

ECG Lead Placement and Identifying Lead Reversal

This quick reference guide is intended to show correct ECG electrode locations and how to recognize inadvertent lead wire reversal.

Limb lead placement

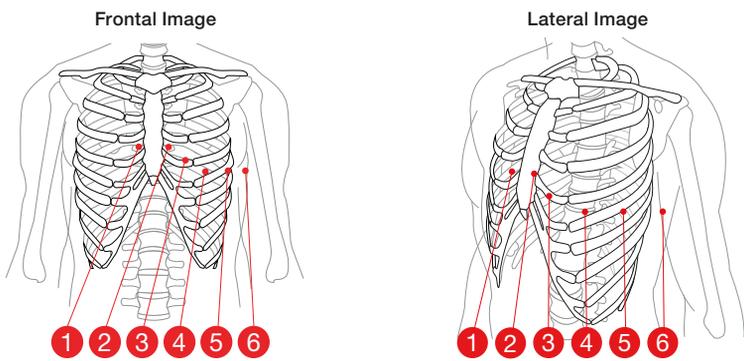
- For accurate 12-lead measurements and interpretation, limb leads must be placed on the limbs, not the torso
- For monitoring rhythm and rate, limb leads may be placed on the limbs or torso

Lead reversal

- Ensuring that the ECG leads are connected to the correct ECG electrode position is very important for acquiring accurate rhythm strips and 12-lead ECGs
- Lead reversal usually produces recognizable ECG abnormalities

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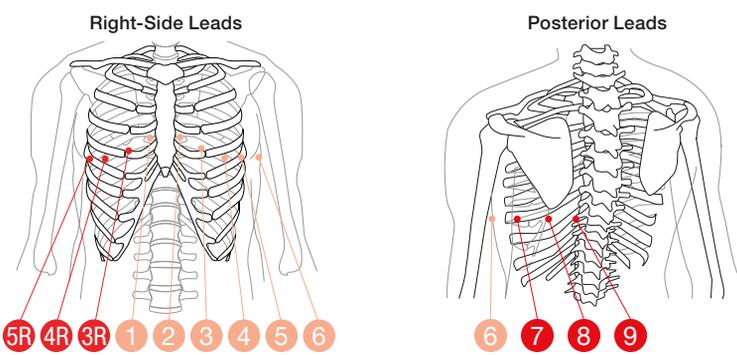
12-lead ECG: chest electrode locations



Electrode	Location
V1 C1	4th intercostal space at right border of the sternum
V2 C2	4th intercostal space at left border of the sternum
V3 C3	Midway between V2 and V4
V4 C4	5th intercostal space at midclavicular line
V5 C5	Level with V4 at left anterior axillary line
V6 C6	Level with V4-V5 at left midaxillary line

AHA leadwire labels in first column, IEC labels in second column

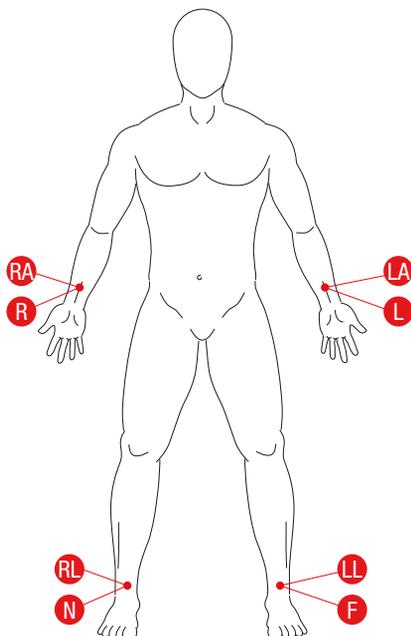
12-lead ECG: additional chest electrode locations



Electrode	Location
V3R C3R	Midway between V1 and V4R
V4R C4R	5th intercostal space, right midclavicular line
V5R C5R	Level with V4R at right anterior axillary line
V7 C7	Level with V4-V6 at left posterior axillary line
V8 C8	Level with V4-V6 at left midscapular line
V9 C9	Level with V4-V6 at left spinal border

