start (and stop) logging when CyScan is not navigating:

1. Click on the **Sensor Operations** button.
2. Click on **Datalogs > Log Data Now.**

## Deleting Log Files

To delete all log files:

1. Click on the **Sensor Operations** button.
2. Click on **Datalogs > Delete all log files.**

## Taking Screen Shots

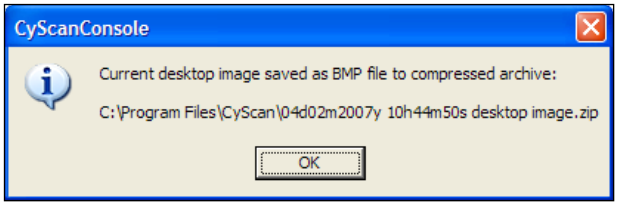
The Screen Shot option records every detail of the current screen and stores it as a bitmap image. Screen shots can be analysed by a service engineer or e-mailed to Guidance Limited in the same way as log files.

Screen shots are stored in the same directory as the log files (C:\Program Files\CyScan4). They are named according to the date and time that they were taken, for example:

```
04d02m2008y 10h44m50s desktop image.zip
```

### To take a screen shot:

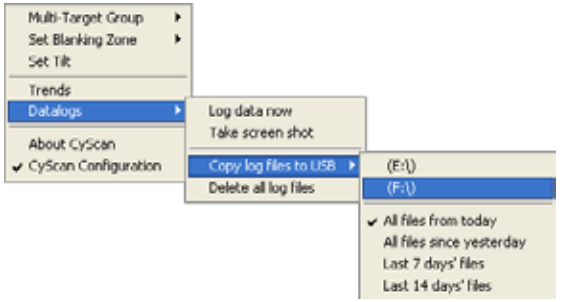
1. Click on the **Sensor Operations** button.
2. Click on **Datalogs > Take screen shot.**
3. The name of the screen shot file is displayed:




4. Make a note of the name and location of the file and click on the **OK** button.

## Copying Log Files to an External USB Drive

1. Connect a USB drive with sufficient free space to your PC.
2. Click on the **Sensor Operations** button.
3. Click on **Datalogs > Copy Log Files to USB.**
4. Click on the time period that corresponds to the log files that you want to copy (either All files from today, All files since yesterday, the Last 7 days' files or the Last 14 days' files).
5. Click on **Datalogs > Copy Log Files to USB > USB DISK**.
6. The light on your USB drive will flash to show that files are being copied. When the light stops flashing, the drive can be disconnected from the PC.



# Troubleshooting

If you experience problems when installing or using the CyScan system, please check through this Troubleshooting section for a possible solution. It contains the following pages:


- ***Problems and Possible Remedies*** (page 69)
- ***Alarm Codes*** (page 70)
- ***Cleaning the Sensor and Targets*** (page 71)
- ***CyScan Fuse Information*** (page 72)


If your problem is not listed or you cannot resolve the issue, please contact the system installer or equipment provider who are trained to assist with installation and operational problems.

If the problem cannot be resolved by the system installer or equipment provider, please contact Guidance Navigation Limited:

## Contact Details


- Phone: +44 (0)116 229 2600
- Fax: +44 (0)116 229 2604
- E-mail: cyscan@guidance.eu.com

# Problems and Possible Remedies

## No communication between CyScan Console and the Sensor

- The User Console alerts the operator on loss of communications and offers to 'Reset Communications'. Click OK.
- Check the Power, DP Feed and Display/Diagnostic connections to the sensor.
- Check that the unit is displaying either 'Running' or 'Suspended' alongside the current time on the sensor information display. If it is showing any errors then power cycle the sensor.
- Check that the data feed converter is powered (yellow LED on) and that the outer transmit/receive lights are flashing once every couple of seconds (i.e. the user console is trying to establish communications with the sensor unit). Under normal conditions the outer LEDs should flash first followed by the inner two LEDs flashing in response (the sensor unit answering with data).

## Rotor does not rotate

- Check the temperature of the unit is above -15 degrees C. Below this the rotor is prevented from spinning to protect the sensor mechanics.
- Check that the console is not showing a 'Motor Stall' alarm, if so suspend and then resume the unit to restart the motor.
- The sensor rotor might be prevented from rotating due to mechanical blockage. Investigate and remove blockage.
- Check the sensor information display on the system unit. Ensure that there are no errors displayed. Otherwise power cycle the unit and observe the messages on the display.
- Check for ice build up under the rotor. Remove any ice which may be present.

## System appears to be operational but no reflections are displayed within CyScan Console

- Check that the blanking zone is configured correctly.
- Clean the CyScan sensor window. (See ***Cleaning the Sensor and Targets*** on page 71).
- Check that the **Show Reflections** option in ***Display Options*** is selected. (See page 16).
- Check that the sensor display zoom is set appropriately.

