Zero Gravity Air Balancer Control Kit
ZG Series
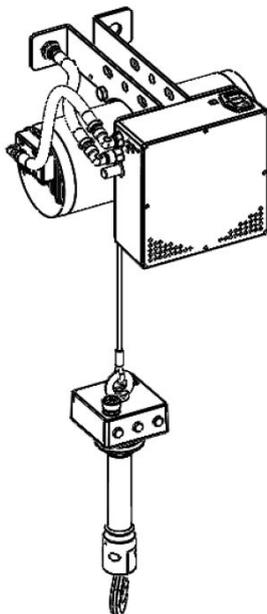
User Manual

EN User Manual
ES Manual del Usuario
FR Manuel d'utilisation
DE Benutzerhandbuch
PT Manual do Usuário

Save These Instructions

Ingersoll Rand.

EN

When product life has expired, it is recommended to:

- disassemble the product
- degrease the product
- separate product parts by material for correct recycling

Product repair and maintenance should be conducted by an authorized service center.

Refer all communications to the nearest **Ingersoll Rand** office or distributor.

Manuals are available at ingersollrand.com

Table 1. Product Information Manuals

Publication	CCN
Product Safety Manual	16598831
Product Information Manual	54072541
Product Parts Information Manual	16598849
Product Installation Manual	47646669001
Product Maintenance Manual	16598856
Declaration of Conformity	47646667001

Product Description

This control kit is designed for use with an air balancer. It provides the ability to electronically move loads up and down using handle actuators or applying force directly to a lifted load.

⚠ WARNING

- **Controller must be used by a single operator. Simultaneous command inputs may result in hazardous movements.**

- **Do not use this product or attached equipment for;**
     - lifting, supporting or transporting people
     - lifting or supporting loads over people

- **Do not operate this product in wet or explosive environments.**

⚠ CAUTION

- **To reduce the risk of electric shock, do not expose to rain. Store indoors.**

Specifications

This device needs to be connected to a standard E type plug or B type plug (for other option, contact factory). It works from 100-150V AC at 50 to 400Hz and the power consumption is 3.5A max. This system is protected by 2 fuses (characteristics: T type, dimension 5x20mm, 3.15A 250V AC.). Working pressure of 100 PSI (6.9bars) dry and clean air only (30 microns filter must be use).

Model Code Explanation

Example:	ZG	W	020	120	00

Type of Control Kit
ZG   =   **Zero Gravity**

Wire
W   =   **Wire Rope**

Capacity
015   =   150 lb. (68 kg)
020   =   200 lb. (91 kg)
035   =   350 lb. (158 kg)
050   =   500 lb. (227 kg)

Inches of Travel
80   =   80 in. (203 cm)
120   =   120 in. (305 cm)

Type of Suspension Kit
00   =   No Suspension
AT   =   ZRAT Rail
A1   =   ZRA1 Rail
A2   =   ZRA2 Rail
HM   =   Top Hook Mount

Installation

⚠ WARNING

- **Prior to installation, refer to Product Safety Information Manual for all sections of installation.**

1. To mount the Balancer, use brackets provided.
2. Connect air supply line to main air inlet using a 3/8 inch coupling.

Fig. A
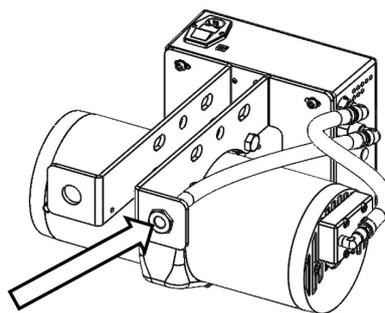
3. Connect power cord to the controller.
     a. Power Supply 100-150V AC, 50-400 Hz.

Fig. B
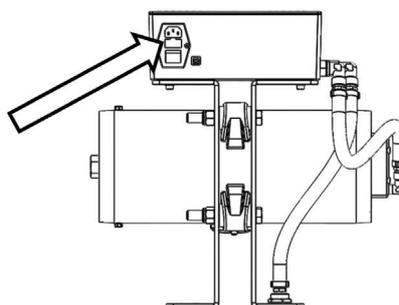
Handle Installation

NOTICE

- To make sure balancer operates as intended, it is not recommended to use balancing mode in the bottom 1/4 of the balancer's stroke. Refer Fig. E.
- For load hook installation and lash up instructions, refer to Balancer Installation Manual 47646669001.
- Control handle can be installed inline with wire rope and the load (Fig. C) or mounted in a remote location using mounting brackets (Fig. D).

Fig. C	Fig. D	Fig. E

Intended Balancing Mode Stroke 60" (90" for ZGB020)

Full Stroke of Balancer handle 80" (120" for ZGB020)

Not recommended to use Balancing Mode in bottom 1/4 of stroke
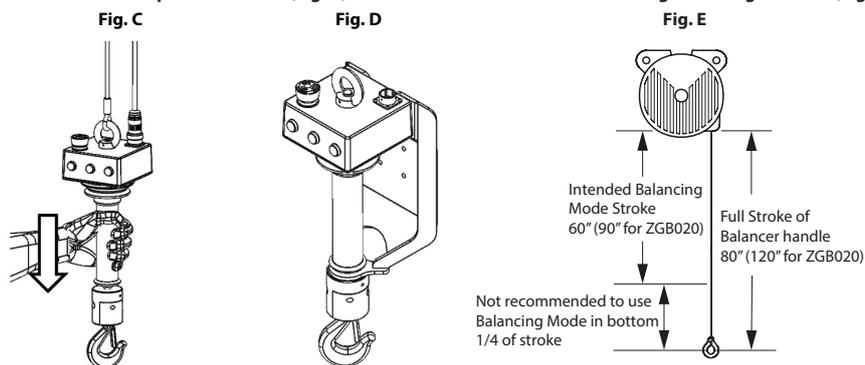
Handle Connection

1. Connect the handle eye bolt to the wire rope eyelet.
2. Connect the electric spiral wire to the electronic box.
3. Connect the electric spiral wire to the plug on top of handle.
4. Fasten the ring clockwise for a secure connection.

