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Service Manual

Orion Auto Traverse / Comprehensive Chair

Item No 8525143 - D-0127233-B – 2025/04

Interacoustics

Table of Contents

1. Introduction

1.1 About this manual

This service manual is for our Orion Auto Traverse / Comprehensive (AT/C) Chair, which can be compatible with VisualEyes™ 525 or Orion AT/C Basic. Please refer to VisualEyes Instructions for Use for more information.

1.2 About warnings and cautions

The below warnings, cautions and notices are applied throughout the manual, indicating the level of attention required for a given action:

 WARNING	**WARNING** identifies conditions or practices that may present danger to the patient and/or user.
 CAUTION	**CAUTION** identifies conditions or practices that could result in damage to the equipment.
NOTICE	**NOTICE** is used to address practices not related to personal injury.

1.3 General information

We continuously strive to improve our products and their performance, hence the specifications in this service manual are subject to change without further notice.

The performance and specifications of our products can only be guaranteed if technical maintenance is conducted routinely every year. Technical maintenance should be carried out by qualified personnel authorized by Interacoustics.

We are happy to receive any inquiries about our products. Our contact details are:

MANUFACTURED BY	DISTRIBUTION AND SERVICE (For US customers)
Interacoustics A/S Audiometer Allé 1 5500 Middelfart Denmark T: +45 6371 3555 M: info@interacoustics.com W: www.interacoustics.com	**Interacoustics US** 10393 West 70th Street Eden Prairie, MN 55344 United States T: +1 (800) 947-6334 F: +1 (952) 903-4200 M: info@interacoustics-us.com W: www.interacoustics.com/us

1.4 Intended use

The Orion AT/C chair in combination with VisualEyes™ software provides information to assist in the nystagmographic evaluation, diagnosis and documentation of vestibular disorders. Nystagmus of the eye is recorded by use of goggles mounted with cameras or with electrodes. These images are measured, recorded, displayed and stored in the software. This information then can be used by a trained medical professional to assist in diagnosing vestibular disorders. The patient will be seated on the Orion AT/C Chair to perform the examination. The Orion AT/C Chair replaces a standard office chair for ocular motor tests and nystagmus tests and rotational chair for Sinusoidal Harmonic Acceleration, Step, SVV, VOR Suppression, and Visual VOR tests.

This guide explains the serviceable components and related information for Orion AT/C chair to help technicians. Biomedical technicians can use this document as a guide for basic troubleshooting and noting locations of components. This system should always be serviced by technician authorized by Interacoustics.

1.5 Environmental Conditions

RECOMMENDED FOR INDOOR USE ONLY	
Relative humidity (operating environment)	30 to 80% (non-condensing)
Temperature storage	32° to 122° F (0° to 50° C)
Operating temperature	59° to 95° F (15° to 35° C)
Power supply	115VAC, 230VAC step down to 115VAC through isolation transformer

1.6 Warnings and precautions

US Federal law restricts the sale, distribution, or use of this system to, by, or on the order of a licensed medical practitioner. The system components should not be modified without consulting the manufacturer.

This equipment is intended to be connected to other equipment thus forming a Medical Electrical System. External equipment intended for connection to signal input, signal output or other connectors shall comply with the relevant product standard e.g. IEC 60950-1 for IT equipment and the IEC 60601-series for medical electrical equipment. In addition, all such combinations – Medical Electrical Systems – shall comply with the safety requirements stated the general standard IEC 60601-1, edition 3, clause 16. Any equipment not complying with the leakage current requirements in IEC 60601-1 shall be kept outside the patient environment i.e. at least 1.5 m from the patient support or shall be supplied via a separation transformer to reduce the leakage currents. Any person who connects external equipment to signal input, signal output or other connectors has formed a Medical Electrical System and is therefore responsible for the system to comply with the requirements. If in doubt, contact qualified medical technician or your local representative.

Grade 2 laser stimulus is used in the Orion Auto Traverse / Orion Comprehensive chairs and the System 2000 Auto Traverse / System 2000 Comprehensive chairs against the booth enclosure. Both operator and patient should avoid looking into the laser beam. There are no user-serviceable components in the laser box assembly.

A Separation Device (isolation device) is needed to isolate the equipment located outside the patient environment from the equipment located inside the patient environment. In particular such a Separation Device is required when a network connection is made. The requirement for the Separation Device is defined in IEC 60601-1, edition 3, clause 16.

The system must not be used in presence of explosive or flammable gases.

The system must be switched off before cleaning. Patients should not be in the rotational chair or wearing the goggles while chair is being serviced.

Do not use any additional multiple socket-outlet or extension cord.

No modification of this equipment is allowed without manufacturer authorization.

The manufacturer will make available on request circuit diagrams, component part lists, descriptions, calibration instructions, or other information that will assist service personnel to repair those parts of this system that are designated by the manufacturer as repairable by authorized service personnel.

For maximum electrical safety, turn off the power from a mains powered instrument when it is left unused.

The instrument is not protected against harmful ingress of water or other liquids. If any spillage occurs check the instrument carefully before use or contact the manufacturer for service.

Do not use the equipment if it is showing visible damage.

Troubleshooting the *Orion AT/C Chair* while power is provided to the device can cause unintended injury to the service technician from the chair rotating unexpectedly or from high voltage found inside the chair base. Service should not be performed without guidance from Interacoustics.

Use this device only as described in this manual.

The system must be serviced at least once a year. The service must include a safety test.

Do not use the equipment if the equipment is damaged; have the equipment serviced.

Only personnel with proper training (skilled personnel) should operate the system.

Proper service and re-installation of this device depends on careful reading of this manual and all additional instructions and labels.

Allow the system to obtain room temperature before using the equipment. Any components that have been stored previously should be brought to room temperature before usage.

Using operating systems where Microsoft have discontinued software and security support will increase the risk for viruses and malware, which may result in breakdowns, data loss and data theft and misuse. Interacoustics A/S cannot be held liable for your data. Some Interacoustics A/S products support or may work with operating systems unsupported by Microsoft.

NOTICE

To prevent system faults, take appropriate precautions to avoid PC viruses, spyware, etc.

Clean the camera lens and the infrared coated mirrors of the goggles regularly to avoid shadows on the displayed images.

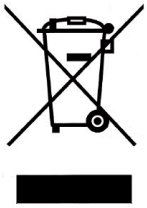
Do not drop the components and avoid other undue impacts to this device. If the system is damaged, contact the manufacturer for repair. Do not use the system if any damage is suspected.

Although the instrument fulfils the relevant EMC requirements precautions should be taken to avoid unnecessary exposure to electromagnetic fields, e.g. from mobile phones etc. If the device is used adjacent to other equipment it must be observed that no mutual disturbance appears.

This symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection for facilities for recovery and recycling.

1.7 Markings

The following marking is found on the instrument:

Symbol	Explanation
	Type BF applied parts.
	Type B applied parts.
	Read and understand instructions for use before operating this device.
	WEEE (EU-directive). This symbol indicates that the product should not be discarded as unsorted waste but must be sent to separate collection for facilities for recovery and recycling.
 0123	The CE-mark in combination with MD symbol indicates that Interacoustics A/S meets the requirements of the Medical Device Regulation (EU) 2017/745 Annex I. Approval of the quality system is made by TÜV – identification no. 0123.
	Medical device
	Manufacturer.
	Year of manufacture.
	Do not re-use. Parts like foam cushions and similar are for single use only.
	Reference number used to denote the model of the equipment.
	 This product contains a component (Orion Comprehensive/Auto Traverse chair) of **'Class 2 Laser beam'. Hence, do not look directly into the laser beam**

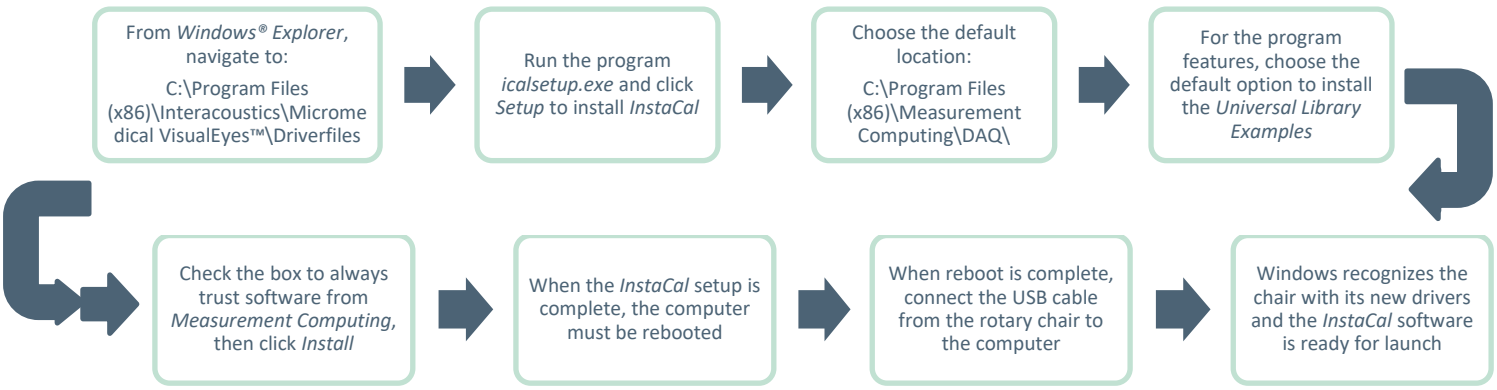
Symbol	Explanation
	Keep dry
	Transport and storage temperature range
	Transport and storage humidity limitations
Interacoustics	Logo

2. Systems connections

2.1 Installing the Orion AT/C chair drivers:

Ensure that all chair internal connections are complete and that the chair has AC power before connecting the USB cable from rotary chair to the computer.

NOTICE: Without AC power the second USB231 board (in the chair frame) and goggles will not be detected.



Depending on your version, find *InstaCal* via one of the paths below:

Windows® 10 and 11	Start	→	All apps	→	Measurement Computing	→ InstaCal

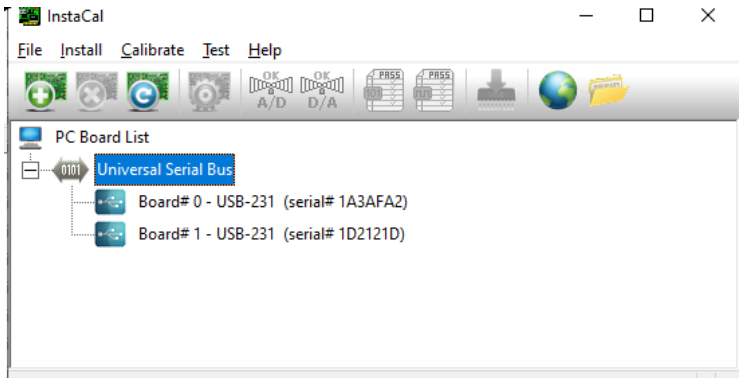


Figure 1

After launch, *InstaCal* detects the rotary chair as USB-231.

Click *OK* to register the devices in the program.

Close the 'Instacal software' after that.

2.2 Chair specifications

ITEM DESCRIPTION	DIMENSIONS						CLEARANCE		WEIGHT		LOCATION	POWER
	WIDTH		HEIGHT		LENGTH / DEPTH				NET LBS	KG		(VA)
	INCHES	CM	INCHES	CM	INCHES	CM	INCHES	CM				
Rotational chair	24	61	65	165	24	61	-		375	170,0	Floor	1000

Table 1

Maximum patient weight is 400 lbs (181 kg). Children under age 5 should sit on the lap of an adult or in the child seat delivered with the child option if the chair is to be rotated. Always use the seat belt and observe the patient at all times. An emergency stop switch on the cart can be used to remove power to the chair for an emergency stop.

