

HUMPHREE®

OPERATOR'S MANUAL

INTERCEPTOR SYSTEM

For software versions 5.1.x

HCS-5



FOREWORDS

Congratulations on your choice of the Humphree Interceptor System.

Humphree's Interceptor Systems provide effective solutions to enhance your vessels performance in both calm and rough water. Depending on configuration, Humphree's Interceptor Systems can provide the following benefits and features:

- Reduced resistance at hump speed
- Reduced wave making and wash
- Increased speed and vessel range
- Easy adaptation to your specific hull shape
- Protected inboard electric servo actuators
- No environmental pollution from oil
- Composite materials eliminating corrosion
- Operator control of running trim and list
- Automatic trim control
- Automatic list control
- Heel control when turning with coordinated turn
- Active damping of pitch and roll motions
- Auxiliary steering using vertical Interceptors
- Remote control or monitoring from external system

For more information, see www.humphree.com

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ALARMS

USING AUTO

DIMMER

KEYS

MAIN SCREEN

ON/OFF

SAFETY INFORMATION

Installation procedures performed incorrectly could lead to personal injury, damage to the Humphree Interceptor System or damage to other property.

Please read the Operators Manual carefully before starting to operate the Humphree Interceptor system and pay extra attention to the safety information.

Safety information in this manual is presented in the way shown and explained below.



WARNING!

Failure to pay attention to a warning or follow any instructions included in the warning could lead to personal injury or death.



IMPORTANT!

Failure to pay attention to important information or follow an important instruction could lead to damage or malfunction of the Humphree Interceptor System or other property.

NOTE!

A note contains information that will facilitate the work during the operation of the Humphree Interceptor System.

General safety information



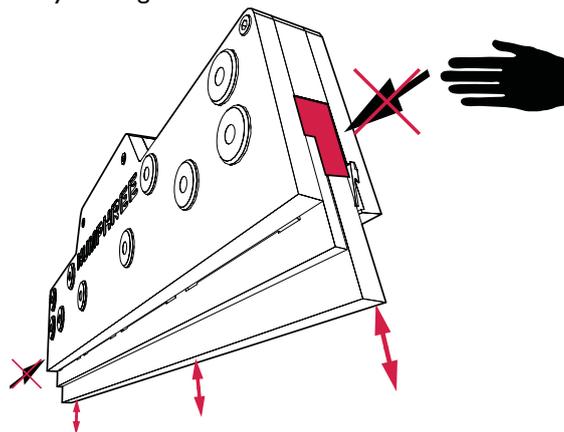
WARNING!

When installing the Humphree Interceptor System make sure that there is no current connected to the system. (Isolate shore current to the engine block, battery charger or accessories mounted on the engine.)



WARNING!

Sharp edges, watch your fingers.



ON/OFF

MAIN SCREEN

KEYS

DIMMER

USING AUTO

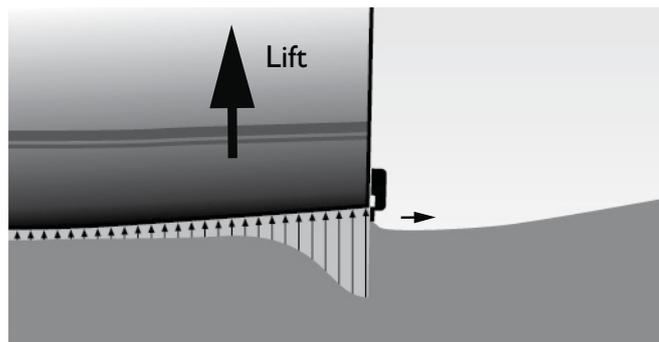
ALARMS

IMPORTANT NOTICES

- The information in this document is the property of Humphree and may not be copied or communicated to a third party, or used for any purpose other than that for which it is supplied, without the express written consent of Humphree. This information is given in good faith based upon the latest information available to Humphree, no warranty or representation is given concerning such information, which must not be taken as establishing any contractual or other commitment binding upon Humphree or any of its subsidiary or associated companies.
- If this manual is lost or worn, see www.humphree.com or contact your local Humphree dealer.
- The contents of this manual and equipment specifications are subject to change without notice.
- All illustrations in this manual are schematically correct but may not be exact copies of the corresponding equipment on your vessel.
- The screens shown in this manual may not match in detail the screens you see on the display. The screens you see depends on software versions, system configuration and system settings.
- Humphree will assume no responsibility for damage caused by improper use or modification of the Interceptor system parts, or claims of loss of profit by a third party.
- The Interceptor system is protected by patent.

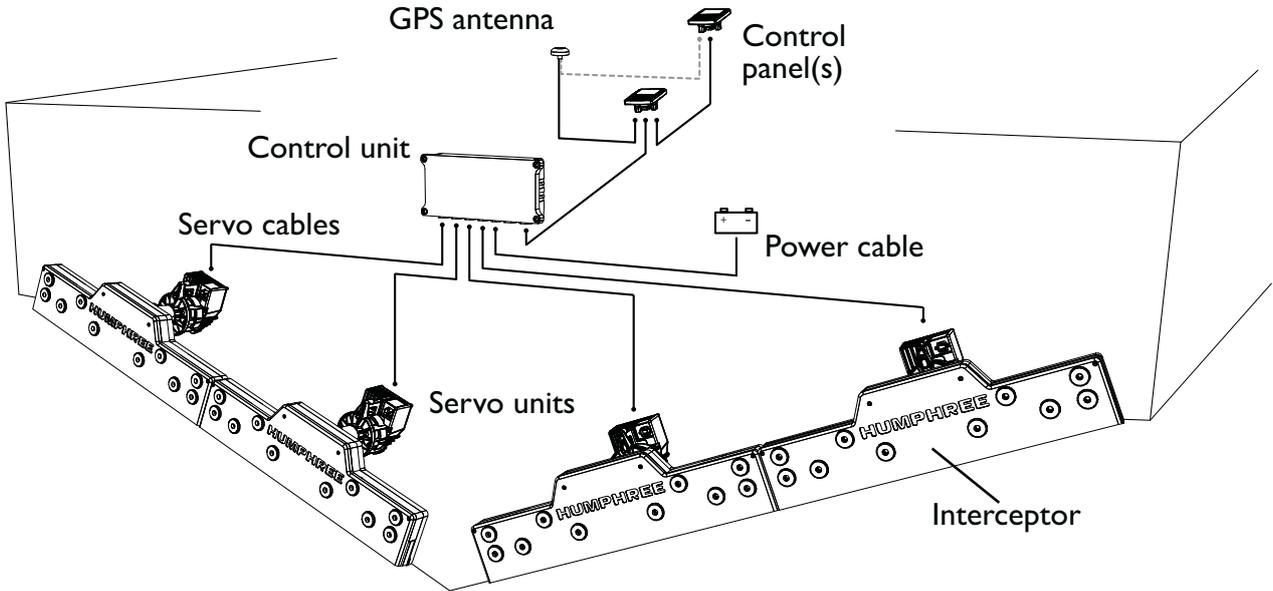
THE INTERCEPTOR WORKING PRINCIPLE

The fundamental working principle of an Interceptor is to generate an increase in pressure on the hull bottom plate directly ahead of the transom by intercepting the flow with a blade. The blade only has to extend a few millimetres below the transom edge to substantially raise the pressure over a large area. This results in a high hydrodynamic lift. The lift of the Interceptor is superior to any other transom-mounted lifting device. This makes it a most suitable device for providing forces to optimise running trim and actively dampen vessel motion.

