AN INVESTIGATION OF THE EXISTENCE OF ELECTRICALLY LOCATED ACUPUNCTURE POINTS

by

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CHAPTER I

INTRODUCTION

Acupuncture Analgesia

In the early 1970's, the mass media stimulated public interest in acupuncture as a form of analgesia. The media published much testimonial support for acupuncture, but the question of whether acupuncture can be helpful in relieving pain has yet to be adequately proven. Well controlled experimentation with sound scientific documentation is necessary to determine if acupuncture is a useful analgesia.

Present Use of Acupuncture

Apparently there is something to acupuncture analgesia. The American Medical Association's delegation to the People's Republic of China estimates 15% of the major surgery in China is performed with acupuncture analgesia (Small 1974b). This would mean that more than 400,000 operations were performed with acupuncture analgesia in China between 1966 and 1972. The fact that major surgery with acupuncture analgesia is possible at all is significant.

Researchers at the Peking Medical College claim to have proven that acupuncture increases the pain threshold of human skin (Small 1974a). Because pain is so poorly understood today, research in acupuncture may help develop a better understanding of pain. The knowledge gained from such research could be useful to those physicians treating persons suffering from chronic pain, one of the major dilemmas in medicine today.

Mechanisms for Acupuncture Analgesia

Many practitioners of acupuncture theorize that acupuncture points represent areas on the skin where motor and sensory nerves emerge from deep tissue to superficial levels of the skin (Melzack 1974). The theory that sensory and motor nerves emerge from deep tissue to superficial layers of the skin at the acupuncture point is probably a result of the fact that the nervous system is generally implicated to explain the effectiveness of acupuncture. Numerous theories for a neural mechanism of acupuncture analgesia have been proposed. Most notable is the widely accepted Melzack and Wall "gate control" theory of pain, which has been consistent with the characteristics of acupuncture analgesia.

The gate control theory of pain suggests that the transmission of pain signals from the body to the spinal cord and brain is a dynamic process capable of modulation at a so-called gate in the substantia gelatinosa of the spinal cord (Melzack 1974). By this theory, nonpainful stimulation of an acupuncture point could feasibly inhibit the transmission of a painful stimuli by causing an inhibitory synapse in the substantia gelatinosa of the spinal cord. (Melzack 1974). The effect that an acupuncture stimulus might have on a distant body site might be explained if the inhibitory synapse in the spinal cord results from inhibitory signals transmitted via descending nerve fibers from the brainstem. Because the brainstem reticular formation receives inputs from widely distributed parts of the body, transmission of the inhibitory signal could occur via the brainstem and result in an analgesia at a distant body site. This theory is supported by the fact that a profound analgesia is produced when certain areas of the reticular formation are stimulated (Melzack 1974). Likewise, descending neural signals from the cortex of the brain could explain the known effect that emotions have on the perception of pain.

A number of other theories for acupuncture's mechanism for relieving pain have been conjectured, not all of them being neural mechanisms. Among the theories include a hypnosis theory (Ulett, Stern, Brown 1973) and even a hormonal theory (Platte 1974).

Skin Impedance and the Acupuncture Point

Those who practice acupuncture analgesia generally believe that acupuncture analgesia requires either physical or electrical stimulation of the skin at certain specific locations of the skin. These so-called acupuncture points are reportedly in the order of one millimeter in diameter. From the traditional Chinese acupuncture charts, it is possible to locate a traditional acupuncture point on an individual to within a few centimeters. In order to locate these points more precisely, skin impedance is measured with a small searching electrode. Although there is no substantial evidence supporting it, many of those who practice acupuncture claim that skin impedance is lower at acupuncture points. In fact, it is an accepted practice today to locate acupuncture points by measuring skin impedance. The change in impedance at acupuncture points is reportedly anywhere from 1/2 to 1/20 of the impedance of the surrounding skin (Frost, Orkin 1973) (Kaslow, Lowenschuss 1975).

The Skin Impedance Question

Like much of the research involving acupuncture, the research involved with the acupuncture point skin impedance relationship has been contradictory and irreproducible. One topic of controversy concerns the specificity of location of acupuncture points, or at least low impedance points on the skin. A number of researchers claim to have demonstrated that points on the skin corresponding to traditional acupuncture points exhibit a lower skin impedance (Bergsmann, Wolley-Hart 1973). Other researchers obtain frequent false positive and false negative results when searching for traditional acupuncture points by the impedance method (Wu 1973) (Frost, Orkin 1973) (Ulett, Stern, Brown 1973) (Tirgoviste, Constantin, Bratu 1974) (Reichmanis, et. al. 1975). Still other researchers and acupuncture practitioners have failed to discern any relationship between skin impedance and the acupuncture point (Mann 1971). Noordergraaf and Silage (1973) argue that no evidence has been produced concerning the existence of electro-acupuncture points. They claim that the observations concerning skin impedance and the acupuncture points can be explained within the framework of the biomechanical properties of the skin-electrode system.