Fig. F
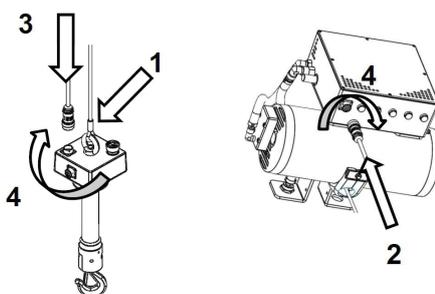
Turn on Power

5. Switch on the Zero Gravity Controls using the power switch on the main box.
   a. To disengage the operation, press the Emergency Stop Button (ESB) located on top of the handle.

⚠ WARNING

- **Do not touch the control handle during initialization of the controller kit.**

6. Release E-stop button by rotating clockwise until it pops.

7. Push the green button on the handle to begin operation.

Fig. G
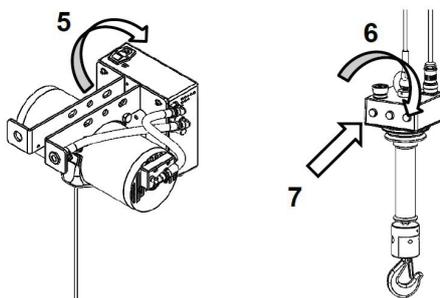
Deflate the Chamber

8. Three yellow lights indicate completion of initialization of controller. When lit, pull down sleeve of handle to deflate the chamber.

Fig. H
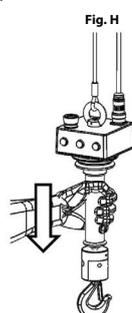
Operation

⚠ WARNING

- **Press Emergency Stop button to stop movement in case of an emergency.**
- **Make sure electrical wiring to the balancer conforms to all relevant safety codes and regulations.**
- **Make sure all electrical connections are secure before applying power.**
- **Never operate equipment with damaged, frayed or twisted electrical cables.**
- **Before each shift or initial use, inspect balancer for visible wear and damage.**
- **Immediately disconnect main power if balancer is damaged.**
- **Only licensed electrical technicians, trained on this product, should be allowed to access electrical components to perform troubleshooting and/or repair.**
- **Troubleshooting of the system by licensed electrical technicians is limited to visual inspection of components and sub assemblies once the enclosures are opened.**
- **Before accessing electrical components, follow 'lock-out, tag-out' procedures to make sure that power to the system has been disconnected.**
- **Disconnect air supply to balancer prior to maintenance.**

Standard operation

Move loads up and down with the sliding portion of the handle.

Fig. J
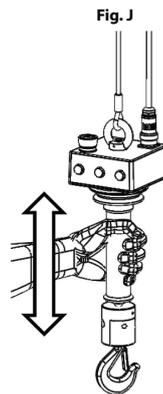
Float Mode

Engage Float Mode

To engage float mode, release handle. Float mode will be triggered by lack of contact with handle. While float mode is engaging, red light will appear on Zero Gravity controller. Do not touch handle while controller is calculating load. Float mode is engaged and calculation complete when three yellow lights appear on controller.

⚠ WARNING

- **Do not apply force on the load (upward / downward) while float mode is calculating as this will cause faulty calculation of the weight and drift of the load.**

Move loads up and down by acting direclty on the load itself.

Disengage Float Mode

Float mode disengages automatically once handle is touched resulting in yellow lights on the controller to turn off. When yellow lights turn off, use handle sleeve to move load upward/downward.

No Load Balancing

Use no load balancing if a handling device is permanently suspended to the unit. This will keep the handling device balanced, in float mode, and help to prevent damaging the part during loading/unloading.

- Turn off power switch on controller box.
- Disconnect the electric power supply.
- Remove the cover of the controller box.
- Connect the controller main box to a laptop to begin Serial Communication. Refer to Software Communication section on page 9.
- Turn clockwise the no load balancing trimmer for the correct weight adjustment on the laptop screen (value must be the gripper weight).
- Close the cover of the controller main box.
- Reconnect electric power supply.
- Turn on the controller. Refer to Turn On Power section.
- Use the handle to move the handling device **down**.
- When handling device touches the ground, the controller should stop the down movement.

Fig. K
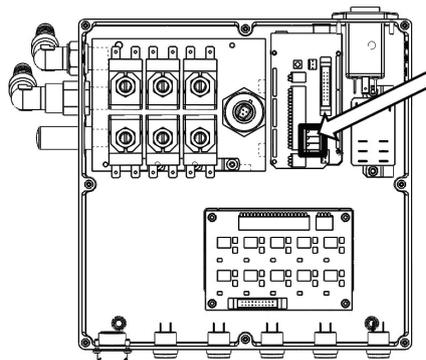
Over Pressure

Controlled pressure within the chamber will prevent fast upward movement if there is a blockage of the load or gripper, or sudden release of the load.