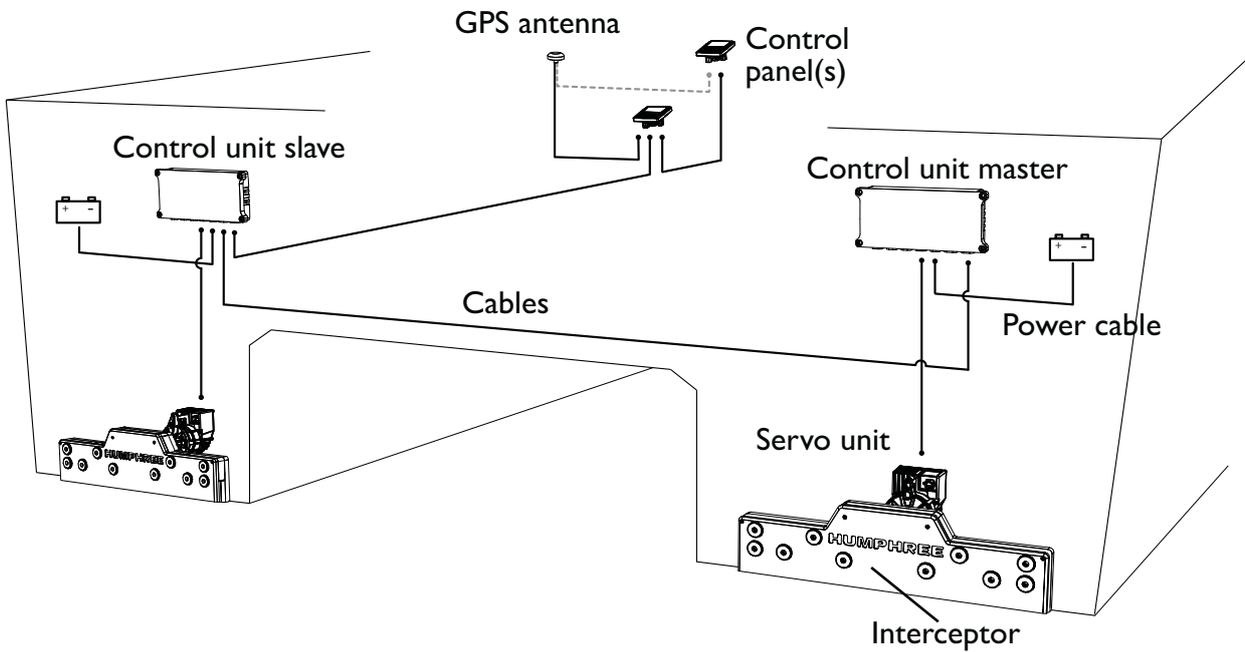


GENERAL SYSTEM OVERVIEW

General system overview: monohull



General system overview: catamaran



ON/OFF

MAIN SCREEN

KEYS

DIMMER

USING AUTO

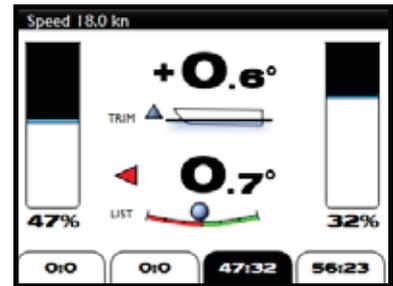
ALARMS

BOAT CONTROL SYSTEMS OVERVIEW

Depending on the system in your vessel, different Boat Control Systems are available on the control panel main screen and menu options. Each selected Boat Control System is shown in the bottom of the main screen.

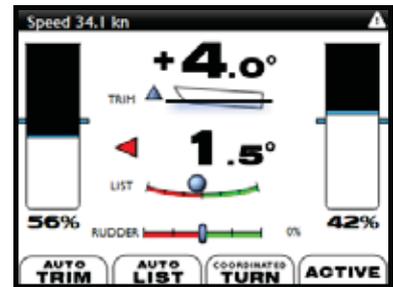
MANUAL TRIM (BASIC)

The BASIC Boat Control System will let the operator manually change the trim and list of the vessel by deploying or retracting the Interceptors. Four trim memories (deployment positions) for the Interceptors can be stored to the function keys for easy access. (only present with BASIC)
The large and intuitive trim and list indicators will present the angles in real time. A GPS antenna is connected to the system and will show the vessel speed.



AUTOMATIC TRIM CONTROL (AUTO TRIM)

The AUTO TRIM Boat Control System adds automatic adjustment of the vessel trim to provide optimum running trim for highest speed and lowest fuel consumption. The operator can manually adjust the trim and list of the vessel by deploying or retracting the Interceptors.



AUTOMATIC LIST CONTROL (AUTO LIST)

AUTO LIST provides automatic correction of vessel list, normally caused by wind or uneven loading. "Set List" shall normally be even keel (0°) and the system will automatically adjust the vessel to run at the set list angle. The function automatically activates at 10 knots and above and will keep the vessel on even keel when running straight forward.

COORDINATED TURN CONTROL (COORDINATED TURN)

The Coordinated Turn Control automatically adjusts the heeling angle of the vessel during turns to reduce the side forces for people on board.

The vessel's turning ability is significantly improved as a result of the Interceptor steering force.

A rudder input bar is additionally seen in the main screen.

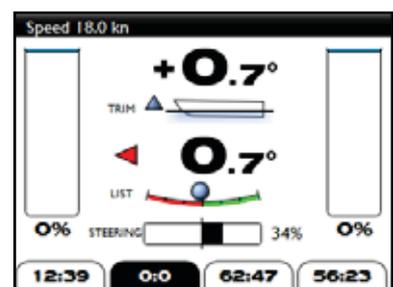
ACTIVE RIDE CONTROL (ACTIVE)

With the Humphree Active Ride Control system the Interceptors are instantly actuated to provide lift which counteracts vessel motions and at the same time optimises the running trim and list angle - all in one system. The system includes a Ride Control Unit (RCU) which consists of an advanced digital controller with unique adaptive control algorithms and an advanced sensor package which uses a combination of GPS, gyro and accelerometers to measure 3D rate of turn and vessel accelerations.

INTERCEPTOR STEERING ASSISTANCE (INTERCEPTOR STEERING)

The Interceptor Steering Assistance, involving vertically installed transom Interceptors in combination with water jet propulsion, enables Interceptor steering with fixed neutral jet buckets for smaller steering commands. For larger steering commands a combination of Interceptors and water jet deflection will result in increased steering force and reduced turning radius.

A steering Interceptor position bar is additionally seen in the main screen.



STARTING UP THE SYSTEM - FIRST TIME

Once the system is installed, perform the following steps to get the system up and running:

- 1) Turn on the power to the Interceptor System (main switch and fuses).

If this screen is shown in the control panel then see chapter Servo Calibration.



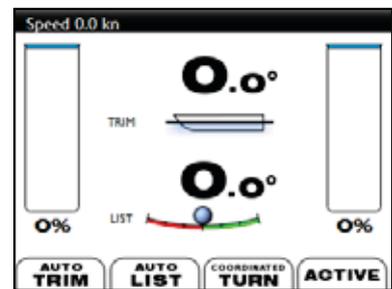
Do not proceed to operate the system until all servos have been successfully calibrated.

If the servo units have been calibrated the system will start up normally. See Screen below.

- 2) Check GPS signal.

Verify that the GPS is working properly. On the control panel, check that the SPEED indication on the main screen shows a speed value. A value of 0,0 should be seen when at dock.

If a speed value is not shown see chapter Troubleshooting.



- 4) Check trim and list angle indication.

The trim and list angle should be set when the vessel was on even keel. The indicators in the control panel will then show the vessels true trim and list value.

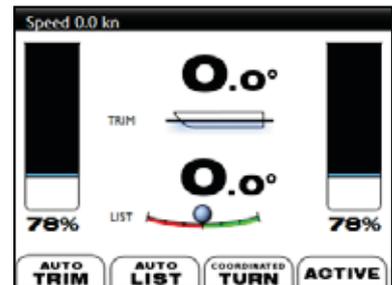
If the displayed angles do not appear to be accurate see chapter Trim and List Angle Calibration.

(Angles should be close to 0.0° when the vessel is floating at even keel and at zero speed)

- 5) Press the trim forward key to deploy the Interceptors.



The black bars will move down indicating how much the Interceptors are deploying.



Now press both List keys for one second and the Interceptors will fully retract. This feature is called force retract. See chapter CONTROL PANEL KEYS.



- 6) Now the system is up and running. Please read more about the keys, main screen, features of the Boat Control Systems and the Cleaning function.

TURNING SYSTEM OFF

The system is turned off by pressing and holding down the EXIT key for more than 1 second. The turn off menu will be shown.

In the turn off menu, press function key OFF to turn off the system. All Interceptors will then fully retract and the system will shut down.



NOTE!

The CLEANING function is by default on.

To turn the system off without the cleaning function, see chapter CLEANING.

The system can also be turned on and off with a remote key switch. See remote key switch cable installation in the Installation Manual.

To turn the system on again, press the EXIT/Power key.



MAIN SCREEN

The following example of the main screen shows an AUTO TRIM, AUTO LIST, COORDINATED TURN and ACTIVE configuration.

The diagram shows a central display with the following elements and callouts:

- GPS speed:** 34.1 kn
- Status bar:** Located at the top right of the display.
- AUTO function position:** A vertical slider on the left side.
- Trim angle:** +4.0°
- Interceptor position port:** 56%
- Interceptor position starboard:** 42%
- List angle/Set list:** 1.5°
- Rudder signal / steering position:** A horizontal slider at the bottom labeled 'RUDDER' with 0% on the right.
- Function indicator:** Four buttons at the bottom: AUTO TRIM, AUTO LIST, COORDINATED TURN, and ACTIVE.

Additional callouts include: 'The AUTO functions will change the Interceptor position automatically.' and 'Function indicator Auto functions ON/OFF/Trim Memories (functions are off on this screen)'.

ON/OFF
MAIN SCREEN
KEYS
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CONTROL PANEL KEYS

This chapter acquaints you with the basic key functions of the control panel.

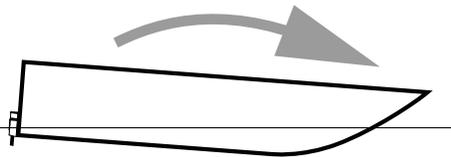


How to trim the vessel

Manual trim and list using the following keys can only be done when the main screen is shown.

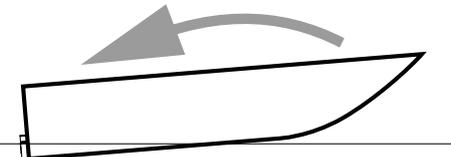
Trim forward (bow down)

Both port and starboard Interceptors extend simultaneously and the vessel's bow will trim down. This key also navigates up in menus.



