CyScan
POSITION REFERENCE SENSOR

OPERATOR'S GUIDE

GUIDANCE NAVIGATION

Contents

Introduction

Welcome to the CyScan position reference system. 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 structure or vessel requires one or more reflective targets to be attached to its sides.

CyScan is designed to be semi-portable and straightforward to operate. In use, the CyScan system consists of several key elements, these being:

- The **CyScan Sensor**, which is mounted on the vessel (typically on the wheelhouse) as required.
- The **CyScan Console**. A monitoring and control software application running within Microsoft® Windows™ on a standard computer. 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 **Power Supply Unit** (PSU). It is contained within a watertight enclosure and is mounted near the CyScan sensor. The Console and DP System cables are connected via this unit.
- The **Data Converter** (optional). This sealed enclosure is situated near the PC running the CyScan console software package. It acts as an interface and translates the RS422 signal generated by the CyScan sensor to the RS232 signal required by a standard PC serial port.

CyScan emits eye-safe infra-red light and detects its reflection from pre-positioned retro-reflective *Targets*. These targets are mounted on the designated structure(s) or vessel(s). They consist of strips of a high performance reflective tape mounted on a flat or a cylindrical support. The accurate range and bearing of the target(s) is measured by CyScan and used to calculate the exact position of the vessel relative to the multi-target group. This positional information is displayed on the console screen and automatically transmitted to the vessel's DP system.

CyScan Sensor

Power

PSU

Console PC Hardware

DP System

The key elements of the CyScan system

Structure or Vessel

Reflective targets

CyScan equipped vessel
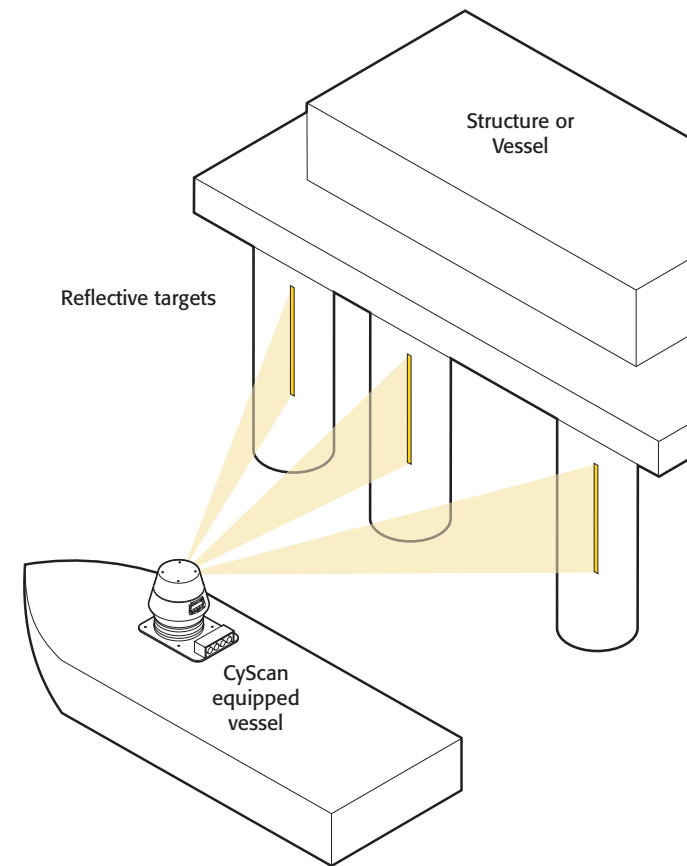
CyScan sensor part names

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

Rotor

Scanner

Sensor unit

Base Plate
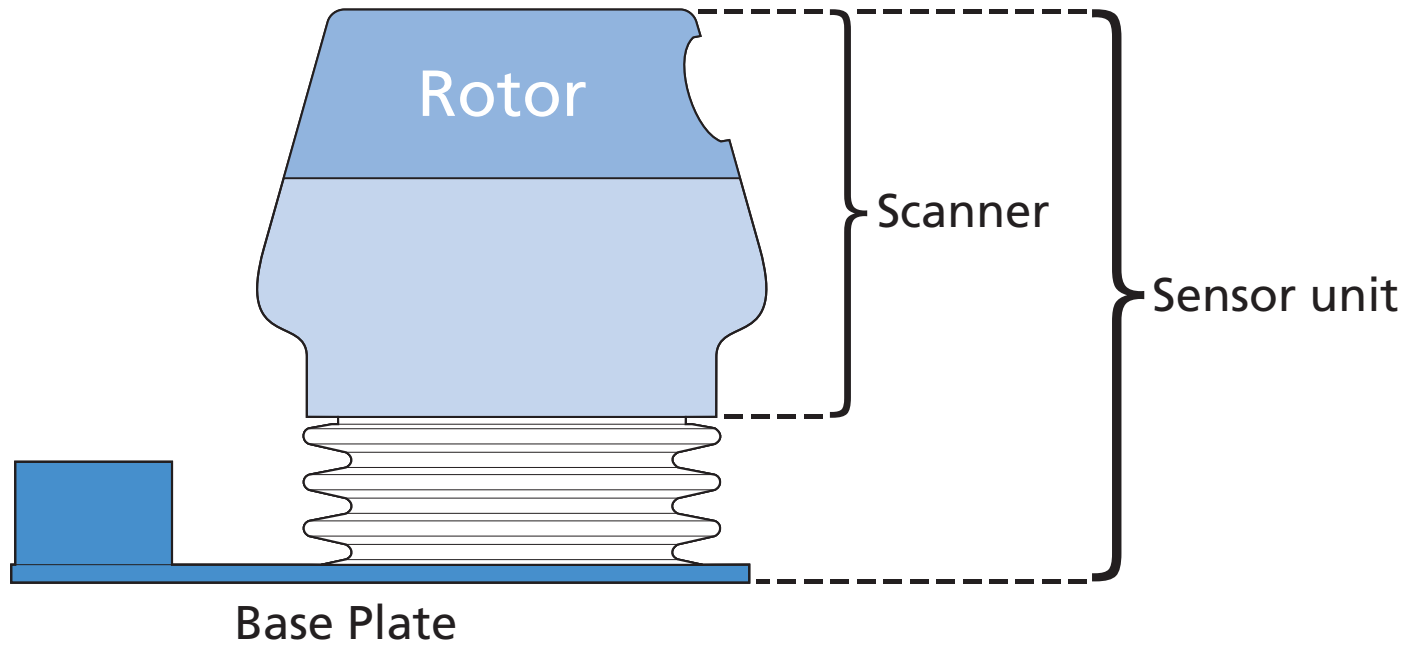
Serial numbers and software versions

Component Part Numbers and individual Serial Numbers are assigned to each component of CyScan. These can be found on product labels affixed to each unit. 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 labels

CyScan sensor part number

CyScan sensor serial number

CyScan Sensor

Class I Laser Product.   Complies with EN 60825-1
Complies with USA 21 CFR 1040.10 & 1040.11
except for deviations pursuant to Laser Notice No 50 26 Jul 2001

Manufacturing Date   September 2005
Place   Leicester

Part Number   20-0028-0-D

20-0028-0-D 332280206

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4 Dominus Way,
Leicester, LE19 1RP, England
Tel: 44 116 2292600
Fax: 44 116 2292604

CyScan PSU part number

CyScan PSU serial number

CyScan PSU

Output 24V dc 5A.

Input 90 - 264V ac rms
47 - 63Hz

Part Number   20-0030-0-C

20-0030-0-C 174989719

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4 Dominus Way,
Leicester, LE19 1RP, England
Tel: 44 116 2292600
Fax: 44 116 2292604

Software version information

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

Software component version information

Name	Console	Sensor	Details
Console	v3.09	v3.08	Jan 23 2006 / 13:38:31
Navigator	v3.09	v3.08	Nov 11 2005 / 12:48:37
Leveller	v3.09	v3.08	v3.08 / Simulation / Navigator
Scanner	v2.93	v2.93	v2.93 / Rotor: 0 / Fpga: 0
Parameters	v3.00	v3.00	220 bytes
Calibrations	v3.00	v3.00	746 bytes
Locations	v3.00	v3.00	

Using the System

CyScan User Console provides an intuitive environment that allows you to quickly assess and control the functions of the CyScan system. This section provides full information about the options and procedures within the CyScan Console program.

Start up

To enter CyScan User Console

1 Ensure that the CyScan sensor is powered on and running correctly.

2 Locate the CyScan User Console icon and double click it ➪
(or run the CyScan User Console application from
Start > Programs > CyScan > CyScan User Console).

CyScan
Console

3 The Console display screen will appear. After a brief initialisation period indicated by a progress dialog, the sensor will begin operation and its scanning results displayed on screen.

Suspend, exit or reset communications

CyScan User Console offers you three options for shutting down, suspending or resetting the sensor communication link. These options are accessed via the CyScan button in the lower left-hand corner:

- **Suspend** - Places the sensor into a 'sleep mode' whereby 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, the CyScan sensor and the DP unit.

To suspend, exit or reset communications

1 Click the 'CyScan' button in the lower left corner of the screen (this button is unavailable while navigating). A dialog box will be displayed:

2 Click the down-arrow to reveal the three options. Select the required option and click the OK button.
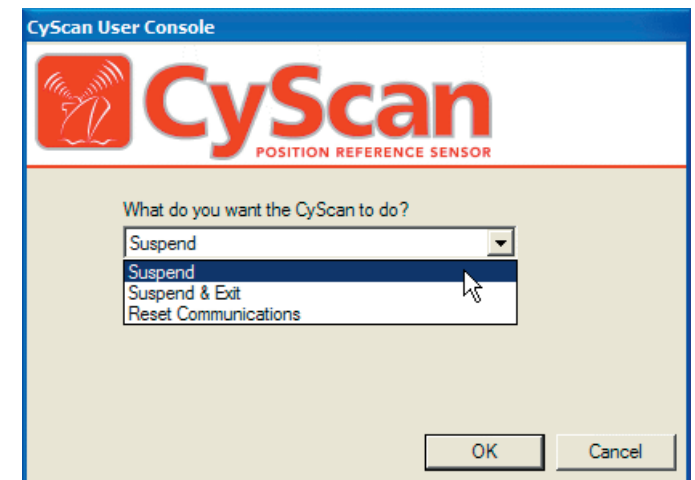
Screen layout

The CyScan User Console screen has five key areas:

- The Sensor display
- The Navigation section
- The Status bar
- The Property sheet
- The Button bar

Positional data display

Navigation section

This section provides navigation information in a simple clear manner whenever navigation mode is invoked and a multi-target group is successfully located.

Sensor display

A large circular area, rather like a radar sweep display, that shows the relationship between the CyScan vessel and any targets that are in view.

Property pages

Provides detailed information on a number of different topics and uses five tabbed pages to group information.

Button bar

A collection of nine buttons that provide, or control, a range of functions.

Status bar

Provides important feedback information on various topics and displays the date and time that the situation was first reported.

The pages that follow provide explanations of each of the five key screen areas and the elements presented within them.

Sensor display

This circular area shows the relationship between the CyScan vessel and the targets of the current multi-target group. There are a number of key elements within the Sensor display:

Reflection images

Tilt-direction and tilt-angle

Multi-target reference frame

CyScan vessel

Range circles

Blanking zone
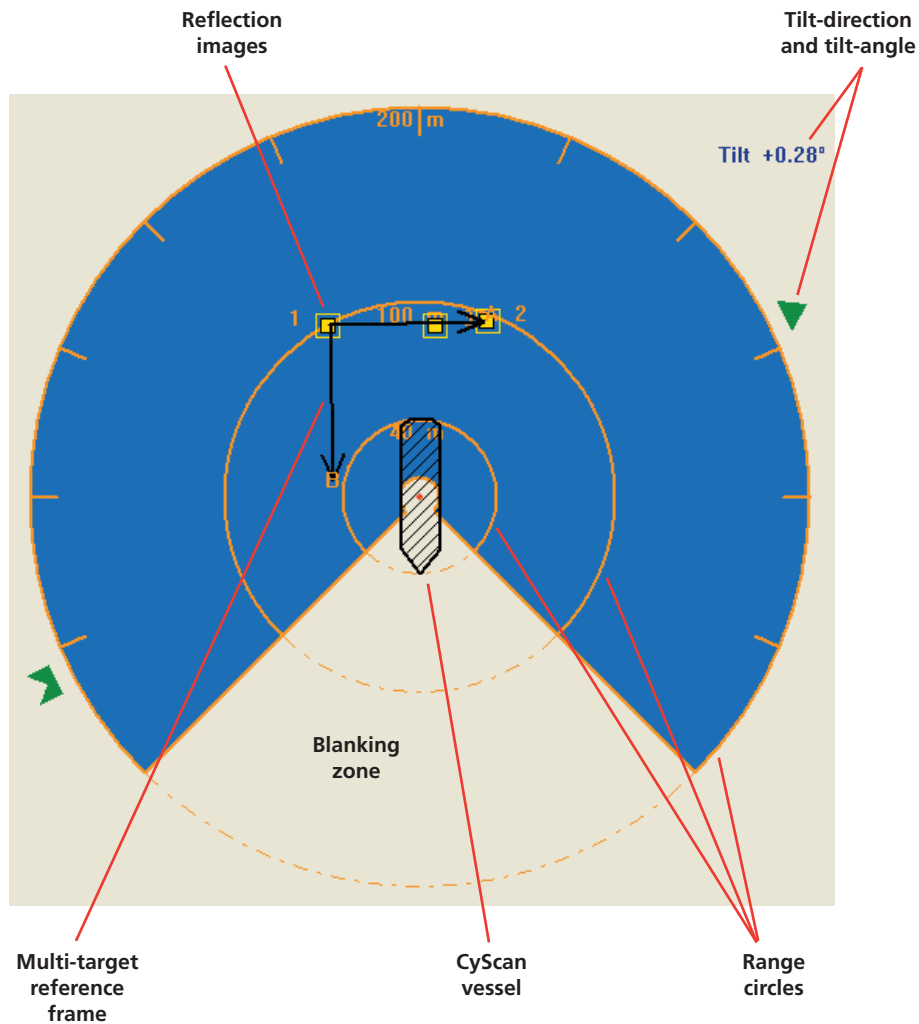
CyScan vessel

The CyScan vessel image is shown, as determined by the setting in the Display options, either as an outline or a solid filled shape, with a distinct bow and stern, or alternatively the vessel image may be switched off – see Display options.