● Turn off power switch on the controller box.
● Disconnect the electric power supply.
● Remove the cover of the controller box.
● Connect the controller main box to a laptop to begin Serial Communication. Refer to Software Communication section on page 10.
● Turn counter clockwise the pressure max trimmer for the correct weight adjustment on the laptop screen (value must be the gripper + max load weight).
● Close the cover of the controller main box.
● Reconnect electric power supply.
● Turn on the controller. Refer to Turn On Power section.
● Use the handle sleeve to move the handling device **up**.
● When the handling device is in the **up** position, the controller should stop the up movement.

Interlock

The interlock feature will not allow the handling device to open while it is suspended. Activation of this option is indicated by three yellow lights on the controller.
- 1 yellow light indicates that the part is clamped.
- 2 yellow lights indicates that the part is released.
- 3 yellow lights indicates that the part is ready to be removed from controller, load is no longer supported.

Interlock Adjustment

The interlock must be adjusted to your application regarding the example as follow:

If your handling device is 20kg, and your load 25kg, you must adjust the interlock to 20kg (the interlock will not allow the handling device to open once the total load carried by the controller exceeds 20kg).

● Turn off the controller using the power switch on the main box.
● Disconnect the electric power supply.
● Remove the cover of the controller main box.
● Connect the controller main box to the laptop to begin Serial Communication. Refer to Software Communication section on page 10.
● Turn clockwise the Interlock trimmer for correct weight adjustment on the laptop screen (value must be the gripper weight).
● Close the cover of the controller main box.
● Reconnect electric power supply.
● Connect the gripper to the extension plug of the Zero Gravity handle as per the following section (refer to item 8 in Fig. L).

Fig. L

● Turn on the controller. Refer to Turn On Power section.

Interlock Wiring

NOTICE

● **The interlock activates an available output on the I/O plug at the back of the handle.**

Connect your handling device to the controller as follow:

- Pin J and K: Clamp control actuator.
- Pin J and L: Release control actuator.
- Pin J and M: Ready to release information.

Use orange button on the controller handle to activate clamping action. Pull down the sliding part of the handle (bimanual action).

Use black button on the controller handle to activate release action. Pull down the sliding part of the handle (bimanual action).

Orange and black buttons can be wired outside of handle sleeve using connection pins.

- Pin C and F: Additional clamp push button (NO contact).
- Pin C and G: Additional release push button (NO contact).

Schematics

Fig. M
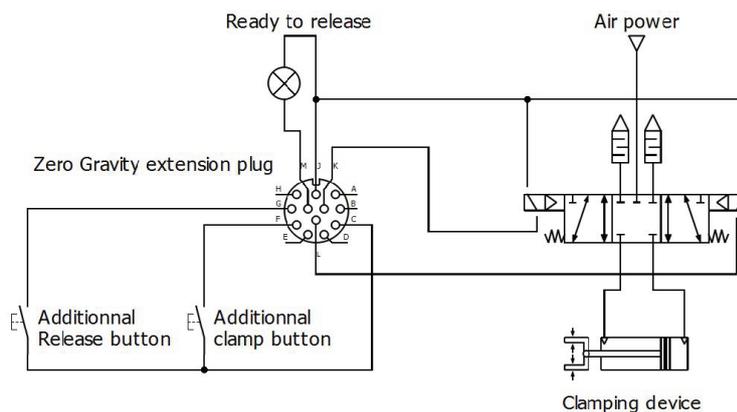
Extension Plug Pinout

Pin	Function
A	Not used
B	Not used
C	Ground
D	+5V for input
E	Additional force sensor input
F	Additional clamp button input
G	Additional release button input
H	Input 4
J	+12V for output
K	Clamping output
L	Release output
M	Ready to release output

Input/Output Hardware

Kit ZGB00-I/O is required to connect to extension plug. Contact your service or sales representative for availability.

To activate, input switch unit to ground; to deactivate, input switch unit to +5V DC or open wire.

To activate controller, output switch output pin to ground. Output power supply voltage is 12V DC. Do not exceed total of 3A.

Zero Gravity Handle Review

Refer to Fig. N.

Fig. N
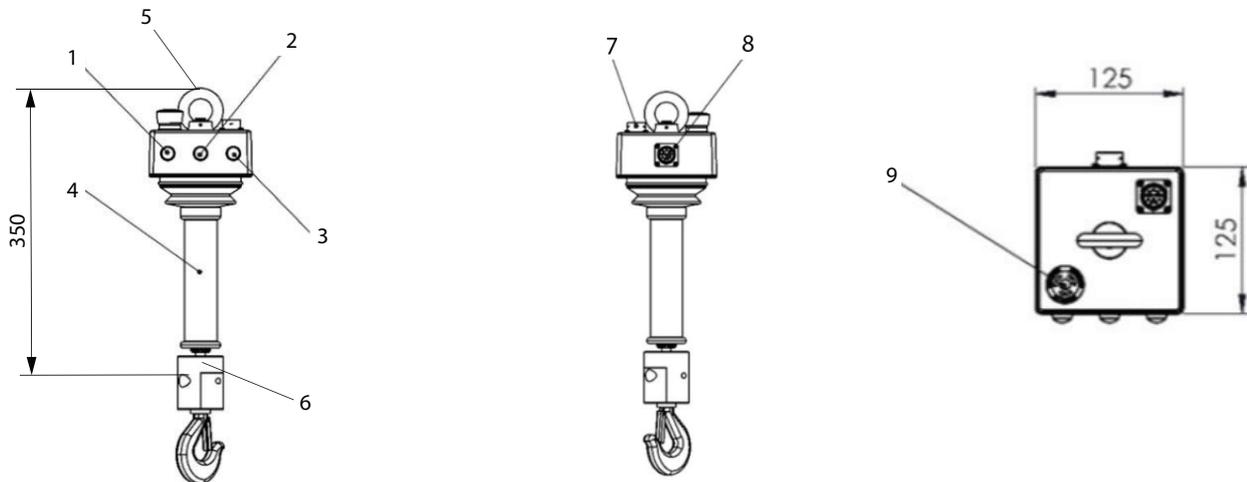
Item Number	Part Description
1	Power Button
2	Clamp Button
3	Release Button
4	Handle Sleeve
5	Top Eyelet
6	Bottom Hook Block
7	Main Plug: to Zero Gravity Control Box
8	Extension Plug: Connection to Input or Output
9	Emergency Stop