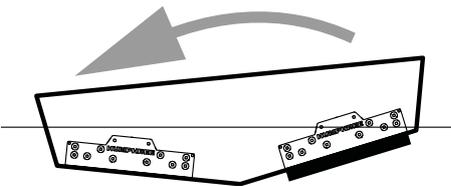
Trim aft (bow up)

Both port and starboard Interceptors retract simultaneously and the vessel's bow will trim up. This key also navigates down in menus.



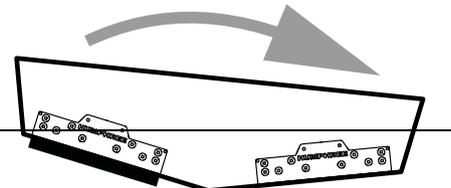
List to port

Port side Interceptors retract and starboard Interceptors extend and the vessel will list to port. This key also navigates back to previous menu.



List to starboard

Starboard side Interceptors retract and port side Interceptors extend and the vessel will list to starboard. This key also navigates into menus.



Force Retract

Available only when main screen is displayed.

Press the port and starboard LIST keys for one second to turn off all automatic functions and rapidly retract the Interceptors.

The function can for example be used when meeting a large wave of an approaching vessel.



Function keys (Soft keys)



The function keys changes depending on which menu is active.

In the main screen, if there are Boat Control Systems shown in your display, the function keys turn on and off each system individually.

If no Boat Control Systems are shown, Trim Memories are shown and can be activated by pressing a function key.

ENTER key (Menu)



The enter key opens the menu screen, enters sub menu screens and turns on and off specific functions.

EXIT/Power key (On/Off/Dimmer)



On main screen a short press enters dimmer popup screen. See chapter DIMMER for more information. When in menus, a short press exits to the main screen.

Two seconds press enters turn off menu.

Center key

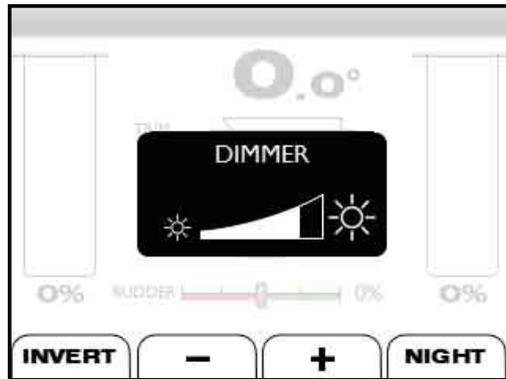


In specific Boat Control Systems the center key is used to change the main screen information. Depending on the installed system, different information is displayed.

Press the center key to change between different main screens.

DIMMER

In the main screen press and release the exit button. A dimmer popup menu will appear and the four function buttons will change.

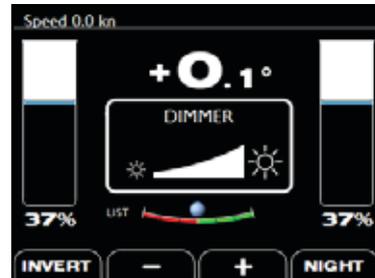


INVERT / RED or GREEN: Changes the background between white and black in day mode or between red and green in night mode.

- : lowers the dimmer light.

+ : increases the dimmer light.

NIGHT / DAY: switches between night and day screens.



USING BOAT CONTROL SYSTEMS

Manual Trim (BASIC)

The BASIC Boat Control System will let the operator manually change the trim and list of the vessel by deploying or retracting the Interceptors.

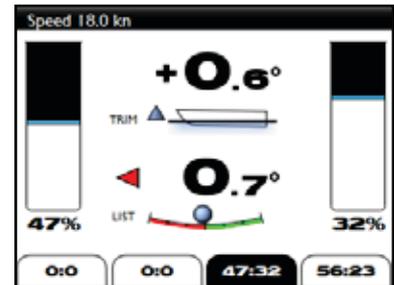
Use the TRIM and LIST keys to change the vessel's trim and list angle when under way.

Trim memories (only available with BASIC)

If there are no AUTO systems present, Trim Memories will be shown instead of the AUTO systems. A preferred Interceptor position can be stored to four memories.

In the main screen, use TRIM/LIST keys to set the preferred running trim of the vessel.

Press and hold the desired memory function key and the settings will be saved.



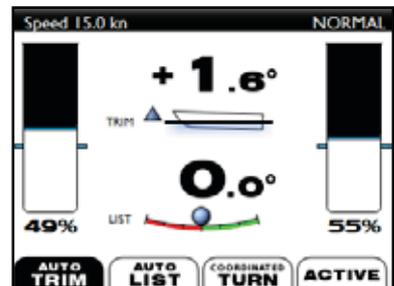
Automatic Trim Control (AUTO TRIM)

May not be available in your system.

Based on the vessel speed, AUTO TRIM continuously adjusts the Interceptor for optimum vessel trim (Interceptor deployment). There are four different user curves that can be used for different load conditions of the vessel.

To turn **ON/OFF** AUTO TRIM press the AUTO TRIM function key in the main screen.

When AUTO TRIM is on, the captain can add manual trim and list offset using the arrow keys to compensate for side wind and/or different load conditions.



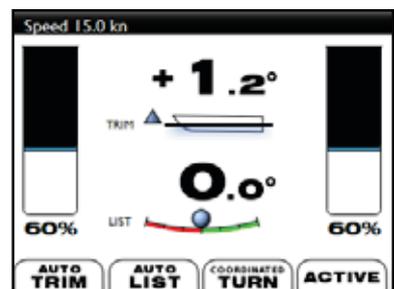
Normally AUTO TRIM should be **ON**.

NOTE!

If speed (GPS) signal is lost, AUTOMATIC TRIM CONTROL is automatically switched off.

AUTO TRIM SETTINGS

In the main menu, scroll to AUTOMATIC TRIM CONTROL and press ENTER or TRIM stb.



There are four AUTO TRIM curves that can be setup depending on load conditions.

Press TRIM Aft to move to the desired curve and press SELECT to activate that curve.

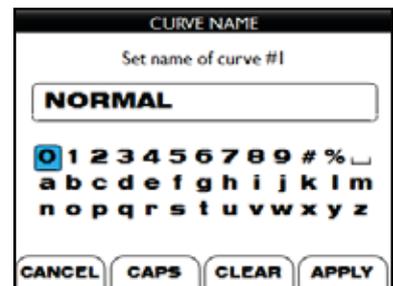
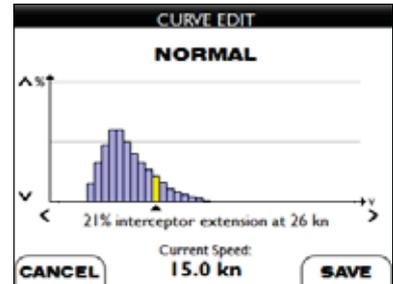
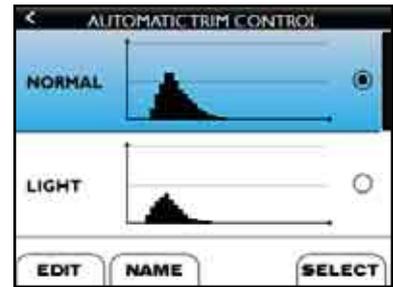
The curves can be manually edited. Press EDIT to enter the EDIT CURVE menu.

AUTOMATIC TRIM CONTROL calibration is normally done during initial sea trials.

Use the LIST keys to move the cursor to the desired speed and then use the TRIM keys to change the Interceptor extension at this speed.

Save the curve by pressing SAVE.

The name of the curve can be changed by pressing NAME.



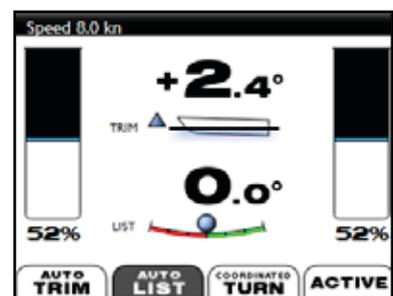
Automatic List Control (AUTO LIST)

May not be available in your system.

The AUTO LIST will automatically adjust the vessel's running list angle to compensate for cross winds or asymmetric load conditions.

To turn **ON/OFF** AUTO LIST press the AUTO LIST function key in the main screen.

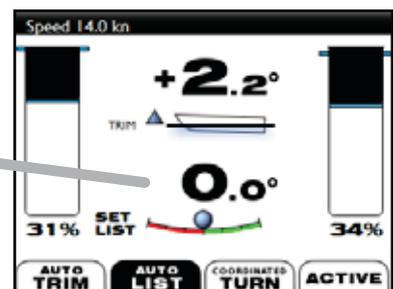
The indication of the AUTO LIST will be grey when the speed of the vessel is below 10kn. The actual list angle will then be shown.



Above 10kn the AUTO LIST will turn black and then the captain can use the LIST keys to change the desired SET LIST angle of the vessel. Above activation speed the SET LIST angle will only be shown.

