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Introduction

The Orbital Shaker is a flexible shaker that will mix samples in tubes, vials, and microplates by shaking the sample. The Orbital Shaker occupies one position on the locator plate of a 215-Series Liquid Handler or a GX-281 Liquid Handler and can accommodate all standard Code 200-series racks.
Unpacking

The Orbital Shaker is delivered with most major components already assembled. Keep the original container and packing assembly in case the Orbital Shaker must be returned to the factory.

The Orbital Shaker and its components are shipped in one container. Unpack the container and inspect for damage. Promptly report any damage to the carrier. Some carriers must receive concealed damage claims within seven days of delivery.

After unpacking the Orbital Shaker and its accessories, ensure you have the following:

- Orbital Shaker
- Power supply, 24V desktop universal
- Power cord 110V for 24V adapter
- Power cord 220V for 24V adapter
- Shielded GSIOC cable
- 2-pin terminal block connector
- Z-height adjustment tool (175 mm)
- Orbital Shaker Documentation CD
Customer Service

Gilson, Inc. and its worldwide network of authorized representatives provide customers with the following assistance: sales, technical, applications, and instrument repair.

If you need assistance, please contact your Gilson representative or if you are in the United States call the Gilson Customer Service Department at 800-445-7661 or 608-836-1551. You can also contact the Customer Service Department via its e-mail address: service@gilson.com. Specific contact information can be found on the Gilson web site at www.gilson.com. To help us serve you quickly and efficiently, please refer to the Before Calling Us on page 5-4.
Technical Specifications

Please be aware of the following before operating the Orbital Shaker.

**Warning**: Changes or modifications to this unit not expressly approved by Gilson could void the factory-authorized warranty.

This unit has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC commercial environment. This unit generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this unit in a residential area is likely to cause harmful interference; in which case, the user will be required to correct the interference at the user’s own expense.

Shielded cables must be used with the this unit to ensure compliance with the Class A FCC limits.

**Note**: Any use other than specified within this user’s guide could void your factory-authorized warranty.
<table>
<thead>
<tr>
<th>Technical Specification</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control</strong></td>
<td>• Computer control via RS-485 in GSIOC protocol</td>
</tr>
<tr>
<td></td>
<td>• Remote control by contact closure</td>
</tr>
<tr>
<td></td>
<td>• Manual control by front panel operation</td>
</tr>
<tr>
<td><strong>Environmental conditions</strong></td>
<td>Indoor use</td>
</tr>
<tr>
<td></td>
<td>Altitude: up to 2000 m</td>
</tr>
<tr>
<td></td>
<td>Temperature range: 5°C–40°C</td>
</tr>
<tr>
<td></td>
<td>Air pressure: 75–105 kPa</td>
</tr>
<tr>
<td></td>
<td>Pollution degree: 1 or 2, in accordance with IEC 66</td>
</tr>
<tr>
<td></td>
<td>Humidity: Maximum relative humidity 80% for temperatures up to 31°C, decreasing linearly to 50% relative humidity at 40°C</td>
</tr>
<tr>
<td><strong>Front panel</strong></td>
<td>ON/OFF key, up arrow key, down arrow key, and LED display</td>
</tr>
<tr>
<td><strong>Manufacturing standards</strong></td>
<td>Meets applicable Safety and EMC certification standards, UL and CE certified.</td>
</tr>
<tr>
<td><strong>Number of racks</strong></td>
<td>One Code 200-series rack</td>
</tr>
<tr>
<td><strong>Physical space requirement</strong></td>
<td>11.8 x 31.6 x 4.7 cm (4.65 x 12.44 x 1.85 in)</td>
</tr>
<tr>
<td></td>
<td>Fits on a 215-Series Liquid Handler or the GX-281 Liquid Handler. Requires one position on the locator plate.</td>
</tr>
<tr>
<td><strong>Power requirements</strong></td>
<td>+24V DC at 1.0A supplied via a 2.5 mm ID power plug. Center contact is positive.</td>
</tr>
<tr>
<td><strong>Speed range</strong></td>
<td>20–720 rpm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>3.3 kg (7.2 lb)</td>
</tr>
</tbody>
</table>
Installation

This section takes you through the steps for setting up your Orbital Shaker and installing it on the locator plate of the liquid handler.
Adjusting the Liquid Handler’s Z-Arm Height

The following pages describe how to adjust the height of the liquid handler’s Z-arm for use with the Orbital Shaker.

- To adjust the height of the Z-arm on a 215-Series Liquid Handler, refer to Adjusting Z-Arm Height on a 215-Series Liquid Handler.

- To adjust the height of the Z-arm on a GX-281 Liquid Handler, refer to Adjusting Z-Arm Height on a GX-281 Liquid Handler.

Adjusting Z-Arm Height on a 215-Series Liquid Handler

To adjust the Z-arm’s height so the probe is properly lowered into the racks, follow the procedures below:

1. Turn off power to the liquid handler.
2. Locate the Z-height adjustment tool that was shipped with the Orbital Shaker.
3. Place the Z-height adjustment tool on one of its ends near the center of the locator plate (if necessary, remove any racks or accessories before doing this).
4. Loosen the mounting screw on the Z-arm mounting bracket and slightly raise the Z-arm.

5. Manually move the Z-arm so it is centered over the Z-height adjustment tool.

6. While holding Z-height adjustment tool flat against the locator plate, use the other hand to lower the Z-arm until it lightly rests on the adjustment tool.

7. Tighten the mounting screw on the Z-arm mounting bracket so the Z-arm is secure.

8. While holding the adjustment tool in place, slide the Z-arm off the tool. Ensure that the bottom of the Z-arm lightly rubs against the adjustment tool as it moves. Repeat steps 4 through 7 until this is true.

9. Store the Z-height adjustment tool.
Indicating Z-Height in 215 Setup Utility Program

To ensure that the Z-arm is adjusted for use with the Orbital Shaker, run the 215 Setup Utility.

The 215 Setup Utility is supplied on the 215 Utility Programs CD-ROM supplied with your liquid handler.

1 Start the 215 Setup Utility.
2 Click on the Z Heights tab.
3 Set the clamp height to 175 mm.
4 Click on OK to store the Z height in the liquid handler’s memory.
5 Click on the About tab then Exit to close the 215 Setup Utility.
Adjusting Z-Arm Height on a GX-281 Liquid Handler

To adjust the Z-arm’s height so the probe is properly lowered into the racks, follow the procedures below.

1. Using the 5/32" T-handled Allen wrench (supplied with the liquid handler), loosen the mounting screw on the Z-arm mounting bracket and remove the Z-arm.

2. Refer to the scale on the side of the Z-arm and replace the Z-arm at a clamp height of 175 mm.

3. Tighten the mounting screw on the Z-arm mounting bracket so the Z-arm is secure.

4. Refer to Z-Arm Fine Adjust for a more precise adjustment.

Z-Arm Fine Adjust

1. Locate the 175 mm Z-height adjustment tool that was shipped with the Orbital Shaker.

2. Using the T-handled Allen wrench slightly loosen the mounting screw.

Warning! If the Z-arm mounting screw is loosened too far, the Z-arm could fall while performing the fine adjustment.

3. Place the Z-height adjustment tool under the Z-arm. Then place the Allen wrench in the screw on the top left side of the Z-arm. Turn clockwise to lower or counterclockwise to raise the Z-arm.

4. While holding the adjustment tool in place, slide the Z-arm off the Z-height adjustment tool. Ensure that the bottom of the Z-arm lightly rubs against the adjustment tool as it moves. Continue the fine adjustment until this is true.

5. Tighten the Z-arm mounting bracket so the Z-arm is secure.
Indicating Z-Height in the GX-281 Offset Utility

To ensure that the Z-arm is adjusted for use with the Orbital Shaker, run the GX-281 Offset Utility.

The GX-281 Offset Utility is supplied on the GX-281 Utility Programs CD-ROM supplied with the GX-281 Liquid Handler.

1. Place the offset tool on an empty rinse station location or remove a rinse station and put the fixture in its place.
2. Start the GX-281 Offset Utility.
3. The GX-281 Offset Utility window will appear.

Set the clamp height to 175 mm.

4. To set XY, select the Rinse Site where the fixture is located and press Move To.
5. The arm will move to that location with the Z at the top and relaxed.
6. Manually move the Z-arm down and align the probe to the center of the fixture using the arrow keys.
7. When the probe is centered, press Set.
8 Select the Offset Z tab.
9 Press **Move To**.
10 Use the arrows to align the top of the probe with the top of the fixture.
11 Press **Set** when this is done.
12 Close the utility and remove the fixture. Replace the rinse station if necessary.
Placement on the Liquid Handler

This section contains instructions for placing the Orbital Shaker on the following instruments:

- 215-Series Liquid Handlers (page 2-8)
- GX-281 Liquid Handler (page 2-12)

The placement of the Orbital Shaker on each of the liquid handlers may vary. Example diagrams showing the placement of the Orbital Shaker and Code 200-series racks are included.

215-Series Liquid Handlers

Be aware of the following:

1. No 200-series rack can be placed immediately to the right of the Orbital Shaker.
2. An Orbital Shaker should not be installed directly in front of an injection module.
3. If a rinse station is installed on a Multiple Probe 215 Liquid Handler, SPE 215 System, or Quad-Z 215 Liquid Handler, an Orbital Shaker cannot be installed in the position(s) directly in front of the rinse station.
4. If a rinse station is installed in the left rinse position on a 215 Liquid Handler, and the Orbital Shaker is installed in the left position, the rinse station will block the contact connections on the Orbital Shaker.

Example configurations for the 215-Series Liquid Handlers are shown on the following page.
Installation

Orbital Shaker Installed on the LEFT Side of a 215-Series Liquid Handler

Orbital Shaker Installed on the RIGHT Side of a 215-Series Liquid Handler
Placement on the Liquid Handler

Attaching the Orbital Shaker Mounting Plate to the Orbital Shaker

To attach the Orbital Shaker mounting plate to the Orbital Shaker, refer to the diagram and instructions below.

1 Determine where you will be placing the Orbital Shaker on the liquid handler and locate the appropriate Orbital Shaker mounting plate (right or left). The plates are included in the mounting kit (ordered separately, part number 2517117).

Each plate is marked with either an “R” or an “L” near the top front of the plate.

2 Ensure that the black knob on the front of the Orbital Shaker is screwed all the way in. Then turn the Orbital Shaker over and place on a flat surface with the front panel facing you.

3 Turn the mounting plate over with the bottom facing up and place over the Orbital Shaker. Align the mounting plate so that the four black pads and four positioning holes on the bottom of the Orbital Shaker can be seen through the holes in the mounting plate as shown in the diagram below.
4 Pass the supplied Phillips screws through the holes in the center of the mounting plate then into the bottom of the Orbital Shaker.

**Installing the Orbital Shaker on the 215-Series Liquid Handler**

1 Using a Phillips screwdriver, remove the two screws from the side of the locator plate where the Orbital Shaker will be placed.

2 Align the holes on the Orbital Shaker mounting plate with the set of holes on the locator plate of the liquid handler.

3 Using a Phillips screwdriver, secure the Orbital Shaker mounting plate to the liquid handler.
**GX-281 Liquid Handler**

Be aware of the following:

- A Code 200-series rack cannot be placed in the location immediately to the right of the Orbital Shaker.
- Orbital Shakers can only be mounted on the right and left side of the locator plate.

Example configurations for the GX-281 Liquid Handler are shown.

[Diagrams of Orbital Shaker installed on the left and right sides of the GX-281 Liquid Handler]
Attaching the Orbital Shaker Mounting Plate to the Orbital Shaker

To attach the Orbital Shaker mounting plate onto the Orbital Shaker, refer to the diagram and instructions below.

1. Determine where you will be placing the Orbital Shaker on the liquid handler and locate the appropriate Orbital Shaker mounting plate (right or left). The plates are included in the mounting kit (ordered separately, part number 264977).

   Each plate is marked with either an “R” or an “L” near the top front of the plate.

2. Ensure that the black knob on the front of the Orbital Shaker is screwed all the way in. Then turn the Orbital Shaker over and place on a flat surface with the front panel facing you.

3. Turn the mounting plate over with the bottom facing up and place over the Orbital Shaker. Align the mounting plate so that the four black pads and four positioning holes on the bottom of the Orbital Shaker can be seen through the holes in the mounting plate as shown in the diagram below.
4 Pass the supplied Phillips screws through the mounting plate then into the bottom of the Orbital Shaker.

**Installing the Orbital Shaker on the GX-281 Liquid Handler**

1 Align the holes on the Orbital Shaker mounting plate with the set of holes (right or left) on the locator plate of the liquid handler. Refer to the diagram below for the location of these holes.

2 Using a Phillips screwdriver, secure the Orbital Shaker mounting plate to the liquid handler using the supplied screws.
Rack Placement on the Orbital Shaker

To place a Code 200-series rack on the Orbital Shaker:

1. Orient the rack on the Orbital Shaker so that the code number (for example, 200) is facing forward.

2. Fit the rack on the Orbital Shaker so that the slots and holes on the underside of the rack align with the pins on the Orbital Shaker.

3. While holding down the rack, tighten the two thumbscrews on the right side of the Orbital Shaker.

**Note:** When placing an Orbital Shaker and Code 200-series racks on the locator plate of a liquid handler with a 125 mm Z-arm clamped at 175 mm, the RH1 rack heightener (part number 25045514) can be used to raise the height of the Code 200-series racks.
Electrical Connections

Rear Panel

1. Input port
2. Gilson Serial Input/Output Channel (GSIOC) port
3. Unit ID selector
4. Power receptacle
Input Port

You can use the input contact found on the rear panel of the Orbital Shaker to receive signals from other instruments. Refer to the diagram on page 2-16 for the location of the input port.

<table>
<thead>
<tr>
<th>Input</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>open to close</td>
<td>operation will start</td>
</tr>
<tr>
<td>close to open</td>
<td>operation will stop</td>
</tr>
</tbody>
</table>

Items you’ll need

- terminal block connector
- 2-conductor cable (22–30 gauge for each wire)
- wire insulation stripper
- small-blade screw driver

Making connections

To prepare and make connections with the 2-conductor cable:

1. Cut the cable into pieces of appropriate length.
2. Strip about 0.25 cm of insulation from each end of the cable.
3. Remove the terminal block connector from the Orbital Shaker. Insert each wire into the appropriate slot on the terminal block connector.
4. Reconnect the terminal block connector to the Orbital Shaker. The wires will be facing left and the pin screws will be facing you as you look at the rear of the instrument. Push the connector in as far as it will go. It is designed to fit snugly into its receptacle.
5 Connect the opposite ends of the cable to other device(s). Be sure to match ground connections correctly.

6 Label each cable to identify the purpose of the connection.

**GSIOC Port**

Gilson systems feature a two-way communication interface between the computer and most Gilson modules. Communication occurs along the Gilson Serial Input/Output Channel (GSIOC).

Use the GSIOC port to connect the Orbital Shaker to the liquid handler. This allows the Orbital Shaker to be controlled via a program running on the computer connected to the liquid handler.

1 Locate the GSIOC cable in the Orbital Shaker’s accessory package.

2 Connect one of the female connectors to the GSIOC port of the Orbital Shaker. Tighten the retaining screws.
3 Connect the other female connector to the GSIOC port of the liquid handler.

4 Use the male connector to connect another GSIOC cable if multiple Gilson instruments are being controlled via the liquid handler. Refer to the diagram below.

**Unit ID Selection**

The unit ID identifies the Orbital Shaker to Gilson software packages that can issue GSIOC commands to the Orbital Shaker.

At the factory, Gilson set the unit ID to 36. There is no need to change this number unless it is the same as that assigned to another Gilson instrument that is also connected along the GSIOC.

To change the unit ID:

1. Gently insert a small Phillips screwdriver into the selector on the rear panel and turn it.
2. Align the white dot with one of the indicated numbers. The unit ID is 30 plus the selected number.

**Power Cord Connection**

Use the DC power supply and power supply cable, supplied with your Orbital Shaker, to make the connection between the Orbital Shaker’s +24V DC power receptacle and a power source.
This section describes how to control the Orbital Shaker. You can control the Orbital Shaker using the front panel, contact closures, or Gilson Serial Input/Output Channel (GSIOC).
Front Panel

Following is a diagram and description of the front panel of the Orbital Shaker.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Display</td>
<td>Displays the target speed of the Orbital Shaker in rpm. A lighted yellow dot indicates that the Orbital Shaker is powered.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Up and down arrow keys</td>
<td>Used to adjust the speed setting of the Orbital Shaker. Press and hold to move quickly through available speeds.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ON/OFF</td>
<td>Starts/stops the Orbital Shaker’s shaking action.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Black knob</td>
<td>Used to stabilize the Orbital Shaker when placing it on the locator plate of a 215-Series Liquid Handler.</td>
<td></td>
</tr>
</tbody>
</table>
Operating Instructions

• If the optimal speed for the rack being used is known, do the following:
  1. Remove the Code 200-series rack (if installed) from the top of the Orbital Shaker.
  2. Power the Orbital Shaker ON to view the speed (rpm) of the Orbital Shaker.
  3. Use the arrow keys to adjust the speed of the Orbital Shaker. Press and hold the arrow key to move quickly through available speeds.
  4. Press the ON/OFF button (OFF) and then replace and secure the Code 200-series rack.

• If the optimal speed for the rack being used is not known, do the following:
  1. Remove the Code 200-series rack (if installed) from the top of the Orbital Shaker.
  2. Power the Orbital Shaker ON to view the speed (rpm) of the Orbital Shaker.
  3. Reduce the speed of the Orbital Shaker to 20 rpm using the Down arrow key. Press and hold the arrow key to move quickly through available speeds.
  4. Press the ON/OFF button (OFF) and then replace and secure the Code 200-series rack.
  5. Power the Orbital Shaker ON.
  6. Use the arrow keys to slowly increase the speed of the Orbital Shaker to the desired speed.

Note: The Orbital Shaker will remember the last speed setting that was used. The factory default setting for speed is 20 rpm.
Operating Tips

To adjust speed for optimal shaking, refer to the following:

- In general, smaller diameter tubes should be operating at a higher speed for optimal shaking.

- The speed of the shaker will be determined by the height of the fluid in unsealed tubes and microplates. A slower speed may be required to prevent fluid from splashing or spilling.

- If a microplate is going to be used, it is recommended to use a rack with a cover to secure the microplate. The following racks are available: Code 201H rack (for standard microplates) or Code 205H rack (for deep-well microplates).

- Heavy racks may require slower speeds to prevent the Orbital Shaker from swaying or rocking.

- Taller racks and racks with tall tubes should not be run at high speeds due to the rocking of the shaker created by a higher center of gravity.

- If the base is shaking or vibrating excessively, reduce the speed.
Contact Closure Control

You can remotely control the Orbital Shaker by using the contact closure pins on the rear panel.

For making contact connections, refer to page 2-17.

For information on sending contact signals, refer to the user’s guide for the contact device.
The Orbital Shaker is designed to require a minimum level of maintenance. Keep the unit clean for peak performance. Wipe the unit with a soft cloth dampened with a mild detergent and disinfect as needed.
Troubleshooting
Electrical

Unit not operational
• Check AC power cord connections.
• Try different AC outlet.
• Check all connections.

Input functions not operating
• Make sure connections into terminal block connector are secure.
• Make sure terminal block connector is secure in input/ output port.
• Check connections for proper pin assignments.
• Be sure pins from external devices are assigned correctly.
• Check polarity of input. Inputs should be a contact closure. If not, it must be TTL level (logic 0 activates).
• Confirm that source supplying input to the Orbital Shaker is working.
• Make sure yellow dot is lit, indicating power.
Mechanical

Base of Orbital Shaker swaying or rocking excessively

- Reduce the speed using the Down arrow until the swaying or rocking subsides.
Repair and Return Policies

Before Calling Us

Gilson Customer Service personnel will be able to serve you more efficiently if you have the following information:

- the serial number and model number of the equipment involved. The serial number is located on the left side of the Orbital Shaker.
- the installation procedure you used
- a list of symptoms
- list of operating procedures and conditions you were using when the problem arose
- list of other devices connected to the Orbital Shaker and a description of those connections
- list of other electrical connections in the room

Warranty Repair

Units covered under warranty will be repaired and returned to you at no charge. If you have any questions about applicability, please contact Gilson or your authorized representative.

Non-Warranty Repair

For out-of-warranty repairs, contact your local Gilson representative or the Gilson Customer Service Department. A Customer Service representative will discuss service options with you and can assist in making arrangements to return the equipment, if necessary.

Rebuilt Exchange

For some units, rebuilt exchange components are available. Contact Gilson for details.
Return Procedure

In the United States, contact the Gilson Customer Service Department to obtain authorization before returning any Gilson equipment. To return a piece of equipment:

- Carefully pack the unit to prevent damage in transit. Check with Gilson regarding proper method of shipment. No responsibility is assumed by Gilson for damage caused by improperly packaged instruments. Indicate the authorization on the carton and on the packing slip.

- Always insure for the replacement value of the unit.

- Include a description of symptoms, your name, address, phone number, and purchase order to cover repair costs, return and shipping charges, if your institution requires it. Ship to:

  Gilson, Inc.
  Attention: Customer Service
  (indicate authorization here)
  3000 W. Beltline Highway
  Middleton, WI 53562

Outside the United States, contact your Gilson representative for return procedures.
Replacement Parts and Accessories

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>59444524</td>
<td>Power supply, 24V desktop universal</td>
</tr>
<tr>
<td>594445241</td>
<td>Power cord, 110V for 24V adapter</td>
</tr>
<tr>
<td>594445242</td>
<td>Power cord, 220V for 24V adapter</td>
</tr>
<tr>
<td>36078143</td>
<td>Shielded GSIOC cable, 30&quot;</td>
</tr>
<tr>
<td>25045514</td>
<td>RH1 rack heightener</td>
</tr>
<tr>
<td>6383025121</td>
<td>2 terminal block mating connector</td>
</tr>
<tr>
<td>25051095</td>
<td>Z-height adjustment tool</td>
</tr>
</tbody>
</table>
The Gilson Serial Input/Output Channel (GSIOC) is an asynchronous serial communications interface that enhances the power of your Gilson equipment.

The GSIOC incorporates an EIA RS-485 interface and allows up to 32 slave devices to be controlled from a single master in a multi-drop configuration.

Each slave device is identified by a unique number which must be known to the device and to the computer. The default ID code of the Orbital Shaker is 36.

Using the computer and software, you:

• specify the Orbital Shaker as the device you want to control
• issue commands that set operating parameters, control operation, or request information from the Orbital Shaker
GSIOC Commands

There are two kinds of commands that you can send over the GSIOC:

- **Buffered commands** send instructions to the Orbital Shaker. These commands are executed one at a time.
- **Immediate commands** request status information from the Orbital Shaker. These commands are executed immediately, temporarily interrupting other commands in progress.

GSIOC Command List

In the command list on the following pages, the GSIOC command must be entered in the proper upper or lower case format. If a buffered command requires additional information, you’ll see italicized text next to the command. The description of the command identifies what you need to enter in place of the italicized parameter.

For example, the command to set the current speed is listed as Sxx. This means you must supply a number for speed (the range is 20-720). For minimum speed type S20, for maximum speed type S720.

Also note that if a parameter is optional, it appears within brackets, [ ].

I = Immediate

B = Buffered
<table>
<thead>
<tr>
<th>Command</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>I</td>
<td>Identifies the selected device. Returns character string “Shaker vx.x.x” where x.x.x is the software version.</td>
</tr>
<tr>
<td>$</td>
<td>I</td>
<td>Resets the Orbital Shaker.</td>
</tr>
<tr>
<td>~</td>
<td>B</td>
<td>Resets the power curve to the default values. Where: Speed=20 rpm, Power level 1=25, Power level 2=40, Power level 3=55, Power level 4=70, Power level 5=85, Power level 6=100</td>
</tr>
<tr>
<td>1</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 20 to 39 rpm.</td>
</tr>
<tr>
<td>1x</td>
<td>B</td>
<td>Sets the power level for speeds 20 to 39 rpm. Where x is the power level from 0 to 100.</td>
</tr>
<tr>
<td>2</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 40 to 79 rpm.</td>
</tr>
<tr>
<td>2x</td>
<td>B</td>
<td>Sets the power level for speeds 40 to 79 rpm. Where x is the power level from 0 to 100.</td>
</tr>
<tr>
<td>3</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 80 to 159 rpm.</td>
</tr>
<tr>
<td>3x</td>
<td>B</td>
<td>Sets the power level for speeds 80 to 159 rpm. Where x is the power level from 0 to 100.</td>
</tr>
<tr>
<td>4</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 160 to 319 rpm.</td>
</tr>
<tr>
<td>4x</td>
<td>B</td>
<td>Sets the power level for speeds 160 to 319 rpm. Where x is the power level from 0 to 100.</td>
</tr>
<tr>
<td>5</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 320 to 639 rpm.</td>
</tr>
<tr>
<td>5x</td>
<td>B</td>
<td>Sets the power level for speeds 320 to 639 rpm. Where x is the power level from 0 to 100.</td>
</tr>
<tr>
<td>6</td>
<td>I</td>
<td>Reads the power level (from 0 to 100) for speeds 640 to 720 rpm.</td>
</tr>
<tr>
<td>6x</td>
<td>B</td>
<td>Sets the power level for speeds 640 to 720 rpm. Where x is the power level from 0 to 100.</td>
</tr>
</tbody>
</table>
### GSIOC Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
</table>
| L       | I    | Reads the inputs. Returns “xxxx” where each x is either 0 or 1 in the following order:  
Contact input: 1 for shorted, 0 for open  
Up arrow: 1 for pressed, 0 for not pressed  
Down arrow: 1 for pressed, 0 for not pressed  
ON/ OFF button: 1 for pressed, 0 for not pressed |
| L       | B    | Resets the hours of the active life counter. |
| L       | I    | Reads the hours of the active life counter. |
| S       | I    | Reads the current speed setting. Returns an ASCII string 20–720 in rpm. |
| Sxx     | B    | Sets the current speed. Where xx is the speed in rpm. |
| R       | I    | Reads the running state. Returns “x” where:  
T - running  
F - stopped |
| Rs      | B    | Sets the running state. Where s is:  
T - to start  
F - to stop |