Zero Gravity Control Box Review

Refer to Fig. P.

Fig. P
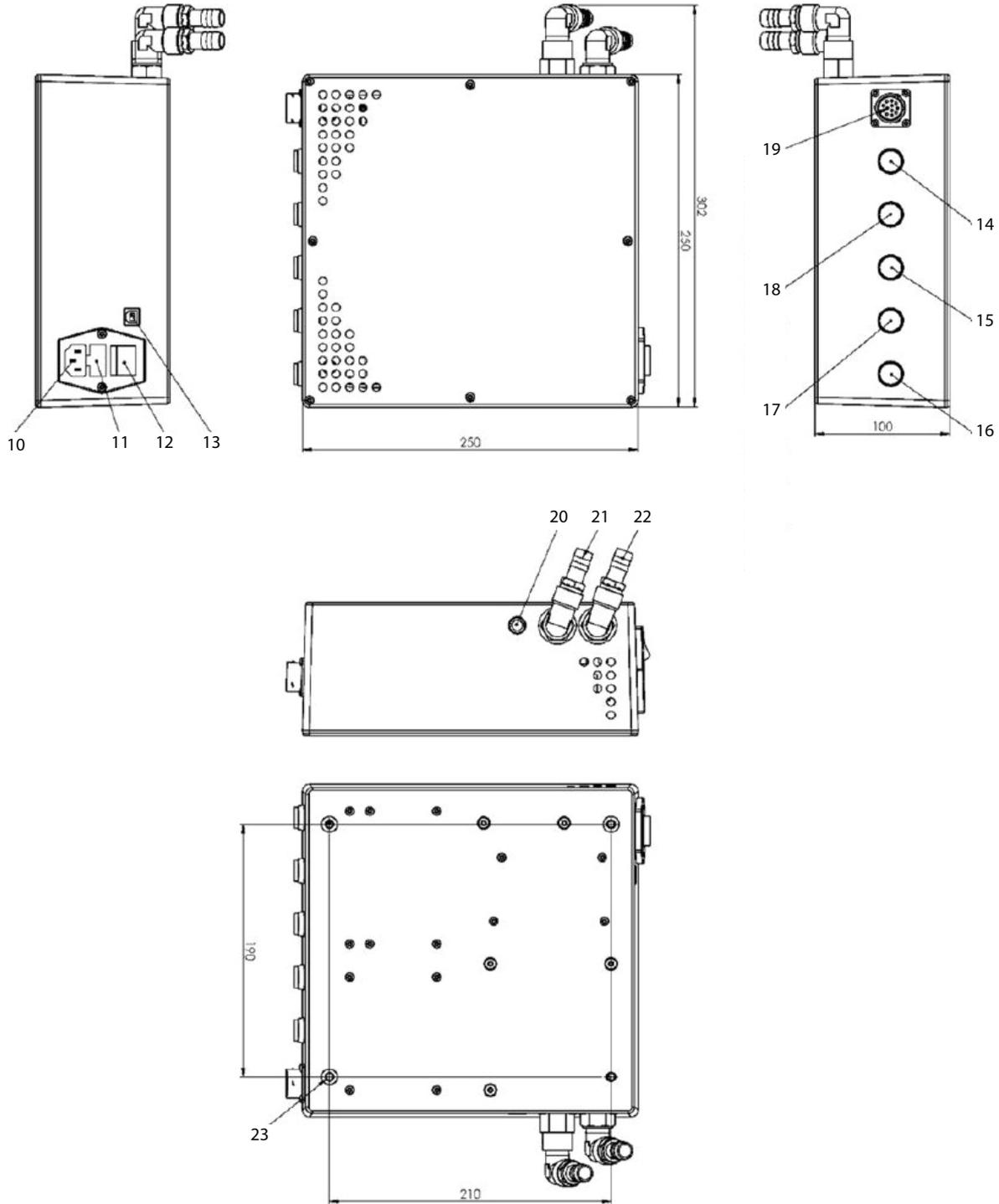
Item Number	Part Description
10	Power Supply 85-250 V AC
11	Fuses
12	Power Switch
13	USB Connection
14	Power ON Indicator Light
15	Balancing Mode or Part Released Indicator Light
16	Error Indicator Light
17	Balancing Mode or Ready to Release Signal Indicator Light
18	Balancing Mode or Part Clamped Indicator Light
19	Main Plug: to Zero Gravity Handle
20	Muffler
21	Air Supply Port Fitting
22	Balancer Hose Port Fitting
23	Mounting Hole 4xM6

Software Communication Section

Installation Requirements

Equipment	Tool
	- Computer
	- Arduino software rev 1.8.x

- Connect your computer to URL: https://www.arduino.cc/en/Main/Software
- Select the right OS according to your computer.