Normally SET LIST shall be 0.0° for running at even keel. It is possible to manually change the SET LIST from port 4° to starboard 4°.

Normally AUTO LIST should be **ON**.



ON/OFF

MAIN SCREEN

KEYS

DIMMER

USING AUTO

ALARMS

AUTO LIST SETTINGS

The sensitivity of AUTO LIST is adjusted in the AUTOMATIC LIST CONTROL menu.

If the vessel starts to roll back and forth when running in calm waters, the sensitivity is set too high. Then lower the sensitivity value.

NOTE!

If speed (GPS) signal is lost, AUTOMATIC LIST CONTROL is automatically switched off.

NOTE!

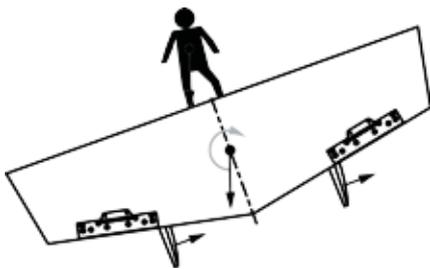
The LIST angle calibration will effect the functionality of AUTO LIST. See chapter Trim and List Angle Calibration.



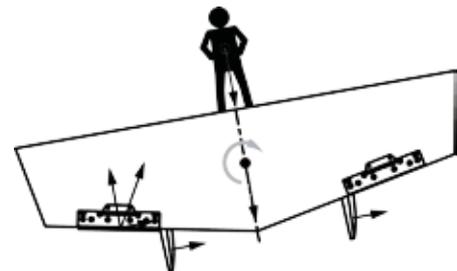
Coordinated Turn Control (COORDINATED TURN)

May not be available in your system.

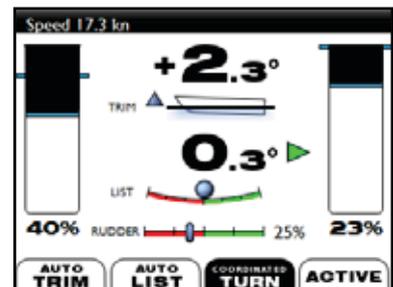
Without Coordinated Turn



With Coordinated Turn



To turn **ON/OFF** COORDINATED TURN press the COORDINATED TURN function key in the main screen.

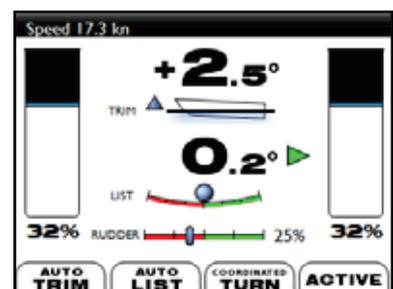


Normally COORDINATED TURN should be **ON**.

COORDINATED TURN calibration is normally done during initial sea trials.

NOTE!

If speed (GPS) signal is lost, COORDINATED TURN CONTROL is automatically switched off.



Active Ride Control (ACTIVE)

May not be available in your system.

The ACTIVE RIDE CONTROL will automatically dampen pitch and roll motions to compensate for induced motions caused by waves.

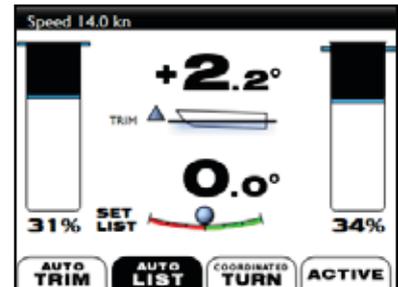
To turn **ON/OFF** ACTIVE press the ACTIVE function key in the main screen.

When ACTIVE is ON, the Interceptors will start to dampen the vessel motions.

Recommended use:

- **Calm seas:**
 AUTO LIST turned ON
 ACTIVE turned OFF

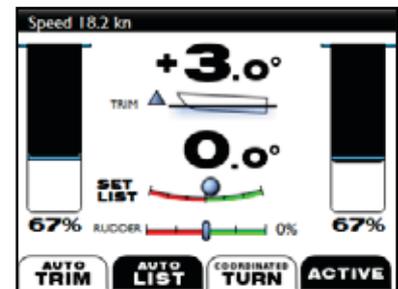
Read also chapter "Automatic List Control".



- **Medium and Rough Seas:**
 AUTO LIST turned ON
 ACTIVE turned ON

With AUTO LIST **ON** and ACTIVE **ON** the system will strive to keep the vessel on even keel. This may result in less roll damping because part of the force is used to keep the vessel even keel.

For catamaran hulls it is recommended to have AUTO LIST **OFF** when ACTIVE is **ON**.

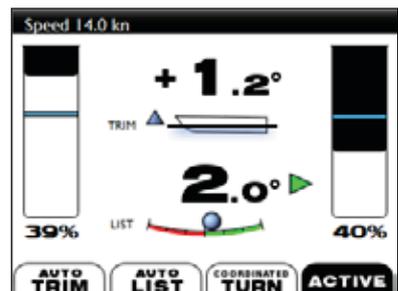


Read also chapter "Automatic List Control".

- **Maximum damping:**
 AUTO LIST turned OFF
 ACTIVE turned ON

For maximum damping force, turn AUTO LIST OFF. The system will use full force to dampen roll & pitch motions.

The system will then not strive to keep vessel at even keel but instead use all force for damping.

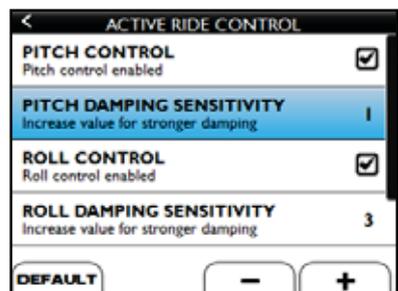


ACTIVE SETTINGS

Normally PITCH and ROLL CONTROL should be **ON**.

- If strongest possible pitch damping is preferred, turn **OFF** ROLL CONTROL or increase PITCH DAMPING SENSITIVITY.
- If strongest possible roll damping is preferred, turn **OFF** PITCH CONTROL or increase ROLL DAMPING SENSITIVITY.

The pitch or roll sensitivity can be adjusted from -10 to +10. A low sensitivity will make the system react more slowly to vessel movements and a high sensitivity enables faster reactions.



NOTE!

The TRIM and LIST angle calibration will effect the functionality of ACTIVE. See chapter Trim and List Angle Calibration.

ON/OFF
MAIN SCREEN
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Interceptor Steering Assistance (INTERCEPTOR STEERING)

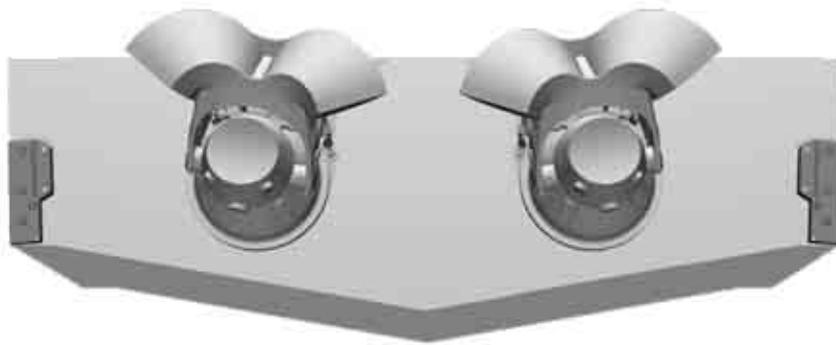
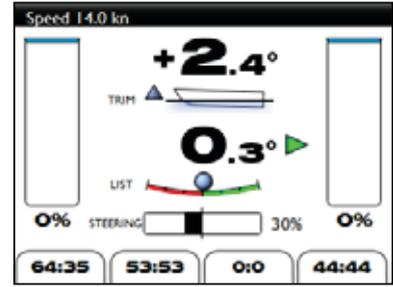
May not be available in your system.

Water jet powered vessels experience significant power losses when deflecting the complete thrust force to steer the vessel. These power losses result in higher fuel consumption and speed loss during the turn but with Humphree Interceptor Steering Assistance this can be avoided. A few millimetres of Interceptor generates the same steering force but significantly less power loss than deflecting the jet thrust flow.

The system, involving vertically installed transom Interceptors in combination with water jet propulsion, enables Interceptor steering with fixed neutral jet buckets for smaller steering commands. For larger steering commands a combination of Interceptors and water jet deflection will result in increased steering force and reduced turning radius.

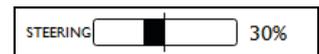
INTERCEPTOR STEERING results in a faster response to a steering command, giving a straighter course, improved fuel economy, better control, increased comfort and less wear of the water jet steering gear. The system can easily be integrated with any autopilot and water jet, and can also be used as in an emergency steering backup mode for increased safety.

The steering force from the Humphree steering Interceptor typically corresponds to a bucket deflection of between 5 and 15 degrees. For larger steering commands the water jet buckets will start to deflect and the Interceptors will contribute with up to 50 percent increased steering force at speeds.