Depending upon the chosen display option, the centre of the Sensor display will either represent the CyScan vessel, or the target origin of the current multi-target group – see Display options.

Blanking zone

Shows the angular area, within each revolution of the sensor rotor, where the laser is switched off. This 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 particular requirements – see Blanking Zone.

Range circles

A series of radiating labelled concentric circles provide a visual indication of the proximity of the CyScan vessel to the multi-target group. Use the Zoom in and Zoom out buttons to change the scale of the display.

Multi-target group reference frame

Indicates the A-B axis that the CyScan system uses to define the positions of each target, relative to the origin of the multi-target group. This axis can be included/excluded from the display as required – see Display options.

Tilt-direction and tilt-angle

These dynamically indicate the amount of tilt, and in which direction, the CyScan sensor is currently applying, in order to keep its rotor at a set level. The arrow head and tail infer the up/down tilt attitude using colour, when the arrow is:

- Green – the scanner is tilting upwards,
- Grey – the scanner is level,
- Red – the scanner is tilting downwards.

When manually adjusting the tilt-angle and tilt–direction, the outer arrow head follows the cursor to apply the necessary offsets – see Scanner Tilt Adjustment.

Target images

All reflectors that are seen by the sensor are displayed as yellow squares. During navigation, red or yellow boxes are drawn around reflections to show how they are associated with the selected targets. A yellow box indicates strong association, whereas a red box indicates poor or no association.

Navigation section

The upper right corner of the screen provides navigation information in a clear manner whenever navigation mode is being used.

Positional display
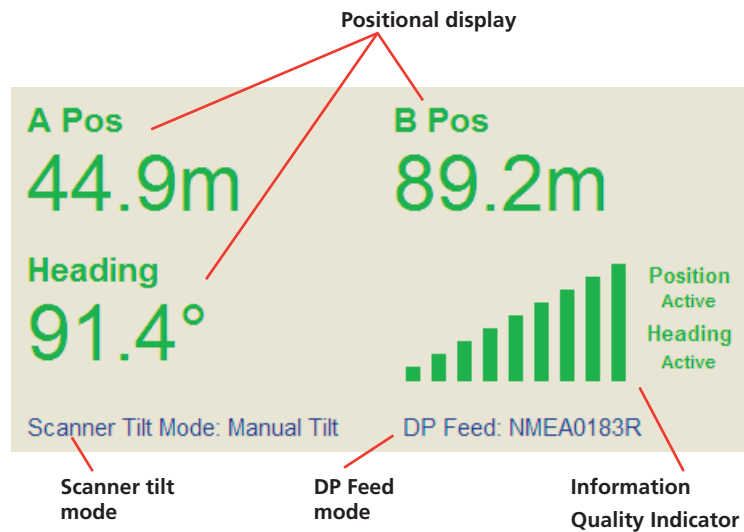
Positional display - Range, Bearing and Heading

- For NMEA0183 DP feed types in single target operation, this display will show distances along Bow and Starboard axes. Heading information is not available in single target operation.

- For NMEA0183 DP feed types in multi-target operation the range is displayed along A and B axes determined by the multi-target group configuration and Heading is calculated relative to the axes origin, i.e. target 1.

- For ASCII17 DP feed types, Range and Bearing data are shown relative to the single target or primary target (in multi target operation).

Information Quality Indicator

This graphical representation provides a quick indication of the confidence that the system has in the quality of the position data being generated. The more bars shown (red, then orange, then green), the better the information. The colours of the A/B/Heading data display change according to the quality of the information. The status of the Scanner Tilt Mode and DP Feed are also displayed.

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 satisfactory.

Double click on the Time and Date portion of the status bar to adjust the current system time and date settings.
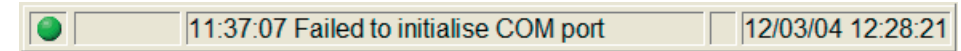
Status bar buttons

To the left of the status bar are two buttons:
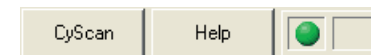
CyScan

Click this button to view the Control dialog. From here you can

- **Suspend** - Places the sensor into a 'sleep mode' whereby the rotor ceases spinning and the scanner tilt returns to a fixed state. However, upon the resume command, the unit will return to full operation.

- **Suspend & Exit** - Shuts the Console software application but maintains power to the sensor. Upon starting the application the unit will return to full operation. This mode is suitable for use when travelling between mooring locations.

- **Reset Communications** - Re-initialises the communication links between the CyScan sensor, the PC and the DP unit.

Help

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

Property pages

This area of the CyScan User Console screen provides detailed information on a number of different topics. The property sheet uses tabbed pages to group information and has six tabs:

Alarms page - Lists any messages received from the various component units of the CyScan sensor. These are classified into four types of alarm which are, in increasing order of severity:

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

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.

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

Deleting alarms from the current list will move the alarms to the Historic list. Deleting them from the Historic list will discard them permanently.
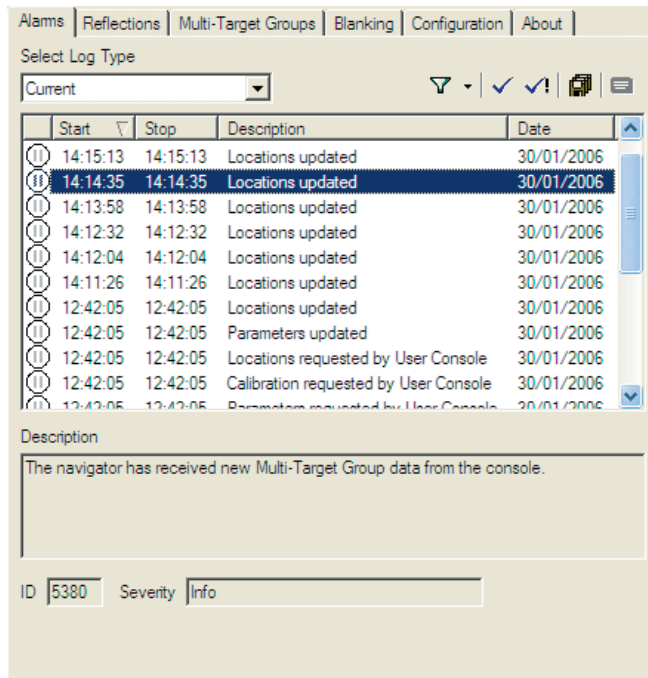
Reflections page - Provides a numeric list of the reflections received during the last complete revolution of the sensor rotor. This page can be used to verify the graphical representation of reflections shown within the Sensor display.

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 for details.

Note: 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 section Scanner tilt adjustment later within this guide.
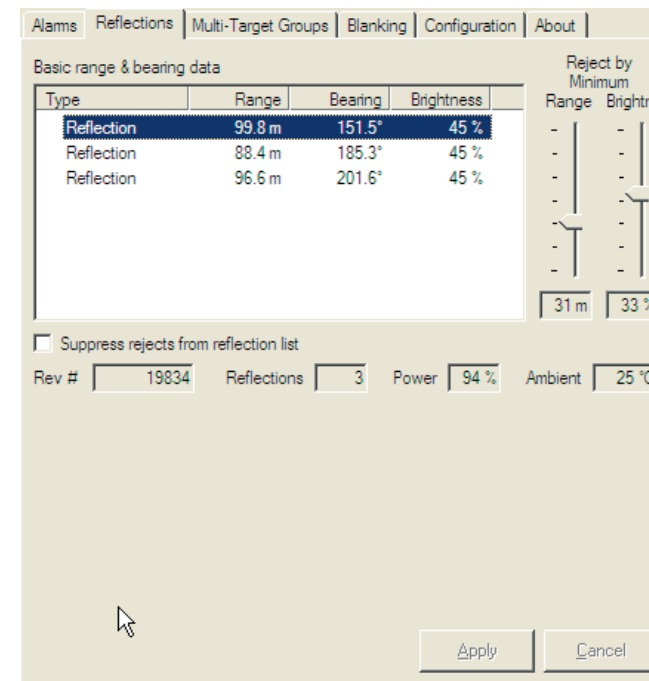
Note: The two rejection sliders are not available if the CyScan sensor has firmware version 3.07 or below.

Multi-target group page - Lists all currently stored multi-target groups and the targets that are defined within each. A blanking zone and scanner tilt bearing are defined for each multi-target group. Within this page you can manually edit any aspect of an existing multi-target group and its targets.
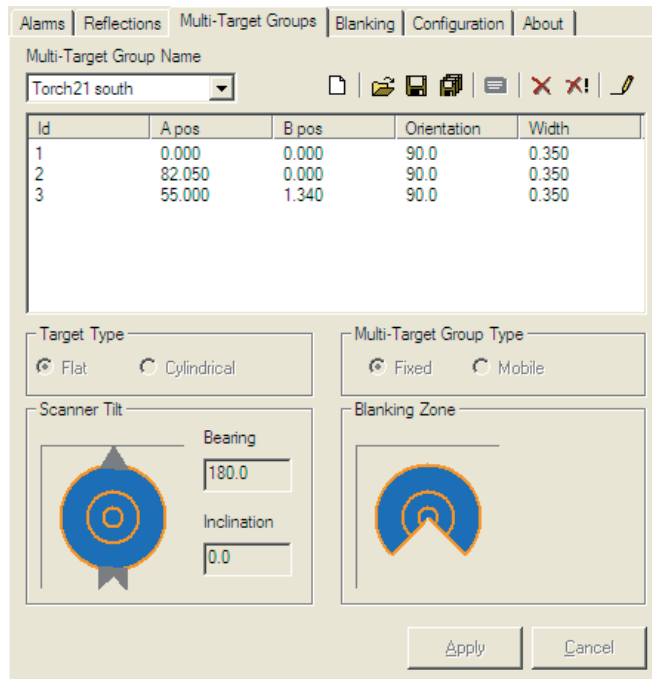
Blanking page - Provides a quick method to select an appropriate blanking zone for the current CyScan installation. This is one of two ways that the blanking zone can be adjusted. For further details, please refer to the section Blanking zone.
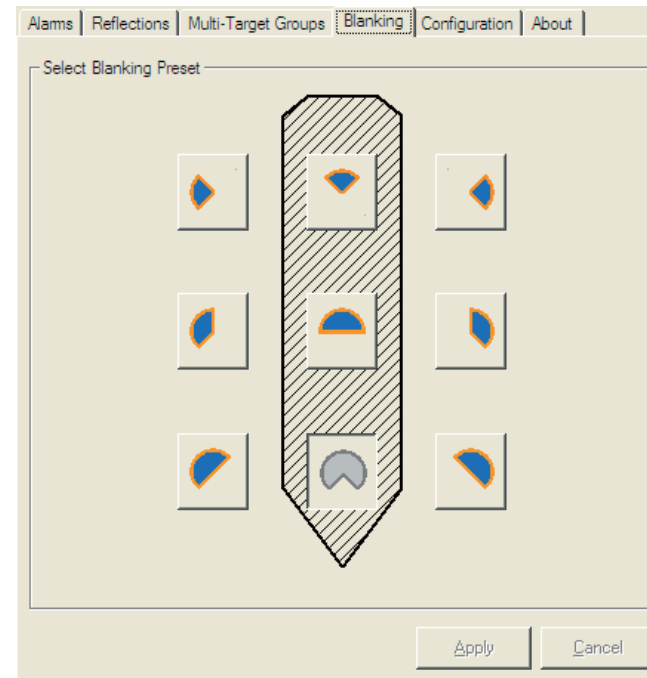
Configuration page - Contains two options, the first of which allows you to change the screen colour contrasts between Day and Night modes. The remaining option, *DP Feed Type*, does not usually require adjustment during normal operation, however, this will depend on your DP manufacturer's recommendations. This page also indicates the name of the vessel, the serial number of the CyScan unit and the version numbers of all installed software components – these items are for information only and are not editable.