Download the Arduino IDE

ARDUINO 1.8.3
The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software.
This software can be used with any Arduino board.
Refer to the Getting Started page for Installation instructions.

Windows Installer
Windows ZIP file for non admin install

Windows app Get

Mac OS X 10.7 Lion or newer

Linux 32 bits
Linux 64 bits
Linux ARM

Release Notes
Source Code
Checksums (sha512)

- Download and install the software setup.
- Open the program to check the installation.

Connection

Step 1
Required :

Equipment	Tool
Controller main box	Computer
	USB cable type A to type B

- Connect the main box of the Controller to an available USB plug on your computer.

Step 2
Required :

Equipment	Tool
	Computer

Auto installation of the Arduino board's driver:
The latest version of Windows will install drivers automatically. When done, please note the communication port number attached to the board.

Installation du pilote de périphérique
Cliquez ici pour obtenir le statut.

Arduino Mega 2560 R3 (COM9)
Le pilote de périphérique a été installé.

Communication number

Manual installation:

Le pilote de périphérique n'a pas pu être installé
Cliquez ici pour obtenir des détails.
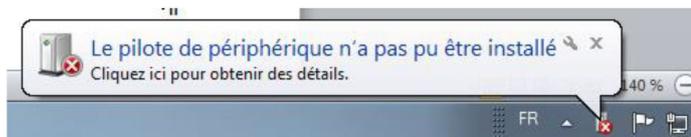
- Open the device manager of the computer: Control panel -> System -> Device manager.
- Open "unknown device" and right click to update the device driver.
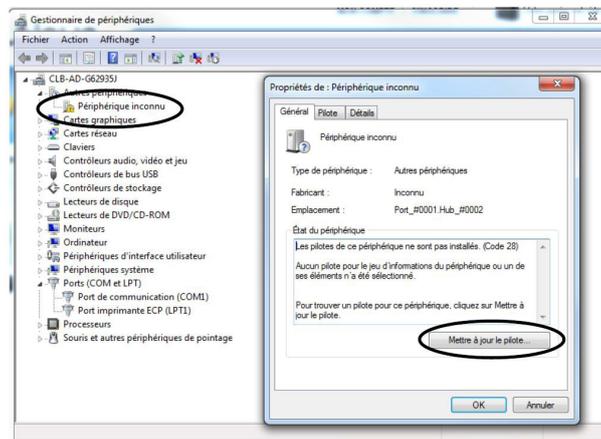
- Click on option: find driver from my computer.
- All drivers are in the folder: \Arduino\drivers\ from the main directory of the Arduino program (usually C:\Program Files\Arduino\drivers).
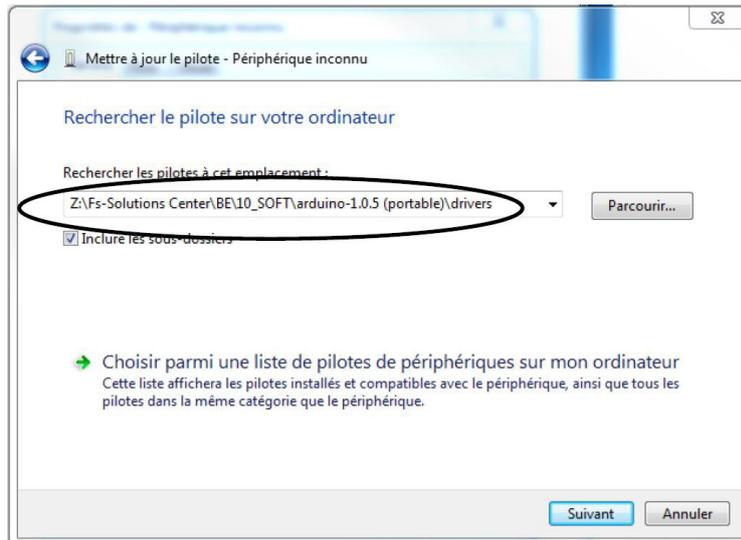
- Click next.
- A warning message appears, click install.
- After a moment the device is ready for use.
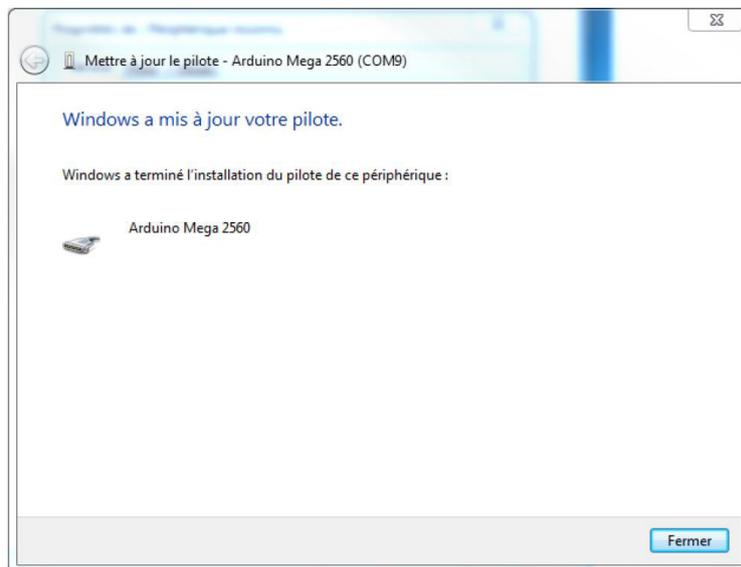
- Come back to the Device Manager and open the communication (COM and LPT). Note the communication number attached to the board Arduino Mega 2560.
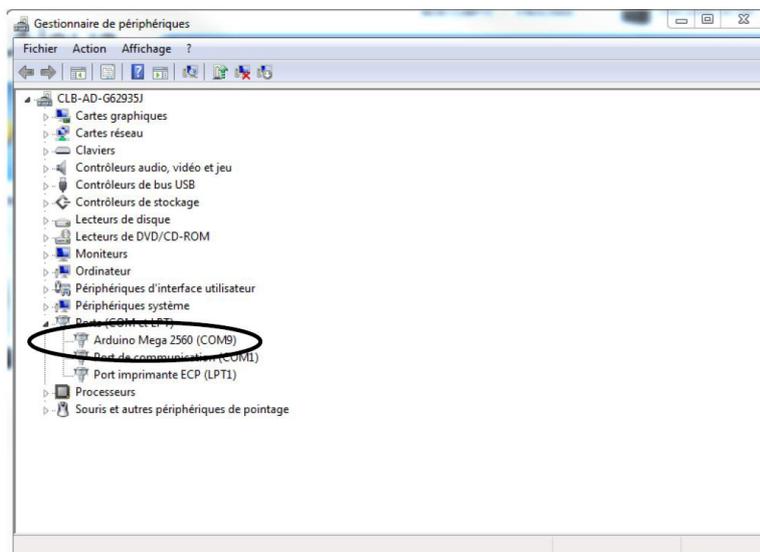
Serial Communication

