

# Framingham Heart Study

## Manual of Procedures

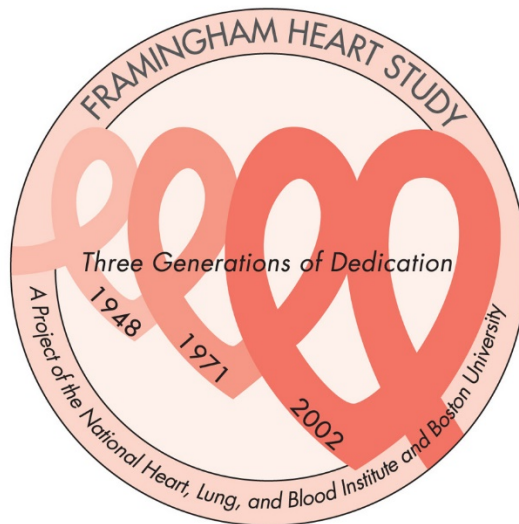
**MOP-version 1.0**

August 22, 2018

### Research Examination Center

Generation 3, Omni 2, NOS Cohorts Examination 3

### Section #6 ECG Protocol





## **Table of Contents**

<b>1.0</b>	<b>ECG Set Up and Lead Placement .....</b>	<b>4</b>
<b>2.0</b>	<b>Equipment for ECG .....</b>	<b>9</b>
<b>3.0</b>	<b>Training and Certification of Staff .....</b>	<b>10</b>
<b>4.0</b>	<b>Supervisor Checklist .....</b>	<b>11</b>

## 1.0 ECG Set Up and Lead Placement

1. Ask the participant to lie supine on the examination table.
2. Inform them you will be performing an ECG and read the following script:

*An ECG is made up of waves showing the electrical activity in different parts of the heart. In order to get an accurate test please try to lie still. The test takes approximately 10 minutes.*

3. Tell the participant you will be placing electrodes on their arms, legs, and chest. Inform them you will be cleaning those areas with Tens Cote Cleaner as well as making marks on their chest with a cosmetic pencil.
4. If he/she is known to be allergic to alcohol, prepare the areas of electrode placement by rubbing with water and drying with a washcloth. If allergies are denied, prepare areas V1, V2-V6, RA, RL, LA, LL, by wiping with a Tens Cote Cleaner. Let dry.
5. **V1:** The first intercostal space is palpated just below the clavicle. Count down and identify the 4th intercostal space just below the fourth rib. **Point V1** is just to the right of the sternum in the **fourth** intercostal space. Make a small line with a marking pencil here to show where the ECG lead should be placed.
6. **V2:** Should be at the same level as **Point V1** and immediately to the left of the sternum. Make a small line with a marking pencil to show where the ECG lead should be placed.
7. To locate the horizontal reference level for electrodes (**Point E**), starting from **V2**, locate the **fifth** intercostal space. Move your finger in the **5th** intercostal space laterally to where the midclavicular (center of the chest where you feel a bend in the clavicle) line intersects the **fifth** intercostal space. Make a horizontal line at this point.

Mark the exact transverse (horizontal) level at this spot with the midsternal line. It should be about one inch (1") below **V1** and **V2** placements.

8. **V6:** Move the participant's elbow laterally away from the body. Mark the midaxillary line in the exact vertical center plane of the thorax down to the intersection of the horizontal plane marked by the location of **E**. This is the exact location of **V6**. (**NOTE:** It is a common mistake to locate the midaxillary line too far anteriorly, toward the **V5** location).
9. **V4:** Place the # arm of the Heart Square firmly across the lower sternum at the level of **Point E** (as you face the participant, the writing on the Heart Square will appear upside

down and backwards). Adjust the **E** and **V6** arms of the Heart Square so they are both perpendicular to the long axis of the thoracic spine at the level of the **E** position. The **E** arm should be exactly horizontal. If the participant is lying flat, the **V6** arm should be exactly vertical.

Slide the **V6** arm so the **0** point (the *arrow* labeled **V6**) is at the marked location for **V6**. Double check that the **E** arm is still in the correct spot.

**V4:** On the **V6** arm (the slide), find the number corresponding to the **E** measurement. Following the corresponding 45 degree line to the surface (e.g. 16) and mark the location following the inside of the square. Place electrodes on **TOP** of the breast.