Range & Bearing Only In Single Target navigation with NMEA feed types the default is to display position in a Bow Starboard axis frame. This option switches the display to one of Range and Bearing to the selected target. To implement tick the box and click the apply button. The DP message string is unaffected.

Extended Dialogs In normal user mode this option displays additional information in the Reflection property page related to the optical system. For more information please refer to Extended pulse data.
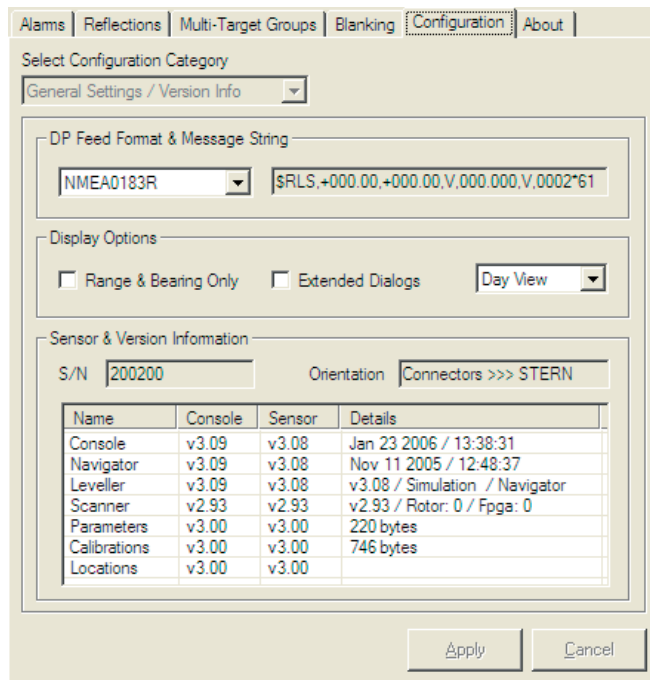
⇨ **Single Target Display - Range & Bearing**
The default display mode for Single Target is to present the position of the sensor vessel in metres along Bow and Starboard axes with origin at the target.
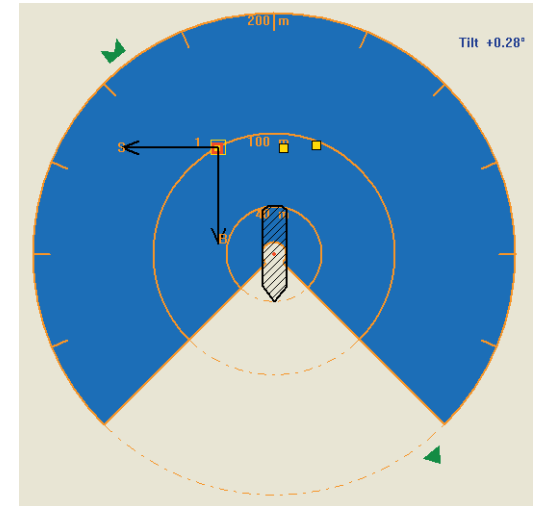
By selecting the *Range & Bearing* option on the Configuration page, the display is changed to the distance and the bearing of the target from the vessel.

Note: Selecting either option has no effect on the message strings that are sent to the DP system.
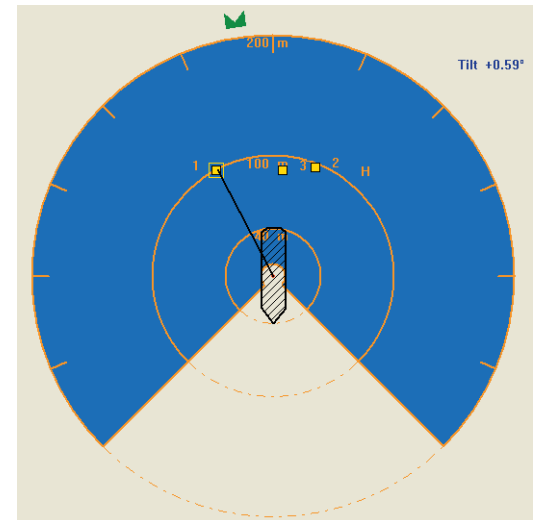
About page - Indicates the software version and copyright details. It also allows you to invoke the temporary service access mode in order to adjust certain settings - please refer to the section Entering service access mode for further details.
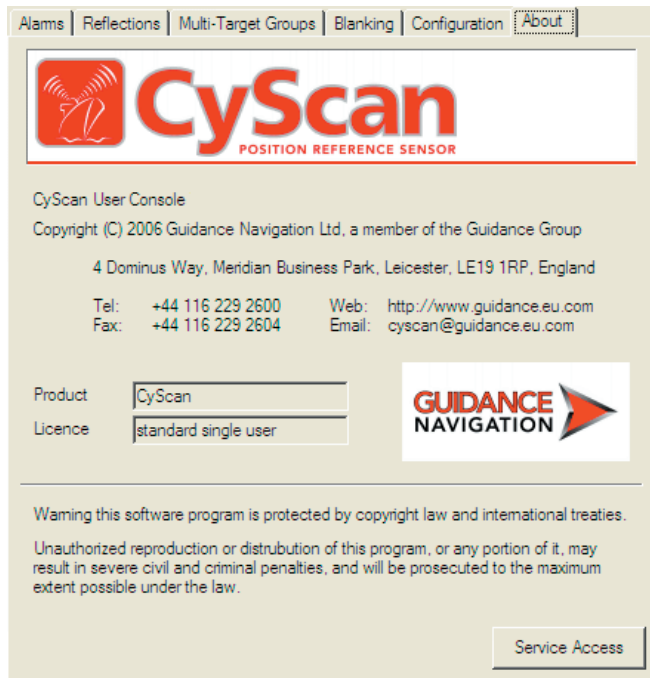
Using the on-screen keyboard

In order to accommodate keyboardless computers, CyScan Console provides an on-screen keyboard option which permits you to enter text using only a mouse pointer. You can activate the on-screen keyboard wherever you see this icon: ▦. This icon is found within the property sheet area on the following pages: Alarms, Multi-target groups and certain Configuration pages (when in service access mode). If the icon is greyed out ▦ then the on-screen keyboard feature is disabled.

Note: As standard, the on-screen keyboard feature is disabled as most installations are made onto systems that do include keyboards. Please refer to 'To enable the on-screen keyboard feature' for more details.

When displayed the on-screen keyboard appears as a floating window (as standard it is set to remain 'Always on Top' of all other applications - this can be changed using its Settings menu).

To use the on-screen keyboard

1 Click the ▦ icon to display the on-screen keyboard.

2 Select an item within CyScan Console that requires text entry or editing.

3 Click the necessary keys on the on-screen keyboard.

To enable the on-screen keyboard feature

Note: This procedure can only carried out when using Service Access mode, for which you require a restricted authorisation code.

1 Enter Service Access mode using a temporary service access code.

2 View the *Configuration* page tab within the Property sheet.

3 Click the down arrow of the *Select Configuration Category* box and select the *Communications / Display Options* entry.

4 Tick the option *Enable On-Screen Display*.

5 Click the Apply button.

Button bar

A collection of nine buttons that provide, or control, a range of functions. When a function is not available, the button image will fade and become unselectable:

Stop navigation
Click to cease sending live positional data to the DP system.

Zoom out
Increases the displayed area

Display options
See below

Sensor operations
See opposite

Cancel
Click to discard any current changes and revert to the previous setting.

Start navigation
Click to begin a sequence of steps that leads to the CyScan system providing live positional data to the DP system. After selecting this button, you will be requested to select a stored multi-target group or single target.

Zoom in
Decreases the displayed area.

Alarms
Becomes available when one or more alarms have occurred, click to view the Alarms page within the Property sheet in the lower right corner of the screen.

Apply
Click to accept the current changes.

Display options

Click to view a list of options that determine the elements within the sensor display:

- **Show Bearing Axis** – display/hide the tickmarks 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 range and target labels within the sensor display.
- **Show Reflections** – display/hide the markers representing the reflections received by the CyScan sensor.
- **Show Targets** – display/hide the association boxes that are superimposed on the reflection squares.

Display options (continued)

- **Show Blanking Zone** – display/hide the angular area within each rotor revolution where the laser is switched off.
- **Show Tilt** – display/hide the tilt arrow and angle label that indicate in which direction, and by how much the scanner is currently tilted.
- **Show Vessel Shape** – determines how the CyScan vessel is represented on the sensor display – the options are: Off, Outline and Filled.
- **Display Centered On** – when navigating on a multi-target group, this selects whether the centre of the scanner display is affixed to the origin target of the current multi-target group ('Multi-Target Group Origin') or follows the 'Cyscan Vessel'.

Sensor operations

Click to view a list of configuration options that include:

- **Align Multi-Target Group** – allows rotation of the entire multi-target group data set so that the axis frame superimposed by the CyScan system aligns with true North/East. Consequently, when navigating, the reported position will be given in true northings and eastings. Refer to the Align multi-target group section.
- **Create Multi-Target Group** – defines a new multi-target group by individually selecting a series of reflections from the sensor display.
- **Set Blanking Zone** – sets the angular area within each rotor revolution where the laser is instructed to switch off and not search for targets.
- **Set Manual Tilt** – controls a preset tilt value in a particular direction for the CyScan sensor. Such an operation is typically necessary when station-keeping close to a platform where the targets are mounted high and the CyScan sensor must be made to 'look up' for them. *Note: Scanner tilt presets are only possible when the 'Select Tilt Mode' setting is 'Manual Tilt'.*
- **Select Tilt Mode** – enables or disables the scanner tilt and to apply an offset. For more information, refer to the Scanner tilt mode section.

Using multi-target groups

A multi-target group is the collective name for two or more targets located on a platform or target vessel, to which the CyScan vessel will approach and/or station-keep. CyScan User Console can store target information for many different multi-target groups and new ones are added using the *Create Multi-Target Group* option.

Creating a new multi-target group

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

Note: Please refer to Technical Note 2 for details about the optimum spacing of three or more targets.

To create a new multi-target group

Note: New multi-target groups cannot be created while CyScan User Console is currently navigating.

1   Click the Sensor Operations button and from the pop-up list, select the 'Create Multi-Target Group' option.
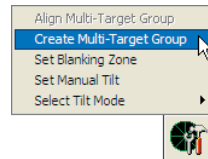
2   Within the sensor display, click on one of the yellow target images.

Consider the following when selecting target:

- The first target that you select will form the origin point for the multi-target group. The positions of the other target(s) will be calculated relative to that origin point.

- If more than two targets are used, select the far right or far left one as the origin.

- Use the zoom in or zoom out buttons to select an appropriate view where you can see all of the targets.

- The pointer changes to cross hairs when it is positioned near to, or over, a target.
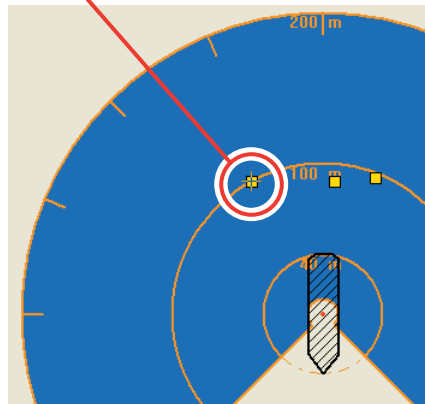
3   Again using the pointer, click on a second target image. Choose one that is a reasonable distance from the origin target.
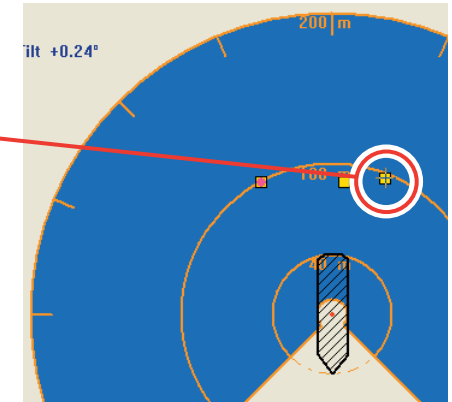
An A-B axis will now be superimposed on the Sensor display, relative to the chosen targets.
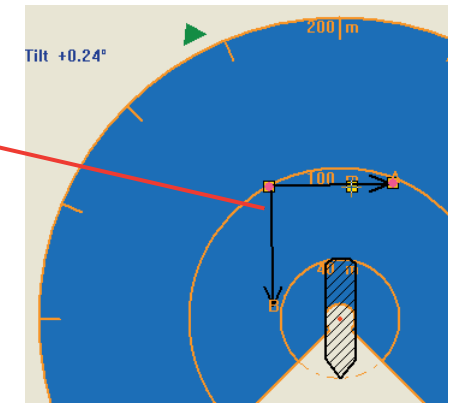
continued

4 If required/available, up to three more targets can be selected in turn.

Note: CyScan navigation accuracy can be improved by the addition of more targets (up to a maximum of five) where the target spacings differ greatly, i.e. 10m spacing between one pair, 20m spacing between the next, etc. This helps CyScan to differentiate between targets with greater precision.