## System is operational but is not navigating

- Check that the correct multi-target group is selected.
- Check that the sensor has a clear view of the targets.
- Check that the blanking zone is not blocking targets from view.

## System navigating but no data is received at the DP system

- Check the DP Feed connection from the sensor.
- Check that the correct data format is selected for the DP system.

## System operates correctly but in cold weather loses targets.

- Check for condensation or ice on targets. Clean if necessary.
- Check for condensation or ice on the window of the sensor. Clean if necessary.

# Alarm Codes

For the purpose of an audit trail, events of any nature are reported in the Console application in the form of 7 different alarm types. These alarms only apply to the embedded navigator and the interaction between the sensor unit and the Console user-interface.

## Fatal Alarms—Codes 2xxx

Signifies a fatal event such as malfunctioning software; the system might be able to recover from this but a power cycle is always recommended (both sensor unit and console computer).

## Errors—Codes 3xxx

Signifies an unexpected event such as a missing parameter file or a lack of response from a particular sub-system; these errors normally clear themselves after a while. If these errors occur repeatedly in quick succession especially after restarting the system, then a serious hardware problem might have occurred.

## Warnings—Codes 4xxx

Signifies a possible error source; it will be followed by a relevant error message if the system deteriorates, otherwise this will clear itself in due course. In general most warnings if they are infrequent can be ignored.

## Information—Codes 5xxx

Signifies purely an event, user initiated or automatic, for audit purposes.

## Proxy Alarms—Codes 6xxx - 6499
## Controller Alarms—Codes 65xx - 6999
## Rotor Alarms—Codes 7xxx - 7999

Proxy alarms, controller alarms and rotor alarms all signify events that are associated with the sensor rotor, tilt mechanism or controller hardware. These codes can provide diagnostic information about issues with this hardware.

# Cleaning the Sensor and Targets

To maintain the CyScan Sensor in good working order it is important that its optical elements are kept free of contamination.

## To clean the optical window

Use a lint-free cloth with IPA spray to carefully wipe the optical window.

## To clean the targets

In dirty environments the reflective faces of the targets should be cleaned regularly for best viewing.

Under icy or frosty conditions, the targets should be cleared of any condensation or ice.

# CyScan Fuse Information

The CyScan system contains two replaceable fuses, one for the Live and the other for the Neutral. These are located on the connector board as shown below.

## Connector Board Fuse

Please refer to the Installer's Guide for details on how to access the connector board.

To remove a fuse from its housing, fit a flat-head screwdriver into the slot in the insert - then push it in and turn it anti-clockwise until the insert releases and can be pulled out.

Reverse the above procedure to replace the fuse.

Both fuses have the same specification.