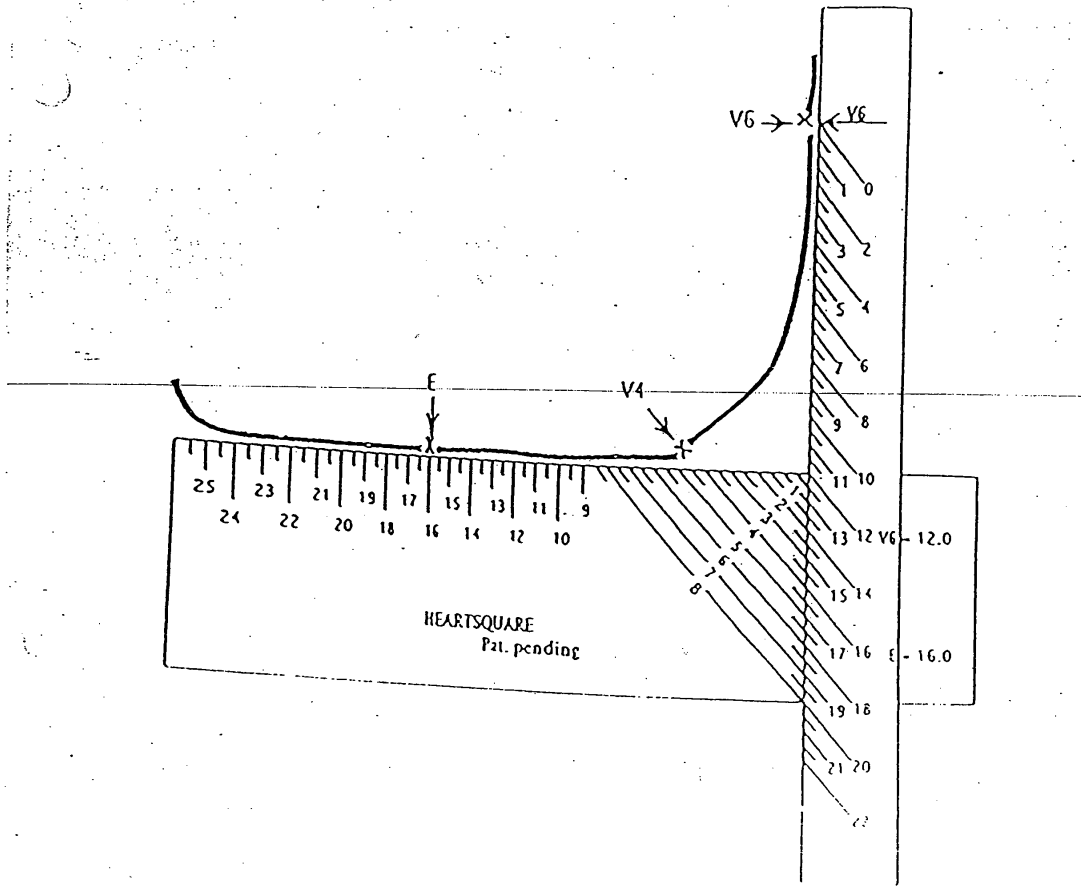
The participant may now lower the left arm in a more comfortable position.