Telephone and Ethernet connections are desirable for technical support assistance.

Please feel free to consult with Interacoustics about architectural details. If the AT/C chair must be moved at a later time, consult the anchoring guidelines provided in the installation instructions.

2.3 Room layout

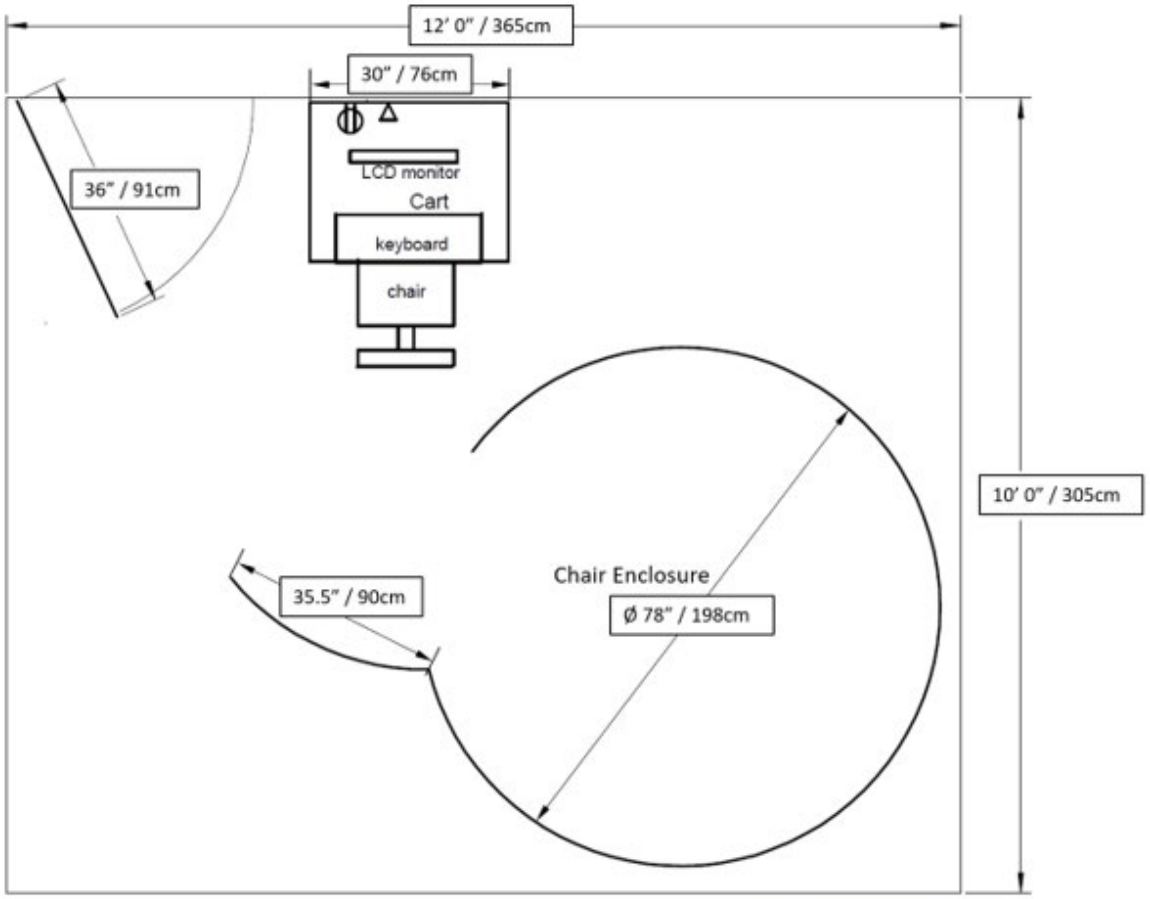


Figure 2

2.4 Interconnect diagram

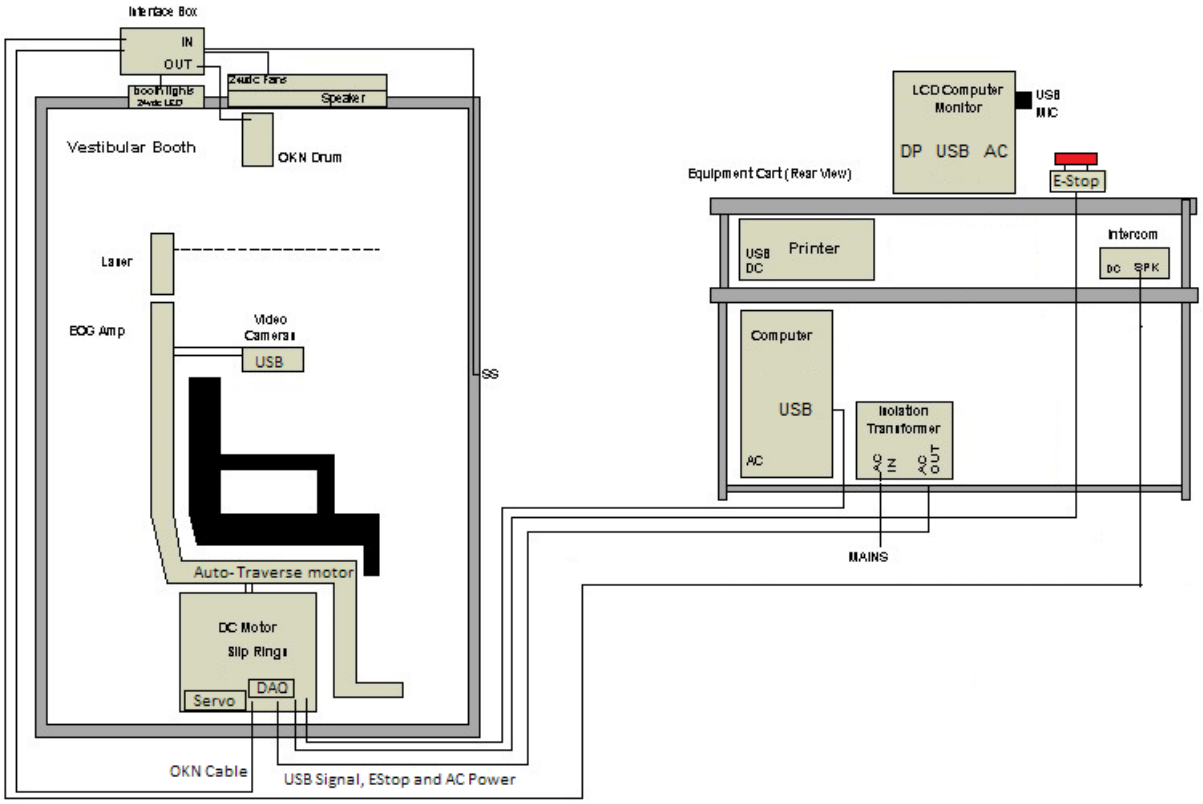


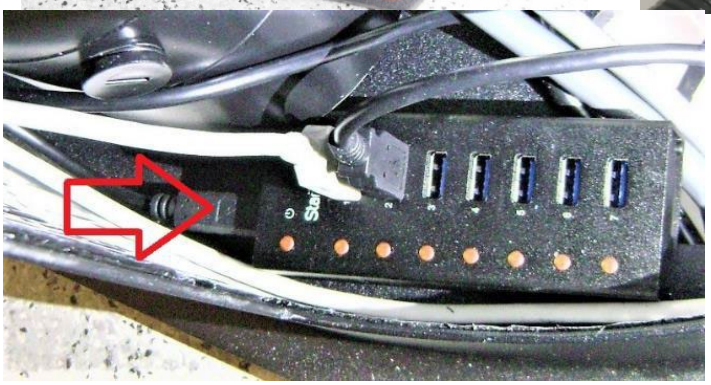
Figure 3

3. Repair and Spare Part replacement

USB cable from computer to chair base:

To replace or insert the USB cable from computer, using a hex wrench supplied with system and a flashlight (not supplied with the system), open the side panel next to the voltage symbol in the chair base. Set the panel and screws aside. The hole for the cable entry should be aligned with the channel in the booth floor.

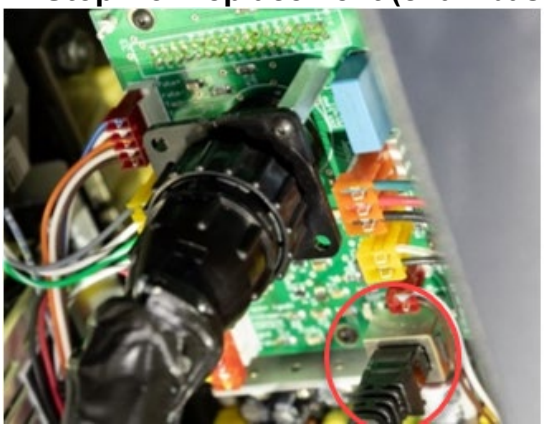
Insert the USB cable through booth channel and collect that through the hole in the bottom of the chair.



Connect the 25’ USB cable from the test computer to the 7 port USB hub in the Base.

CAUTION: The chair may spin up at full speed so be sure to secure everything that is not secured and be ready with the E-stop box in case it does.

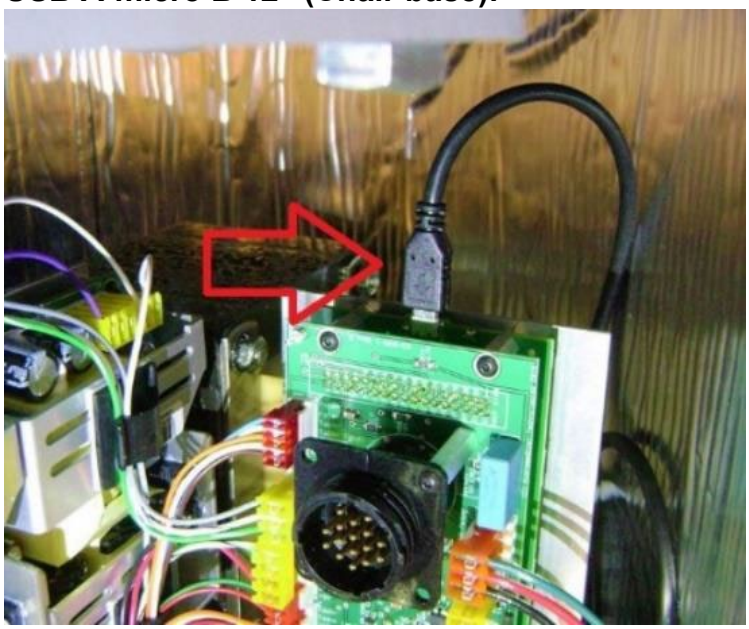
E- Stop Box replacement (chair base):



Open the chair base (procedure is mentioned above) and connect the E-Stop Box to the Lower I/O board- RJ45 connector in the chair base.

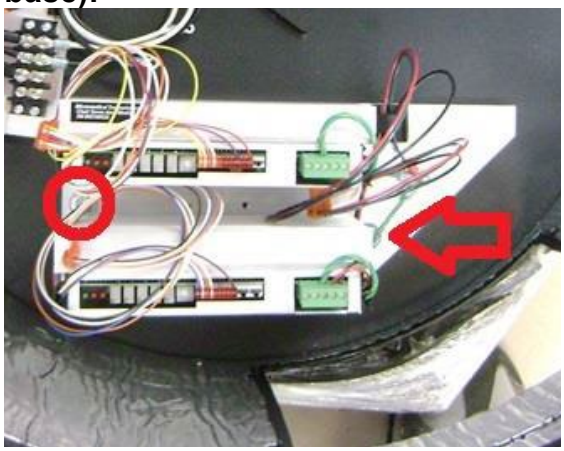
NOTICE: After installing the E-stop box, redo the steps for board 231 in Instacal software. The E-Stop LED should now be lit. Verify that the Board Status window is green in system default settings.

