SMA

Shaker Motion Analyzer

User Manual

Rev 1 field-trial units

Firmware 0.2.2 | Android app 1.2.4

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1 About the SMA

The Cutpoint SMA (Shaker Motion Analyzer) is a battery-powered puck that rides on a shale shaker and records how its deck moves. A phone app connects to the puck over Bluetooth, records a run at each sampling point, and turns the runs into a report: G-force, stroke, motion angle, running speed and data-quality checks.

This manual covers the **Rev 1 field-trial units** with **firmware 0.2.2** and **app 1.2.4** (Android).

> **Field-trial hardware**
> Field-trial units are pre-production hardware. Please report anything unexpected (see Section 11).

2 The kit and the puck

The puck is a sealed round enclosure that holds itself to the shaker's top rail with six magnets in its base. Everything you need to place it correctly is marked on the outside.

In the kit

- SMA puck (Rev 1), with its battery installed
- USB-C cable for charging
- Link to the Android app on Google Play (section 5)
- This manual

On the puck

Feature	What it is for
Raised +X arrow	Points along the sensor's X axis. Always point it toward the **discharge end** of the shaker.
Magnetic base	Six magnets in a 2×3 pattern hold the puck flat on a top rail. Their long side runs along the arrow.
Status light (RGB)	Shows what the SMA is doing (see Section 4.6).
Power switch	Inside, under the lid. A slide switch that turns the SMA on and off.
USB-C port	Inside, under the lid. For charging, and for factory firmware loading.

3 Safety

> **Site rules come first**
> The SMA is placed on running equipment, so your site's rules for working near shakers always come first. Follow your rig's JSA, permit and lockout procedures.

- **Placing and removing the puck on a running shaker** is only allowed where your site permits hands near a running basket. If it doesn't, stop the shaker, place the puck, and restart it.
- **Keep hands, sleeves and the phone clear** of the screens, motors and moving basket. Never reach across a running basket.
- **The magnets are strong.** Watch for pinched fingers when the puck snaps onto steel, and keep it away from pacemakers, credit cards and other magnetic media.
- **The puck is not rated for hazardous areas** (it has no Class I Div 1/2 or ATEX approval). Use it only where your site allows ordinary electronics such as a phone.
- **Lithium battery:** don't puncture or crush the puck, open it near the shaker, or leave it in a closed vehicle in the West Texas sun. Charge it only with USB power, on a non-flammable surface, away from the shaker area.
- **Field-trial units have no low-battery cut-off.** Recharge before storing them, and don't leave a unit flat for weeks.

4 Battery, charging and power

The power switch and the USB-C charging port are inside the puck, under the screw-on lid. Charge it fully before each trip, switch it on when you arrive at the rig, and switch it off when you leave.

Battery life

- **About** 4 h from a full charge while switched on. That is time awake. Asleep, it uses far less (see Sleep and wake below).
- A shaker survey takes about 10 min, so one charge covers a rig visit with several shakers.
- The app can't show the battery level yet. When the battery runs flat, the light goes out and the app loses the connection. Charge the puck, then re-record that point.
- The 4-hour figure is an estimate. Please note your actual run times in your trial feedback.

Opening and closing the lid

1. Open the puck somewhere clean and dry, such as a truck cab or the doghouse, never at the shaker. Wipe the mud off first so none falls inside.
2. Hold the base and unscrew the lid counter-clockwise.
3. Set the lid down with the gasket facing up, out of the dirt.
4. To close, check that the gasket is clean and sitting in its groove. Then screw the lid on clockwise until it is hand-tight. Don't use tools.

Switching on and off

1. Open the lid.
2. Slide the power switch to ON. The status light shows yellow, then turns green within a few seconds.
3. Close the lid, then connect from the app.

To switch off, open the lid and slide the switch to OFF. The light goes out.

Sleep and wake

The SMA goes to sleep by itself to save battery and wakes with a firm tap or a shake, so you rarely need to open the lid to switch it off.

- **It goes to sleep** after 5 min with no phone connected and no movement. The status light flashes green three times, then goes dark.
- **It stays awake** while the app is connected, while it records or sends a run, and while it sits on a running shaker.
- **To wake it,** give the puck a firm tap with a knuckle or a quick shake, or set it on a running shaker. Just picking it up won't wake it, so it stays asleep in your bag or truck. The light shows yellow, then green within about 2 s, and the app can connect again. You can also press the BOOT button inside the lid.
- The app can't wake a sleeping SMA. If it doesn't appear in the device list, tap or shake the puck and scan again.
- A sleeping SMA still uses a little power. Switch it off with the power switch for storage or shipping.

Charging

1. Open the lid.
2. Plug a USB-C cable into the port inside the puck. Plug the other end into a USB charger: a phone charger, a laptop or a truck USB port.
3. The CHG light stays on while the battery charges and goes out when it is full. Charging from flat takes about 1.5 h.
4. Unplug the cable and close the lid.

The battery charges whether the switch is on or off.

> **Battery**
> Charge it indoors, on a non-flammable surface, and don't leave it charging unattended. Don't unplug or swap the battery in the field. If a battery must be replaced, return the unit: Rev 1 boards have no battery protection, so a battery connected backwards can damage the board or the cell.

Status light

Colour	Meaning
Yellow	Starting up
Green	Ready. Waiting for the app, or connected and idle.
Blue	Recording a run. Don't touch or move the puck.
Cyan	Sending the run to the phone
Red	Fault, for example the motion sensor did not start. Switch off, wait 5 s, switch on.
●●● then dark	Going to sleep. Tap firmly or shake the puck to wake it.

> **In bright sun**
> The light shines through the white lid. In bright sun it can be hard to see, so shade the puck with your hand.

5 Installing the app and connecting

The app, **Cutpoint SMA** (titled *SMA Companion* inside the app), runs on Android phones and installs from Google Play. Later versions update through Play like any other app.

Install

Scan to get the app

Point the phone's camera at the code and open the link. It goes to the app's page on Google Play.

`https://play.google.com/store/apps/details?id=com.cutpoint.sma`

1. Scan the code above with the phone, or search Google Play for **Cutpoint SMA**.
2. Tap **Install**.
3. Open the app and allow **Bluetooth** when asked. Android 11 and older also ask for **Location**, because those versions need it to find Bluetooth devices. If you refused either one, the app shows *Permissions Required*; tap **OPEN SETTINGS** and turn it on.

Connect

1. Switch the SMA on, or tap or shake it to wake it, and wait for the green light.
2. In the app, wait for *Scanning for devices…* to finish. The SMA appears under **AVAILABLE DEVICES** as *Shaker Motion Analyzer (PCB)*.
3. Tap it. The app opens **Job Specifications** once connected.

4 Not listed? Keep the phone within a few feet of the puck and tap **RE-SCAN DEVICES**.

> **Demo mode**
> **RUN DEMO MODE** on the same screen simulates a survey without a puck. Use it for practice only: its results are not real measurements.

6 Calibrating the sensor

Calibrate every 90 days, after a drop, or whenever the app shows **Calibration due** or **SMA not calibrated**. It takes about five minutes on a bench. The calibration is stored on the puck itself, so it moves with the unit to any phone.

The status is on the **Job Specifications** screen, with the calibration date and when the next one is due.

1 Put the SMA on a flat, steady bench or tailgate, away from running equipment.
2 On Job Specifications, tap **CALIBRATE** on the calibration card.
3 Set the puck in one of its six resting positions, let go, and tap **Measure**. The six positions are: flat, upside down, and on each of its four edges.
   - Any order works: the app recognises each position.
   - For the four edge positions, hold the puck against a square block or the corner of a box so it stays put. It doesn't need to be perfectly square.
   - If you see *The SMA moved while measuring*, set it down, let go, and try again.
4 When *All six positions measured* appears, check the result, then tap **Save to SMA**.

Until it is calibrated, runs use raw sensor values. G-force and deck angle can then be off by a few percent.

7 Running a survey

A survey records one short run at each of six points on the shaker's top rails, then compiles them into one report. Allow about 10 min per shaker.

> **Where the puck goes**
> Flat on the top rail, with the **+X arrow pointing toward the discharge end**. The points walk down the left side and back up the right. Left and right are as seen from the discharge end. *Detailed* mode adds a seventh point on the base frame (skid), to check the isolators.

1. Fill in the job

On **Job Specifications**, enter:

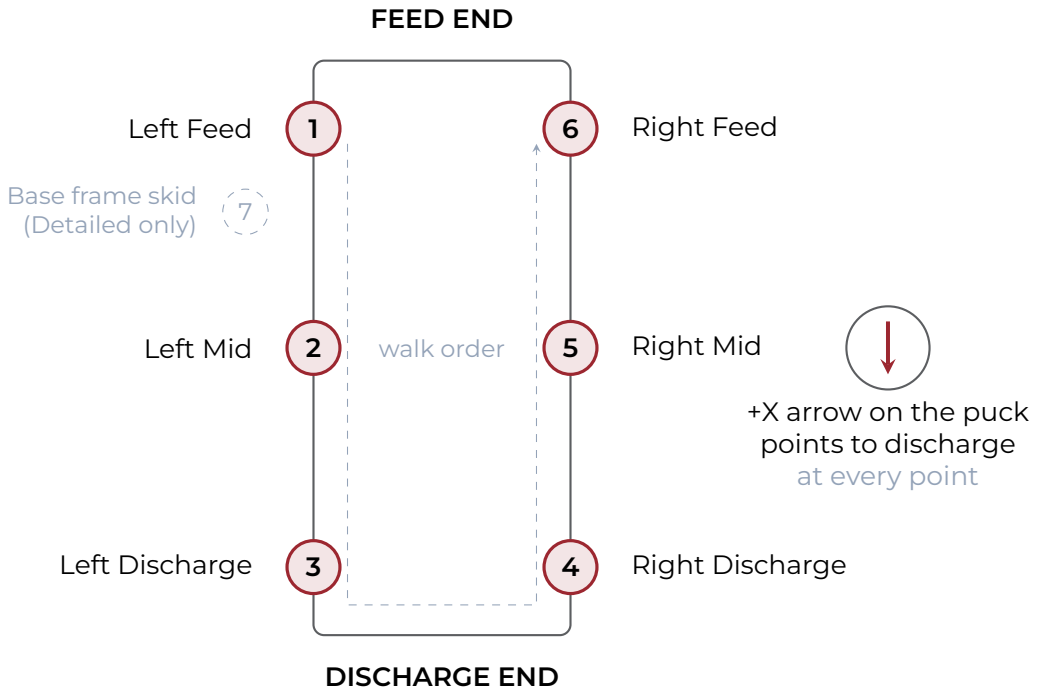


Figure 1. Sampling points, top view. Left and right as seen from the discharge end, facing the feed. The app shows the same view, with the point to measure highlighted.

Field	What to enter
Rig Name, Shaker Number	As the rig names them. They label the report.
Logging Depth (ft), Mud Weight (ppg)	Current values, for the report
Accelerometer Range	Leave at 16 g unless told otherwise. Lower ranges clip on a hard-running shaker.
Machine	*Shale shaker (5–8 G)* for most rigs. *Custom (OEM spec)* when you know the maker's G, stroke and angle.
Sampling Points	Standard six points, or *Detailed: add the base frame*
Sampling Duration	5 s is enough for most shakers. Use 10 s if the motion looks uneven.

Tap **START SAMPLING RUNS**.

2. Record each point

1. The app shows **PLACE THE SMA AT:** and the point, for example *Left Feed*.
2. Place the puck flat on the rail at that point, arrow toward discharge. Make sure it is seated squarely and not rocking.
3. Step back and tap **START LOGGING**. The light turns blue. Don't touch the puck until the run ends.
4. The run downloads to the phone (cyan light). Keep the phone near the puck until **POINT RECORDED** shows.

5 Tap **NEXT POINT** and move the puck.

Bad run? **RE-RECORD THIS POINT** replaces it. Can't reach a point safely? **SKIP THIS POINT** leaves it out of the report. Tap any point in the list to go back to it.

3. Compile the report

After the last point, tap **COMPILE REPORT**.

8 Reading the results

Report Summary shows each result for the whole shaker, judged against the G range or OEM spec you set for the job. Tap the help icon (*How to read these results*) for a plain-language explanation of every item.

Results by confidence tier

Each result carries a tier chip.

> **During the field trial**
> Treat every result as information to compare and report back, not as the sole basis for a maintenance decision.

Tier	Results	How to use them
Measured	Running speed, G-force, Stroke, Motion angle, Motion shape, Deck angle and side tilt	Direct physics. Compared with the expected range.
Indicator	Conveying direction, Lateral motion, Left/right balance, Feed-to-discharge consistency, Pitch and roll, Residual vibration, Isolation (base frame)	Sound method, but thresholds aren't field-proven yet. Shown as a comparison, never as a diagnosis.
Experimental	Harmonic content	Hidden unless you turn on **Show experimental results**. Not for maintenance decisions.

Data-quality warnings

When a run can't be trusted, the app withholds G, stroke and the motion results for that point and says why:

Warning	What to do
SMA moved during the run	Re-seat the puck flat on the rail and re-record.
Data missing from the run	Keep the phone closer and re-record.
Two shaking speeds found	Check that both motors run at the same speed, then re-record. Report it if it persists.
Running speed not clear	Usually a point with little motion. Try a 10 s run.
Too little motion to measure here	The shaker may be off, or the point barely moves.

Saving and sharing

Tap **Export PDF Report**. The PDF and a zip of the raw run data are saved to the phone's **Downloads/SMA Reports** folder. Email both files to `support@cutpoint-inc.com` (see Section 11).

9 Updating the firmware

The app installs new SMA firmware over Bluetooth. It checks for updates whenever it connects and needs an internet connection to do so. The firmware card on **Job Specifications** shows **Up to date** or **Firmware update available**.

1. Charge the SMA first. An update takes a few minutes, and Rev 1 units can't report a low battery.
2. Tap the firmware card, read **WHAT'S NEW**, then tap **INSTALL UPDATE**.
3. Keep the phone next to the SMA and the screen open. The SMA restarts at the end and reconnects.

The SMA checks that each update is genuine Cutpoint firmware made for its board, and refuses anything else. Updates can't run while the SMA is recording or sending a run.

> **If an update fails**
> The SMA keeps running its current firmware. Try again, or carry on surveying and update later.

10 Troubleshooting

> **Try this first**
> Most problems clear by switching the SMA off for 5 s and on again, then reconnecting from the app.

Problem	Try this
No light when switched on	It may be asleep: tap it firmly with a knuckle or give it a shake. If it stays dark, charge it for 30 min and try again. If it still stays dark, return the unit.
SMA not in the device list	Check for the green light; if it's dark, tap or shake the puck to wake it. Move the phone closer, check that Bluetooth is on (and Location, on Android 11 and older), and tap **RE-SCAN DEVICES**. Close the app on any other phone that may be connected to the puck.
Connection drops during a run or download	Keep the phone within about 30 ft, with no steel between it and the puck. Reconnect, then **RE-RECORD THIS POINT**.
Red light	Switch off, wait 5 s, switch on. If red returns, note it and return the unit.
Calibration not available or *Update the SMA firmware to calibrate it*	The SMA's firmware is too old. Install the update (Section 9).
Too old for wireless updates	That unit needs a one-time USB update at the office. Return it.
Puck slides or rocks on the rail	Clean mud and scale off the rail and the magnets. Pick a flat spot clear of welds and bolt heads.
Readings look implausible	Check that the arrow points to discharge and the puck sits flat, then re-record. Check the calibration date.
Google Play won't install the app	A test version from a download link may already be installed. Copy any reports you need off the phone, uninstall it, then install from Play.

11 Specifications, care and support

Specifications (Rev 1)

Item	Value
Sensor	ISM330DHCX 3-axis accelerometer + 3-axis gyroscope
Accelerometer range	±4 g, ±8 g or ±16 g (default ±16 g)
Sample rate	About 1.7 kHz per axis (the exact rate is measured on each run)
Run length	5 s or 10 s per point
Wireless	Bluetooth Low Energy, to an Android phone
Battery	200 mA h lithium-polymer, charged over USB-C
Battery life	About 4 h switched on and awake (estimate)
Sleep	After 5 min idle; wakes on a firm tap, a shake or the BOOT button
Firmware / app	0.2.2 / 1.2.4 at the start of the trial

Care and storage

- Wipe mud off with a damp cloth. Don't pressure-wash the puck or soak it in a mud tank.

- Keep the magnets clean. Steel filings and scale stop the puck from seating flat.
- Store it charged, switched off, with the lid screwed on, and out of direct sun. Top up the charge at least once a month.
- Open the lid only to switch the SMA on or off or to charge it. Nothing else inside is user-serviceable.

Field-trial feedback and support

> **Send your test data**
>
> After each survey, email the **PDF report** and the **data zip** from **Downloads/SMA Reports** to `support@cutpoint-inc.com`. Add a line on anything odd: how you placed the puck, the shaker's condition, and any warnings you saw.

Contact for support and returns: `support@cutpoint-inc.com`.