Step 1

Required :

Equipment	Tool
Controller main box	Computer
	USB cable type A to type B
	Arduino software rev 1.8.x

- Open Arduino.exe.
- Click "Tool" menu, then "Type of board".
- Select "Arduino Mega 2560 or Mega ADK".
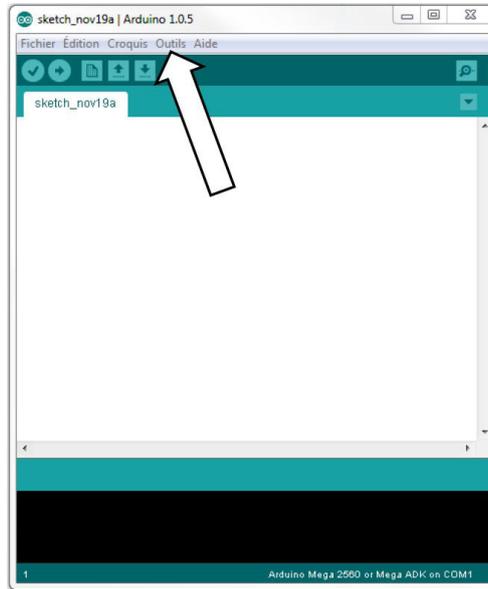
- Click "Tool" menu, then "Port".
- Select the right port's number, previously noted in Connection section.

Step 2

Required:

Equipment	Tool
Controller main box	Computer
	USB cable type A to type B
	Arduino software rev 1.8.x

- Push Ctrl + Shift + M on keyboard.
- A Serial Communication windows will open.
- The Controller main box will restart and start the communication automatically.
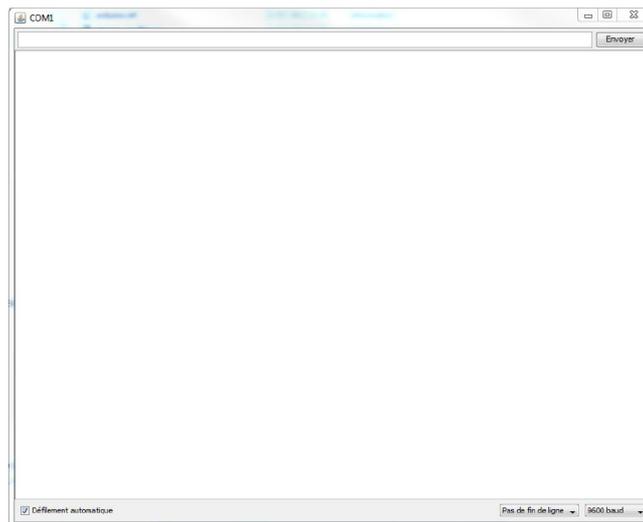
Maintenance

Electronics

Steady red light on controller box indicates run error. Restart system to troubleshoot errors. If problem recurs, system will switch to safe mode and red light remains constant. Conduct yearly system check to prevent drifting of the sensor.

Spiral / Electric Wire

Inspect electric wires daily. Make sure all electric wires are free of rust, dirt, water, oil, and any damage to insulation or plug. Replace spiral wire yearly.

Wire Rope

Do not yard wire rope more than 10 degrees from vertical center of wire rope guide. Excessive yarding will cause increased wear on the balancer and decrease the life of the components. Replace wire rope if frayed, kinked, or bird caging is visible.

Refer to the Product Maintenance Manual.