**Ensure the replacement fuse has the same specification as the original fuse.**

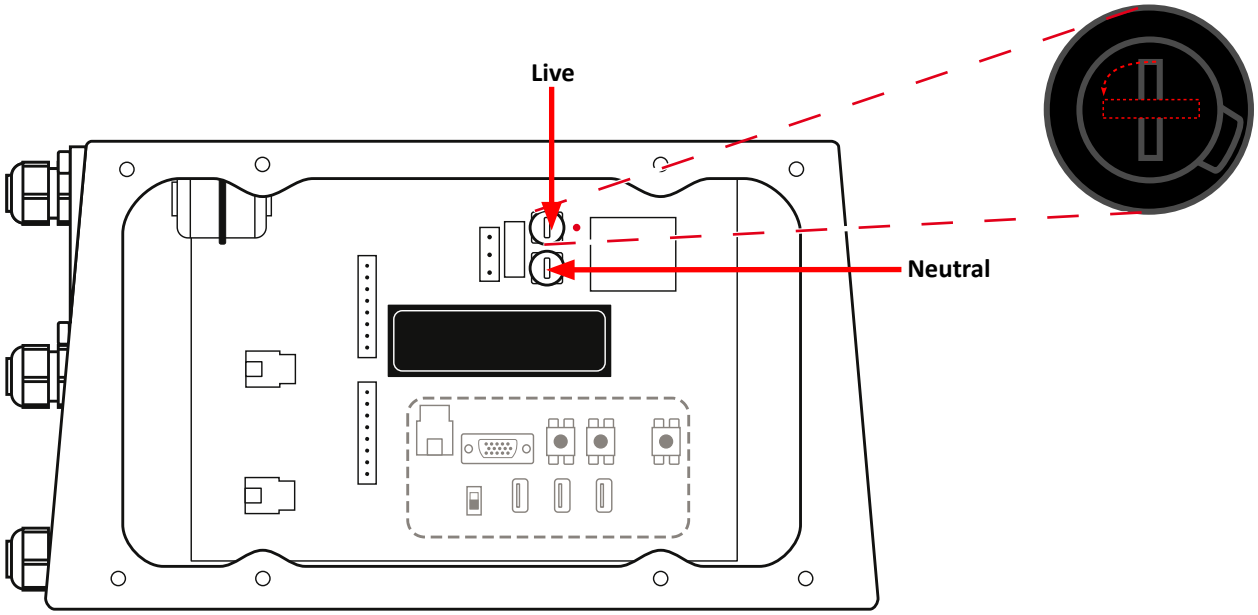
**Fuse specification:**

20mm

T 630mA L 250v

Antisurge Glass

**CAUTION: DOUBLE POLE/NEUTRAL FUSING**



# Technical Notes

This section contains the following pages:


- *Targets-Reflective Material* (page 74)
- *Targets-Installation and Position* (page 75)
- *Vertical Beam Divergence* (page 77)
- *Low Temperature Operation* (page 78)

TECHNICAL NOTE 1

# Targets-Reflective Material

CyScan has been designed to operate with good quality retro-reflective targets. There are numerous manufacturers and types of reflective material available worldwide. These have widely varying angular reflective specifications and are not all suitable for laser navigation purposes.

Only one type of reflective material is recommended for use with CyScan. It is known as Scotchlite Diamond Grade White 4090 and is manufactured by the 3M Company. It is widely available as a tape or flexible sheet in a variety of sizes with an adhesive backing. The material can be obtained through 3M's international product distribution network as detailed below.

3M trademarks are acknowledged.

## Contact details for 3M product distribution network:

| Country | Contact point |
|---|---|
| United States | 3M Austin Centre, Austin, Texas, 78726<br>Tel: 512-984-1800 |
| United Kingdom | 3M UK Plc, Bracknell, Berkshire, RG12 1JU<br>Tel: 01344-858000 |
| Canada | 3M Canada Product Information Centre,<br>London, Ontario, N5V 3R6<br>Tel: 1-800-364-3577 |
| Japan | Sumitomo 3M Limited, Setagaya-ku, Tokyo 158<br>Tel: 813-3709-8170 |
| Germany | 3M Deutschland GmbH, 41453 Neuss<br>Tel: 02131-143472 |
| Italy | 3M Italia SpA, Segrate, Milano<br>Tel: 392-70351 |
| France | 3M France Customer Information Centre,<br>F-95006 Cergy Pontoise Cedex<br>Tel: 331-130-318-020 |
| Hong Kong | 3M Hong Kong Limited, North Point, Hong Kong<br>Tel: 852-2806-6111 |

Recommended reflective tape:

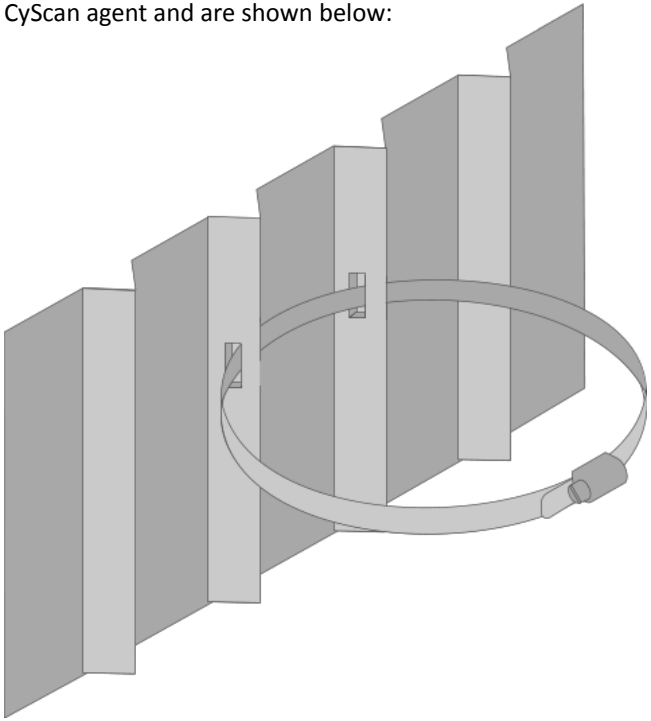
**3M Diamond Grade**

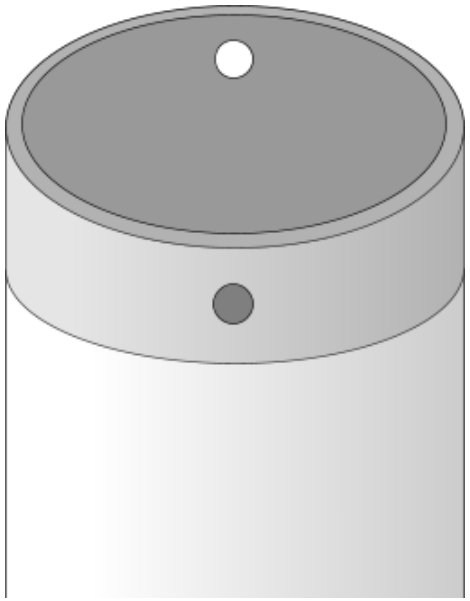
**White 4090**

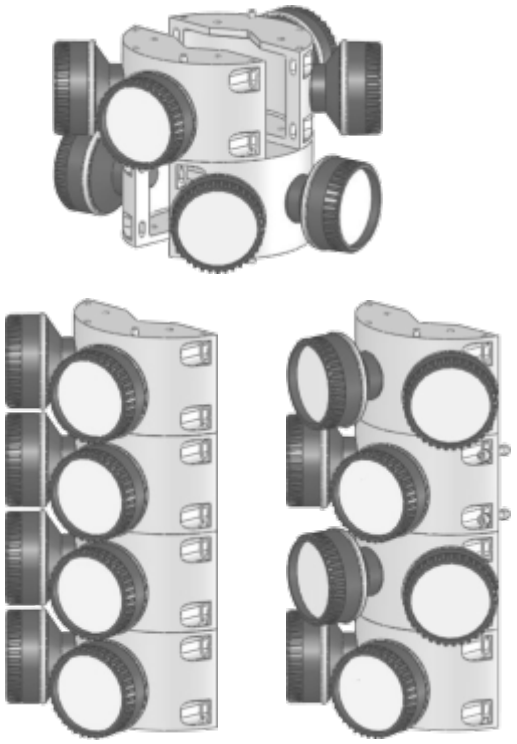
# Targets-Installation and Position

## Target Types

CyScan can operate successfully with flat or cylindrical targets. These are available from your CyScan agent and are shown below:







### Flat Targets

Flat targets are generally attached to rigid structures such as metal stanchions using steel bands.

2 metre tall flat targets can typically be seen at up to 400 metres in ideal conditions. Shorter 1 metre tall flat targets are visible at up to 250 metres when viewed straight on.

**Part number: 20-0031-0**
(2m x 350mm flat reflector including stainless steel bands)

### Cylindrical Targets

Cylindrical targets can be used up to approximately 300 metres. They can be hung over the side of the structure/vessel and secured at either end.

**Part number: 20-0078-0-B**
(2m cylindrical reflector)

### Prism Targets

Prism cluster with 8 x 6cm elements for extended range operations. Variable configurations allow for optimisation of the visible reflection, visible reflection level or reflected power.

**Part number: 20-0075-1-A**

# Targets-Installation and Position (Continued)

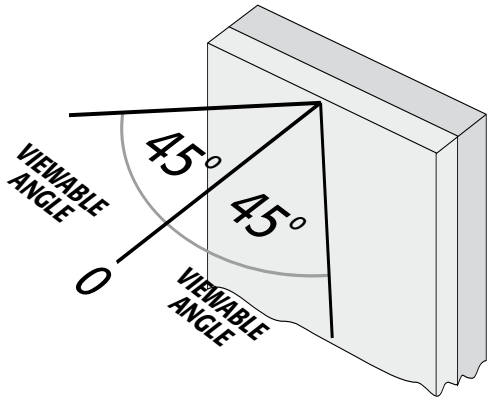
## Target Installation

Key to the operation of the CyScan system is the correct installation of targets. Please follow the guidelines given below when installing targets on the structure/vessel.

Once the targets are installed, their relative positions can be automatically surveyed by the system.

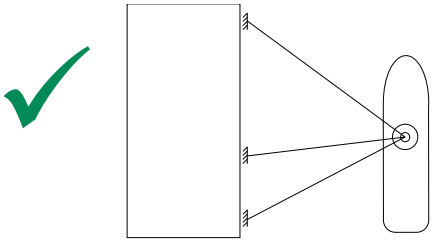
### Installation Tips

- Targets should be placed in positions where the sensor can see them while the vessel is within the expected working area. Consider vertical position as well as horizontal.
- Flat targets should not be placed too far along the structure/vessel from the expected working area as this can reduce the viewing angle for close operations.
- The sensor beam should not strike a flat target at an angle of more than 45 degrees to the target surface.
- Cylindrical targets can be viewed from any angle equally well.

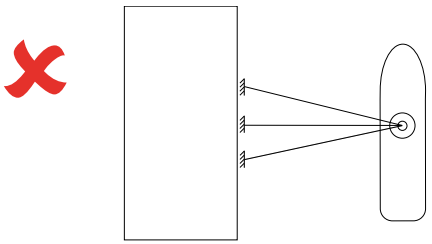



### Optimum Spacing for Multiple Targets

- Targets should be positioned with unequal spacing between them – this helps the system to distinguish between specific targets. For example, with a typical mooring distance of 40-80m using three targets, suitable spacings between the targets would be 10m and 20m – giving a total spread of 30m.
- Targets should be placed no closer than 5m together. Ideally they should be placed 10m or more apart.