If unique spacing between the targets isn't given, then it is better to operate with fewer (say 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 superfluous 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 - refer to the section Blanking zone.
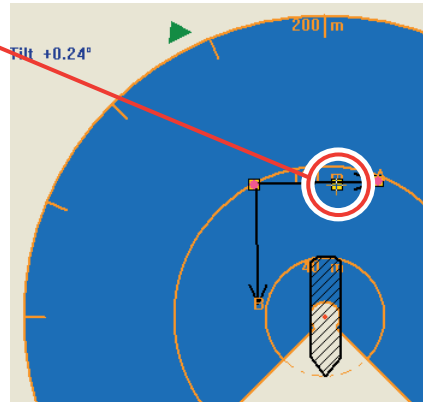
5 When all required targets have been selected, click the Apply 'tick' ✔ button.

Attention will now switch from the Sensor display to the 'Multi-Target Groups' page of the property sheet in the lower right corner of the screen. The coordinates and other details of all surveyed targets will be displayed here along with an automatically generated name for the new multi-target group.

Id	A pos	B pos	Orientation
1	0.000	0.000	90.0
2	82.030	0.000	90.0
3	54.990	1.340	90.0

6 Optionally edit the multi-target group name: Click the multi-target group name to highlight it and then enter your new name.

Note: You can automatically align the multi-target group so that the navigation information given by CyScan coincides with true North/East. For further details, please refer to the section Align multi-target group.

7 Click the [Apply] button to finalise your action.

Aligning a multi-target group

When navigating using a multi-target group, CyScan creates a local co-ordinate frame on which it bases all of its calculations. It is possible to rotate this frame to align with the ship's compass so that when navigating, the reported position will be given in true northings and eastings.

Note: The data to the DP system will change instantly once the alignment is confirmed, hence it is recommended to deselect the CyScan sensor at the DP Console before commencing this operation.

To align a multi-target group

1   Click the ▶ button and begin navigating using the required multi-target group.

2   Click the Sensor Operations 🛠 button to reveal a pop-up list of options.

3   Select the 'Align Multi-Target Group' option. The property sheet will display the Align Multi-Target Group page containing a compass representation.

4   Enter the current heading from the ship's compass, or drag compass needle to the required setting. Click the Apply button and in the subsequent dialog, click 'Yes' to confirm.

After a short pause, the multi-target group frame reference will be rotated and navigation will begin using the new multi-target group frame reference.

Multi-Target Groups | Blanking | Configuration | About | Align Multi-Target Group

Enter the current heading of the vessel according to the compass

91.4   degrees
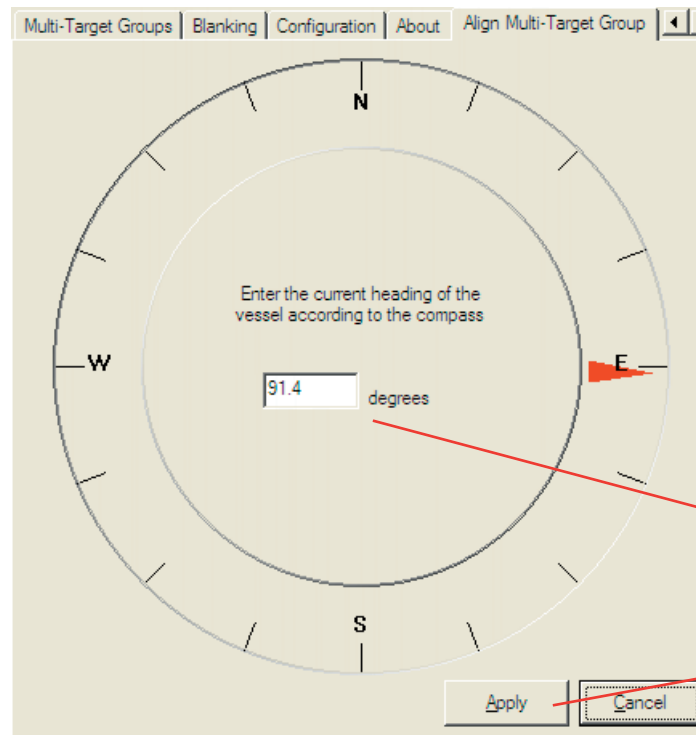
Enter the current heading here from the ship's compass, or drag the compass needle and then click Apply

Apply   Cancel

Navigation: modes

You can choose from two main modes of navigation:

Single target navigation

Single target is the simplest type of navigation as it only requires a single target *(including flat, cylinder, prism or prism cluster target types)* and does not involve the creation of a target group. It is quick and easy to use however be aware that this method has certain limitations as follows:

- Tracking stability will be affected if there is the temporary loss of the target reflection as there is no redundancy.
- If the true target reflection is obscured by vessel operations there is a possibility that the sensor track will jump to another reflection.
- There is no provision for Heading data to be produced.

To start **single target navigation**

Multi-target navigation

The use of multiple targets gives certain advantages over single target navigation and is worth considering whenever suitable targets are available.

The advantages are as follows:

- Improved tracking stability.
- Increased immunity to false reflections.
- Redundancy allowing temporary loss of target reflection.
- Multi-target group settings stored for re-use.
- Provision of Heading data in relation to target group.

To use multi-target navigation a multi-target group must exist for the location or a new multi-target group must be created. If a group exists it will be shown in the pick list when you click the ▶ button.

A new multi-target group can be created whenever the CyScan vessel is in range of the target vessel and two or more targets (up to a maximum of 5) are visible on the console display.

To start **multi-target navigation**

Navigation: single target

To start single target navigation

1 Click the ▶ button to reveal a pop-up list of navigation options.

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). *Note: the most common targets are flat or cylindrical.*

3 In the subsequent dialog, click 'OK' to confirm your selection.

4 Click the cursor on one of the target reflections shown on the sensor display.
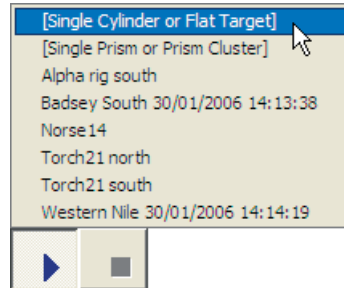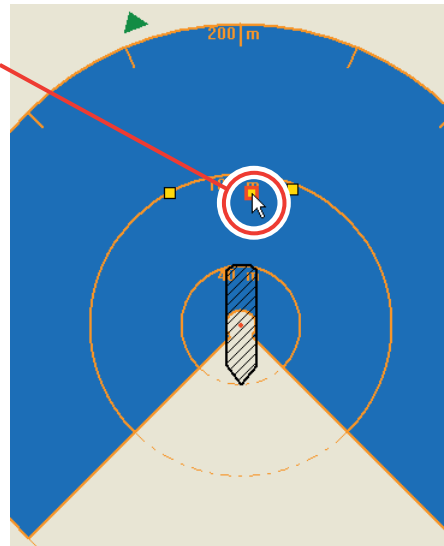
    After a short delay, the navigation data will be determined and displayed.

    Note that only 'Range and Bearing' or 'Bow and Starboard' values will be shown as single target/prism modes cannot provide heading information.

[Single Cylinder or Flat Target]
[Single Prism or Prism Cluster]
Alpha rig south
Badsey South 30/01/2006 14:13:38
Norse 14
Torch21 north
Torch21 south
Western Nile 30/01/2006 14:14:19

To end single target navigation

1 Click 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. The viewed targets will remain shown on the sensor display, CyScan will make no attempt to associate them with the multi-target group information.

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

Information quality indicator

When beginning navigation, the readouts in the navigation section of the screen (top right corner) will initially turn red (to indicate that the positional information received is not yet sufficient).

The CyScan system will improve upon its positional information and as quality increases, the readouts will change from red to amber and then to green. Additionally, the information quality indicator bar graph will show more similarly coloured bars.

Position Active
Heading Active
DP Feed: NMEA0183R

Navigation: multi-target group

To start multi-target group navigation

1 Click the ▶ button to reveal a pop-up list of navigation options. A list of all stored multi-target groups will be shown.

2 Select the multi-target group that matches the vessel/platform that you are currently approaching.

3 In the subsequent dialog, click 'OK' to confirm your selection.

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

Note: 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.
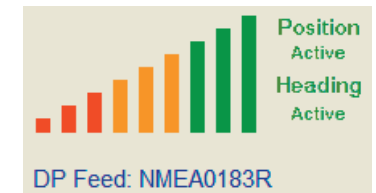

To end multi-target group navigation

1 Click 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. The viewed targets will remain shown on the sensor display, CyScan will make no attempt to associate them with the multi-target group information.

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

Information quality indicator

When beginning navigation, the readouts in the navigation section of the screen (top right corner) will initially turn red (to indicate that the positional information received is not yet sufficient).

The CyScan system will improve upon its positional information and as quality increases, the readouts will change from red to amber and then to green. Additionally, the information quality indicator bar graph will show more similarly coloured bars.
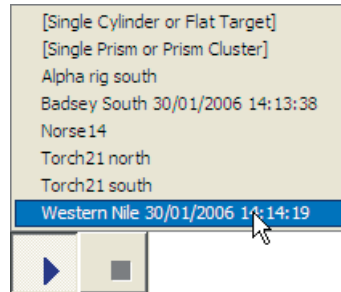
Alarms

During operation, the CyScan system produces an event audit trail in the form of alarms from its various constituent components. 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 page tab of the property sheet.

To assist with quick recognition of the various alarm types, a colour coding scheme is employed. The triangular and square symbols used to represent the start and stop points of each alarm condition are represented in three colours to indicate their severity:

- Information   Grey
- Warning   Orange
- Fatal and Error   Red

As an alarm condition occurs, its entry is appended by a start symbol in the relevant severity colour. When the condition is resolved, the entry is appended with a stop symbol.

The Alarms page offers two key features to assist in the display of applicable alarms. These are the Alarm filter and the Alarm History.

Using the alarm filter

This allows you to choose which types of alarms (of the four categories) to display within the Alarms page. As standard the filter is activated with only the 'Information' alarms un-ticked to conceal them. To use the alarms filter:

1 View the Alarms page within the Property sheet (in the lower right corner).

2 Click the right side of the two-part 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/uncheck them as necessary – *Note: Alarm types that are ticked are shown in the alarms list, un-ticked items are hidden.*

4 To enable/disable the filter, click the left side of the two-part filter button. The filter is active whenever the right side of the filter button is 'pressed in'.
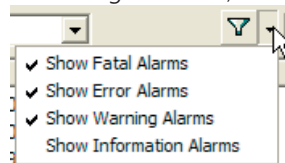
Using the historic alarm list

The Alarms page has two alarms lists. The 'Current' list is where new alarm reports (since the last start of the console software) are automatically stored as they occur. In addition, a 'Historic' list allows you to clear the Current list and transfer its alarms so that you do not lose potentially important diagnostic feedback. On shutdown, current alarms are automatically transferred to the Historic list.

To accept alarms in the current list

1 View the Alarms page tab within the Property sheet and check that the 'Select Log Type' entry shows 'Current'.

2 Select the alarms that you wish to move into the Historic list:
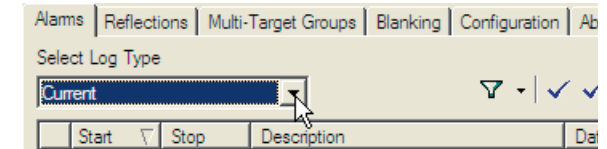
- **To accept one alarm** - click the alarm entry and click the ✔ button.

- **To accept two or more** - hold down the CTRL key, click the required alarm entries and click the ✔ button.

- **To accept all alarms** - click the ✔! button.

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

To clear the historic list

Items in the Current list cannot be deleted, they may only be moved to the Historic list. Once there, however, they may be erased.

1 View the Alarms page tab within the Property sheet and check that the 'Select Log Type' entry shows 'Historic'.

2 Select the alarms to delete:
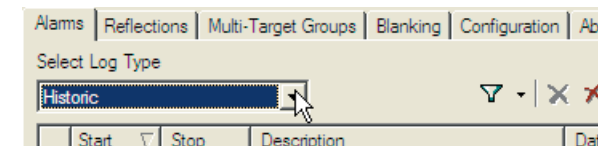
- **To delete one alarm** - click the alarm entry and click ✘.

- **To delete two or more** - hold down the CTRL key, click the required alarm entries and click ✘.

- **To delete all alarms** - click the ✘! button.

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

To export an alarms list

1 Click the Export alarms button to export all alarms to a text file.

Rejecting unwanted reflections

In certain approaches or station keeping situations, there may be unwanted reflections that could cause confusion to the CyScan system. The reflections property page provides two sliders which allow you to set minimum thresholds for range and brightness. Once set, any reflection that does 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.

- The Range value can be adjusted between 10m and 70m

- The Brightness value can be adjusted between 0% and 60%

Rejection settings can be adjusted at any time, whether the CyScan Console is navigating or not.
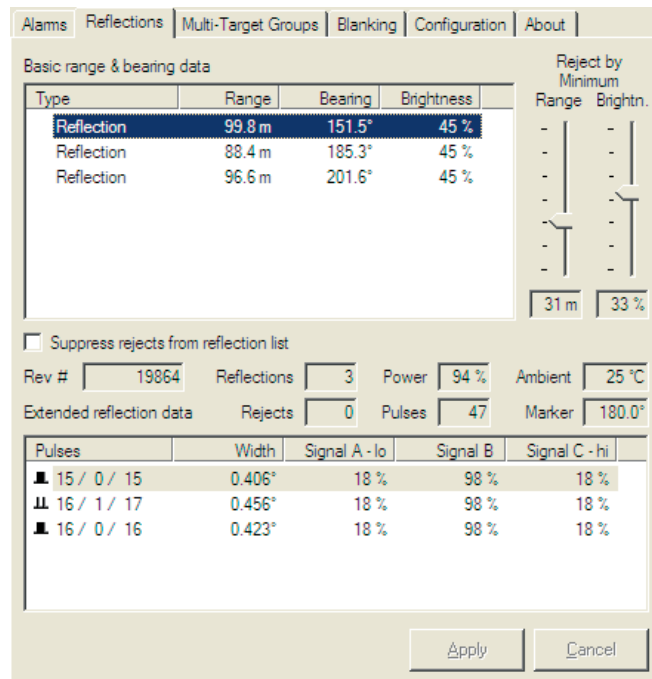
Type	Range	Bearing	Brightness
Reject	99.8 m	151.5°	45 %
Reflection	88.4 m	185.3°	48 %
Reflection	96.6 m	201.5°	48 %

Reject by Minimum: Range — , Brightn. 46 %
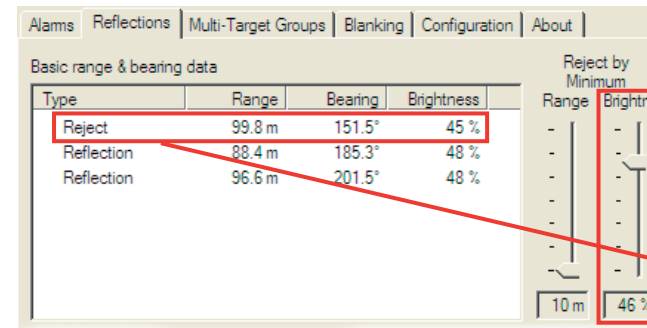
The minimum brightness setting of 46% has caused the first reflection in the list to be rejected and to be marked in red on the scanner display.

Type	Range	Bearing	Brightness
Reflection	99.8 m	151.5°	45 %
Reflection	88.4 m	185.3°	45 %
Reflection	96.6 m	201.6°	45 %

Reject by Minimum: Range 31 m, Brightn. 33 %

Suppress rejects from reflection list

| Rev # | 19864 | Reflections | 3 | Power | 94 % | Ambient | 25 °C |
| Extended reflection data | | Rejects | 0 | Pulses | 47 | Marker | 180.0° |

Pulses	Width	Signal A - lo	Signal B	Signal C - hi
15 / 0 / 15	0.406°	18 %	98 %	18 %
16 / 1 / 17	0.456°	18 %	98 %	18 %
16 / 0 / 16	0.423°	18 %	98 %	18 %

Apply Cancel

Note: The two rejection sliders are not available if the CyScan sensor has firmware version 3.07 or below.

Tilt +14.36°

200 m
100 m

To adjust the reflection rejection settings

1 Using the mouse, click and drag the required slider to the threshold value that causes the unwanted reflection(s) to be rejected but leaves the desired reflections intact.

2 Click the Apply button.

Scanner tilt controls

The Scanner tilt forms a key component within the CyScan sensor and ensures that the scanning rotor remains at a predetermined level. In each of the three active tilt modes, motion sensors and a two axis tilt drive mechanism will actively and automatically compensate for vessel pitch and roll due to wave action.

Scanner tilt mode

The scanner tilt mechanism can either be Disabled or operated in one of three active modes as follows:

- **Zero Tilt** – the scanner tilt automatically maintains the rotor at a horizontal position by compensating for the action of waves and vessel movement.
- **Manual Tilt** – this mode is used when it is necessary to tilt the angle of view in order to optimise/maximise the brightness of the reflection being returned by the target. As a rule, the stronger the reflection the better for stable navigation with CyScan.

The current tilt mode is displayed above the top left corner of the property page.
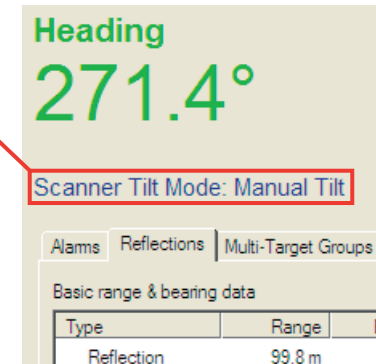
To change the scanner tilt mode

1 Click the Sensor Operations button to reveal a pop-up list of options.

2 Click 'Select Tilt Mode' and then choose the required scanner tilt option from the sub-menu.

3 Click the Apply tick button and in the subsequent dialog, click 'OK' to confirm your action.
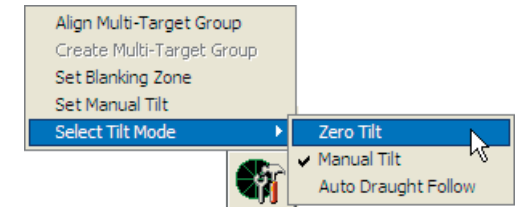
Note: When changing from Zero Tilt to Manual Tilt modes, after clicking the OK button, you will be immediately asked to select the required tilt bearing and angle of tilt. Please refer to the To adjust the tilt bearing and angle *section and follow the instructions from step 3.*

- **Auto Draught Follow** – the scanner tilt automatically adjusts to compensate for draught changes as the vessel loads or unloads.

Manual tilt - scanner tilt adjustment

This feature is particularly useful when CyScan is being used close to a platform and where the target(s) is/are above the sensor. In such cases it is necessary to tilt the sensor upwards so that the centre of the fanned beam is pointing at the target.

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

Extended Pulse Data

This optional display gives extra information on the performance of the system in relation to the target layout. It is accessed by ticking the *Extended Dialogs* in the Configuration page.
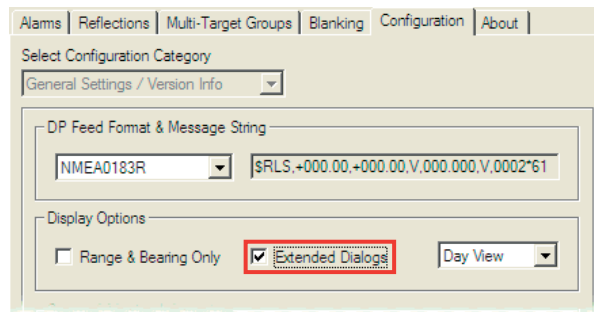
The electronic circuit that receives the reflection divides the beam spread into 3 sectors vertically. These sectors give signals A, B and C.
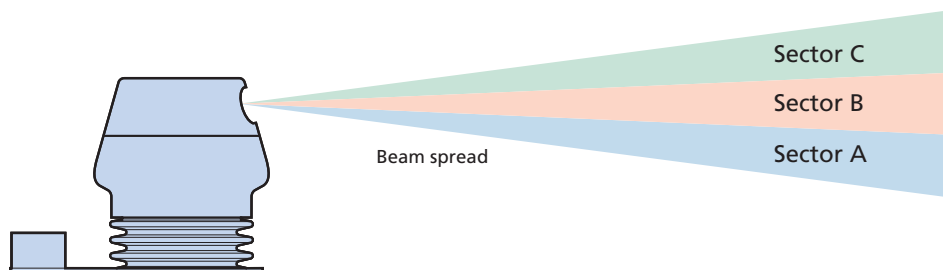
The amount of signal being received in each sector is displayed on the Reflections page (when *Extended dialogs* is selected). Optimally, most of the signal should be seen in the sector B channel. If the sensor is pointing too low then most of the signal will be in sector C and if too high then most in sector A.

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.

The following information is also displayed:

Pulses
This shows the number of pulses received back from each target. In general, the larger the target the more pulses that will be returned. This value will increase as the distance to the target reduces. Two pulse values are displayed: the first value shows the number of pulses that are being used in the position calculation, the second value shows the total number of pulses received during the last sensor revolution. The total number of pulses received during the last revolution is shown in the the Pulses box.

Power
This gives an indication as to the quality of the reflections received. An automatic circuit controls the power output of the laser in order to achieve an adequate reflection from the brightest target without saturating the detector. The maximum value is 100. In practice, when working with good quality targets at ranges of up to say 100 metres the value will be much less than 100.

To adjust the tilt bearing and angle

Note: If the tilt bearing and angle are adjusted while navigating, the new values are applied only to the active multi-target group. However, if the tilt bearing and angle are 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.

1   Check the current tilt mode. The current mode is displayed just above the top left corner of the property page. If the current tilt mode shows 'Zero Tilt' or 'Auto Draught Follow' then it must first be changed to **Manual Tilt**. *See* Scanner tilt controls *for further details.*

2   Click the Sensor Operations 🐾 button to reveal a pop-up list of options. Click on 'Set Manual Tilt'.

3   **Select the tilt bearing** - place the cursor within, or near, the sensor display (the arrow head will follow the position of the cursor) so that the arrow points in the required direction of tilt.

4   When the tilt bearing is correct, click the mouse button to fix the direction.

5   **Select the angle of tilt** – within the area of the sensor display, now move the cursor in and out between the centre of the scanner to the outer edges. As you move the cursor, you will notice a small readout (located just outside the sensor display in the quadrant containing the tip of the tilt bearing arrow) indicating the current angle of tilt.

   The colour of the tilt arrow also indicates the up/down direction of tilt:

   • Green – upwards tilt in the chosen bearing axis - when the cursor is between the middle circle and the outer reaches of the sensor display.

   • Red – downwards tilt in the chosen bearing axis – when the cursor is between the middle circle and the centre.

6   When the tilt angle is correct, click the mouse button to fix the setting.

7   Click the Apply ✔ tick button and in the subsequent dialog, click 'OK' to confirm the new tilt settings.

Heading
271.4°

Scanner Tilt Mode: Manual Tilt

Alarms | Reflections | Multi-Target Groups

Basic range & bearing data

Type	Range	Be
Reflection	99.8 m	1

Tilt +13.00°

Editing Tilt Bearing for the Sensor

Move cursor to required Tilt and Click to select
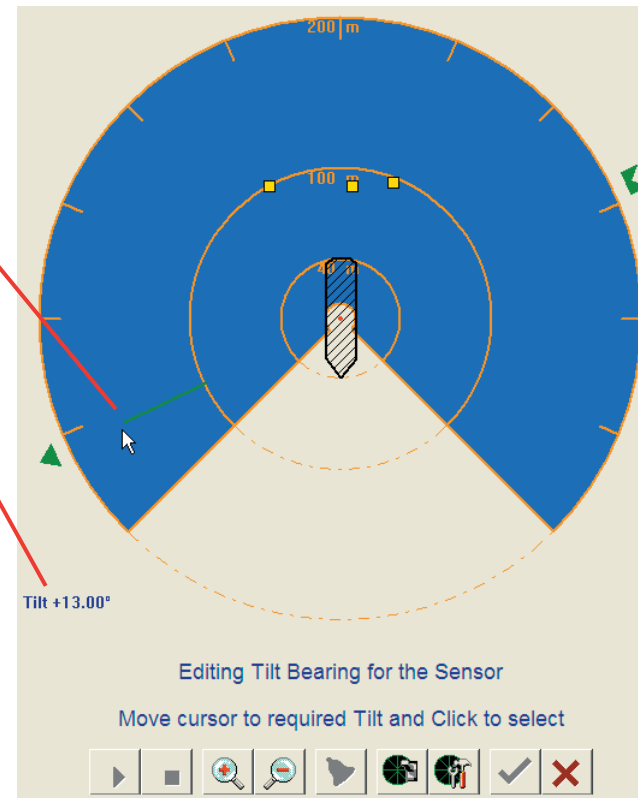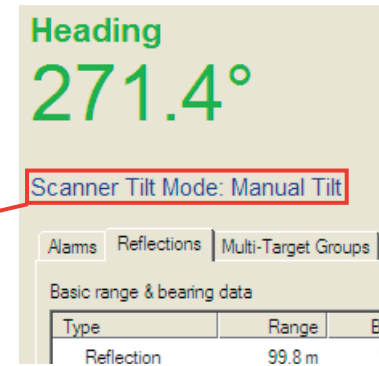
Blanking zone

The blanking zone is the angular area within each rotor revolution where the laser is instructed to switch off and not search for targets. The blanking zone is usually set to cover the angular area occupied by the vessel's superstructure which could, because of its close proximity, cause a strong interfering reflection. Generally, once the blanking zone is set it does not require adjustment during normal operation, however, there may be occasional circumstances where it is necessary.

Note: 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 the blanking zone, either:

- Select a preset zone shape provided within the 'Blanking page', or

- Create a custom zone shape using the 'Set Blanking Zone' option available via the Sensor operations button.

To select a preset blanking zone

Note: 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.

1   View the 'Blanking page' tab within the Property sheet.

2   Click on the blanking zone shape that best suits the current CyScan installation and its field of view.

3   Click the Apply button.

To create a custom Blanking zone

Note: 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.

1 Click the Sensor Operations 🖼 button to reveal a pop-up list of options.

2 Select the 'Set Blanking Zone' option.

Note: The 360^0 sweep of the sensor display is split into 16 segments and the CyScan rotor spins in an anti-clockwise manner. When selecting the start and stop segments for the blanking zone, you must always work in an anti-clockwise direction.

3 Using the cursor, click the first segment where you wish the laser to switch off.

4 Now move the cursor to the final blanking zone segment of the anti-clockwise rotation, where the laser will still be off (i.e. the laser will resume at the beginning of the next segment). As you move the cursor into a new segment, that segment will be blanked so that you can see a representation of the final blanking zone. To fix the zone, click the mouse within the final segment.

Note: The blanking zone must use a minimum of four segments.

5 Click the Apply tick ✔ button and in the subsequent dialog, click 'OK' to confirm your action.

Blanking zone start segment
The first segment where the laser is switched off.

Blanking zone end segment
The last segment before the laser is switched back on.

200 m

Tilt +0.34°

100
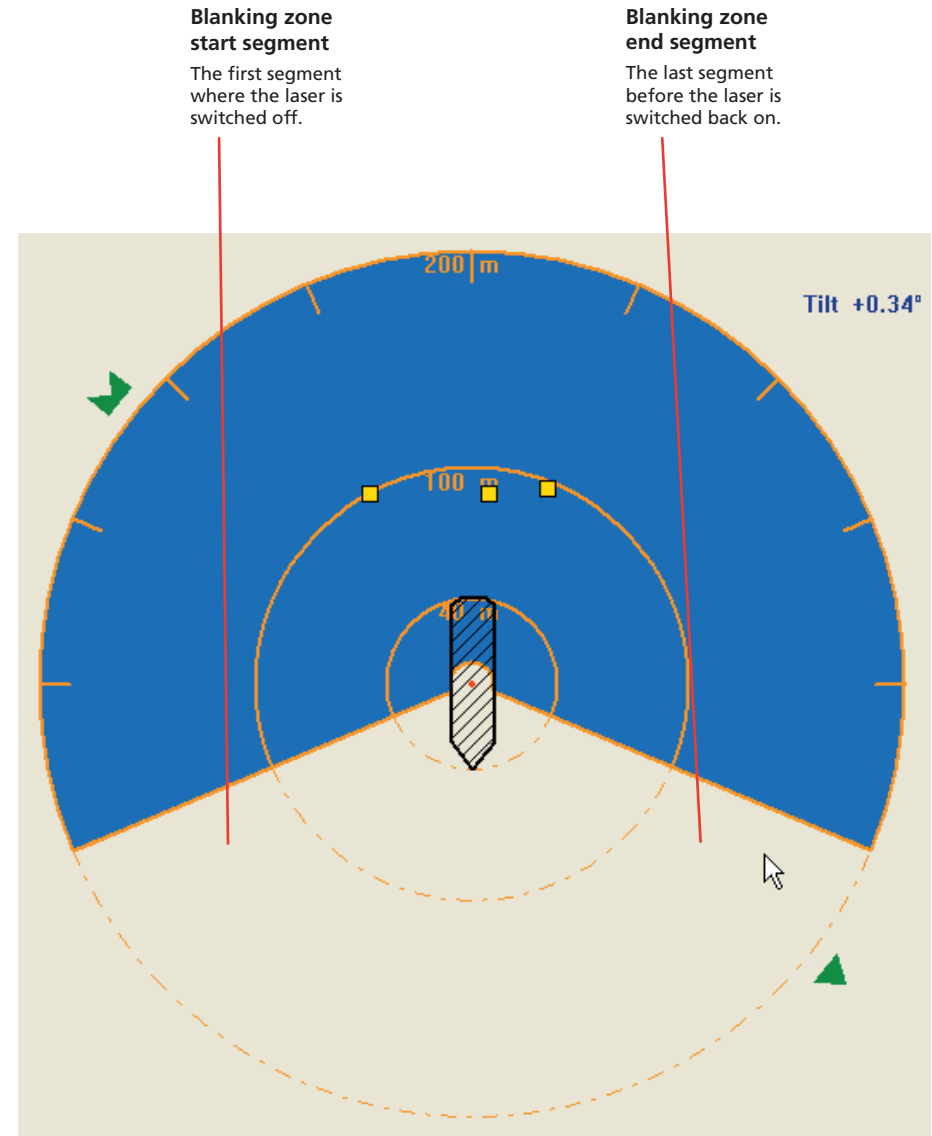
Configuration property page

The Configuration page provides a mixture of CyScan sensor data for troubleshooting purposes and also offers four selectable options:

- **Day View/Night View** - This option is essential in maintaining optimum usability between day and night operations.

- **DP Feed Format & Message String** - This is key to correct operation but which does not usually require alteration during day-to-day operations.

- **Range & Bearing Only** - In Single Target navigation with NMEA feed types, the default is to display position in a Bow Starboard axis frame. This option switches the display to one of Range and Bearing to the selected target. To implement, tick the box and click the apply button. The DP message string is unaffected.

- **Extended Dialogs** - In normal user mode this option displays additional information in the Reflection property page related to the optical system. For more information please refer to the *CyScan Engineer's Guide*.

Day View/Night View

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'.
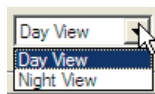
To change the view mode:

1   View the Configuration page within the Property sheet.

2   Click the down arrow of the view box to reveal a drop-down list with two options.

3   Select the appropriate display format and then click the [Apply] button.

'Day' colour contrast setting
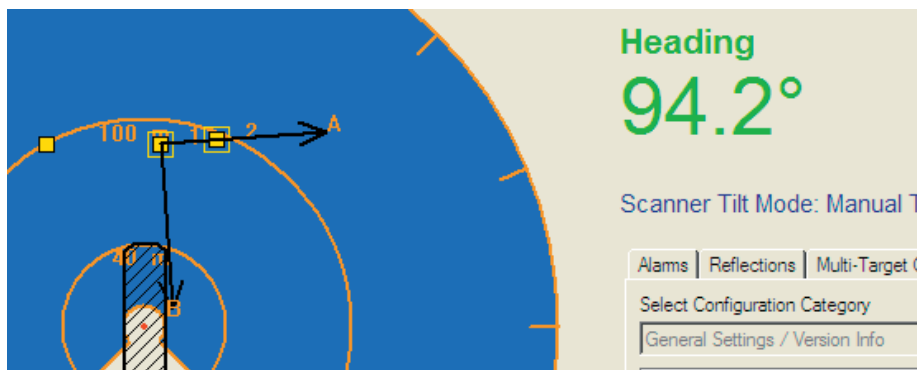
DP feed format & message string

This 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. 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 and variant thereof. 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.

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

To change the DP feed format:

Note: Changes in formats, other than between NMEA and ASCII, can only be carried out in service access mode.

1   View the Configuration page within the Property sheet.

2   Click the down arrow of the DP Feed Format box to reveal a drop-down list of options.

3   Select the appropriate format and then click the [Apply] button.

    Ensure that the DP system is correctly prepared to receive the new message format.
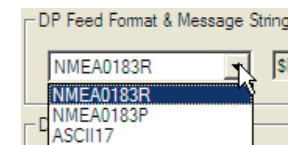
'Night' colour contrast setting
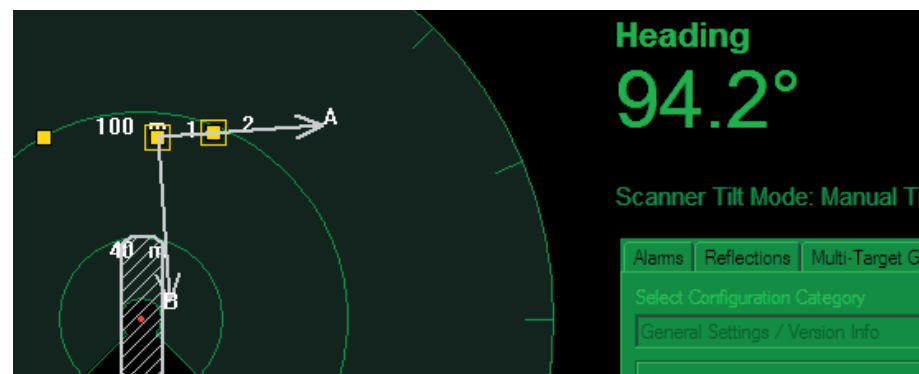
Using log files

Whenever CyScan is navigating it generates a comprehensive set of operation logs which are stored at C:\Program Files\CyScan. These are segmented into folders containing log information for 1 hour periods. These can be accessed for engineer analysis or sent by email to Guidance Navigation or your DP supplier.

When in service access mode, the system logs can be collected manually, without the need to be navigating against a target, by using the control command Alt + L. Once activated, logs are collected until the Alt + L command is used again to deactivate.

Note: For details about temporarily switching into service access mode, please refer to the section Entering service access mode on the next page.
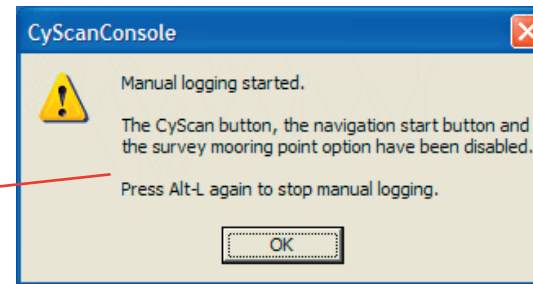
To locate and send a log file:

1   When a sufficient time period has elapsed in which at least one instance of the expected problem has occurred, end the navigation session.

2   Use the 'Start' button and 'My Computer' to access the Local Disk (C:) folders and filing system. Locate the 'Program Files\CyScan' folder.

3   Within the folder, locate the log file whose filename matches the date and time of your session. The name of the folder will include the start and finish dates and times, for example:

    03d05m2004y 20h33m03s to 03d05m2004y 20h33m38s

4   This folder and its contents should be transmitted via email to (support@cyscan.co.uk) or posted on diskette back to Guidance Navigation Ltd where the captured data can be interpreted.