Note: automated interpretation may be invalid if V leads are moved to these locations

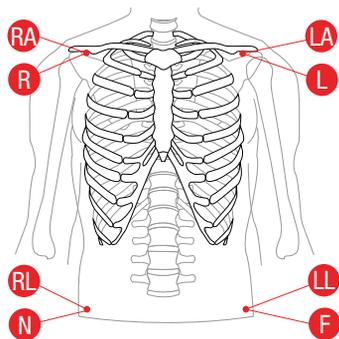
12-lead: limb electrode locations



- Choose an ECG electrode site away from areas with a large amount of adipose tissue, major muscle groups or bony prominences
- Limb electrodes can be placed anywhere on the arms distal to the axillary fold, and anywhere on the legs

Electrode	Standard Location
RA R	Right arm, near the wrist
LA L	Left arm, near the wrist
RL N	Right leg, above the right ankle
LL F	Left leg, above the left ankle

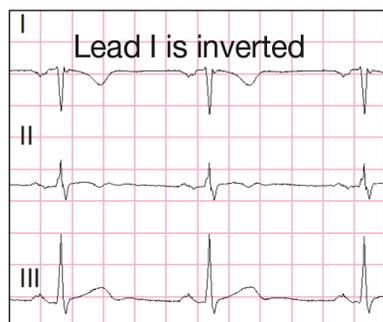
Rhythm monitoring ECG: limb electrode locations



- Limb leads may be placed on the torso (pictured) or limbs
- Choose an ECG electrode site away from areas with a large amount of adipose tissue, major muscle groups or bony prominences

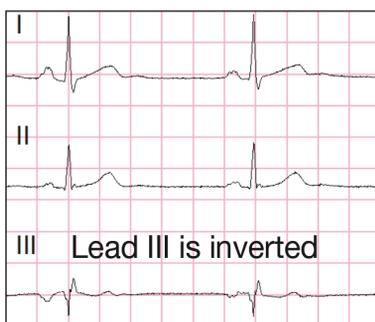
Electrode	Torso Location (limb location also acceptable)
RA	R Middle to outside end of the right clavicle, close to the bone
LA	L Middle to outside end of the left clavicle, close to the bone
RL	N Lower right trunk, just above the hip
LL	F Lower left trunk, just above the hip

LA ↔ RA lead reversal



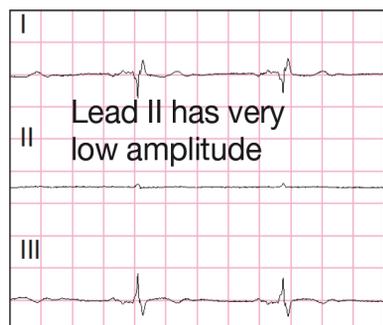
- If there is P wave inversion in lead I, check for LA ↔ RA reversal
- Also, if the other complexes in lead I appear inverted, check for LA ↔ RA reversal

LA ↔ LL lead reversal



- If P waves or QRS complexes appear inverted in lead III, check for LA ↔ LL reversal
- However, be aware that physiologic left axis deviation can cause a negative QRS in lead III
- If P wave is larger in lead I than in lead II, check for LA ↔ LL reversal

RL lead reversals



- If lead II has extremely low amplitude, check for RA ↔ RL reversal
- If lead III has extremely low amplitude, check for LA ↔ RL reversal

Additional Tips

- LL ↔ RL reversal has almost no effect on the ECG; you cannot identify it from the ECG, and it has little effect on ECG interpretation
- If the RL electrode has poor skin contact, ECG artifact may occur
- RL is used to minimize noise from common mode voltages, such as from power lines

Chest electrode reversal (V1–V6)

Correct V leads



- Normal R wave progression in leads V1–V6
- In a normal ECG, R wave amplitude should begin small in V1, then gradually increase through about V4, then decrease, however loss of R wave amplitude can occur due to an established myocardial infarction or other abnormality

V1 ↔ V2 reversal



- Abnormal R wave progression in V1–V3 is due to V1 ↔ V2 reversal