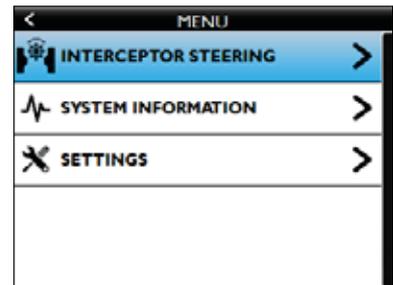
The Interceptor Steering Assistance is usually setup to be controlled by an external system.

The steering bar in the control panel will show the position of the Interceptor.



Backup Steering

If the Main Steering Control System has failed, the Interceptors can be separately operated from the Humphree control panel at speeds where the Interceptors provide some steering force. This will give the vessel an option to manoeuvre.



Use the LIST port and starboard keys to back up steer when backup steering is enabled.



ON/OFF

MAIN SCREEN

KEYS

DIMMER

USING AUTO

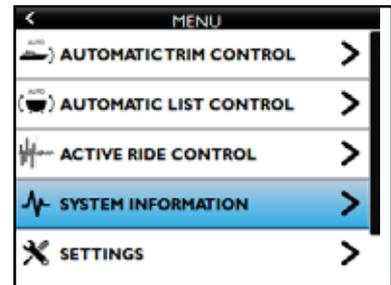
ALARMS

GENERAL MENUS

Main Menu

In the main screen, press the ENTER/MENU key.

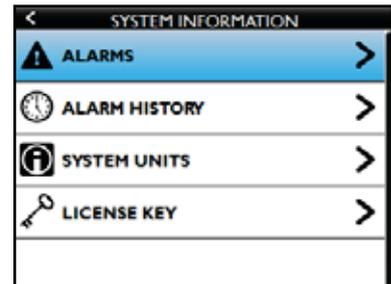
Press LIST port to get back to the previous page or EXIT to go back to main screen.



System Information

Navigate to SYSTEM INFORMATION and press the ENTER key or LIST Starboard key.

To return to the main screen, press the EXIT key at any time.



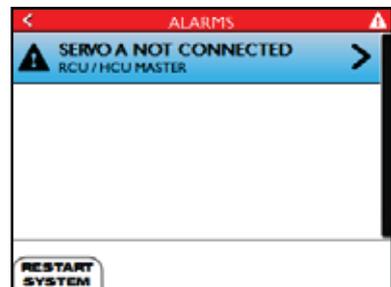
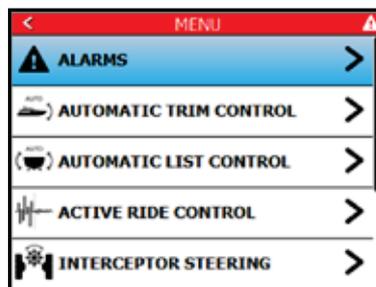
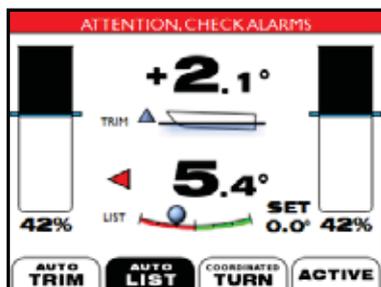
Alarms

If an alarm is present, the information bar in the main screen will turn red.

The alarm menu will be shown at the top of the MAIN MENU. Press ENTER or LIST Starbord to enter the alarm menu.

In the alarm menu, error information of the present alarm will be shown.

An error is indicated by a heading and description. See Trouble Shooting for more information.

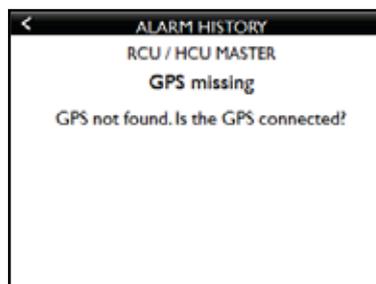
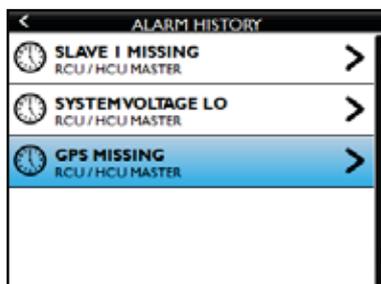


If an alarm has been checked and solved press RESTART SYSTEM. If the alarm is still present see chapter Troubl Shooting.

When an ALARM is cleared it is moved to the ALARM HISTORY menu.

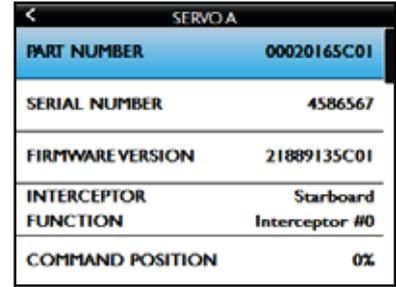
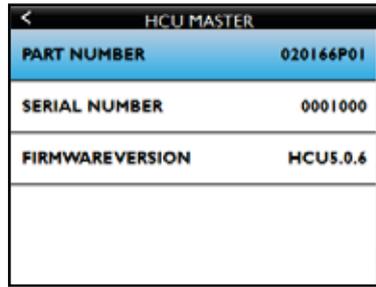
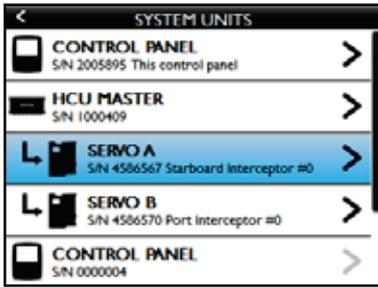
Alarm History

Alarms that are not active are stored in the alarm history.



System Units

The system units menu will list all the units found in the system. Each unit will list specific information.

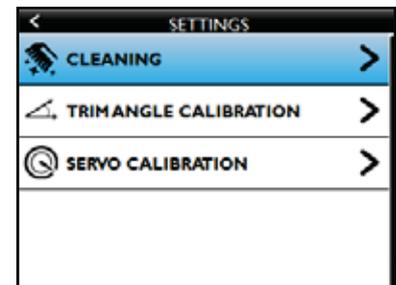


License Key

In this menu it is possible to enter a license key to add a new Boat Control System. Additional parts may be required. Contact Humphree for an upgrade.

Settings

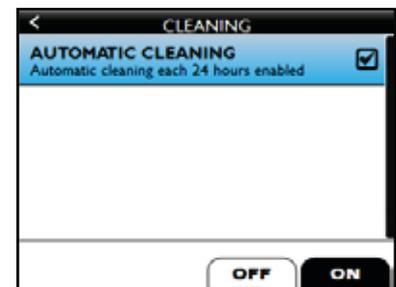
Under the SETTINGS menu, changes can be made to the system.



Cleaning

Cleaning is used to remove any initial marine growth from the Interceptors when the vessel is not in use. The function is by default **ON** and is activated when the system is turned off, see chapter TURNING SYSTEM OFF.

In the CLEANING menu cleaning can be turned ON or OFF.



WARNING!

If the cleaning function is ON the Interceptors will make a full stroke every 24 hours. Make sure people are clear from the Interceptors.

The Interceptor system's cleaning function should always be used when the vessel is not used for longer periods of time. When the system is turned off, the system will start to clean after 24 hours. The cleaning function will exercise the Interceptors every 24 hours, removing any initial marine growth from the Interceptor blades. The screen will indicate that cleaning is being performed.

To turn **OFF** the cleaning function go to menu SETTINGS / CLEANING and press OFF. This is recommended if the vessel is on land.

NOTE!

Power supply (breaker or main switch) to the system must be on for the cleaning to function.

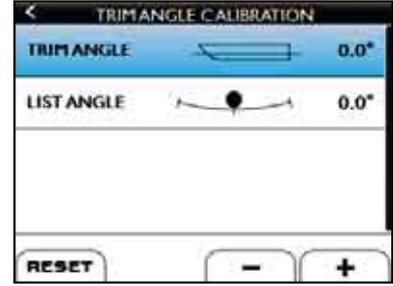
Trim and List Angle Calibration

The Trim and List angles should correspond to the true angles of the vessel.

If possible ballast the vessel so the vessel is at even keel.

Navigate to the MENU / SETTINGS / TRIM ANGLE CALIBRATION menu to set zero angles for the trim and list indication.

Press RESET for the trim / list angle to be set to zero.



If it is not possible to ballast the vessel and the vessel is leaning to one side or to the bow then the trim and list angles can be fine tuned by pressing the plus (+) or minus (-) function keys.

For the TRIM ANGLE, the angle will increase if the bow is raised. If the vessel floats lower in the aft press the plus (+) key to change the indicator so it represents the true angle. If uncertain of how many degrees the vessel is leaning start with one degree and watch the angle when the vessel is running to see if it is accurate.

For the LIST ANGLE, the angle will increase when the vessel is leaning to the starboard side. If the vessel is floating with a static port list, then press the minus (-) key to change the indicator so it represents the true angle. If uncertain of how many degrees the vessel is leaning, start with one degree and watch the angle when the vessel is running.