USB A-micro B 12” (Chair base):



Connect the 1’ USB A to micro B Cable to the USB Hub and to the USB 231 board

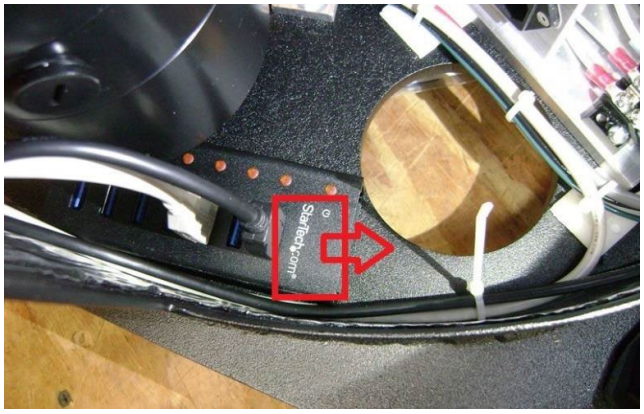
Servo amplifier module OKN motor and Servo amplifier module chair motor: (chair base):



Please refer the instructions shipped with this spare part for detailed steps for replacement.

USB hub (chair base and chair frame):

Adhere a 4” piece of 1” VHB tape to the bottom of the USB hub



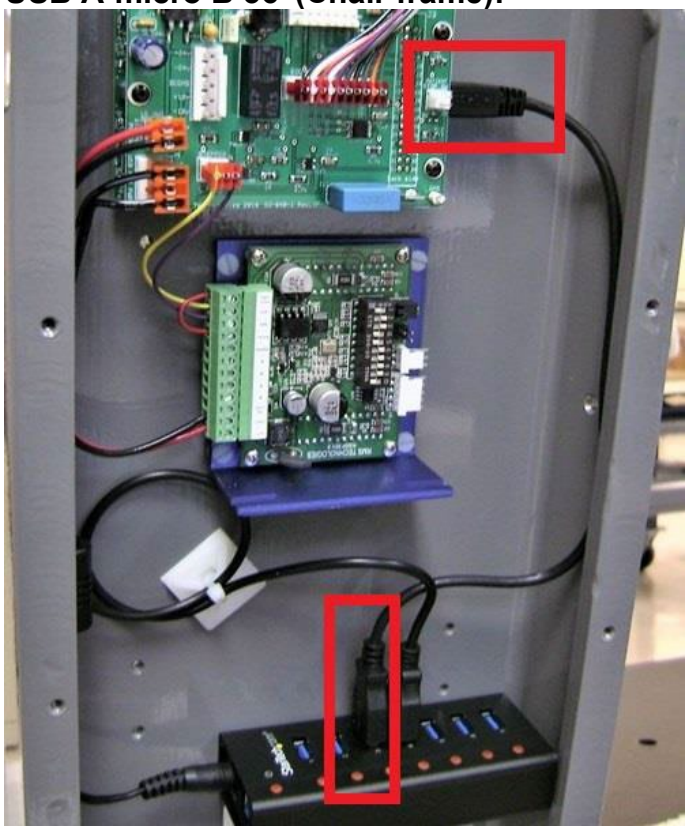
Adhere the hub in the chair base as shown.

To fix the USB hub in the chair frame,

Fasten the USB Hub Mount to the Chair Frame using two 8-32 x 3/8” PHS.

Place a 1.5” of VHB Tape on each end of the Hub Mount. Now adhere a Startech 7 Port hub onto the Hub Mount. NOTE: The power and USB connection should be on the left side.

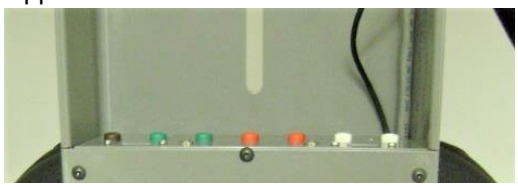
USB A-micro B 36”(Chair frame):



Connect the 1’ USB A to micro B Cable to port 2 of the USB Hub and to the USB 231 board

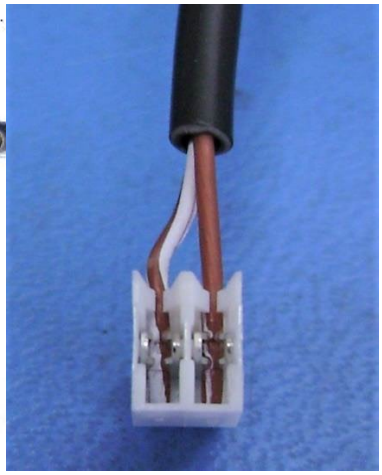
Patient Stop Emergency switch replacement (chair frame):

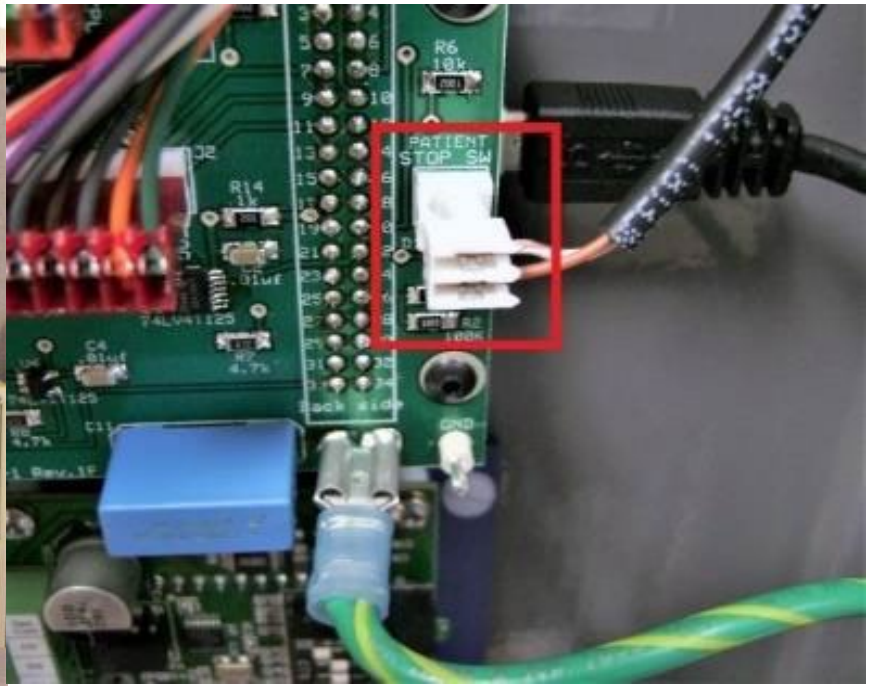
To replace the patient emergency switch, Remove the upper chair frame cover and remove the old from J8 of Upper I/O Board.

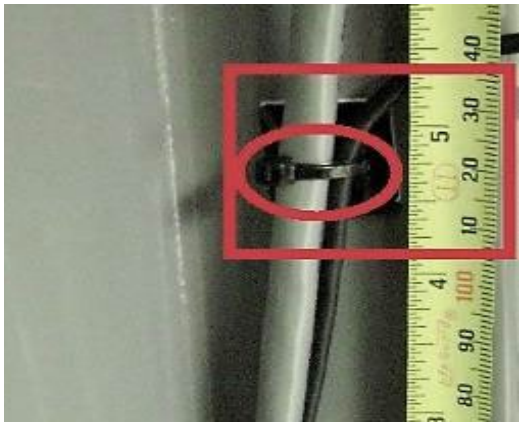


Insert the 2 pin White MTA Connector of the new switch through the hole on the top of the chair frame.

Slide the 2 pin White MTA Connector to the respective onto J8 of Upper I/O Board.

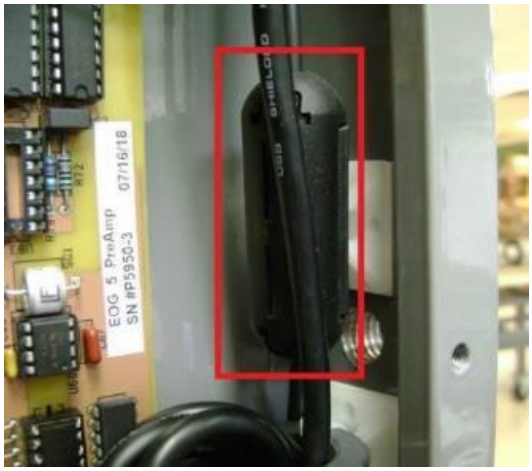




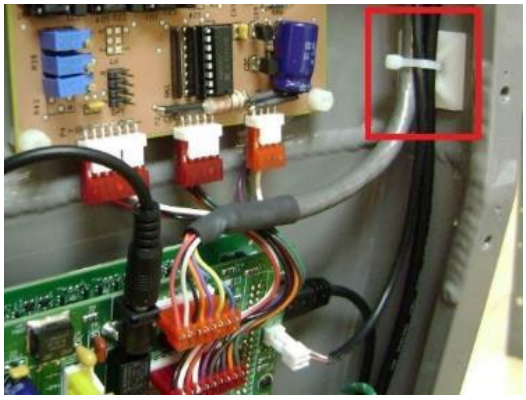


Adhere a Black Cradle Mount on the right 4.5” above the Top Plate and secure the Laser and Patient Safety Switch cables with a 4” Black Cable Tie.

NOTICE: Ensure that the Patient Stop Switch cable or Laser cable are pinched while fixing.



Clip a 5mm Ferrite onto the Patient Stop Switch Cable where shown.

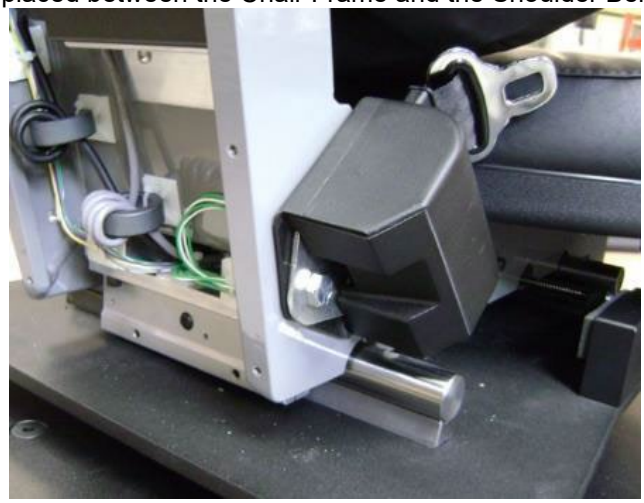


Place a Cradle Mount where shown and secure the USB Cable, the Laser Cable, and Patient Stop Switch Cable with an 8” Cable Tie. NOTE: Do not overtighten Cable Tie because the wires inside the USB cable may break.

Fasten the Upper Frame Cover to the Frame using five 8-32 x 3/8” Button Head Screws.

Seat belt set replacement (chair frame):

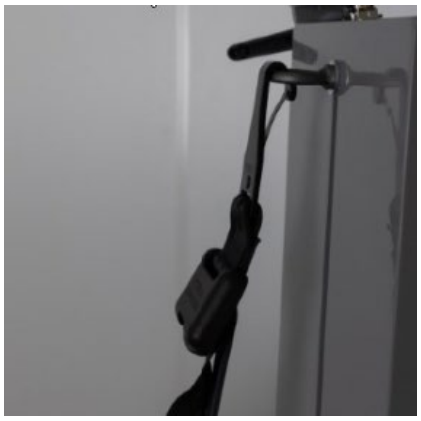
Attach the right and left Shoulder Belts (ones with silver edges) to the Chair Frame using a 3/8-16 x 1” Screw and Black Flat Washer on each side. NOTE: Flat Washer is placed between the Chair Frame and the Shoulder Belt.