Although numerous papers have reported a relationship between skin impedance and the traditional acupuncture points, no such relationship has been detected with laboratory animals. From the results of his study with rabbits, Teruo Matsumoto (1973) conjectured that either rabbits have no acupuncture points or that the skin resistance is not significantly different over the sites of superficial major peripheral nerves.

Those supporting the idea that skin impedance is lower at acupuncture points presuppose that there are numerous, small points on the skin that are physically different from the surrounding areas of the skin. A number of studies report that an increased number of sensory nerve endings are located at acupuncture points as compared to adjacent areas of the skin (Bergsmann, Wolley-Hart 1973) (Stern 1973) (Numoto, Donaghy 1973). On the other hand, others argue that, logically, the acupuncture points were discovered and rejected by trial and error at locations where no major nerves or blood vessels exist, thereby providing a built-in safety factor so that needling would not become clinically complicated (Shnider 1973). Research by the Peking Acupuncture Anesthesia Coordinating Group supports the argument that acupuncture points are not specific points on the body. Their work suggests that the specificity of acupuncture points is relative since an analgesic effect can be obtained at nonacupuncture points (Small 1974). These researchers do admit, however, that the effectiveness of acupuncture analgesia may not be as great at non-acupuncture points. In another study supporting the nonspecificity of acupuncture points, pain was relieved by electrical stimulation in a patient series greater than 2,500 while paying no attention to acupuncture points (Long 1973). Success was reportedly similar to those practicing acupuncture.

Differences in Impedance Measuring Techniques

Part of the reason for the controversy concerning skin impedance and the acupuncture point may be due to a lack of standardization of technique for measuring impedance. A number of different techniques are apparent in the literature. For example, Dr. A.L. Kaslow, M.D. (1975) states that from his clinical experience the best, most reproducible results of locating acupuncture points by the impedance method were obtained when using sufficiently large currents while applying the electrodes with a considerable amount of pressure. Kaslow (1975) cites the nonlinear current-voltage relationship at the acupuncture point as the reason. On the other hand, Numoto (1973) states that one should be careful to use minimal testing currents to avoid 'breaking' the skin resistance and getting a false reading. In addition, Frost and Orkin (1973) state that the exploring electrode must be touched to the skin lightly and gently at each spot to prevent false readings from being obtained.

Another source for the discrepancies in skin impedance measurements may be differences in the devices used to measure skin impedance. These devices, when documented, show significant differences. For example, some researchers (Wolley-Hart 1972) use a constant-voltage source for measuring impedance, while others (Noordergraaf, Silage 1973) use a constant current source. In other articles in the literature the impedance measuring devices were not adequately documented to determine their mode of operation.

As will be pointed out later, both the force with which the electrode is applied to the skin and the current applied to the skin are important parameters to control when measuring skin impedance.

Purpose of This Study

Considering the previous discussion, a safe assumption might be that the bioelectric activities of the acupuncture point are not clearly understood. Too many discrepancies and inconsistencies appear in the literature concerning skin impedance and the acupuncture point. In order to answer the questions concerning the acupuncture point impedance that have been opened by previous research, adequately controlled experiments with reproducible results must be devised. The purpose of this study is to determine if small, low impedance areas of the skin exist at locations corresponding to acupuncture points, and, if so, to determine why these low impedance points exist.

CHAPTER II

BACKGROUND INFORMATION

Theory for a Skin Impedance Acupuncture Point Relationship

Supporters of the hypothesis that skin impedance is lower at acupuncture points assume that anatomical properties of the skin cause the changes in skin impedance. When electrically stimulating the skin, the membrane characteristics of excitable cells can change, and the permeability of these cells increases. This increased permeability of the membranes of the cells of the epidermis and dermis are assumed by many to be the cause of the decreased electrical impedance at the acupuncture point. The assumption that excitable cells cause the decrease in skin impedance is based on the theory that the acupuncture point has a higher concentration of excitable nerve cells as compared to other areas of the skin. Considering the above theory, an understanding of the anatomical structures of the skin and an understanding of the characteristics of the electrical circuit model of an electrode on the skin is basic to the study of the relationship between skin impedance and the acupuncture point. With a knowledge of the anatomy of the skin and the impedance model of the skin, one can more easily identify which components of the skin impedance model are changing as one collects impedance data. In addition, one can more easily determine and understand the relative magnitudes of the impedance components of the electrical model of the skin with respect to one another.