✓ Targets are asymmetrically spaced, thus making it easier for the CyScan system to assess which reflection corresponds to a particular target.



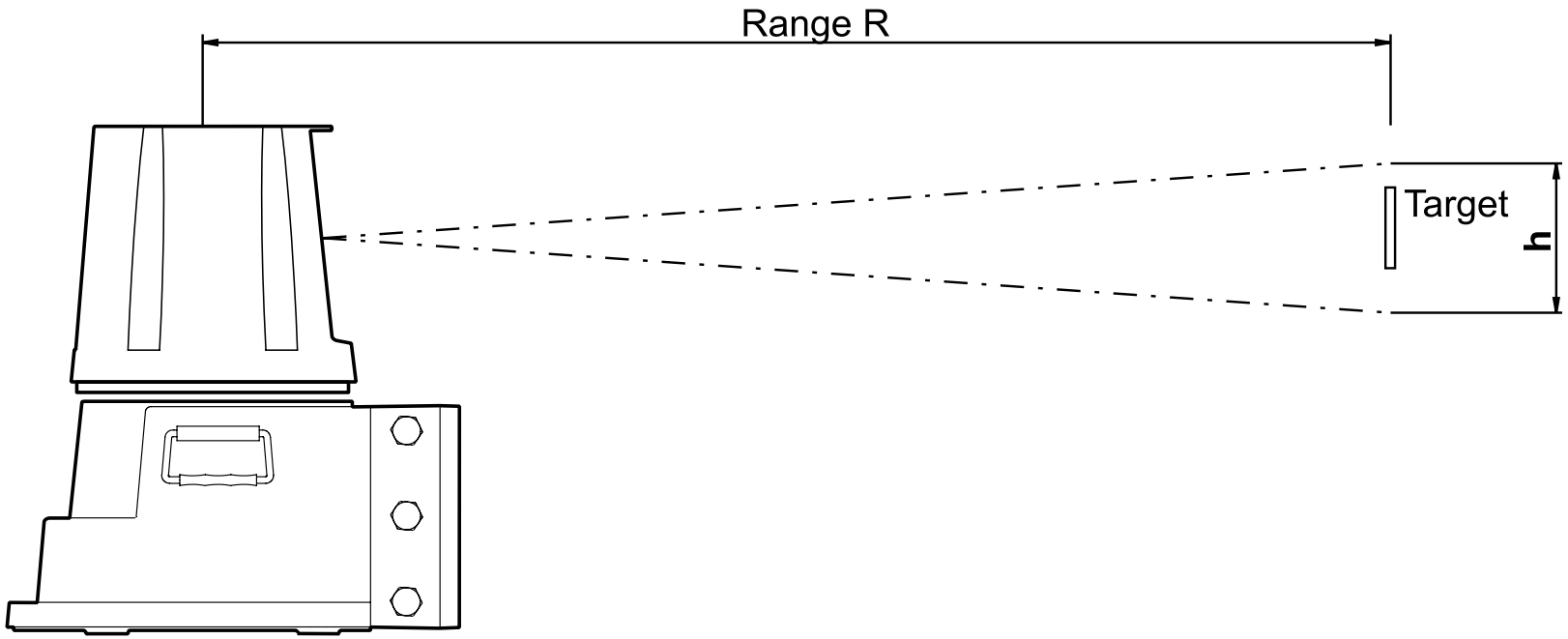
✗ Targets are too close together and have even spacings. This makes it more difficult for the CyScan system to differentiate them.

**TECHNICAL NOTE 3**

# Vertical Beam Divergence

CyScan has an optimised optical system to ensure that bearing precision and target lock are maintained even in high sea states and over the full range of the sensor. The optics produce a vertically divergent beam (12°) with a very narrow profile. As the distance from the target increases the beam becomes deeper as shown in the diagram.

| Range R (m) | Height h (m) to nearest metre |
|---|---|
| 20 | 4 |
| 30 | 6 |
| 50 | 11 |
| 70 | 15 |
| 90 | 19 |
| 100 | 21 |
| 120 | 26 |
| 150 | 32 |
| 180 | 38 |
| 200 | 43 |
| 250 | 53 |
| 300 | 64 |




Not to scale

TECHNICAL NOTE 4

# Low Temperature Operation

## Introduction

CyScan is a precision electromechanical device with hardware components that, of necessity, are mounted in an external position on a vessel's superstructure. It is recognised that industrial marine operations may subject these components to harsh environments, including low temperature.