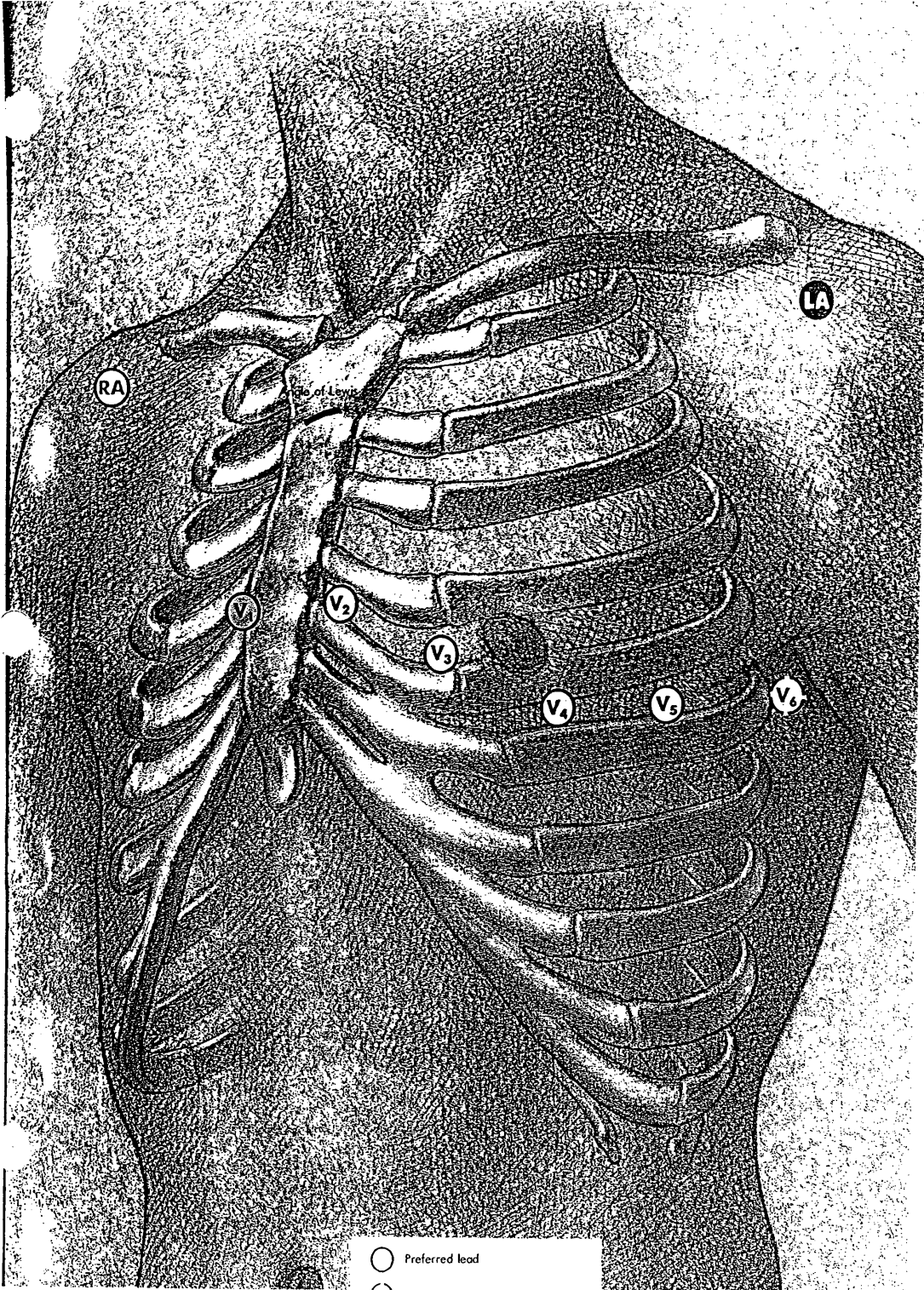
10. **V3:** Exactly halfway between **V2** and **V4**.
11. **V5:** Exactly halfway between **V4** and **V6**.
12. If he/she is known to be allergic to alcohol wipes, prepare the areas of electrode placement by rubbing with water and drying with a washcloth. If allergies are denied, prepare the areas by wiping with an alcohol wipe and drying with a washcloth.

*NOTE:* Place the electrodes on the participant and hook up the leads before entering the data in the ECG machine. This will allow ample time for the participant to relax and the machine interference to smooth out.

13. Attach limb leads in the following order: right arm (RA), right leg (RL), left arm (LA), left leg (LL) parallel to the limb with tabs facing toward the heart. This will avoid lead reversal.
14. The body of the electrode is placed centrally at the pencil mark with the tab extending downward. Precordial electrodes are attached in the following order: V1, V2, V3, V4, V5, V6. Recheck all leads for proper placement.
15. Ask the participant to lie still and relax. In the computer, enter the participants Name, ID, Age, Height, Weight, and Gender. Enter the Exam Cycle, Location (1=clinic), and your Tech ID.
16. The ECG is printed and reviewed for errors. If ECG needs to be run at **5 mmHg** because of high voltage (if the standard **10 mmHg** is beyond the lines of the ECG paper), highlight (yellow or orange highlighter) the **5 mmHg** on the bottom of the printed ECG. On the top margin of the tracing write “ 1/2 **STANDARD**” using a bold magic marker.