Anatomy of the Skin

The skin functions as a protective covering for the underlying parts of the body, as an organ of sensation to keep one informed with the environment, as a gateway for the regulated passage of substances from the body, and as a body thermal regulator. To perform its functions, the human skin utilizes three distinct layers of cells; the outer epidermis, the dermis, and the subcutaneous tissue. Figure one illustrates a section of the skin and the three layers of the skin.

The Epidermis

The epidermis is characterized by dead cells on top of pigmented dying and living cells. Depending on the area of the skin, two to four zones of stratified epithelial cells make up the epidermis. The layers of the epidermis are labelled from the superficial layers in as (1) the stratum corneum, (2) the stratum lucidum, (3) the stratum granulosum, and (4) the stratum germinativum. These layers of the epidermis are illustrated in Figure two.

The Stratum Corneum

The outer layer of the epidermis, the stratum corneum, consists of a broad zone of several layers of dead epithelial cells. The dead cells are the end product of differentiation of the epidermal cells and are flattened, dehydrated, and continually flaking off. The body casts off one to ten grams of its outer dead cells per day (Montagna 1974). The excised cells are continually being replaced by cells

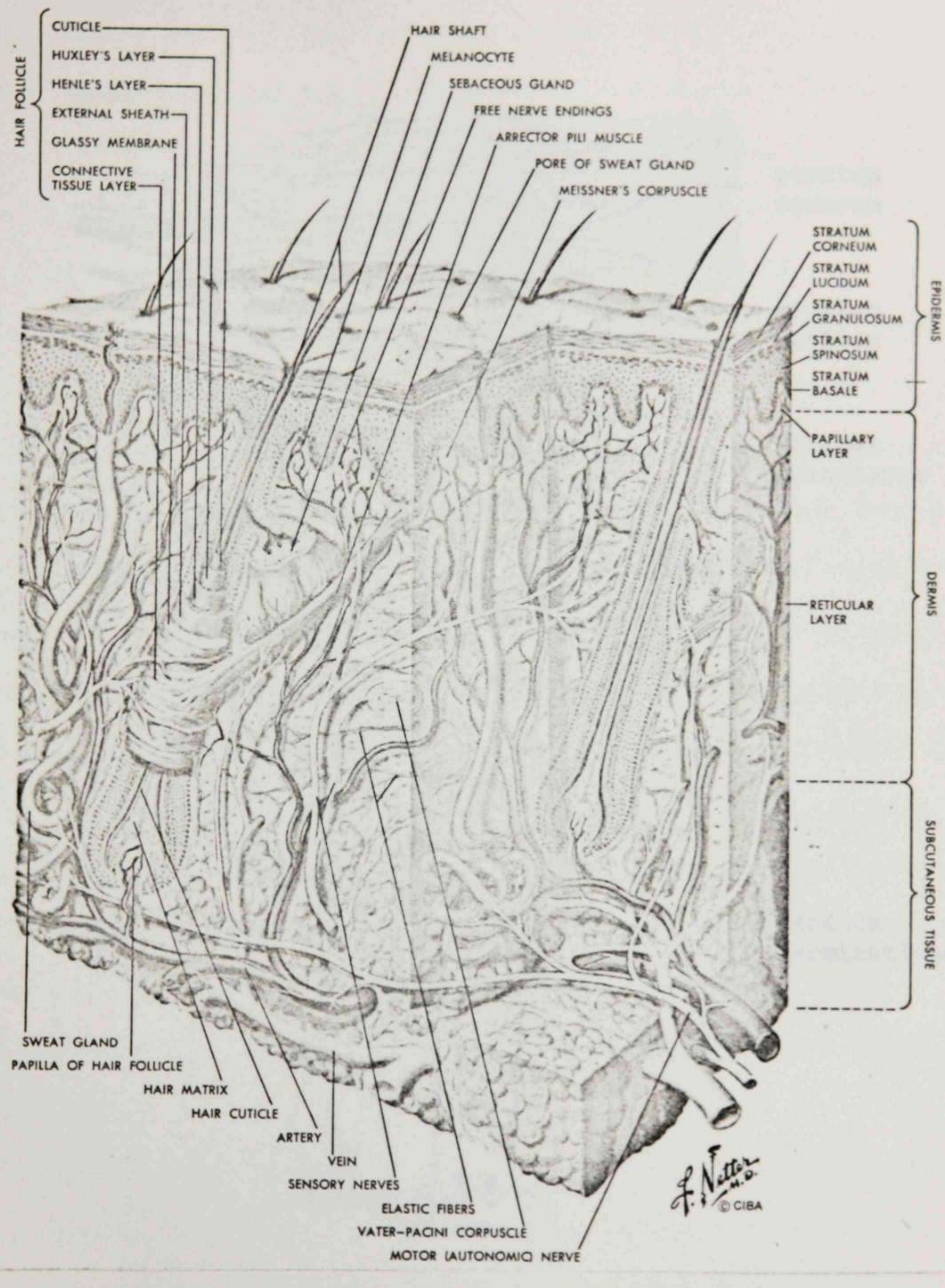


Figure 1. Cross Section of Skin (Netter 1973).