Fig. Q
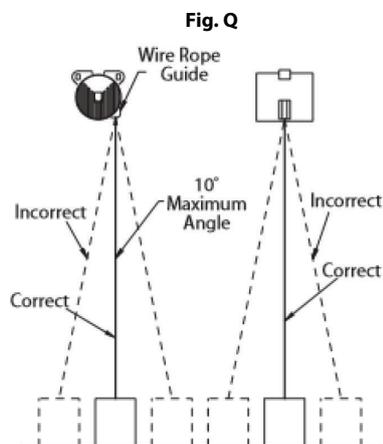
Maintenance Schedule

⚠ **WARNING**

● **Disconnect the power supply before working on the equipment. The unit must be repaired by qualified personal, risk of electric shock.**

Component	Inspection	Criteria for operation	Daily	Frequent (6 months)	Periodic (1 year)
Spiral Wire	Damages	No visible damage on entire length or on plugs.	X	X	X
	Kinks	No visible kinks on entire length.	X	X	X
Power Cord	Damages	No visible damage on entire length or on plugs.	X	X	X
	Kinks	No visible kinks on entire length.	X	X	X
Control Box	Valves leaks	Load doesn't move when the system is switched off.		X	X
	Pressure sensor damages	Balancing mode operational.		X	X
Command Handle	Force sensor damage	Load doesn't move when handle is free and power on.	X	X	X
	Gap between sensitive area and handle	No resistance in motion, only axial motion must be possible.			X
	Emergency stop	Good operation of this part.	X	X	X
	Control buttons	No visible looseness, or sticking of buttons.	X	X	X

Troubleshooting

Plug the air supply

Does the load moves up alone? — No → Check leaks

Does the load moves up alone? — Yes → Check the yellow and black piping connected to ZG box. (up: to balancer middle: from air supply down: exhaust)

Check the yellow and black piping connected to ZG box. → Pipes are in the right way?

Pipes are in the right way? — Yes → Does the load moves up alone?

Pipes are in the right way? — No → Remove air supply and reconnect the pipe.

Does the load moves up alone? — Yes → Remove air supply and disconnect pipe. Open the box and clean D1 D2 D3 valve.

Does the load moves up alone? — No → Remove air supply and disconnect pipe. Open the box and clean M1 M2 M3 valve.

Check leaks → Do you hear leaks?

Do you hear leaks? — Yes →
- Check fittings
- Check piping
- Check the 2 O-ring inside the fitting on the ZG main box.

Do you hear leaks? — No →
- Plug electric supply.
- Plug spiral wire and lock by turning the plug.
- Turn on by main switch.
- Unlock safety stop.
- Switch on the system by the green push button.

Do the green light is on? — Yes → - Open ZG main box

Do the green light is on? — No → - Wait till the red light is off.

- Open ZG main box → Do the green light on power transformer is on?

Do the green light on power transformer is on? — Yes →
- Unplug spiral wire.
- Test the spiral wire with the wire special tool.

Do the green light on power transformer is on? — No →
- Check customer electric power.
- Check the 2 fuses near to the power plug.

- Unplug spiral wire. / - Test the spiral wire with the wire special tool. → Is spiral wire OK?

Is spiral wire OK? — Yes →
- Check connection.
- Check wiring in the handle.
- Check wiring in the main box.

Is spiral wire OK? — No → - Change the spiral wire.

- Wait till the red light is off. → Is red light off ?

Is red light off ? — Yes → Check if orange or black button on the handle is free?

Is red light off ? — No → - Wait till 3 orange lights are on.

Check if orange or black button on the handle is free? — Yes → - Connect ZG to the laptop and start serial communication.

Check if orange or black button on the handle is free? — No → - Remove pressure on orange or black button

Are orange lights on ? — **Yes** → Do the orange and red light flash? — **Yes** → Does the load moves alone? — **Yes** → - Wrong calibration of the force sensor: Switch off the device and remove all part from the handle before turn on the ZG.

Are orange lights on ? — **No** → - Push on the load for change the height.

Do the orange and red light flash? — **No** → - Something activate orange or black button.

Does the load moves alone? — **No** → - Pressure sensor detect motion, check why.

- Push on the load for change the height. → Do the valves are activated?

Do the valves are activated? — **Yes** → - Connect ZG to the laptop and start serial communication.

Do the valves are activated? — **No** → - Take the hand and move up & down.

- Take the hand and move up & down. → Do the valves are activated?

Do the valves are activated? — **Yes** → - Connect ZG to the laptop and start serial communication.

Do the valves are activated? — **No** → - Check if the load stop correctly.

- Check if the load stop correctly. → Do the load stop directly?

Do the load stop directly? — **Yes** → - Check if the force area handle move correctly. → Does the handle return correctly in neutral position?

Does the handle return correctly in neutral position? — **Yes** → - Return the handle to the factory.

Does the handle return correctly in neutral position? — **No** → - Check electromagnetical shield of the spiral wire.

Do the load stop directly? — **No** → - Wait switching in balancing mode.
- Move the load in balancing mode.
- Check if the valve shaking.

- Wait switching in balancing mode... → Do you hear valve shaking?

Do you hear valve shaking? — **Yes** → - Set the hook of the balancer to use ZG near to the top of the balancer stroke.

Do you hear valve shaking? — **No** → - ZG is in good running condition.