NOTE!

This calibration will effect the functionality of AUTOMATIC LIST CONTROL and ACTIVE RIDE CONTROL.

Servo Calibration

The servo units will deploy and retract the Interceptors to find their end positions.



WARNING!

The vessel must be at zero speed when performing a calibration. The Interceptor deployment can cause undesired vessel movements.



Press MENU and navigate to SETTINGS.

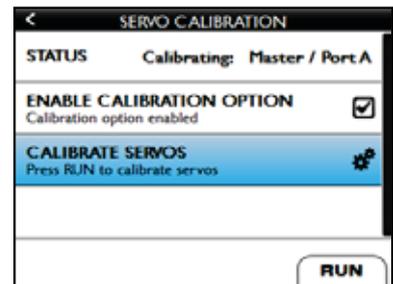
Navigate to SERVO CALIBRATION

ENABLE SERVO CALIBRATION by pressing ON and then navigate to CALIBRATE SERVOS.

Press RUN and the servos will calibrate.

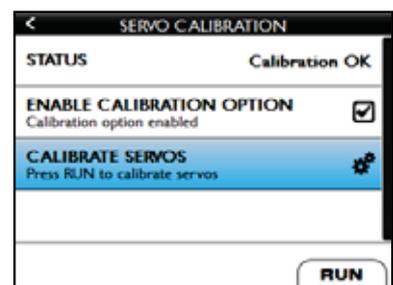
NOTE!

If the servos have been dismantled for any reason a new calibration must be performed.



When all servos have been calibrated the STATUS will read OK.

Press EXIT to go to the main screen.



ON/OFF
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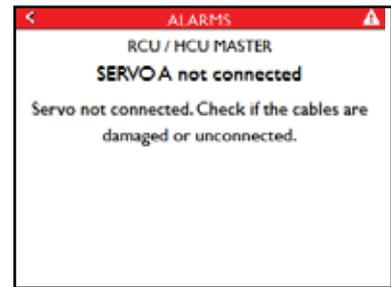
TROUBLE SHOOTING

Alarms

An alarm is presented by a number, header and a instruction in the alarm page.

Ex: 0xD00087 GPS not found. Is the GPS connected?

Follow the instructions to clear the alarm.



Error Correcting Actions

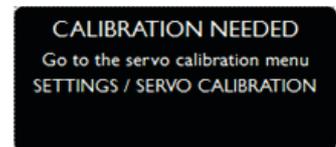
If the error correcting action does not help, please contact Humphree Service, see www.humphree.com for service network.

For mounting/dismounting the servo unit and checking the Interceptor shaft torque, see chapter Removing the Servo Unit and Checking the Shaft Torque.

POPUP SCREENS

If the control panel shows a popup menu CALIBRATION NEEDED:

1. See chapter STARTING UP THE SYSTEM.



If the control panel shows a popup menu COMMUNICATION ERROR:

1. The panel starts up but there is no communication to HCU/RCU.
2. Check all connectors and cables.
3. Connect the termination plugs in the last control panel and the last control unit on both ends of the control bus. See cable installation and connection diagram in the Installation Manual.



If the control panel shows a popup menu CONTROL PANEL ERROR:

1. The panel starts up but there is no communication to HCU/RCU.
2. Restart the control panel by unplugging and replugging the control panel cable on the back of the control panel.
3. Contact Humphree.



ALARMS

If the system indicates **Servo X stuck**:



1. Remove the servo unit which is connected to port X. Do not remove the servo cable.
2. Perform a servo calibration (see chapter Servo Calibration) and check that the servo unit shaft is rotating. (Ignore alarm **SERVO X no end stop detected**)
3. Check the rotation of the Interceptor shaft. The shaft should be able to be rotated 100°. If less than 100° something is blocking the stroke. If the shaft can be rotated more, then the Interceptor parts must be checked.
4. See chapter Checking the shaft torque. If higher than 12 Nm, the Interceptor unit must be checked, cleaned or re-installed. Do not proceed until the Interceptor shaft torque is below 12 Nm.
5. Mount the servo unit to the Interceptor.
6. On the control panel, navigate to the calibration menu and start calibration of the servo units.
7. Restart the system.

If the system indicates **Servo X calibration error** or the **Servo X calibration torque high**:



1. Turn off the Interceptor System power.
2. Remove the cable from servo unit connected to port X.
3. Dismount the servo unit from the Interceptor.
4. Check the rotation of the Interceptor shaft. The shaft should be able to be rotated 100°. If less than 100° something is blocking the stroke. If the shaft can be rotated more, then the Interceptor parts must be checked.

5. See chapter Checking the shaft torque. If higher than 12 Nm, the Interceptor unit must be checked, cleaned or re-installed. Do not proceed until the Interceptor shaft torque is below 12 Nm.
6. Mount the servo unit to the Interceptor.
7. Connect the cable to the servo unit.
8. Turn on the Interceptor System power.
9. On the control panel, navigate to the calibration menu and start calibration of the servo units.

Servo X no end stop detected:

1. Check that the servo is connected to the Interceptor.
2. If servo is connected, remove the servo and check the shaft rotation. It should be able to rotate 100° and have end positions.
3. Check Interceptor moving parts.
4. Remount the servo unit.
5. On the control panel, navigate to the calibration menu and start calibration of the servo units.
6. Restart the system.

Servo X not connected:

1. Check that the servo X is connected to the HCU/RCU X port.
2. Check if the cable is damaged or unconnected to port X.

GPS missing:

1. Check GPS connection to Control Panel.

Rudder signal missing:

1. Check rudder signal connections. See connection diagram for more information.
2. See Setup Manual - Rudder Input Signal.

Slave X missing:

1. Slave HCU not responding. Check power supply.
2. Check Control Bus cables.
3. Check and install termination plugs.

OTHER ERRORS

Text "**Waiting for GPS fix**" in the information bar of the main screen.

1. Make sure the GPS is not covered by any metallic structures or metallic parts.
2. Make sure the GPS is not mounted on structures with vibrations.
3. Check that the wind screen does not have a metallic coating which can disturb the signal.
4. Move the GPS so that it has good GPS satellite reception.
5. Check GPS source signal if not using a Humphree GPS antenna.

GPS speed is not shown in main screen.

1. Check GPS connection to Control Panel.
2. Check GPS source signal if not using a Humphree GPS antenna.

Missing unit under System Units (Servo unit or control unit):

1. Check all system connectors and cables.
2. Make sure all the units are connected correctly.

A **unit** is connected but it is still **not shown** in the System Units:

1. Connect the termination plugs in the last control panel and the last control unit on both ends of the Control Bus. See cable installation and connection diagram in the Installation Manual.

If the control panel does not start when the **system power** is on then:

1. Check all the connectors and cables.
2. Use wiring diagram to establish power supply to all the units in the system.

The Humphree system does not turn on when the engine **ignition switch** is turned on (Only if remote key switch is installed):

1. If the Humphree system usually does not turn on when the engine ignition switch is turned then there is no remote key switch cable. Contact Humphree for a remote key switch cable.
2. If the Humphree system usually turns on when the engine ignition switch is turned then check the remote key switch connection.
3. Press the power key on the Humphree control panel, if the system starts then the problem is in the remote key switch cable.
4. If the Humphree system does not start check the system power and cables.
5. Check connection and wiring diagram for details.

The **Trim or List angle** can not be reset to 0°.

1. Check the orientation of HCU/RCU. See Installation Manual and Setup Manual - HCU/RCU control unit orientation.
2. Match the software orientation of the HCU/RCU so it corresponds to the specific HCU/RCU installation in the vessel.

Vessel BEHAVIOUR PROBLEMS

When cruising, the **vessel leans to starboard** when the LIST Port key is pressed:

1. The servo cables are connected to the wrong port of the HCU/RCU or the HCU/RCU is oriented incorrectly. See the Setup Manual - HCU/RCU control unit orientation.
2. Position the cables according to the figures in the Servo Unit cable installation in the Installation Manual.
3. Check the orientation of HCU/RCU so it corresponds to the orientation in the Installation Manual.

When cruising, the **vessel leans to port** when the LIST Starboard key is pressed:

1. The servo cables are connected to the wrong port of the HCU/RCU or the HCU/RCU is oriented incorrectly. See the Setup Manual - HCU/RCU control unit orientation.
2. Position the cables according to the figures in the Servo Unit cable installation in the Installation Manual.
3. Check the orientation of HCU/RCU so it corresponds to the orientation in the Installation Manual.

Interceptor is moving in and out rapidly when the vessel speed is changing back and forth. For example in head sea.

1. Check the AUTO TRIM curve so the gain does not differ more than 30% between each speed interval.
2. Check the COORDINATED TURN CONTROL curve so the gain does not differ more than 30% between each speed interval.
3. Check the GPS signal. Make sure the GPS has good satellite view.
4. Check the signal quality from the rudder sensors.

MAINTENANCE

Regular Maintenance

Cleaning

- Regular cleaning is done by the system automatically when the system is turned off. For this to function properly, make sure that the cleaning function is kept on. Read more about the cleaning function in chapter Cleaning.