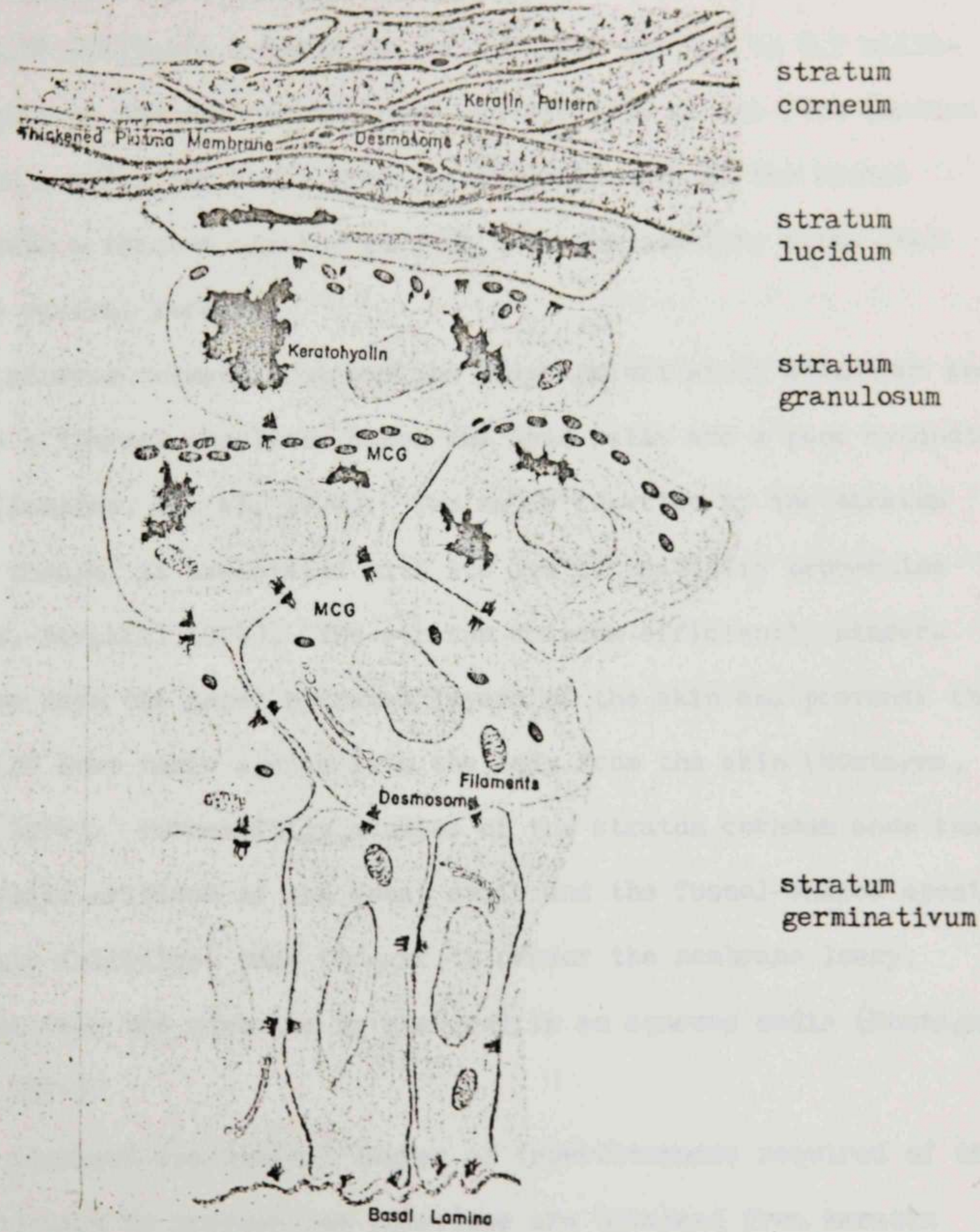


Figure 2. Schematic diagram showing the layers of the epidermis (Montagna, Parakkal 1974).

migrating to the surface that originate from the stratum germinativum layer of the epidermis. The thickness of the stratum corneum varies with the location on the body. For example, the stratum corneum is 0.02 to 0.04 millimeters thick in the forehead and 0.4 to 0.7 millimeters thick on the palm of the hand and the sole of the foot (Geddes 1972). As a rule, the hairy areas of the skin such as the dorsal forearm have a thicker stratum corneum than the nonhairy areas such as on the ventral forearm.

The stratum corneum protects the body against minor abrasions and serves as a thermal insulator since the dead cells are a poor conductor of heat (Longley, et. al. 1974). The major function of the stratum corneum, though, is associated with its low permeability properties (Montagna, Parakkal 1974). The stratum corneum efficiently hinders water loss from the inner hydrated layers of the skin and prevents the entrance of most toxic agents into the body from the skin (Montagna, Parakkal 1974). Permeability studies of the stratum corneum show that the slit-like orifices of the sweat ducts and the funnel-shaped openings of the hair follicles, once thought to render the membrane leaky, swell shut when the membrane is immersed in an aqueous media (Montagna, Parakkal 1974).

The strength and desired degree of imperviousness required of the stratum corneum to perform its functions are obtained from keratin fibers embedded in a matrix of protein (McGilvery 1970). Keratin contains fibrous protein made from peptide chains in the right-handed α-helical configuration. The keratin fibers embedded in a protein matrix give the skin strength and flexibility in much the same way that steel rods give concrete its strength and flexibility. The protein matrix distributes stresses among the keratin fibers, and the keratin fibers prevent the protein matrix from cracking (McGilvery 1974).

As the epidermal cells differentiate and migrate from the stratum germinativum, wall-to-wall keratin fibrils form within the cells; and the ends of the protein fibrils gather at thickenings in the cell wall called desmosomes. Adjacent cells fuse at the desmosomes resulting in a cabled network of fibrils and desmosomes that tie all the cells together (McGilvery 1974). As the cells unite, covalent intermolecular and intramolecular disulfide bonds are formed between the large number of cysteine amino acid residues of the cell's protein. The result is a protein matrix. Figure three illustrates the protein disulfide bond involved.

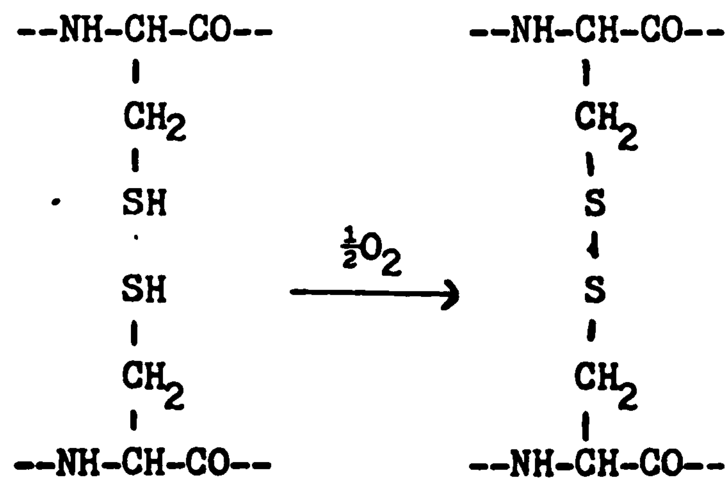


Fig. 3. Protein disulfide bond

The resultant disulfide bonds cement the smaller protein molecules into a solid mass around the keratin fibrils (McGilvery 1974). As the disulfide bonds form, the cell structures lose their shape, the original cells fill with keratin, and the cells become a part of the horny layer, or stratum corneum, that resists tearing and effectively confines the body fluids within the body (McGilvery 1974). As will be discussed later, this protein mat of the stratum corneum exhibits a high electrical impedance.