CyScan is designed to operate within the temperature range – 25 to 55°C. The hardware complies with the requirements of IEC60068-2-1 and is able to operate for prolonged periods at temperatures down to – 25°C provided that certain operating conditions are maintained.

## Operating Conditions

The following recommendations are made for low temperature use:

- If it is necessary for the system to be switched on after a prolonged period at temperatures below 5°C (and down to – 25°C) the sensor will warm itself, but will require some time to reach optimum operating condition.
- If the unit is switched on after a period at temperatures between -15 to -25°C it will power up immediately and communicate with the console but the scanner will not rotate until the internal temperature of the base unit rises above -15°C.
- When the system is not in use (i.e. un-powered or suspended) the sensor should be protected by means of a suitable insulating and protective cover to prevent the external build-up of ice.
- For operation below – 25°C additional forced air heating must be provided

  **Not exhaust emissions as these contain particulates which will degrade the optics.**

## Technical Considerations

- CyScan uses a sophisticated rotating infra-red laser range-finder to accurately measure the distance and bearing to retro-reflective targets that are placed at specific locations in the working area. Movement sensors allow mechanically driven optics to compensate for vessel motion due to wave action. The internal mechanism may become disabled if it is allowed to cool in a low temperature environment.
- A safety interlock prevents activation of the range-finder laser if the scanner rotor head stops or is prevented from rotating by ice build-up.
- View of the retro-reflective targets will be obscured by a build-up of ice on either the optical window of the scanner or the surface of the targets (N.B. ice has poor reflective properties at the infra-red frequency used by CyScan).

# Appendices

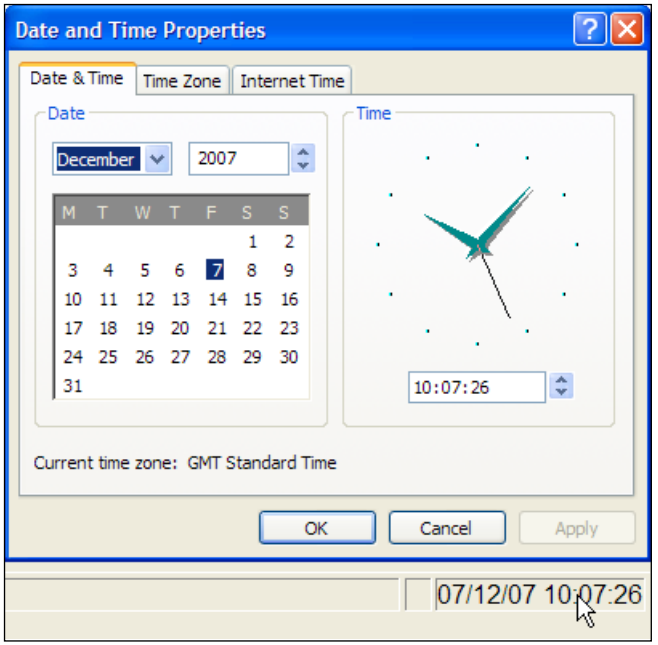
This section contains the following pages:


- *Setting the Date and Time* (page 80)
- *Using the On Screen Keyboard* (page 81)
- *Working with Alarms* (page 82)
- *CyScan System Specifications* (page 84)
- *CyScan Optional Accessories* (page 85)
- *Index* (page 86)
- *Document History* (page 89)

# Setting the Date and Time

## To Set the System Date and Time

1. Double-click on the **time** displayed on the **Status Bar** at the bottom of the screen.
2. The **Date and Time Properties** window is opened.
3. Set the correct date and time and click on the **OK** button.



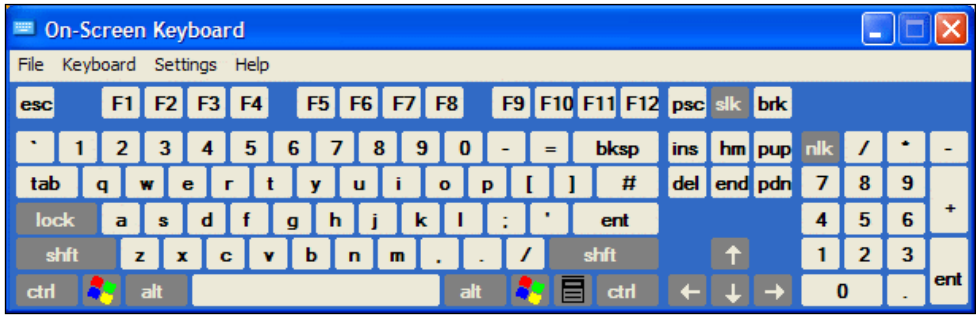
# Using the On Screen Keyboard

In order to accommodate systems without keyboards, CyScan Console provides an on-screen keyboard option. This enables text to be input using only a mouse pointer. You can activate the on-screen keyboard wherever you see this icon:

If the icon is greyed out then the on-screen keyboard feature is disabled.

When displayed the on-screen keyboard appears 'Always on Top' of all other applications – this can be changed using its Settings menu.

**By default, the on-screen keyboard feature is disabled as CyScan is usually installed on systems with keyboards. (See 'To enable the on-screen keyboard' below).**




## To use the on-screen keyboard

1. Click on the icon to display the on-screen keyboard.
2. Select an item within CyScan Console that requires text entry or editing.
3. Click on the necessary keys on the on-screen keyboard using your mouse.

## To enable the on-screen keyboard

**This procedure can only be carried out when using Service Access mode, which requires a restricted authorisation code.**

1. Enter ***Service Access Mode***. (See page 64).
2. Click on the **Sensor Operations** button.
3. Click on **CyScan Configuration.**

   The ***Configuration Tab*** is opened. (See page 62).
4. Click on the down arrow of the **Select Configuration Category** box and select the **Communications / Display Options** entry.
5. Tick the **Enable On-Screen Display** option.
6. Click on the **Apply** button.

# Working with Alarms

During operation, the CyScan system produces an event audit trail of system messages. These range in increasing order of severity from: **Information**, **Warning**, and **Error** to **Fatal**. As these alarms are received from the sensor, the console application lists them within the ***Alarms tab*** on the property sheet.

Alarm types are colour coded:

**Information -** (grey)

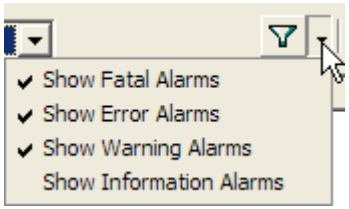
**Warning -** (orange)

**Fatal and Error -** (red)

The triangular and square symbols represent the start and stop points of each alarm.

When an alarm is raised, a start symbol is displayed at the beginning of the entry.

When the alarm is resolved, the stop symbol is appended to the entry.




## Filtering Alarms

The alarm filter allows you to select the types of alarm that are displayed.
By default, only Warning, Error and Fatal alarms are displayed.

To enable/disable the filter, click on the left side of the filter button.
The filter is active whenever the left side of the filter button is 'pressed in'.

### To use the alarms filter

1. Click on the **Alarms tab** on the Property sheet (in the lower right corner of the screen).
2. Click on the right side of the filter button.

   A drop-down list will be displayed showing the four types of reports/alarms.
3. Click on each type of alarm to check/un-check them as necessary.

   Alarm types that are ticked are displayed in the alarms list, un-ticked items are hidden.

# Working with Alarms (Continued)

## Using the Historic Alarm List

The Alarms tab has two alarms lists:

- The **Current List** displays new alarms (since the last start of the console software).
- The **Historic List** is used to store alarms that have been cleared from the current list.

Current alarms are automatically transferred to the Historic list on shutdown.

Items in the Current List cannot be deleted, they may only be moved to the Historic List. Only items in the Historic List can be permanently deleted.

### To accept alarms in the current list

1. Click on the Alarms tab on the Property sheet and check that the **Select Log Type** entry is **Current**.
2. Select the alarms that you wish to move into the Historic list:

   **To accept one alarm**—Click on the required entry and click on the ✓ button.

   **To accept all alarms**—Click on the ✓! button.

**If you attempt to transfer any alarms that are still unresolved, a warning dialog will be displayed.**

### To clear the historic list

1. View the Alarms tab within the Property sheet and check that the **Select Log Type** entry shows **Historic**.
2. Select the alarms to delete:

   **To delete one alarm** – click on the alarm entry and then on the ✕ button.

   **To delete all alarms** – click on the ✕! button.

   A dialog will be displayed and will require confirmation for each deletion. You can confirm each deletion individually, or click on the **Yes to All** button.

### To export an alarms list

- To export all alarms to a text file, click on the **Export Historic and Current Alarms** button