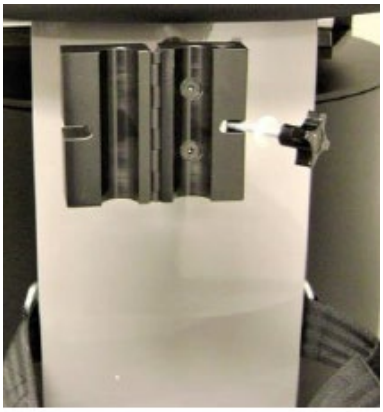
Attach the Shoulder Belt Buckles to the Chair Frame using two ½-13 x 3-3/4” Hex Head Bolts and 3” powder coated spacers.

Child option Accessory kit (Chair frame):

If a user decides to upgrade the Orion AC chair with paediatric option, the required modification to the chair frame should be done. For details steps of installation, refer the instruction guide comes with child option accessory kit. Below are the sample picture major components which are part of child option accessory kit.

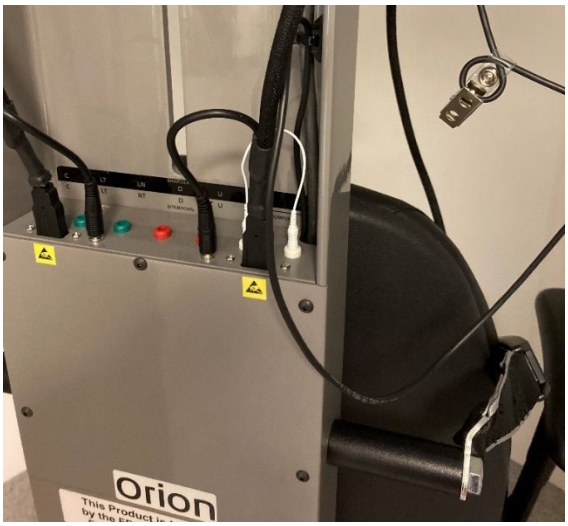







USB cable for goggle (chair frame):

Fix the USB cable from goggles to the backside of the channel frame as shown below. If extra grounding wires are available fix those to the respective (right or left) next to the USB port for the goggle.



USB cable Extension (USB A M-F ext. 3.0’ black) for SVV receiver:

The USB cable extension can be replaced to receive better signal for SVV.

USB AA- panel mount extension:

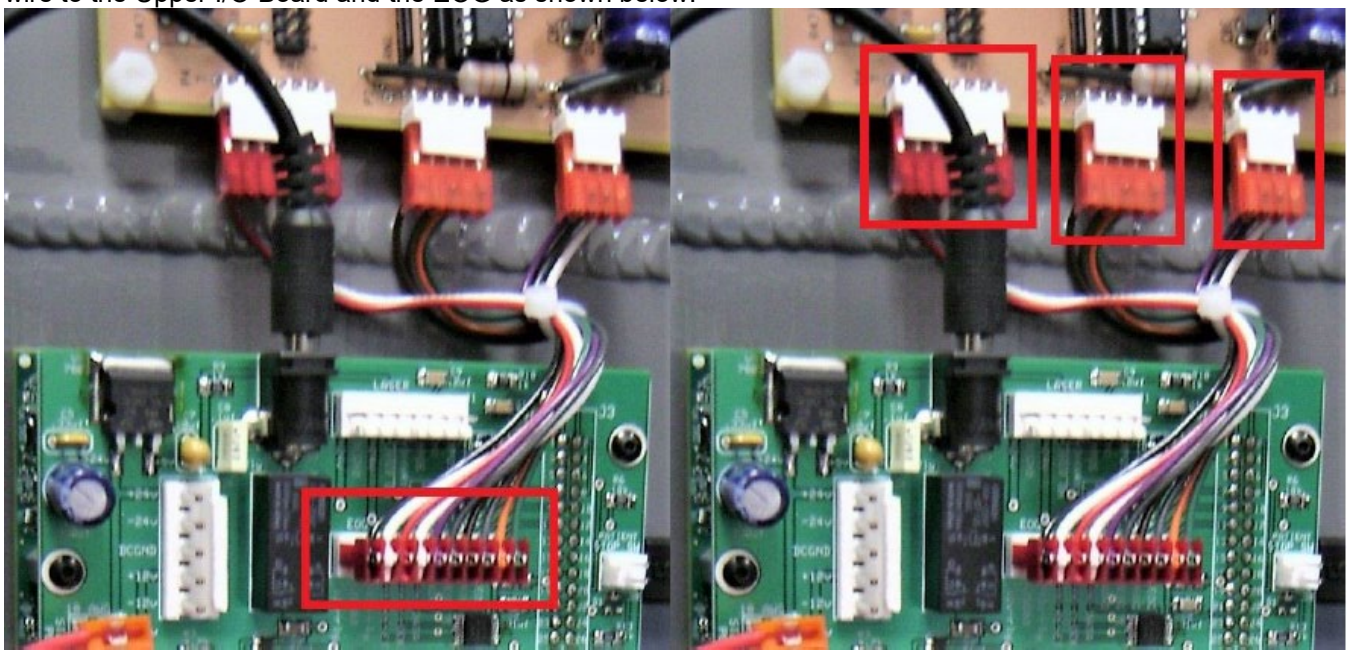
The USB AA extension cable is connected to USB hub in one end, the other end is panel mounted towards the top of the chair frame.

RF remote replacement:

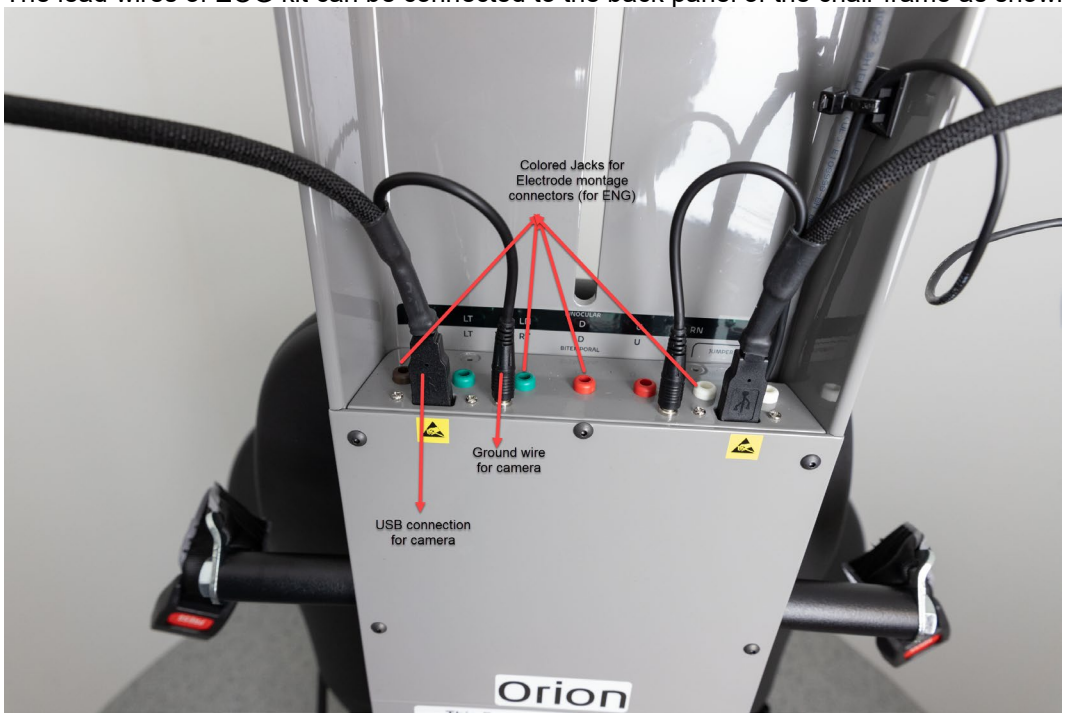
If any problem found with RF remote, that can be replaced.

EOG accessory kit:

If the user decides to upgrade the system with EOG option, remove the EOG Omit cable and connect the EOG wire to the Upper I/O Board and the EOG as shown below.



The lead wires of EOG kit can be connected to the back panel of the chair frame as shown below.



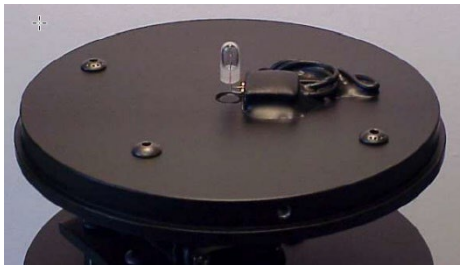
NOTICE. Consumables like Electrode skin prep pads, Electrode blue sensor and Electrode H69P should be used single patient use to avoid cross infection possibilities.

OKN Lamp replacement (OKN drum):

When the user sees no stripe pattern during OKN Test, they should confirm that the drum is spinning, as that will indicate that the OKN system has power. If there no stripe pattern is seen with the spinning drum, check the round CPC connector is properly seated on both ends (top of booth and inside the chair base).

After confirming all above mentioned possibilities, proceed with OKN Lamp replacement. Usually you can visibly see the lamp is brunt.

Spare projection lamp should be stored in a clear plastic box on conductive foam. This custom lamp operates from a 3.7vdc power supply in the OKN controller. The lamp is turned on and off by the software. To replace this bulb, Remove the OKN drum cover by unscrewing the four 4-40 X ¼" hex standoffs and then remove the old bulb.



The leads of the OKN lamp are bent approximately 1/16" from the bottom of the lamp. Cut the leads after the bend to a length that will place the lamp in the center (note: wipe the lamp with isopropyl alcohol to remove any oil from accidental contact to the bulb).

The projector can now be attached to the base using four 4-40 X ¼" hex standoffs .

4. Calibration

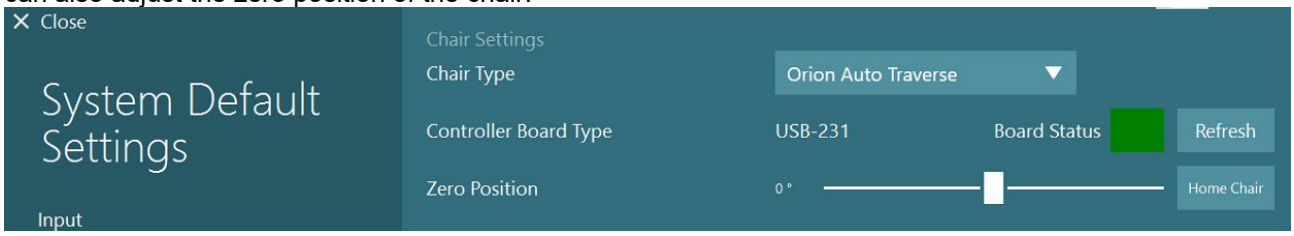
After service, the system should be calibrated, validated and checked for safety features before taken into routine operation.

Program Check

Double check all connections to the equipment. Turn on the power for isolation transformer and boot the computer. Launch Otoaccess platform and VisualEyes™ software.

Go to Configuration>System Default Settings and select Rotational Chair option.