NOTE!

Power supply (breaker or main switch) to the system must be on for the self cleaning to function.

- When cleaning the control panel, use lightly soaped water and a clean paper towel. Use the protective cover, when the vessel is not in use.

Annual Maintenance

Cables & Connectors:

- Check all connectors for signs of water or corrosion.

Interceptor Units

- During regular haul-out, visually inspect the Interceptor for any damages.
- Extend the blades using the control panel and inspect. Clean if needed. After inspection, remember to retract the blades.

For heavy duty commercial users only:

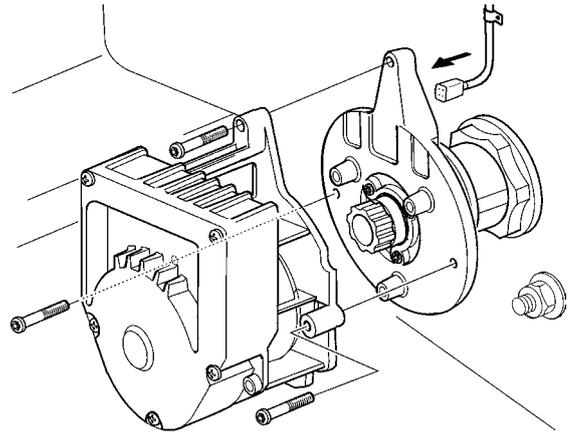
- Perform a calibration to measure servo unit torque. This is done at the control panel, see servo calibration described in this manual.
- The torque presented in the control panel under system information / system units / HCU / servo / calibration torque: shall be below 18Nm. (shaft torque 12Nm + servo gear 6Nm). If a higher torque is measured, the system components will experience excessive wear. In such case, check Interceptor moving components for possible damages, marine growth or contamination (sand, silt etc.). Remove the servo unit and check the shaft torque. The shaft torque shall be below 12Nm. See chapter Checking the Shaft Torque.
- Re calibrate again to check that torque is below limits.

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Removing the servo unit

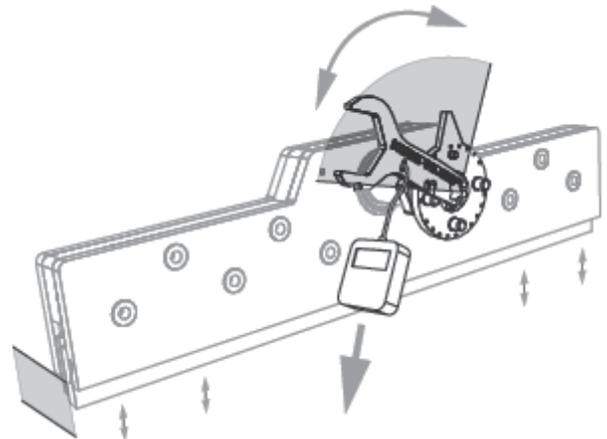
Remove the connector and secure the cable so it does not drop into the bilge resulting in water contamination. Place the connector in the connector slot on the back of the servo flange.

To remove the servo unit unscrew the three M5 bolts. Move the servo unit back and forth to release it from the studs and shaft.



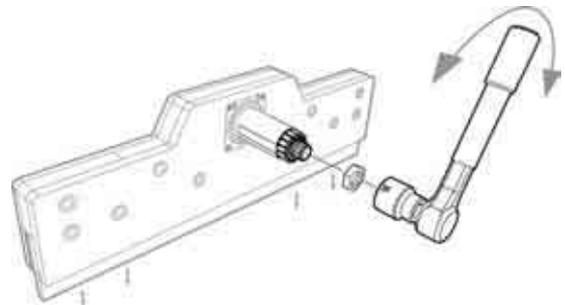
Checking the shaft torque

By rotating the shaft $\sim 100^\circ$ the Interceptor blade will make a full stroke. Connect the Humphree key to the shaft and place a spring scale in the hole as shown in the figure. Pull the spring scale 90° to the key so the shaft rotates. While doing this read the scale value during a $\sim 100^\circ$ rotation. The value will correspond to the shafts torque value. Ex. 8 kg = 8Nm. Check in both directions.



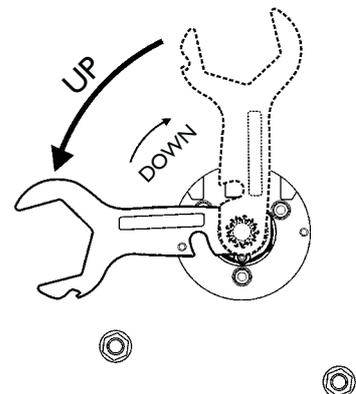
Alternatively push the Humphree torque adapter onto the shaft and use a torque wrench with a socket size 36 mm, to check the torque of the shaft.

If the torque is higher than 12Nm, check moving parts for damage or see the Installation manual - chapter Interceptor Installation.



Moving the Interceptor blade up

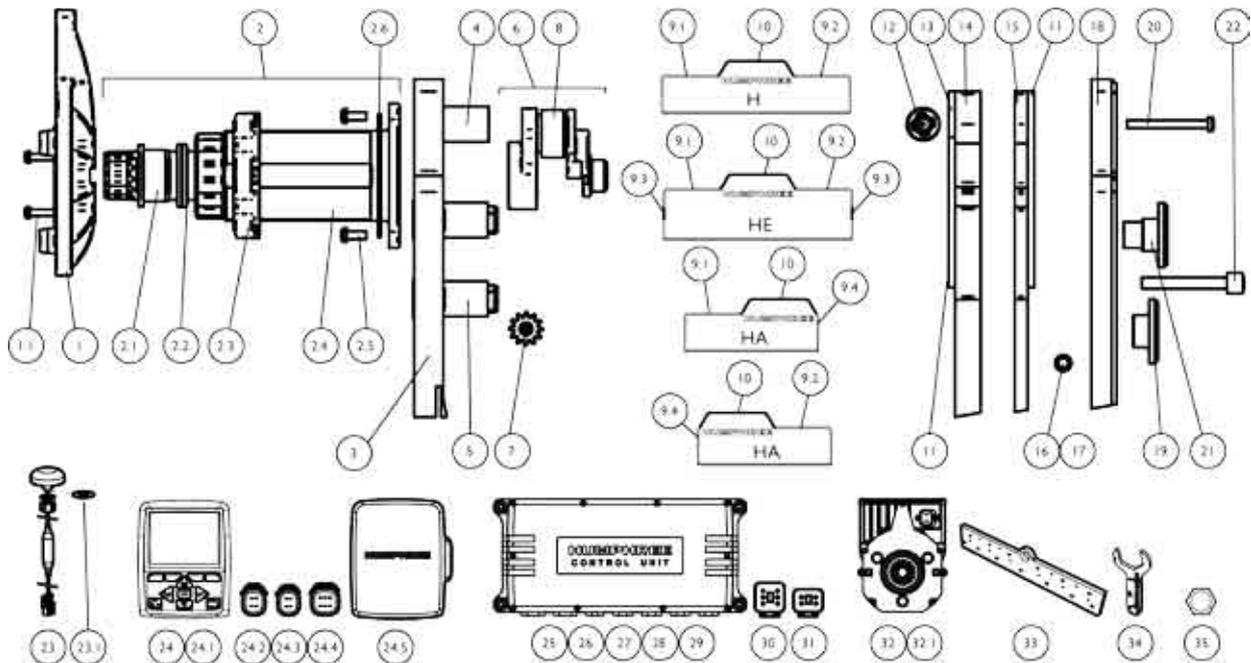
Place the Humphree key on the shaft. Rotate the key counter clockwise until it stops to retract the blade.



Locking the Interceptor blade

By rotating the shaft $\sim 100^\circ$ the Interceptor blade will make a full stroke. Turning the shaft counterclockwise will retract the blade. Rotate the shaft with the Humphree key clockwise to deploy the Interceptor blade to a desired position. Replace the key to a position where the M5 nut is in line with the hole on the key. Lock the key with one of the bolts from fastening the servo unit.