# CyScan System Specifications

| Sensor | |
|---|---|
| Laser Type | Pulsed (min. 30kHz) semiconductor laser diode (904nm) |
| Laser Classification | Eye safe to Class 1 IEC60825 |
| Beam Shape (nominal) | 12° vertical, 0.13° horizontal |
| Operating Range (nominal) | 10m to 1250m (dependent on target size and atmospheric conditions) |
| Extended Operating Range (nominal) | to 2500m (requires licence code) |
| Range Resolution | 8.5mm (< 30ps time of flight) |
| Angular Resolution (typical) | 0.012° (0.2 mrad) |
| Range Repeatability (typical) | 75mm [3σ @ <100m], 150mm [3σ @ <1000m] |
| Angular Repeatability (typical) | 0.02° (0.35 mrad) [3σ @ <100m],<br>0.04° (0.70 mrad) [3σ @ <1000m] |
| Target to Target Repeat (typical) | 0.03° (0.45 mrad) [3σ @ <100m] |
| Position Repeatability (typical) | 0.3m [3σ] or better than 0.5% of range @ <100m,<br>0.05% @ <1000m |
| Heading Repeatability (typical) | 0.5° [3σ @ <100m] - two targets |
| Rotational Scanning Frequency | 1Hz (60 rpm), or 2Hz (120rpm) - operator selectable |
| **Levelling Optics** | |
| Active Axis | Single axis with automatic dynamic stepper control |
| Tilt Compensation | -20° to +20° roll and pitch (combined) |
| Sensors | 3 axis solid state gyros and accelerometers,<br>2 axis inclinometer |
| Total Vertical Angular Coverage | 52° (mechanical + optical) |
| Wave Motion Compensation (typical) | ±5° for 5 second wave period |
| **Environmental** | |
| Temperature Range | -25 to 70°C (operating) |
| Marine Certification | IEC 60945 (IE10) and IMO Resolution A962 (23) 'GREEN PASSPORT' |
| Marine Type Approval | ABS, Lloyds Register (pending), DNV (pending) |
| EMC Certification | CE Certified, FCC Part 15(a) |
| Compass Safe Distance | 1000mm (worst case) @ 0.3° deflection |
| Water / Dust Protection | IP66 rated |

| Vessel Interface | |
|---|---|
| Power Requirement | 85-264VAC, 45-65Hz, max100W, 1.5A (fuse) |
| Sensor Control and DP Feed I/O | 2 x RS422 + 2 x Ethernet 100Base-T Auto MDI/X |
| Sensor Cable Connectors | Power (J12) - 3 way R/A socket w/strain relief<br>Serial (J9 & J11) - 8 way socket w/strain relief |
| Sensor Diagnostics Display | 2 lines 20 character VFD (startup messages and runtime status or diagnostics) |
| Service Access I/O | 3 x USB 2.0 + 1 x Ethernet 100Base-T + VGA |
| Supported DP Protocols | NMEA, ASCII, Kongsberg, Simrad, Nautronix, MDL, Artemis, L3 |
| Supported Operating Modes | Serial Console (single) + Serial DP (single)<br>Ethernet Console (master & slaves) + Serial DP (single or dual)<br>Ethernet Console (master & slaves) + Ethernet DP (single, dual or triple) |
| Supported Ethernet Protocols | TCP/IP + multicast (Console), UDP/IP unicast (Console and DP Feed) |
| **Sensor Dimensions** | |
| Enclosure | Anodised alloy with powder coating |
| Dimensions | 405 x 407mm footprint, 456mm height |
| Weight | ca. 25kg (without flight case and accessories) |
| **Flight Case** | |
| Dimensions | 680 x 570 x 780 mm |
| Weight | ca. 61kg (typical accessories) |
| **Target Details** | |
| Flat (small/large) | 1000mm x 350mm (h x w) / 2000mm x 350mm (h x w) |
| Cylindrical | 2000mm x 205mm (h x Ø) |
| Prism Cluster | 8 prisms in 3 configurable formats<br>(additional prisms can be added as required) |
| | Laptop PC with 15" TFT display |

# CyScan Optional Accessories

| Optional Accessory | Description | Part Number |
|---|---|---|
| Retro-Reflective Targets | Flat 2m x 350cm | 20-0031-0 |
| | Cylindrical 2m Ø 200mm | 20-0078-0-B |
| | Glass prism cluster with 8 x 6cm elements | 20-0075-1 |

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# Document History

| Document Number | Changes | Issue Date |
|---|---|---|
| 94-0084-4-B | Updated page 9 and front cover.<br>Adjusted layout throughout.<br>Updated screen shots throughout for CyScan Console v4.40.<br>Updated System Overview on page 7.<br>Various amendments on page 13.<br>Amended note about CyScan Button on pages 11 and 14.<br>Amended button bar details on page 15.<br>Updated Sensor Operations menu details on page 17.<br>Added descriptions of the Trends tab buttons on page 19.<br>Amended the definition of Rev# on page 25.<br>Amended details for the brightness slider on page 26.<br>Amended details for switching a Master Console to slave mode on page 58.<br>Amended details for what is accessible on Master vs Slave Consoles on page 59.<br>Added details of Service Access Mode indicator on page 64.<br>Added details for Manual Power Control on page 66.<br>Amended default datalog file location and example filename on page 67.<br>Updated system specifications on page 84.<br>Removed references to keyboard shortcuts throughout. | 9th December 2010 |
| 94-0084-4-A | First release | 29th March 2010 |
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GUIDANCE
NAVIGATION