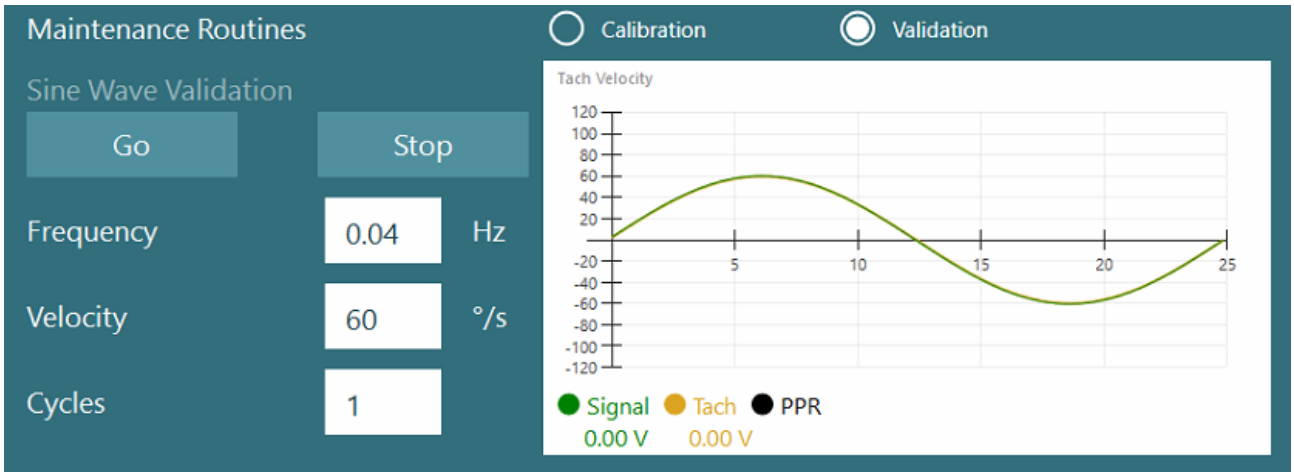
The user can select the chair type from the drop-down menu. The user can see the Controller board status and can also adjust the zero position of the chair.



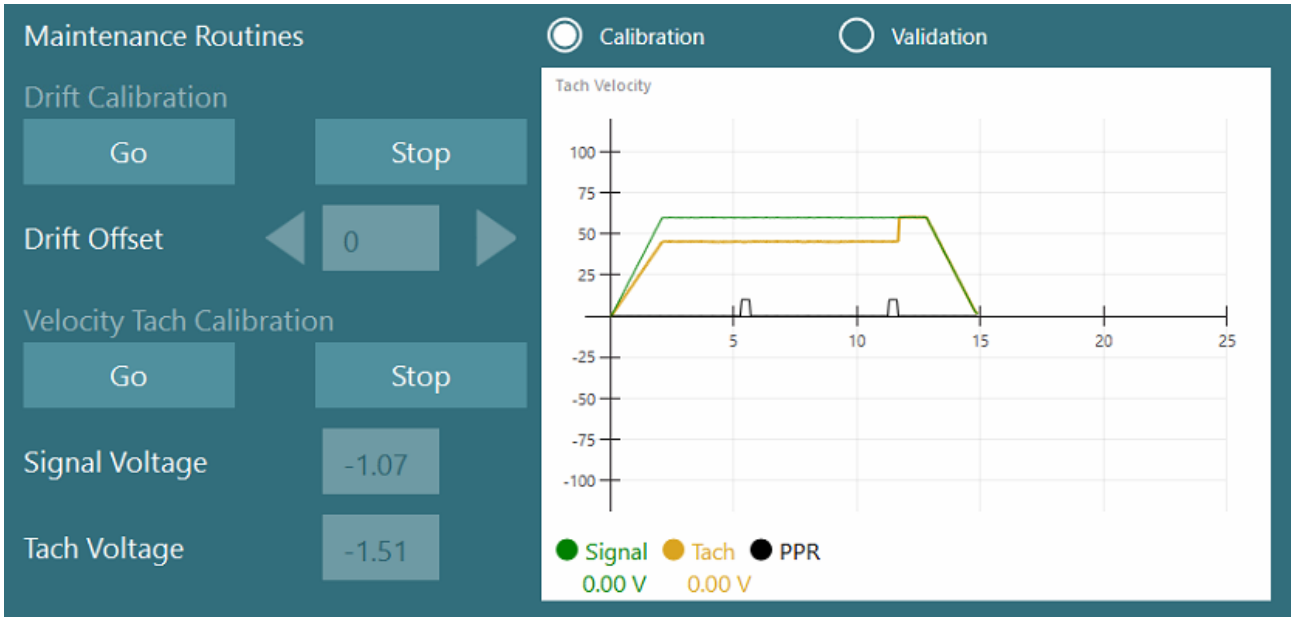
Validation

As part of installation checks, the user can validate and calibrate the system. Once the installation is done the user has to validate the system. By choosing Validation option under Maintenance Routines, the user can perform Sine Wave Validation.

Click Go on the Sine Wave Validation screen. Chair should rotate back and forth slowly. Watch the sine wave. There should be two colored sine waves that are superimposed into one curve. If curves match, there is no need to calibrate.



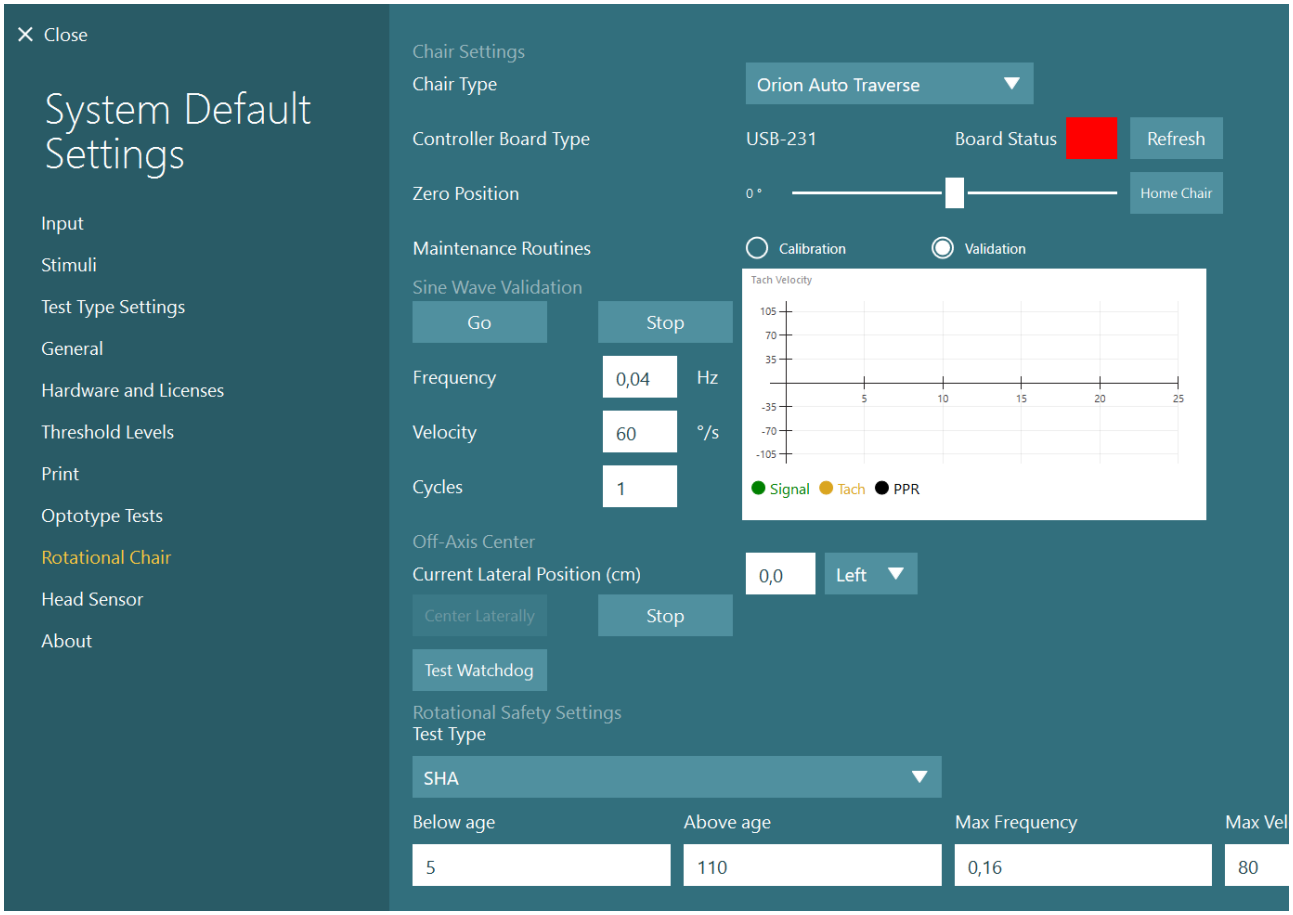
If NOT matched, then switch to the Calibration Maintenance Routines. Click Go under Drift Calibration. Chair should be stopped and not drifting. If the chair is moving slowly, remove the drift using the Drift Offset left / right arrow buttons. Once the chair stops moving, click Stop. Then click Go under Velocity Tach Calibration. The chair will spin CW. Two lines will be shown and eventually be superimposed. The calibration will stop automatically.



For testing otolith function, a 0 to 7 cm micro-centrifuge option is available. The chair seat should be centered laterally on the chair base. If the scale shows the chair is off-center, enter the current chair off-center position under ”Current Lateral Position (cm)”, then select the direction the chair is from center (Left / Right). Click on the Center Laterally button to move the chair to center.

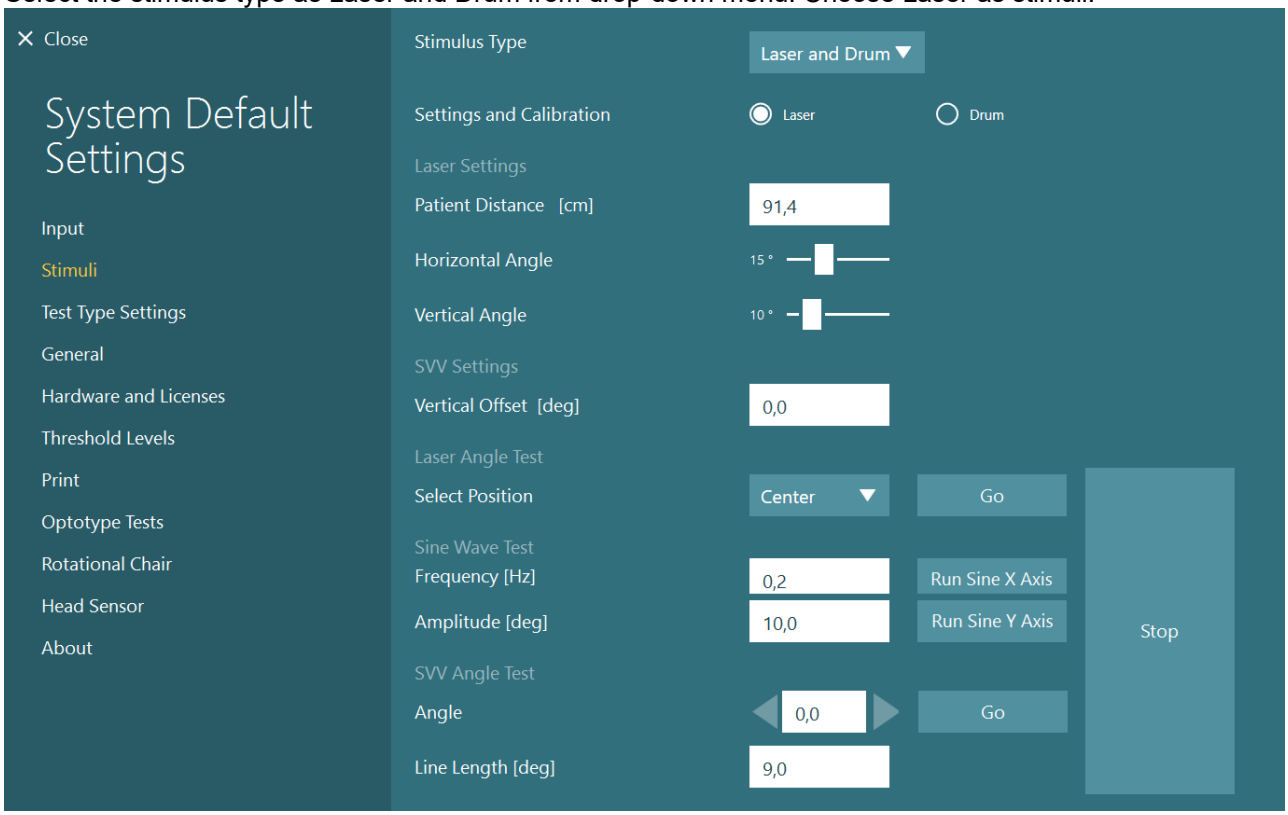
CAUTION

Do not attempt to move the chair frame laterally by pushing on the chair frame or damage may occur.