Wiring Diagram - Part List

Zero Gravity Controller - Parts List

Model Driver	Suspension Kit	Balancer	Manifold Kit	Balancer Brackets	Control Box	Command Handle	Spiral Wire
ZGW01508000	ZGS00	BW015080					
ZGW015080A1	ZGSA1-150	BW015080					
ZGW015080A2	ZGSA2-150	BW015080					
ZGW015080AT	ZGSAT-150	BW015080		ZGE06	ZGB015		
ZGW015080HM	ZGSHM-150	BW015080					
ZGW015080S2	ZGSS2-150	BW015080					
ZGW02012000	ZGS00	BW020120					
ZGW020120A1	ZGSA1	BW020120					
ZGW020120A2	ZGSA2	BW020120			ZGB020		
ZGW020120AT	ZGSAT	BW020120					
ZGW020120HM	ZGSHM	BW020120					
ZGW020120S2	ZGSS2	BW020120	ZGB-MANIFOLD			ZGP00B	ZGC2
ZGW03508000	ZGS00	BW035080					
ZGW035080A1	ZGSA1	BW035080					
ZGW035080A2	ZGSA2	BW035080					
ZGW035080AT	ZGSAT	BW035080		ZGE10	ZGB035		
ZGW035080HM	ZGSHM	BW035080					
ZGW035080S2	ZGSS2	BW035080					
ZGW05008000	ZGS00	BW050080					
ZGW050080A1	ZGSA1	BW050080					
ZGW050080A2	ZGSA2	BW050080					
ZGW050080AT	ZGSAT	BW050080			ZGB050		
ZGW050080HM	ZGSHM	BW050080					
ZGW050080S2	ZGSS2	BW050080					

Spare Parts

Fig. R
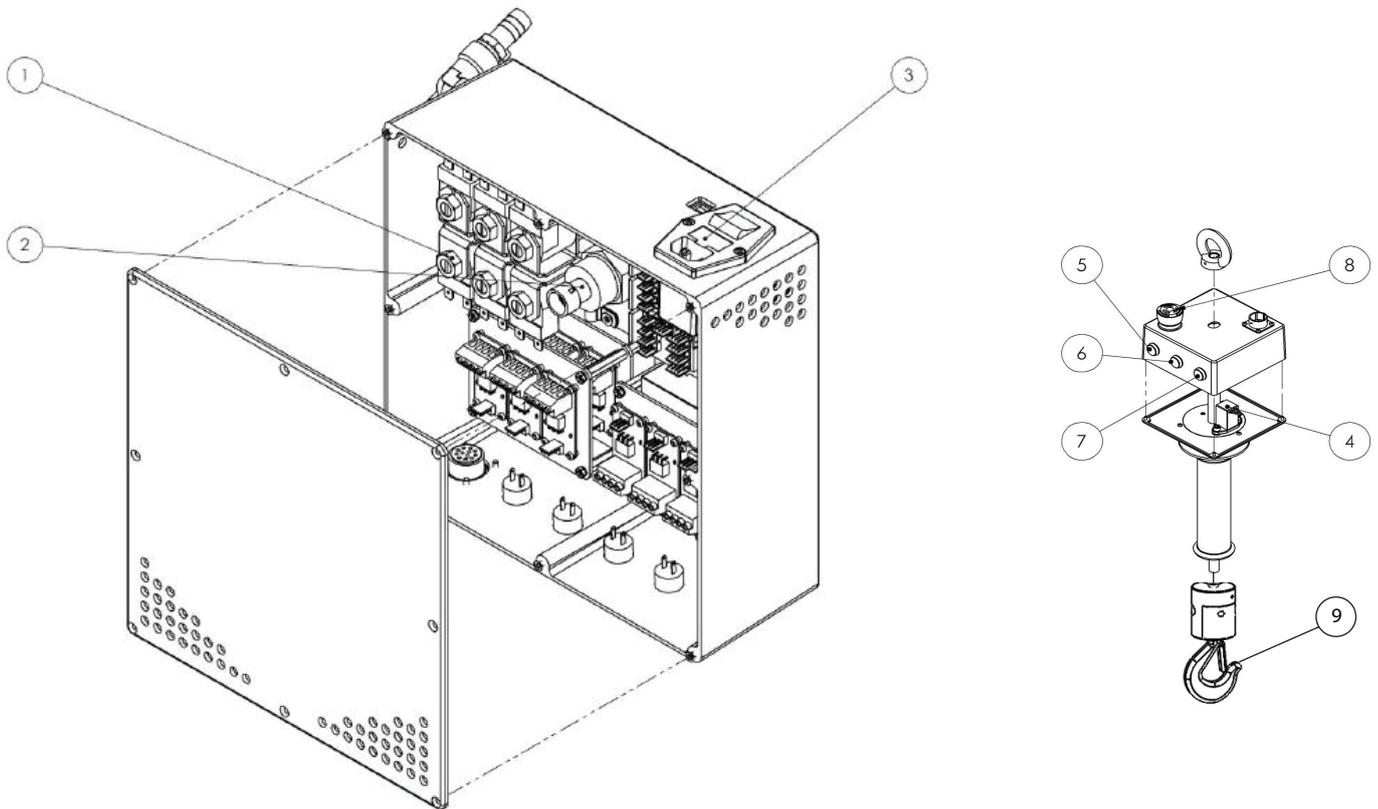
Command box				
Item	**Part number**	**Description**	**Supplier**	**Quantity**
1	47563675001	Set of Valve for FSB015	IR	1
	47563676001	Set of Valve for FSB020	IR	1
	47563677001	Set of Valve for FSB035	IR	1
	47563678001	Set of Valve for FSB050	IR	1
2	ZHSEA0080 04709614	Pressure Sensor	IR	1
3	47738840001	Fuses	IR	2
4	47563682001	Force Sensor	IR	1
5	47563683001	Power Button	IR	1
6	47563684001	Input 1 Button	IR	1
7	47563685001	Input 2 Button	IR	1
8	47563686001	Emergency Stop	IR	1
9	CE120-KBB377 03504545	Bullard Hook Assembly	IR	1
*	47728057001	Power Cord	IR	As Required
*	Contact Factory	Hose and Fittings Kit ZGB	IR	As Required
*	47739078001	Muffler	IR	As Required

* Indicates not illustrated.

Notes:

Notes:

Notes: