EKG TECH BASICS · ONE-PAGER

# Artifact and Lead Problems

Tremor, 60-cycle interference, wandering baseline, loose electrodes, lead-off and cable faults, artifact that mimics VT, VF or a pause, and limb and chest lead reversals

12 sources + more detail
ekgtechbasics.com/sheets/ekg-artifact-troubleshooting.html
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## 1 The patient first

> ⚠ SAFETY Before you fix any tracing, look at the patient. Alert and talking: it is not VF or asystole, so look for the cause. Unresponsive and not breathing normally: call for help and the code team, and start CPR and use the AED if you are trained. Never silence or ignore an alarm because the last one was artifact.

1. Check the patient, then a second signal: pulse, $SpO_2$ or arterial waveform.
2. Look at the baseline: fuzz, regular sawtooth, slow drift, jumps or a flat line.
3. Find which leads carry it (table below), then check those electrodes and wires.
4. Check the cable, the machine settings and the room.
5. Fix the cause, record again, and label anything you changed.

## 2 Troubleshooting by problem

| PROBLEM | USUAL CAUSE | HOW IT LOOKS | FIX |
|---|---|---|---|
| **Somatic tremor (muscle artifact)** | Cold, shivering, tense or talking patient; Parkinson or other tremor | Fine or coarse irregular fuzz; can hide P waves or look like AF, flutter or VT | Warm the patient, support the limbs, hands tucked behind the legs, stay still; 40 Hz filter only as a last step, labeled |
| **AC (60-cycle) interference** | Power cords and plugged-in devices near the cables | Thick baseline of tiny, identical, regular spikes: 60 a second (12 per large box) | Cables away from cords, unplug what is not needed; good electrode contact |
| **Wandering baseline** | Breathing, moving, poor skin contact | Slow up-and-down drift of the whole line; can fake ST changes | Re-prep the skin, fresh electrodes, patient relaxed and still |
| **Loose or dry electrode** | Dried gel, sweat, hair, expired pads, poor prep | Sudden jumps, spikes or dropouts in the leads that use it | Clean and dry skin, clip hair, new electrode from a sealed pouch |
| **Lead-off** | Wire off its snap, electrode lifted | Flat line or lead-fault message in that lead only | Reattach or replace, then record again |
| **Cable or lead-wire fault** | Cracked wire, loose connector, cable pulled tight | Spikes, dropouts or loss of signal, often in every lead | Slack wires, cart close; swap the cable; report damaged equipment |
| **Pulse tapping** | Limb electrode over a pulsing artery | A bump or false ST-T change at the same spot after every QRS | Move that electrode off the pulse |
| **Lead reversal** | Wires on the wrong limbs or chest sites | Inverted, swapped or flat limb leads; broken R-wave progression | Check every label, correct, repeat before it is sent |

## 3 Which electrode? Read the leads

| ARTIFACT SEEN IN | CHECK FIRST |
|---|---|
| **All leads except lead I (II, III, aVF worst)** | Left leg electrode |
| **All leads except lead II (I, III, aVL worst)** | Left arm electrode |
| **I and II, lead III clean or nearly so** | Right arm electrode |
| **One chest lead only** | That chest electrode and wire |
| **Every lead equally** | Cable, machine, power cords nearby; or a whole-body tremor |

Lead I uses the two arms, lead II the right arm and left leg, lead III the left arm and left leg. The clean limb lead is the one that does not use the bad electrode.

## 4 Artifact or real arrhythmia?

| CHECK | POINTS TO ARTIFACT |
|---|---|
| **The patient** | Awake, talking, no new symptoms |
| **QRS complexes** | Normal QRS complexes march through the burst on time |
| **Other leads or channels** | Burst in some leads only; a pause or flat line in one channel while another shows beats |
| **$SpO_2$ or arterial waveform** | Keeps pulsing at the old rate |
| **Timing** | Starts and stops with movement, brushing teeth, scratching, a pump or sleep |
| **Rate** | Too fast to be real (400 to 600 a minute) |

> ⚠ SAFETY True VT or VF shows in every lead and weakens or stops the pulse waveform. Wide complexes in every lead, no native QRS between them and a flat pleth: treat it as real and alert the nurse now. A generalized tremor can also reach every lead, so matching leads alone do not prove a rhythm is real.

## 5 Limb lead reversal fingerprints

| SWAP | KEY SIGN | UNCHANGED |
|---|---|---|
| **LA and RA** | Lead I fully inverted, aVR often upright; chest leads normal | aVF |
| **LA and LL** | Lead III inverted; P wave bigger in I than in II | aVR |
| **RA and LL** | I, II, III and aVF inverted; aVR upright | aVL |
| **RA and RL (neutral)** | Lead II flat | III |
| **LA and RL (neutral)** | Lead III flat; I looks like II | II |
| **Both arms with both legs** | Lead I flat | None |
| **LL and RL** | No visible change | All |

Lead I inverted with R waves that shrink across V1 to V6 may be true dextrocardia: check the wires, and if they are right, give it to the provider as recorded with a note, then follow the lab's procedure for a right-sided repeat.

## 6 Chest lead problems

- R waves should grow and S waves shrink from V1 toward V5. One lead out of step with its neighbors: suspect two chest wires swapped.
- V1 and V2 too high (2nd or 3rd space) can fake incomplete RBBB, T inversion, septal Q waves or ST elevation. Count down to the 4th space.
- A limb wire swapped with a chest wire makes the tracing look bizarre: limb leads take on chest-lead size and most leads change.
- Machine statements often miss misplaced electrodes. Your check comes first.

> 💡 EXAM TIP Exams test: 12 tiny regular spikes per large box = 60-cycle; irregular fuzz = tremor; slow drift = wandering baseline. Clean lead I = left leg. Flat limb lead = neutral (RL) wire swapped. Inverted lead I with normal chest leads = arm reversal. 'VT' with QRS marching through and a steady pleth = artifact. Fix the cause before using a filter, and label any filter.

## MORE Why artifact matters

Artifact is any signal on the tracing that did not come from the heart. It costs in two directions. Read as an arrhythmia, it can lead to drugs, procedures or devices the patient did not need: in one case report, runs of artifact called VT were treated before review showed QRS complexes inside them (DeLeon 2023). Dismissed as artifact, a real event is missed. On monitors false alarms, artifact among their causes, drive alarm fatigue. In a month of monitoring in five adult ICUs, 88.8% of 12,671 annotated arrhythmia alarms were false, including 86.8% of VT alarms, 67.0% of asystole alarms and 87.7% of pause alarms (Drew 2014).

The NHA CET test plan names three artifacts by name (wandering baseline, somatic tremor and AC interference) and asks the technician to identify, troubleshoot and resolve them, and to know lead placement and troubleshooting. Misplaced electrodes belong to the same job: they produce tracings that look like disease.



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