Laser Check

Select the stimulus type as Laser and Drum from drop-down menu. Choose Laser as stimuli.

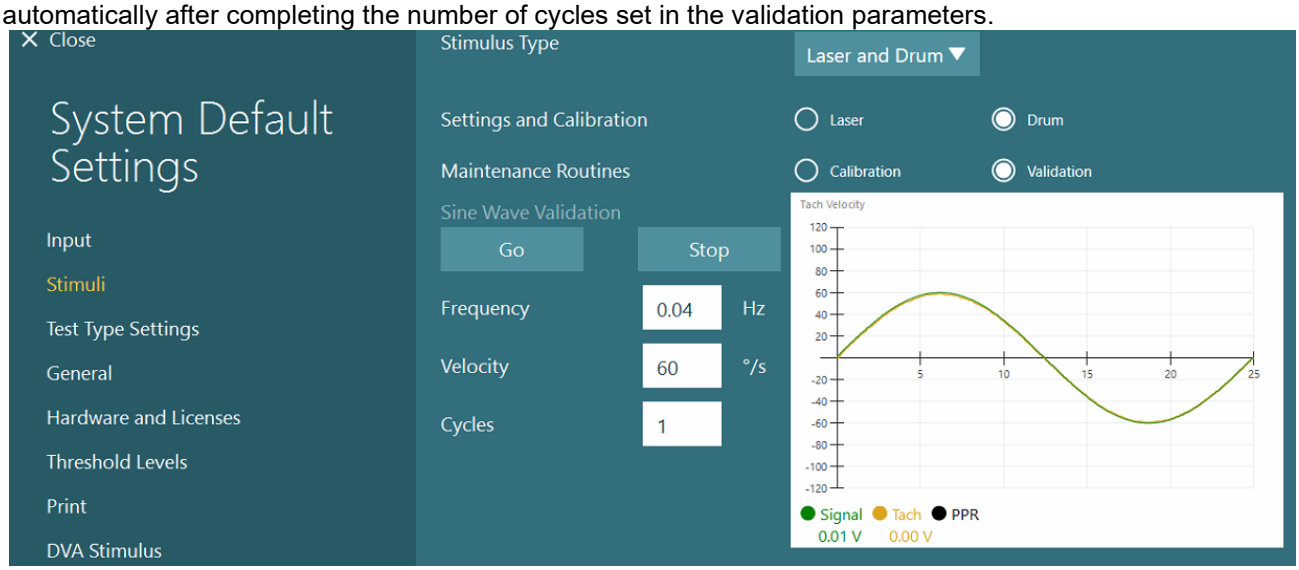


Select Center position and then, click 'Go' under Laser Angle Test. Laser light should put a red target on the booth wall depending on the position selected (Center, Left 15, Right 15, Left 25, Right 25 etc.). After that perform Sine Wave Test using 'Run Sine X Axis or Run Sine Y Axis' and observe that the laser moves in a smooth pattern. Click Stop to stop the Sine Wave Test.

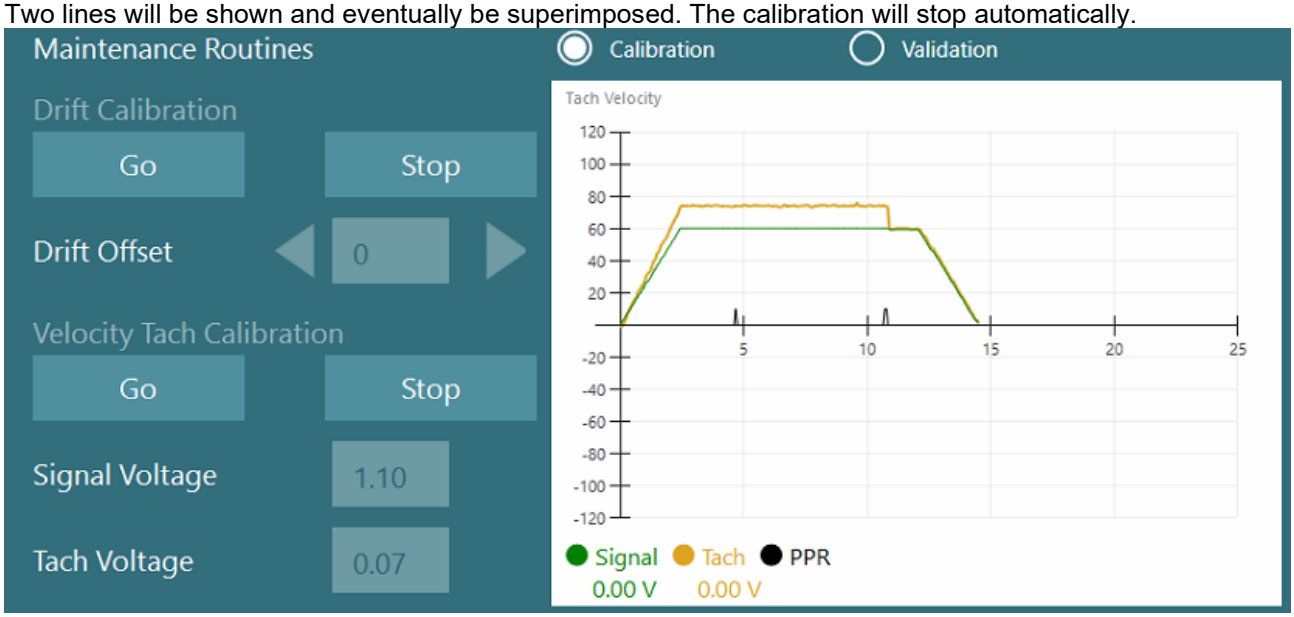
Under SVV Angle Test, click Go to check that the SVV line is rendered. Use the left / right arrow buttons to change the line angle and confirm smooth movement of the line.

OKN Check

Select the stimulus type as Laser and Drum from drop-down menu. Choose Drum as stimuli and select validation option. Click on 'Go' for Sine Wave validation. The OKN lamp should turn on and stripes will appear on the booth wall. The drum should rotate first one way then the other with symmetrical sine wave. The drum will stop automatically after completing the number of cycles set in the validation parameters.



If the Sine wave does not show superimposed lines, select the 'Calibration' option. Click the Go button under Drift Calibration and adjust the drift using the left / right arrow buttons to stop any drum movement. Click Stop. Then click on Go button under Velocity Tach calibration. The drum will begin to rotate. Make sure the direction is CCW. Two lines will be shown and eventually be superimposed. The calibration will stop automatically.



Safety checks

Before beginning the test in the chair system, certain safety tests to be done as described below.

Safety checks for new for Orion AT/C

- Watchdog safety: Make sure the Estop has been disengaged. The Estop will remain off until one enters the VisualEyes™ software and clicks on Begin Testing or goes into System Default Settings → Rotational Chair and selects Orion A/C. Exiting VisualEyes™ will turn off the Estop light after a few seconds. This ensures the Watchdog safety is working.
- Booth door safety: Click Begin testing with the booth door open. You should receive a message alerting that booth door needs to be closed to continue testing. Close the booth door and go to a Rotational chair test. You will get a safety checklist. The list needs to be checked before test can begin.

At this point, the Orion AutoTraverse / Comprehensive Rotational Chair has been installed and can be used to test patients.

If all the system checks are passsed, then the system is ready for use.

5. Preventative maintenance

ESD protection

The USB video goggles are static sensitive. The cameras will disconnect from the computer if static electricity from the patient or the user touches the metal connectors or camera cables.

To prevent ESD maintain the room relative humidity above 30% and if necessary use a local room humidifier to achieve that level. Additionally, an anti-static spray can be used on the chair seat surface.

If the cameras disconnect and a white eye image results, simply disconnect the USB cables from the side of the chair, wait 2 seconds, then reconnect the cameras. The eye images should return.

If the cameras do not reconnect, disconnect the USB cable from the back of the PC, wait 2 seconds, and then reconnect the cable.

Cleaning

AFTER EACH PATIENT
Use a mild upholstery fabric cleaner or Sani-Cloth wipes to clean the chair seat and head support.
Both video goggles and headbands should be wiped clean using wipes.
Use ONLY the supplied lens cleaning microfiber cloth to clean goggle mirrors.

WEEKLY
With a damp cloth, wipe the plastic and metal components of the chair.
Use a brush to remove any dust or hair.
Check the integrity and cleanliness of the head support strap.
Replacement straps can be ordered from Interacoustics

Drive belt tightening

MONTHLY
If the chair base is bolted to the floor, check the tightness of the floor bolts.
Check the tightness of the two drive belts in the chair base by attempting to rotate the chair when it is enabled but not rotating. The chair will feel “tight” and not slip easily. If the drive belts have stretched, they can be tightened.
The instruction below provides correct belt tension values and procedure for adjustment:

Belt tension values (Belt #1)	Kg	Lbs
Orion Reclining	17 - 20	37 - 44
Orion Auto-Traverse/Comprehensive	16 - 19	35 - 42

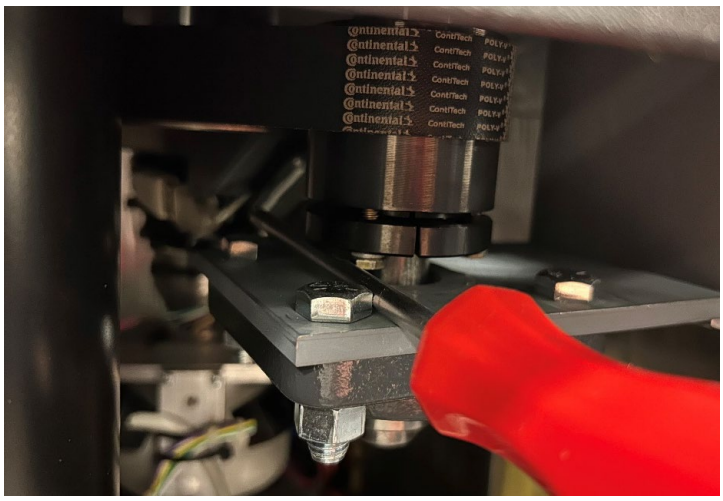
Tools needed:

- Screwdriver – Ø6mm rod
- Scale – capacity >25 kg/ 55 lbs
- Socket wrench with extension and ½" or 13mm socket

Tools needed to adjust drive belt tension

Procedure:

1. Turn OFF AC power to the chair controller.
2. Remove the two covers from the Orion base to get access to the adjustment bolt and the pulleys.
3. Insert the screwdriver rod to block the rotation of the chair.