   Note: To compress the whole folder prior to transmission by email, you can make use of the folder compression utility with a right mouse click and by choosing 'Send to compressed folder'. Such compressed folders can be also be decompressed with standard tools such as WinZip.
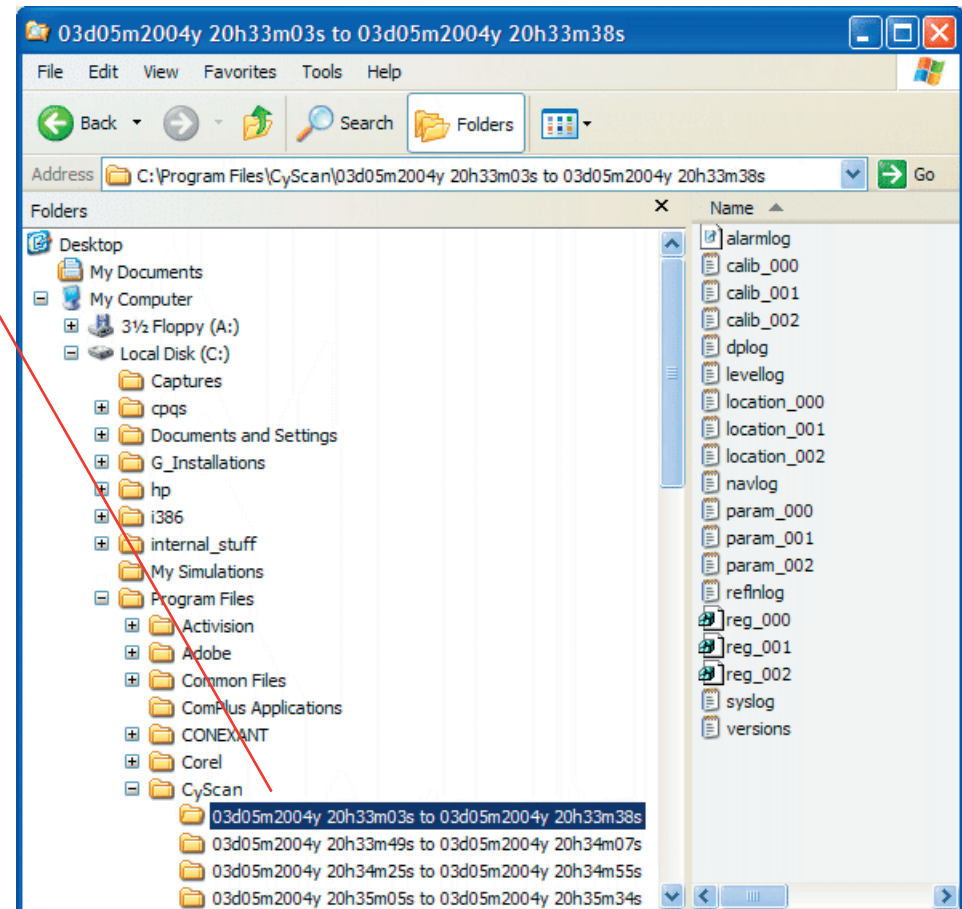
Entering service access mode

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.

❗ IMPORTANT: 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 a qualified technician or Guidance Navigation Limited.

Service access mode can be entered by plugging an engineer USB key into any available USB port on the console computer prior to starting the application. It is recommended that the application be re-started without the key in order to return to normal user mode.

To obtain and use a temporary service access code

1   Within the CyScan Console application, view the *About* page tab.

2   Click the *Service Access* button in the lower right corner of the About page. A dialog will be displayed and will show a Service request code.

   Note: 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.

3   Transmit the service access code to Guidance Navigation Limited (*support@cyscan.co.uk*) or an authorised customer service representative. A corresponding Service access code will be supplied to you. This code is non-transferable and will operate only with current Console system for a limited period.

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

4   Enter the received code into the *Service access code* field of the displayed page and click OK. 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 - you need to re-click the Service Access button within the *About* page.

   Note: The service access code is a 12 digit hexadecimal number [0-9, A-F].

The Configuration page

In service access mode, the Configuration page of the property sheet provides a number of extra items. Firstly, the full range of DP Feed types become selectable within the General category.

Additionally, use the *Select Configuration Category* control to select the *Communications* and *File Transfer/Admin* pages.
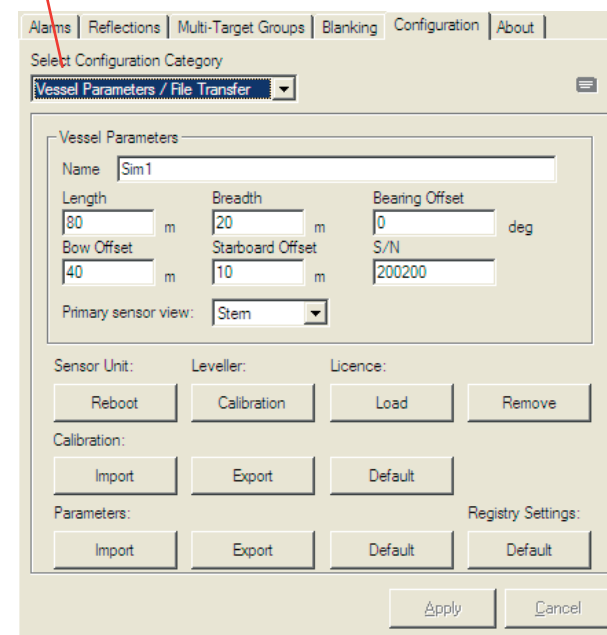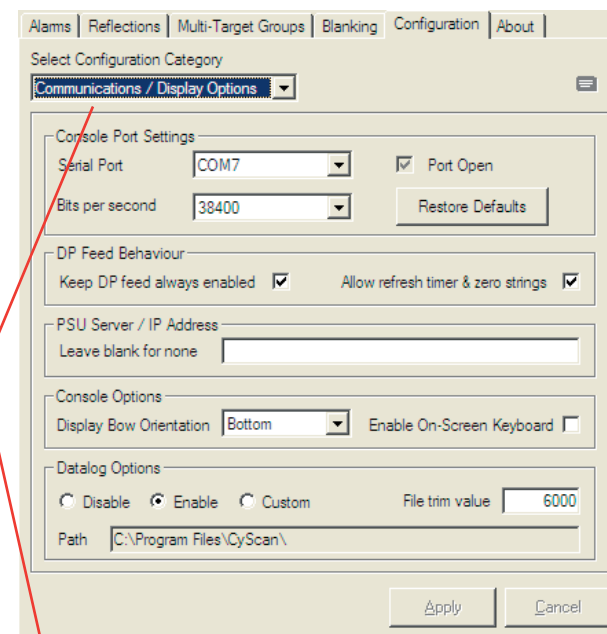
See Using the on-screen keyboard for details.

Troubleshooting

For further assistance

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

If your problem is not listed here or you cannot resolve the issue, then please contact the system installer or equipment provider who are trained to assist with installation and operation problems. A screen dump can be obtained by pressing the F10 key and selecting OK. The location of the file is shown in the dialog box. This image can be sent via email to Guidance Navigation Limited, if necessary.

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

By phone: +44 (0)116 229 2600

By fax: +44 (0)116 229 2604

By email: cyscan@guidance.eu.com

Useful information

This section provides the following useful information:

- Problems and possible remedies
- Alarm codes
- Cleaning the sensor and targets
- CyScan fuse information
- CyScan LED indicators

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.
- Ensure that the LEDs on the sensor unit only show the green LED flashing fast, the yellow and red LED should be off. If this is not the case, power cycle the sensor and observe the LED behaviour.
- Check on the data feed converter that it 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

- The sensor rotor might be prevented from rotating due to mechanical blockage.
  - Investigate and remove blockage.
- Check the LEDs on the system unit. Ensure that the red LED is not on. Otherwise there is a hardware fault; power cycle the unit and observe LED behaviour.
- Check for ice build up between rotor and gearbox cover. Remove any ice which may be present.
- Check that the red locking pins used in transit have been removed.

Rotor rotates slowly

- When switched on from cold at low temperatures the unit may rotate slowly for several minutes before building up to normal speed of 1 rev per second.

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

- Check that the blanking zone is configured correctly.
- Clean lenses of CyScan unit. Please refer to the section 'Cleaning the CyScan Sensor' on the next page.
- Check that the 'Show Reflectors' option in 'Sensor display options' is selected.
- 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 appears to be operational, however, it is exhibiting erratic behaviour with communications locking up occasionally

- Check that the external supply voltage, supplied via the Power cable, to the sensor has not dropped below 18V.

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 lenses 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 4 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.

In addition a special category of tilt alarms in the code range 6xxx can occur in any of the four classifications above. These will signify events that are associated with the sensor rotor and tilt mechanism and can provide diagnostic information about hardware issues.

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

CyScan fuse information

The CyScan system contains two fuses, their locations are:

- Inside the Power Supply Unit casing on the AC input
- On the Controller PCB within the CyScan sensor housing on the DC input

Power supply fuse
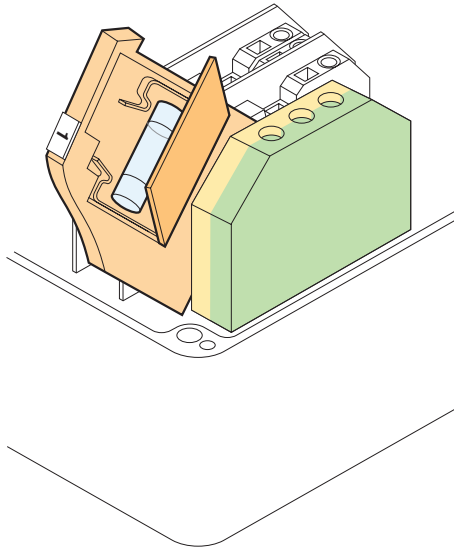
Fuse specification:

20mm

4A rating

Slow Blow

Controller PCB fuse
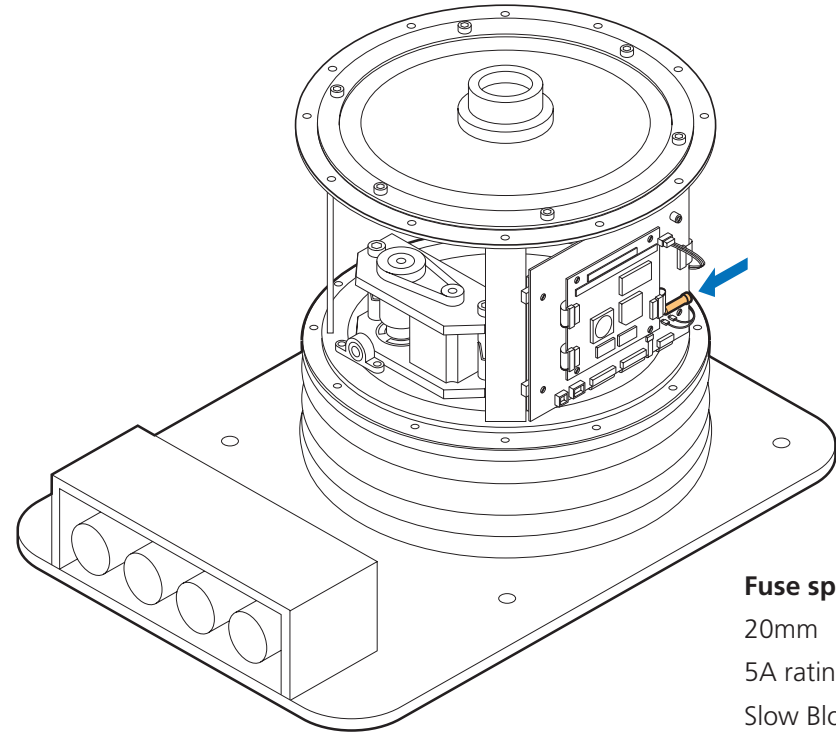
Fuse specification:

20mm

5A rating

Slow Blow

Please refer to the Engineer's Guide for details on how to gain access to the controller PCB.

CyScan LED Indicators

To provide instant status information, the CyScan sensor features three LED indicators mounted beneath both carrying handles. Each indicator displays the current status of three key elements of the sensor circuitry:

Red   Sensor diagnostic

Yellow   Embedded PC status

Green   Main status
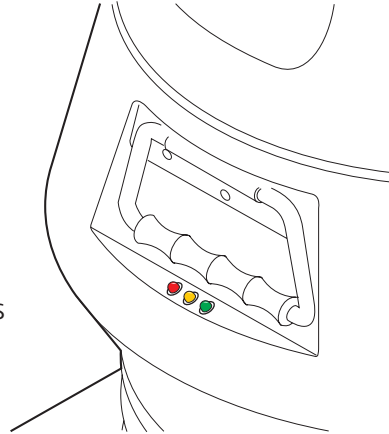
Correct startup indication

As the CyScan sensor initialises itself, the following sequence should be seen:

Red   Flashes once briefly when power is applied and should then be off for as long as the yellow LED is on. As soon as the yellow LED has turned off, it will toggle at one second intervals as the scanner tilt circuitry initialises for about 30 seconds. After the initialisation period, the Red indicator should switch off and stay off. If at any point it stays on permanently then a hardware fault has been detected.

Yellow   On continuously after power has been applied while the embedded PC circuitry initialises. After the initialisation period, the Yellow indicator should switch off and stay off. It will come on again once the system has been shutdown or in case of an embedded PC failure.

Green   Flashes once per second after power is applied and while the yellow led is on. As soon as the yellow led switches off and the leveller initialises (RED led toggles), the green led will begin to flash at 10 Hz intervals giving the main system heartbeat. When the system is suspended it flashes briefly once a second.

Error states and possible causes

Red   *Permanently on at any point* - Electronic hardware failure within the leveller or sensor circuitry. Can also come on when a hardware failure is detected during operation.

Yellow   *On after the initialisation period is complete* - Embedded PC failure or unit is shut down. Communication with the sensor is not possible. Recycle power to the CyScan system.

Green   *Permanently on or off* - No "heartbeat" to the system. No operation is possible. Recycle power to the CyScan system.

Blinking slowly - unit suspended or shutdown (see YELLOW and RED LEDs).

Toggling twice a second - after power has been applied, waiting for the PC to initialise and the yellow LED to turn off.

Shutdown/suspend

Red   Off unless there is a hardware failure.

Yellow   On for shutdown, Off for suspend.

Green   Flashes briefly once a second.

Technical notes

- Technical note 1: Targets - reflective material
- Technical note 2: Targets - installation and position
- Technical note 3: Vertical beam divergence
- Technical note 4: Low temperature operation

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 world-wide. 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 3970 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 Tel: 512-984-1800
United Kingdom	3M UK Plc, Bracknell, Berkshire, RG12 1JU Tel: 01344-858000
Canada	3M Canada Product Information Centre, London, Ontario, N5V 3R6 Tel: 1-800-364-3577
Japan	Sumitomo 3M Limited, Setagaya-ku, Tokyo 158 Tel: 813-3709-8170
Germany	3M Deutschland GmbH, 41453 Neuss Tel: 02131-143472
Italy	3M Italia SpA, Segrate, Milano Tel: 392-70351
France	3M France Customer Information Centre, F-95006 Cergy Pontoise Cedex Tel: 331-130-318-020
Hong Kong	3M Hong Kong Limited, North Point, Hong Kong Tel: 852-2806-6111

Recommended reflective tape:
**3M Diamond Grade
White 3970**

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:
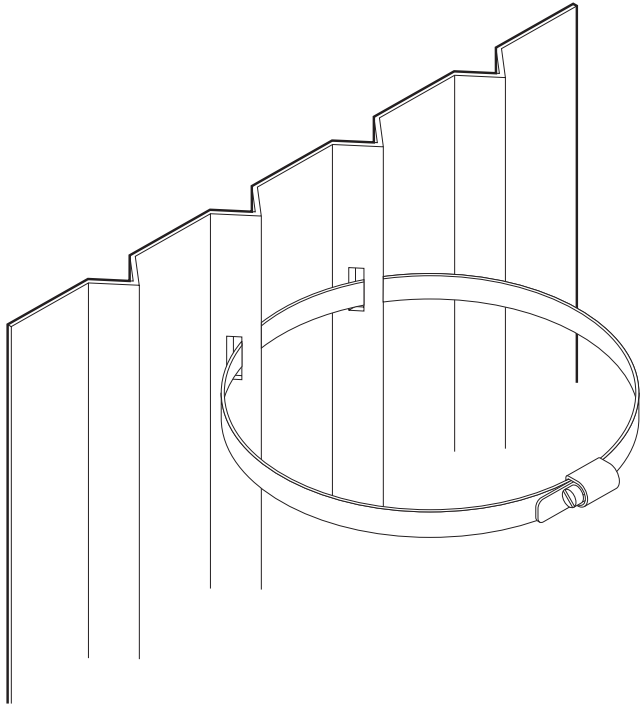
Flat targets

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)
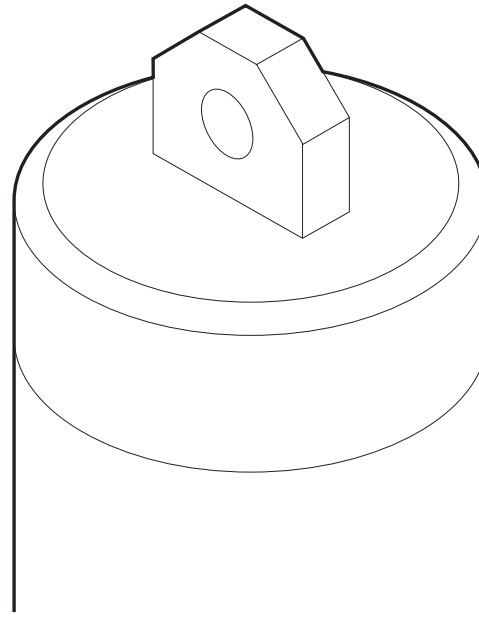
Cylindrical targets

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

Part number: 20-0032-0
(1.5m cylindrical reflector including shackles)
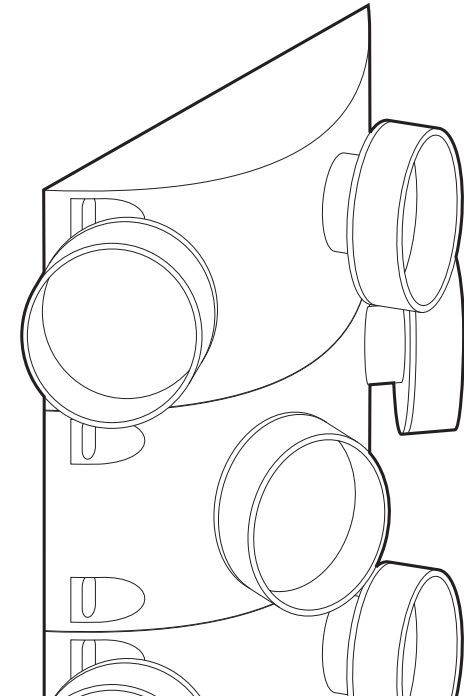
Prism targets

Prism cluster with 8 x 6cm elements for extended range operations.

Part number: 20-0075-1

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.

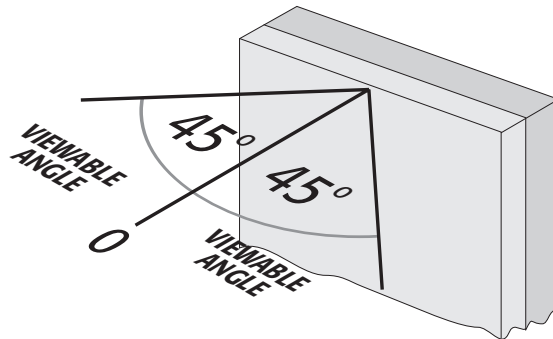- The sensor beam should not strike a flat target at an angle of more than 45 degrees to the target surface.

- 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 are asymmetrically spaced, thus making it easier for the CyScan system to assess which reflection corresponds to a particular target.
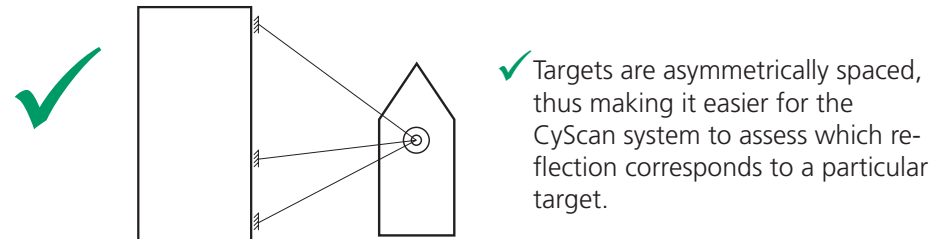
- Targets should be placed no closer than 5m together. Ideally they should be placed 10m or more apart.

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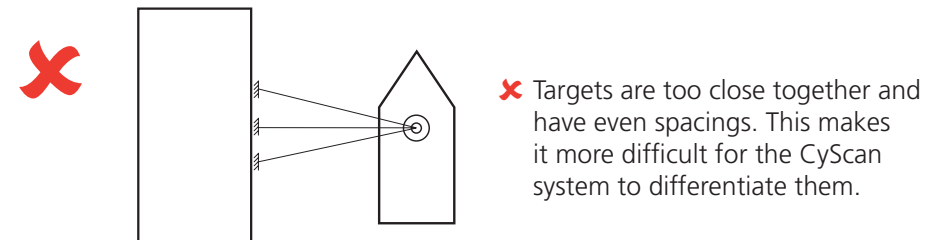
Vertical beam divergence

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 (16º) with a very narrow profile. As the distance from the target increases the beam becomes deeper as shown in the diagram.

(Not to scale)
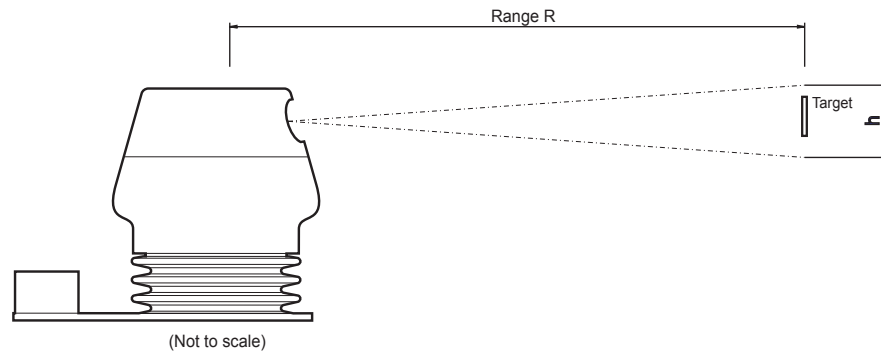
MK II

Range R (m)	Height h (m)
20	5.6
30	8.4
50	14.0
70	19.5
90	25.1
100	27.9
120	33.5
150	41.9
180	50.3
200	55.9
250	69.8
300	83.8

Low temperature operation

Introduction

CyScan is a precision electro-mechanical 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.

The standard variant of CyScan is designed to operate within the temperature range -10 to 55°C. A low temperature variant of 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:

- For operation below 5°C the sensor should remain powered and running (i.e. not suspended). However, where this is not possible and it is necessary for the system to be switched on at temperatures below 5°C (and down to -25°C) the sensor will require some time to reach optimum operating condition.

- 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 (*Note: Not exhaust emissions as these contain particulates which will degrade the optics*).

- The external PSU leads are rated for static operation to -40°C but only to -5°C for flexing operation. The leads must therefore be adequately secured to prevent flexing and the system should not be installed or de-installed at temperatures below 0°C.

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 a mechanically driven base 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 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 windows of the scanner or the surface of the targets (n.b. ice has poor reflective properties at the infra-red frequency used by CyScan).

CyScan system specifications

SENSOR	
Emitter type	pulsed (30kHz) semiconductor laser diode operating at 904nm.
Classification	eye safe to Class 1 EN60825
Beam characteristics	16° vertical, 0.23° horizontal
Positional accuracy	better than 0.5% of range – dependent on target layout
Range resolution	10cm
Range repeatability	20cm
Angular resolution	0.006° (0.1 mrad)
Angular repeatability	0.03° (0.5mrad) for multiple targets
Rotation	uni-directional 360°/sec (6.28rad/sec)
LEVELLING PLATFORM	
Active axis	twin with independent dynamic control
Tilt compensation	±20° roll and pitch combined
Sensors	3 axis solid state gyros, twin axes fluid tilt sensor
Drive mechanism	stepper controlled linear actuator
Maximum tilt speed	5°/sec maximum acceleration 4°/sec^2
Total vertical angular visibility	56°
Typical wave motion compensation	±5° for 15 second wave period ±2.5° for 5 second wave period
MECHANICAL	
Enclosure	anodised aluminium alloy baseplate with composite body shell
Dimensions	340 x 460mm footprint, 400mm (Ø) x 440(h) unit
Weight	ca. 27kg
Mounting	permanent by securing bolt holes in base

VESSEL INTERFACE	
Power requirement	stabilised 22-26VDC, 4A from PSU
I/O	RS422 data feed for sensor control and data display
	RS422 9600 baud data feed to vessel control
Data formats	compatible with all DP and other vessel control systems using standard or customised message types
Connections	IAC PP series connectors
Diagnostics	status LEDs with advanced software functions
CONTROL & DATA DISPLAY	
Operating system	PC / MS Windows XP Professional
Software	dedicated real-time interactive
Hardware options	compact industrial PC module + 15" TFT monitor + Mouse device
	Hatteland JH15 Type Approved integrated PC/TFT module + Mouse device
	laptop PC with 15" TFT display
ENVIRONMENTAL	
Marine certification	ABS Type Approved version available IACS E10 and IEC60945
Operating temperature	-10 to 55°C (Low Temperature variant available to -25°C)
Water / dust protection	IP66 rated
EMC	CE certified
Compass safe distance	80cm for 0.33 deg deflection.
SUPPORT	
Documentation	training DVD, Engineer's, Maintainer's and Operator's Guides
Warranty	12 months return to base
Transport packaging	re-usable ruggedised flight case

continued

OPTIONAL ACCESSORIES	
Simulator	a software package for training purposes
Power Supply Unit	24V regulated PSU (90-264 VAC, 47-63 Hz) complete wit data cable assembly and mounted in IP66 rated terminal box
Cables and converters	RS422 to RS232 converter
	serial test cable
	software upload cable
Retro-reflective targets	flat 1m x 350cm
	flat 2m x 350cm
	cylindrical 1.5m Ø 205mm
	glass prism cluster with 6 cm elements