SPARE PARTS



Pos	P/N	Name
0	02....	Interceptor H, HA, HE (Contact Humphree for P/N)
1	020295	Servo flange KIT
1.1	020161	Screw delta PT 40x20 A4 x1 (3 needed)
2	020579	Shaft sleeve KIT short L=155mm (metal shaft)
2	020264	Shaft sleeve KIT long L=214mm (metal shaft)
2.1	020250	Shaft Short L=155mm (composite)
2.1	020577	Shaft Short L=155mm (metal)
2.1	020244	Shaft Long L=214mm (metal)
2.2	020184	Shaft seal x1 (2 needed)
2.3	012377	Shaft sleeve nut
2.4	012387	Shaft sleeve short L=126mm
2.4	020243	Shaft sleeve long L=185mm
2.5	020162	Screw delta PT 50x12 A4 x1 (4 needed)
2.6	020242	O-ring 70x4
3	02....	Transom Plate (Contact Humphree for P/N)
4	010834	Interceptor plate spacer ø22 (White)
4	020532	Interceptor plate spacer ø10 (Black)
5	012375	Bolt pin without thread
6	020583	Crank KIT H, HA L=67mm (composite)
6	020584	Crank KIT HE L=83mm (metal)
7	011790	Rod ASM L=307mm
7	012207	Rod ASM L=535mm
7	011414	Rod ASM L=606mm
8	012332	Sliding shoe
9.1	010317	Cover strip left
9.2	010319	Cover strip right
9.3	013229	HE cover strip
9.4	011304	HA cover strip
10	010318	Centre cover strip
11	P10290	Guide list
12	012335	Blade roller
13	013194	HE guide list (extension)
14	02....	Blade (Contact Humphree for P/N)
15	02....	Bearing Plate (Contact Humphree for P/N)
16	011023	Bearing roller L=98
17	P10072	Bearing roller L=158
18	02....	Aft Plate (Contact Humphree for P/N)
19	P10289	Bolt Washer (composite) L=15,5mm

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- 19 P10118 Bolt Washer (metal) L=15mm
- 20 020160 Screw delta PT 50x50 A4
- 21 011891 Bolt Washer HE (metal) L=29mm
- 22 011239 Interceptor mounting bolt M8x75 A4 x1

Other

- 23 020145 GPS 501
- 23.1 020294 GPS 501 washer (open)
- 24 020144 Control Panel 501
- 24.1 011271 Plastic nut black x1 (2 needed)
- 24.2 020319 Control Panel Termination Plug 120ohm (4 pin black)
- 24.3 020595 Control Panel GPS Seal Plug (4 pin grey)
- 24.4 020596 Control Panel EXTBUS Seal Plug (6 pin black)
- 24.5 020597 Control Panel Cover CP501
- 25 020166 Humphree Control Unit 501
- 26 020167 Humphree Control Unit 502
- 27 020175 Humphree Ride Control Unit 501
- 28 020363 Humphree Ride Control Unit 502
- 29 020304 Humphree Ride Control Unit 551
- 30 020303 HCU/RCU Termination Plug 120ohm (6pin black)
- 31 020251 HCU Seal Plug (4 pin, servo port)
- 32 020165 Servo Unit 501
- 32.1 013227 Servo Unit mounting bolt M5x35 x1 (3 needed)
- 33 Mounting plate (Contact Humphree for P/N)
- 34 020182 Humphree key HCS-5 (composite)
- 35 020601 Humphree torque adapter kit
- 36 020540 Volvo Penta Interface VPI100 HCS-5
- 37 020433 NMEA 2000 Interface NMI501
- 38 020598 Simrad Rudder feedback unit RF25

Cables (see connection diagram)

- 39 020180 Servo Cable 4m for 12-24VDC
- 40 020181 Servo Unit Cable 8m for 24VDC
- 41 020168 Control Panel Cable 10m
- 42 020169 Control Panel Cable 15m
- 43 020170 Control Panel Cable 20m
- 44 020171 Control Panel Cable 25m
- 45 020172 Control Panel Cable 30m
- 46 020173 Control Panel Cable 40m
- 47 020174 Control Panel Cable 50m
- 48 020146 HCU/RCU Adaptor (molex/deutsch)
- 49 020176 Extension Cable, 7m (Female-Male)
- 50 020177 HCU/HCU cable, 5m
- 51 020178 HCU/HCU cable, 10m
- 52 020179 HCU/HCU cable, 20m
- 53 020289 HCU/RCU Power Cable, 8m
- 54 020371 Interface cable 2,5m (incl. key switch)
- 55 020367 Remote key switch cable 2,6m
- 56 020396 HCU/RCU cable (free length)

Spare parts kit

- 57 020578 Seals and fasteners for one Interceptor HCS-5
 - 3 x Servo Unit mounting bolt M5x35 (013227)
 - 4 x Screw delta PT 50x50 A4 (020160)
 - 3 x Screw delta PT 40x20 A4 (020161)
 - 4 x Screw delta PT 50x12 A4 (020162)
 - 2 x Shaft seal (020184)
 - 1 x O-ring 70x4 (020242)

SERVICE NETWORK

While installing or using a HUMPHREE Interceptor System, questions might occur or spare parts might be needed.

Contact Humphree Service at:

<http://www.humphree.com/contact-us/>

APPENDIX

Connection diagram

ON/OFF

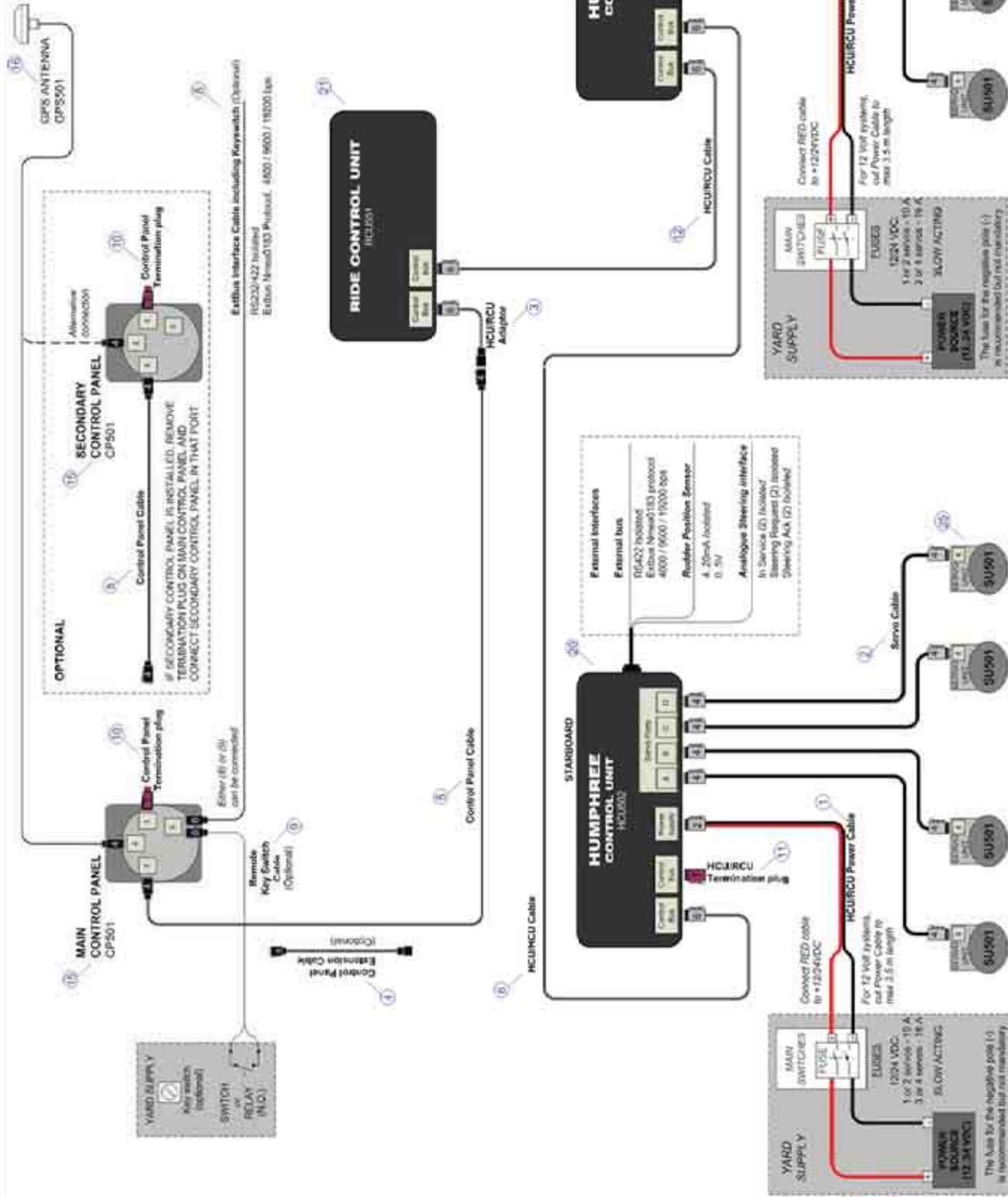
MAIN SCREEN

KEYS

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- Part numbers:
- 1 020285 (8 m)
 - 2 020180 (4 m)
 - 3 020181 (0 m)
 - 4 020146 (0.3 m)
 - 5 020176 (7 m)
 - 6 020168 (10 m)
 - 7 020169 (15 m)
 - 8 020170 (20 m)
 - 9 020171 (25 m)
 - 10 020172 (30 m)
 - 11 020173 (40 m)
 - 12 020174 (50 m)
 - 13 020177 (5 m)
 - 14 020178 (10 m)
 - 15 020179 (20 m)
 - 16 020271 (2.5 m)
 - 17 020287 (2.5 m)
 - 18 020319
 - 19 020393
 - 20 020264 (Custom length cable)
 - 21 020345 (Connector kit)
 - 22 020344
 - 23 020146 (14 m)
 - 24 020166 (HCUS01)
 - 25 020167 (HCUS02)
 - 26 020284
 - 27 020165

For software versions 5.1.x

Ship ID

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