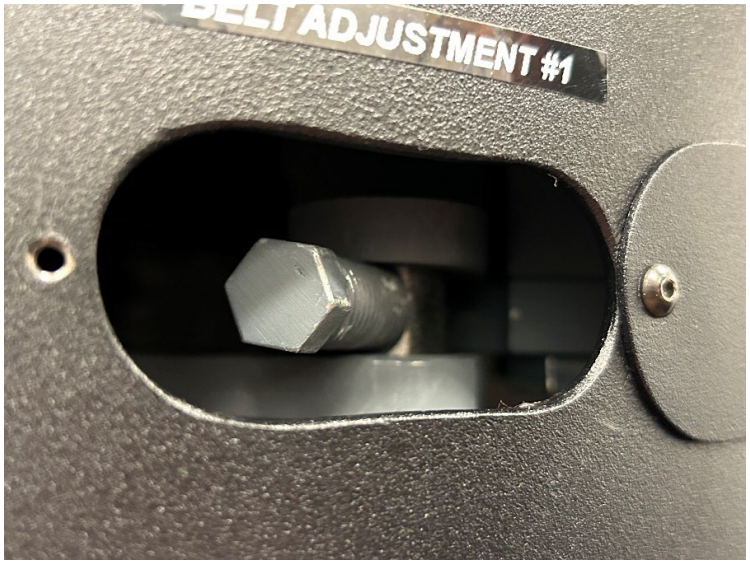
Placement of screwdriver to block rotation of the chair.

4. Place the scale hook in the middle of the footrest's edge.

: Placement of scale on the footrest (Left: Orion AT/C, Right: Orion Reclining)

5. Pull the scale to read the belt tension value. If the value is less than specified, prepare to tighten the belt tension.

6. Assemble the ½"/13 mm socket, extension piece and socket wrench. At the BELT ADJUSTMENT #1 opening, turn the adjustment bolt ½ turn clockwise.



Adjustment bolt at entry point for Belt #1.

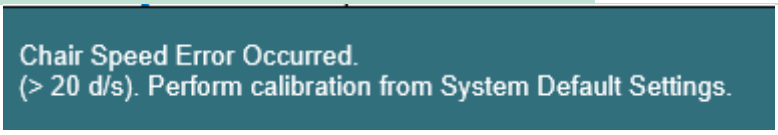
7. Repeat steps # 4 and 5 to see if the belt tension is within the specified range. If not, turn the adjustment bolt another ½ turn clockwise and repeat step 5.

8. Continue the adjustment until the belt tension is according to specifications.

9. Remove the screwdriver, refit the service door covers and turn the AC power back ON.

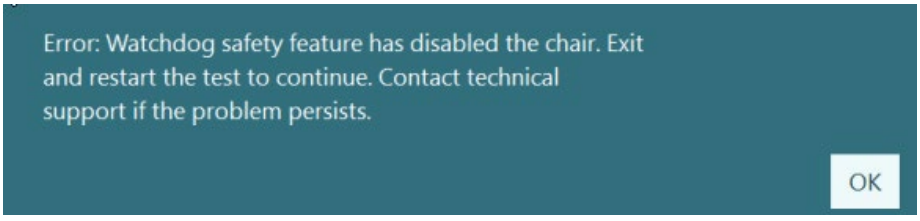
6. Troubleshooting

ROTATIONAL CHAIR SPEED ERROR



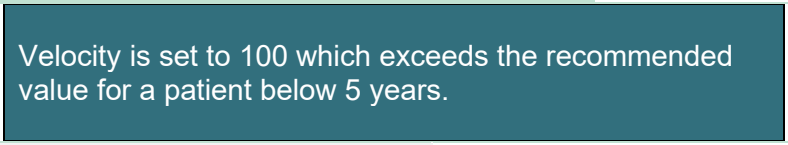
Chair Speed Error Occurred. (> 20 d/s). Perform calibration from System Default Settings.	If the rotational chair has not been calibrated previously, then the chair's tachometer and signal traces will not align, resulting in the chair spinning slower or faster than intended. The following message is given in this case. The operator should run the Velocity Tach Calibration routine from the System Default Settings screen.

WATCH DOG ERROR



Watchdog IC fails to see the Watchdog Timer Pulse within 5 seconds of last pulse, and removes power from the Servo Amps and 24V power supplies (and red E-Stop Switch LED is not lit)	Test Watchdog from SDS □ Rotational Chair. Perform Sine Wave Validation and click on "Test Watchdog" while the chair is spinning. The screen will appear to freeze, and the chair will stop spinning in within 5 seconds, E-Stop red light will go off. Close SDS and come back in to re-activate watchdog and continue. If the software freezes during chair rotation tests (SHA, Step, Visual VOR etc) watchdog will activate in similar fashion. Try to find the cause of software freeze. The user will need to close and re-enter the current test continue. If the problem persists, contact Technical Support.

PATIENT SAFETY ERROR



Velocity is set to 100 which exceeds the recommended value for a patient below 5 years.	If the patient's age lies outside the required age range for performing a rotational chair test, the software will give an error stating the patient cannot perform the test if the velocity or frequency exceeds the allowable limit for the patient's age.

EMERGENCY STOP ERROR

Emergency stop button was engaged or Chair Controller was powered off. Turn on the Chair Controller and disengage the Emergency Stop in order to perform rotational testing.	
Emergency stop button was engaged or Chair Controller was powered off. Turn on the Chair Controller and disengage the Emergency Stop in order to perform rotational testing.	If the operator presses the Emergency Stop button during the rotational chair test, the chair will stop, and the software will present an error message. The operator can resume rotational chair testing by disengaging the emergency stop and restarting the test.

CHAIR SERVO ERROR STATE ERROR

Chair is not moving due to servo error state. Press the emergency stop till the red light in the switch goes off. Then try again.	
Chair is not moving due to servo error state. Press the emergency stop till the red light in the switch goes off. Then try again.	If the chair tries to spin and fails due to obstruction or hardware failure, the software will detect the error as an emergency stop error first, and when the test is restarted, the software will give the chair servo error state message. The operator can resume rotational chair testing by pressing the Emergency Stop button until the light turns off in the switch (approximately 20 seconds), then disengage the emergency stop and restart the test.

BOOTH DOOR OPEN ERROR

Booth door is open. Close the door to continue testing.	
If the Orion Auto Traverse or Orion Comprehensive chair's booth enclosure has the door opened before or during testing, the software will display the following message	Close the booth door and go to a Rotational chair test. You will get a safety checklist. The list needs to be checked before test can begin.

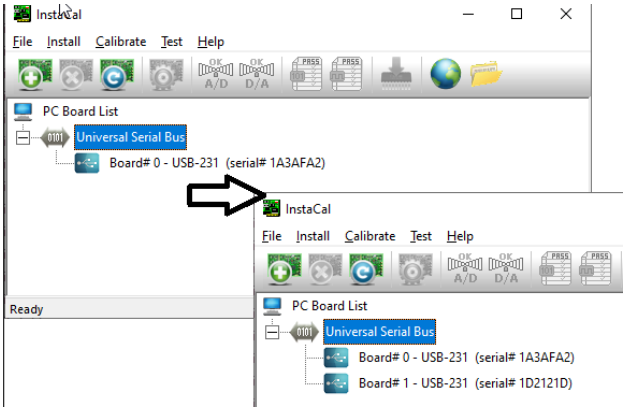
CAMERAS NOT DETECTED ERROR

If the software is unable to detect the cameras while connected to the chair, then disconnect the cameras from the side of the chair and connect them to the pc directly.

If the cameras can be seen on the pc while in the VisualEyes™ software, then run down one's hands down the length of the cables to check if the camera will drop out due to a break or short in the cable.

1. Check if the board status in System Default Settings to see if the chair can turn. if the Board Status is Green, check that the chair can turn. If the status is green and chair can turn, proceed to Step 2. If the chair does not turn, check the power source for the chair.

   If Board Status is red, possibly only one USB231 board is detected. Close VisualEyes™ software and launch Instacal from Start menu. If only one USB231 board is found in Instacal, check that the Orion A/C power cable is connected. Give a few seconds for USB device discovery and then relaunch Instacal. After both USB231 devices are detected, launch VisualEyes™ and confirm operation.



2. Take the cameras one at a time to the back of the computer

   Go to Flycap in search bar by Windows start button.

   Double click the serial number, *SN#*

   Look for dropped frames while you move the cable.

   Repeat for the other cable.

   Take a functioning cable and plug into the normal configuration while keeping non-functioning camera unplugged.

   Replace the verified non-functioning cables.

If the cables and cameras do not show any connection problems, then contact the local distributor for additional troubleshooting with the components in the base of the chair.

CHARI CONTROL BOARD ERROR

Chair control board not detected. Please check configuration and cable connections then try again.

Unplug the USB.

Then power on base of chair and restart computer.

Appendix A – Technical Specifications

General technical specifications

Computer specifications

Hardware and software

Desktop PC: One PCI Express card available (FireWire® systems only).
USB port required (expanded by USB hub)
Intel i5 processor 2.5 GHz or better, and not older than 5th generation. Minimum 4 cores (4 threads).
Minimum 8 GB RAM or more.
Hard drive with min. 250 GB space.
Minimum display of 1366x768 (Higher resolution recommended).
Touch monitor or laptop with touch screen is highly recommended though not required.

Operating systems supported:

Using operating systems where Microsoft have discontinued software and security support will increase the risk for viruses and malware, which may result in breakdowns, data loss and data theft and misuse. Interacoustics A/S cannot be held liable for your data. Some Interacoustics A/S products support or may work with operating systems unsupported by Microsoft. Interacoustics A/S recommends you to always use Microsoft supported operating systems that are kept fully security updated.
Windows® 10 and 11 64-bit.

Standards

IEC 60601-1: 2012	Medical electrical equipment – Part 1: General requirements for basic safety and essential performance
IEC 60601-1-2: 2014	Medical electrical equipment – Part 1-2: General requirements for basic safety and essential performance – Collateral standard: Electromagnetic compatibility – Requirements and tests
ANSI S3.45	Performance standard

Systems can operate on 100 to 240 VAC at frequencies of 50/60 Hz. A grounded plug can be used for the intended voltage, frequency and socket style used in the customer's region. Only power cables supplied should be used with the equipment. When used with the rotary chair, an isolation transformer is used to supply power to the components from power mains.

ORION AUTO TRAVERSE / COMPREHENSIVE ROTARY CHAIR

Quick Description:	Rotary chair in enclosure with built in laser and optokinetic drum for visual stimuli. With the Orion Auto Traverse, it is furthermore possible to do off axis rotation, for dynamic SVV, ENG and Child	
Technical Specifications:		
Standards:	IEC 60601-1 Class 1, Type B	
Operation Environment:	Temperature: Relative Humidity:	15 – 35°C 30 – 80%
Transport & Storage Environment:	Transport Temperature: Storage Temperature: Relative Humidity:	0 – 50°C 0 – 50°C 30 – 80%, Non-condensing
Rotation Control:	Software controlled	
Available rotary tests (on top of standard VisualEyes Tests):	Step Rotation (up to 350°/s) Sinusoidal Harmonic Acceleration (0.01 – 1.28 Hz) VOR Suppression (0.01 – 1.28 Hz) Static SVV Dynamic SVV (only Auto-Traverse)	
Interface:	USB 2.0	
Maximum Chair Speed:	350°/s	
Maximum Chair Acceleration:	200°/s	
Maximum Patient Weight:	180kg	
Dimensions (L x W x H):	Chair: 61 x 61 x 165 cm Booth Enclosure: 206 x 206 x 239	
Weight:	Chair: Booth Enclosure:	170 kg (375 lbs) 295 kg (650 lbs)
Patient Fixation:	Safety belt for body Ankle belt Head strap	
Headrest:	Yes	
Footrest:	Yes	
Emergency Stop:	Yes	
Laser:	Class: Wavelength: Beam divergence: Pulse pattern: Maximum Power Output:	2 680 nm 0.35 mrad Not pulsed, solid on state <1 mW
EOG built in:	See technical specifications for DATALINK (EOG/ENG) under Accessories	
Lateral Movement:	-7cm to +7cm (only Auto Traverse)	
Lateral Movement Speed:	0.8 cm/sec (only Auto Traverse)	
Shipping info:	Shipping crate dimensions (LxWxH):	Enclosure crate: 236x118x133 cm Chair crate: 119x175x100 cm Accessories pallet: 122x60x115 cm
Power supply:	110VAC, 220VAC step down to 110VAC through included isolation transformer	

Orion Auto Traverse/Comprehensive Accessories

PEDIATRIC OBSERVATION CAMERA

Quick Description:	Camera mounted on a unipod that can be attached to the Orion AutoTraverse / Comprehensive. Can be used when doing measurements on babies who can't wear one of the goggles.
Technical Specifications:	
Interface:	Dual USB 2.0
Cable Length:	1.8m
Capture Resolution:	640x480 @50fps
Video Resolution:	320x240 @25fps
Dimensions (L x W x H):	Camera: 54 x 69 x 62 mm Unipod: 978 x 84 x 79 mm
IR LED infrared illumination:	940 nm @ 252.6 mW/sr

EOG IN CHAIR

Quick Description:	Amplifier used for EOG/ENG measurements.
Technical Specifications:	
Standards:	ISO 60601-1 Class II, Type B
Number of channels:	2 or 3
Internal Noise:	<4 µV RMS inputs shorted, bandwidth DC-40 Hz
Input DC withstand:	300 mW
Programmable Gains:	1250, 2500, 5000, 10000
Common mode rejection:	>100 dB measured at 10 Hz measured with 5k imbalance
Isolation mode rejection:	>130 dB measured at 10 Hz

EMC compliance

This section is valid for the VisualEyes™ system including all variant of goggles.