17. Leads are checked again for proper placement and disconnected. Electrodes are carefully removed.
18. After each use, wash the Heart Square gently with soap and water (1 part detergent to at least 20 parts water, approximately 3 drops of detergent to one cup of water) and gently wipe dry with a soft cloth.







## 2.0 Equipment for ECG

- ECG Machines: GE MAC5500 (3)

Marquette Electronics  
100 Marquette Drive  
Jupiter, FL 33468-9100

**Sales Rep:** Kevin Manning  
781-439-5969 (cell)  
[Kevin.manning@ge.com](mailto:Kevin.manning@ge.com)

- ECG Carts
- MUSE

### **3.0 Training and Certification of Staff**

#### **New Staff**

- Given Protocol to read, understand, ask questions to Supervisor
- Protocol is demonstrated by Supervisor
- New Staff observes other Techs performing Protocol
- New Staff practices Protocol on staff and volunteers
- New Staff performs Protocol on participant with Supervisor or Certified Tech observing
- When Supervisor feels New Staff is proficient in Protocol, Supervisor will certify New Staff
- Certified New Staff will perform Protocol on own
- Certification date is noted in Certification Log

#### **Recertification of Staff**

- Occurs when there is a major deviation on Supervisor Observations or a new study with a new protocol is introduced into the exam
- Protocol is demonstrated by Supervisor
- Staff observes other Techs performing Protocol
- When Supervisor feels Staff is proficient in Protocol, Supervisor will recertify Staff
- Recertification date is noted in Certification Log

## 4.0 Supervisor Checklist

Date: \_\_\_\_\_

Tech ID# \_\_\_\_\_

Supervisor: \_\_\_\_\_

Participant \_\_\_\_\_

### ECG Supervisor Checklist

Check that each procedure is carried out correctly. Check yes if correct or no if incorrect. Provide an explanation of the incorrect item. Items are presented in the sequence of the examination procedure, but may require confirmation before or after the exam.

Yes	No	ECG Procedures
		Participant is informed that ECG is going to be done. Procedure is explained. Participant is asked to lie on bed, get comfortable.
		Tech establishes a rapport with participant so participant is at ease with procedure. Answers any questions participant may have.
		Electrode location V2 is located in the 4 <sup>th</sup> intercostals space at the left sternal border, a mark is made with pencil.
		V1 is found at the same level as V2 but at the right sternal border, a mark is made.
		The E point is located at the intersection of the 5 <sup>th</sup> intercostal space and the mid-clavicular line, a mark is made.
		A line is drawn at mid axillary in exact vertical center plane of the thorax.
		V6 is located in the mid axilla at the same level as the E point. (The heart square should be firmly placed on the body and kept on a horizontal plane from the E point to the mid-axillary point).
		The difference between the E measurement and V6 measurement is calculated.
		The difference from the above calculation is located in the heart square and V4 is located on the chest, a mark is made.
		V3 is located midway between V2 and V4, a mark is made.
		V5 is located midway between V4 and V6, a mark is made
		Tens Cote wipe is used to clean each area, RA, RL, LA, LL, V1 – V6
		RA electrode is located on the upper (dorsal) surface of right forearm, placed with tab extending away from body.
		RL electrode is located on the inside surface of the right lower leg, placed with tab extending away from body.
		LA electrode is located on the upper (dorsal) surface of left forearm, placed with tab extending away from body.

		LL electrode is located on the inside surface left lower leg, placed with tab extending away from body.
		Chest Electrodes are placed at V1, V2, V3, V4, V5, V6 with the body of the electrode placed centrally on each pencil measurement, tab extending down.
<b>Yes</b>	<b>No</b>	<b>ECG Procedures (cont'd)</b>
		Leads are connected to electrodes in the following order: RA, RL, LA, LL, V1 – V6
		All leads are rechecked for proper placement
		The participant's identifying information is typed into the MAC.
		Participant is requested to relax and lie quietly while ECG recording is in process.
		When tracing appears acceptable, the ECG is printed and reviewed for errors
		All leads are rechecked for proper placement and then disconnected and electrodes gently removed
		2 copies of the ECG is printed and stamped with the correct exam number.

<b>Comments/Corrections:</b>
<b>Supervisor:</b>
<b>Date:</b>