This equipment is suitable in hospital and clinical environments except for near-active HF surgical equipment and RF-shielded rooms of systems for magnetic resonance imaging, where the intensity of electromagnetic disturbance is high.

NOTICE: ESSENTIAL PERFORMANCE for this equipment is defined by the manufacturer as:
This equipment does not have an ESSENTIAL PERFORMANCE Absence or loss of ESSENTIAL PERFORMANCE cannot lead to any unacceptable immediate risk.
Final diagnosis shall always be based on clinical knowledge.

Use of this equipment adjacent to other equipment should be avoided because it could result in improper operation. If such use is necessary, this equipment and the other equipment should be observed to verify that they are operating normally.

Use of accessories and cables other than those specified or provided by the manufacturer of this equipment could result in increased electromagnetic emissions or decreased electromagnetic immunity of this equipment and result in improper operation. The list of accessories and cables can be found in this section.

Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of this equipment, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result in improper operation.

This equipment complies with IEC60601-1-2:2014, emission class B group 1.

NOTICE: There are no deviations from the collateral standard and allowances uses.

NOTICE: All necessary instructions for maintenance comply with EMC and can be found in the general maintenance section in this instruction. No further steps required.
To ensure compliance with the EMC requirements as specified in IEC 60601-1-2, it is essential to use only the following accessories as applicable:

Item	**Manufacturer**	**Model**	**Cable**	
			Length [meter]	Screened [Y/N]
Camera System for Vestibular Analysis	Interacoustics	2D-VOGfw (Side Mount)	4,5	Y
Goggles USB Binocular 4.0	Interacoustics	BG4.0USB (Top Mount)	1,8	Y
Goggles USB Monocular Adult Mask or Pediatric Mask	Interacoustics	USBM2.1A (Front Mount)	1,8	Y

Anyone connecting additional equipment is responsible for making sure the system complies with the IEC 60601-1-2 standard.

Conformance to the EMC requirements as specified in IEC 60601-1-2 is ensured if the cable types and cable lengths are as specified below:

Item	**Manufacturer**	**Model**	**Cable**	
			Length [meter]	Screened [Y/N]
Mains cable (Grey)	-	IEC C13/C14	2,9	Y
USB cable	-	USB A/B	2,9	Y
Emergency switch	Interacoustics	-	4,4	N

Guidance and manufacturer's declaration - electromagnetic emissions		
The *Instrument* is intended for use in the electromagnetic environment specified below. The customer or the user of the *Instrument* should assure that it is used in such an environment.		
Emissions Test	**Compliance**	**Electromagnetic environment - guidance**
RF emissions CISPR 11	Group 1	The ***Instrument*** uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emissions CISPR 11	Class B	The ***Instrument*** is suitable for use in all commercial, industrial, business, and residential environments.
Harmonic emissions IEC 61000-3-2	Complies Class A Category	
Voltage fluctuations / flicker emissions IEC 61000-3-3	Complies	

Recommended separation distances between portable and mobile RF communications equipment and the ***Instrument***.			
The ***Instrument*** is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ***Instrument*** can help prevent electromagnetic interferences by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ***Instrument*** as recommended below, according to the maximum output power of the communications equipment.			
Rated Maximum output power of transmitter [W]	**Separation distance according to frequency of transmitter [m]**		
	150 kHz to 80 MHz $d = 1.17\sqrt{P}$	**80 MHz to 800 MHz** $d = 1.17\sqrt{P}$	**800 MHz to 2.7 GHz** $d = 2.23\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.37	0.37	0.74
1	1.17	1.17	2.33
10	3.70	3.70	7.37
100	11.70	11.70	23.30
For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. **Note 1** At 80 MHz and 800 MHZ, the higher frequency range applies. **Note 2** These guidelines may not apply to all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Guidance and Manufacturer's Declaration - Electromagnetic Immunity			
The ***Orion AT/C chair*** is intended for use in the electromagnetic environment specified below. The customer or the user of the ***Instrument*** should assure that it is used in such an environment.			
Immunity Test	**IEC 60601 Test level**	**Compliance**	**Electromagnetic environment - guidance**
Electrostatic Discharge (ESD) IEC 61000-4-2	+8 kV contact +15 kV air	+8 kV contact +15 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be greater than 30%.
Immunity to proximity fields from RF wireless communications equipment IEC 61000-4-3	Spot freq. 385-5.785 MHz Levels and modulation defined in table 9	As defined in table 9	RF wireless communications equipment should not be used close to any parts of the ***Orion AT/C chair***.
Electrical fast transient/burst IEC61000-4-4	+2 kV for power supply lines +1 kV for input/output lines	+2 kV for power supply lines +1 kV for input/output lines	Mains power quality should be that of a typical commercial or residential environment.
Surge IEC 61000-4-5	+1 kV Line to line +2 kV Line to earth	+1 kV Line to line +2 kV Line to earth	Mains power quality should be that of a typical commercial or residential environment.
Voltage dips, short interruptions and voltage variations on power supply lines IEC 61000-4-11	0% *U*T (100% dip in *U*T) for 0.5 cycle, @ 0, 45, 90, 135, 180, 225, 270 and 315° 0% *U*T (100% dip in *U*T) for 1 cycle 40% *U*T (60% dip in *U*T) for 5 cycles 70% *U*T (30% dip in *U*T) for 25 cycles 0% *U*T (100% dip in *U*T) for 250 cycles	0% *U*T (100% dip in *U*T) for 0.5 cycle, @ 0, 45, 90, 135, 180, 225, 270 and 315° 0% *U*T (100% dip in *U*T) for 1 cycle 40% *U*T (60% dip in *U*T) for 5 cycles 70% *U*T (30% dip in *U*T) for 25 cycles 0% *U*T (100% dip in *U*T) for 250 cycles	Mains power quality should be that of a typical commercial or residential environment. If the user of the ***Orion AT/C chair*** requires continued operation during power mains interruptions, it is recommended that the ***Orion AT/C chair*** be powered from an uninterruptable power supply or its battery.
Power frequency (50/60 Hz) IEC 61000-4-8	30 A/m	30 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or residential environment.
Radiated fields in close proximity — Immunity test IEC 61000-4-39	9 kHz to 13.56 MHz. Frequency, level and modulation defined in AMD 1: 2020, table 11	As defined in table 11 of AMD 1: 2020	If the ***Orion AT/C chair*** contains magnetically sensitive components or circuits, the proximity magnetic fields should be no higher than the test levels specified in Table 11
Note: *U*T is the A.C. mains voltage prior to application of the test level.			

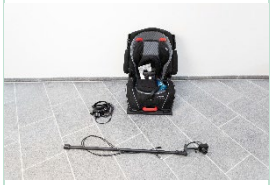
Guidance and manufacturer's declaration — electromagnetic immunity			
The ***Instrument*** is intended for use in the electromagnetic environment specified below. The customer or the user of the ***Instrument*** should assure that it is used in such an environment,			
Immunity test	**IEC / EN 60601 test level**	**Compliance level**	**Electromagnetic environment – guidance**
			Portable and mobile RF communications equipment should be used no closer to any parts of the ***Instrument,*** including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. **Recommended separation distance:**
Conducted RF IEC / EN 61000-4-6	3 Vrms 150kHz to 80 MHz 6 Vrms In ISM bands (and amateur radio bands for Home Healthcare environment.)	3 Vrms 6 Vrms	$d = \frac{3,5}{Vrms}\sqrt{P}$
Radiated RF IEC / EN 61000-4-3	3 V/m 80 MHz to 2,7 GHz 10 V/m 80 MHz to 2,7 GHz Only for Home Healthcare environment	3 V/m 10 V/m (If Home Healthcare)	$d = \frac{3,5}{V/m}\sqrt{P}$ 80 MHz to 800 MHz $d = \frac{7}{V/m}\sqrt{P}$ 800 MHz to 2,7 GHz Where *P* is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey,[a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 
NOTE1 At 80 MHz and 800 MHz, the higher frequency range applies NOTE 2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			
a) Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the ***Orion AT/C chair*** is used exceeds the applicable RF compliance level above, the ***Orion AT/C chair*** should be observed to verify normal operation, If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ***Orion AT/C chair.*** **b)** Over the frequency range 150 kHz to 80 MHz, field strengths should be less than 3 V/m.			

Appendix B – Parts & accessories

PART	PART NUMBER	PART DESCRIPTION
SPAREPARTS		
	8518594	E-Stop box assembly Orion AC USB
	8517970	Seat belt set retractable, Rot. Chair Frame AC
	8517580	Patient Stop Emergency Switch, Orion AC USB
	8100212	USB Cable, 25.0’ black
	8502990	3.7V T-1 1/2 Stiff Pin Lead Incandscent bulb Xenon clear
	8102898	USB A M-F ext. 3.0' black
	8519717	Wireless RF Remote Targus Orion AC USB

	8502374	Servo amp module OKN motor. Chair Controller AC CC
	8502375	Servo amp module Chair motor Rot. Chair Controller ACR
	8502745	USB A-micro B 12.000" black
	8503670	7 port 3.0 StarTech USB Hub black
	8517968	USB A-A Panel Mount ext. 36.000" black
	8518740	USB A-micro B 36.000" black

ACCESSORIES AND CONSUMABLES

	8517811	Child Option Accessory Kit Orion AC
	8503781	EOG Accessory Kit
	8101700	Electrode Skin Prep Pads
	8101702	Leadwire 40.00” set of 7
	8101705	Electrode Blue sensor snap disposable (12 pack)
	8101706	Electrode H69P disposable (30 pack)
	8502980	6.000x6.750" 160 count tub, SANI-CLOTH AF3 Wipes

Appendix C - Revision history

The following modifications have been made to this instrument and/or service manual:

DATE	ACTION	REMARKS
2025/04	Revision of service manual	-Section 1.3 Fax no removed -Section 1.7 Markings updated with standards - Section 5: Drive belt tightening updated - Section 5: Cleaning: Mention of Sani Cloth removed as it no longer exists. - Appendix A Technical specifications updated with Windows® 11 and removal of 7 and 8. -Appendix A EMC compliance: Table updated to latest standard - Appendix B Parts and Accessories updated - Appendix Block diagrams removed
2020/10	New Service manual	