Stratum Lucidum

The stratum lucidum is a clear zone of flattened non-nucleated cells found just below the stratum corneum at friction areas such as the palms of the hand and sole of the foot (Geddes 1972). This layer is one to two cell layers deep and measures about ten microns thick (Langley, et. al. 1974). The turnover time for these cells is approximately two days.

Stratum Granulosum

Immediately below the stratum lucidum is the stratum granulosum which consists of two to five layers of spindle-shaped cells arranged with their long axes parallel to the surface of the skin. The cells of this layer contain pigment granules and granules of keratohyalin (Geddes 1972) (Langley, et. al. 1974).

Stratum Germinativum

The deepest layer of the epidermis, the stratum germinativum, contains several layers of cells undergoing mitosis. The stratum germinativum consists of columnar and cuboidal cells. The cells of the stratum germinativum eventually differentiate and are pushed outward to become part of the outer layers of the epidermis.

General Characteristics

No convincing evidence exists to prove that nerve fibers transverse the dermis to the human epidermis (Montagna, Parakkal 1974). According to Montagna and Parakkal (1974) intraepidermal nerves are found predictably in adult tissue only in the eyelids and around the genitalia, especially the clitoris. The epidermis is also devoid of blood vessels. Because of the lack of blood vessels and the limited distribution of nerve endings, one can shave off several layers of the skin without blood loss or pain.

The Dermis

The dermis consists basically of a matrix of loose connective tissue composed of such fibrous proteins as collagen, elastin, and reticulin embedded in an amorphous ground substance. The matrix is traversed by blood vessels, nerves, and lymphatics, and into it penetrate epidermal appendages such as eccrine sweat glands and apocrine glands. The tough, resilient tissue of the dermis can arbitrarily be divided into an upper papillary layer composed of protein fibers immediately beneath the epidermis and a lower reticular layer composed of a network of thick collagen fibers. The interfibrillar spaces of the papillary layer are larger than those of the reticular layer (Montagna, Parakkal 1974).

The dermis functions as a medium for ion exchange and as a protective cushion to prevent mechanical injury to the body. The dermis transports nourishment to the epidermis and interacts with the epidermis during skin repair and remodelling (Montagna, Parakkal 1974).

Ground Substance

All dermal components such as cells, fibers, blood vessels, and nerves are embedded in an amorphous matrix called the ground substance. The ground substance appears to be a multicomponent system of substances derived from the blood and cellular metabolic products. Although there is no free fluid in the ground substance, water is bound to the hydrophilic components of the ground substance (Montagna, Parakkal 1974). Because the metabolites of all cells separated from their blood supply by connective tissue must pass through this bound water, the ground substance serves as an extension of the vascular system.

Vascular Supply

The dermis and hypodermis are perforated by a continuous arteriovenous blood vessel network with meshes of different sizes and with various spatial relationships (Montagna, Parakkal 1974). All levels of the dermis are rich in blood vessels. Because the skin functions as a thermal regulator, the blood vessels are nearly always greatly in excess of the biological needs of the tissues. The dermis blood supply has an arterial-venous shunt which can control the blood to and from the superficial layers. This shunt enables the dermis to regulate the heat loss from the skin (Geddes 1972). Hence, the blood supply to the dermis serves a dual function as a source of nutrition to the cells of the skin and as a thermal regulator for the body. Because of its rich blood supply, the dermis exhibits a very low impedance when compared to the impedance of the epidermis.

The Dermal Nerve Network

The dermis has a rich nervous supply. The interconnected, superimposed dermal nerve networks become progressively more dense at the outer layers of the dermis. These dermal networks are probably the principal sensory receptors (Montagna, Parakkal 1974).

In short, the dermis is richly supplied with blood vessels and nerve cells while the epidermis essentially has no blood supply or nerve enervation.

The Impedance Model

When studying skin impedance, an understanding of the electrical model of the circuit between the electrodes on the skin is as important as an understanding of the anatomy of the skin. The circuit between the electrodes and the skin is not easy to quantify accurately, but its components can be identified (Geddes, Valentinuzzi 1974).

The Components of the Model

The electrical model between the electrode and the skin is comprised of three parts. The electrical model consists of the conducting properties of the electrode-skin interface, the skin, and the tissues and fluids under the skin. Figure four represents the electrical model of an electrode placed on the skin.

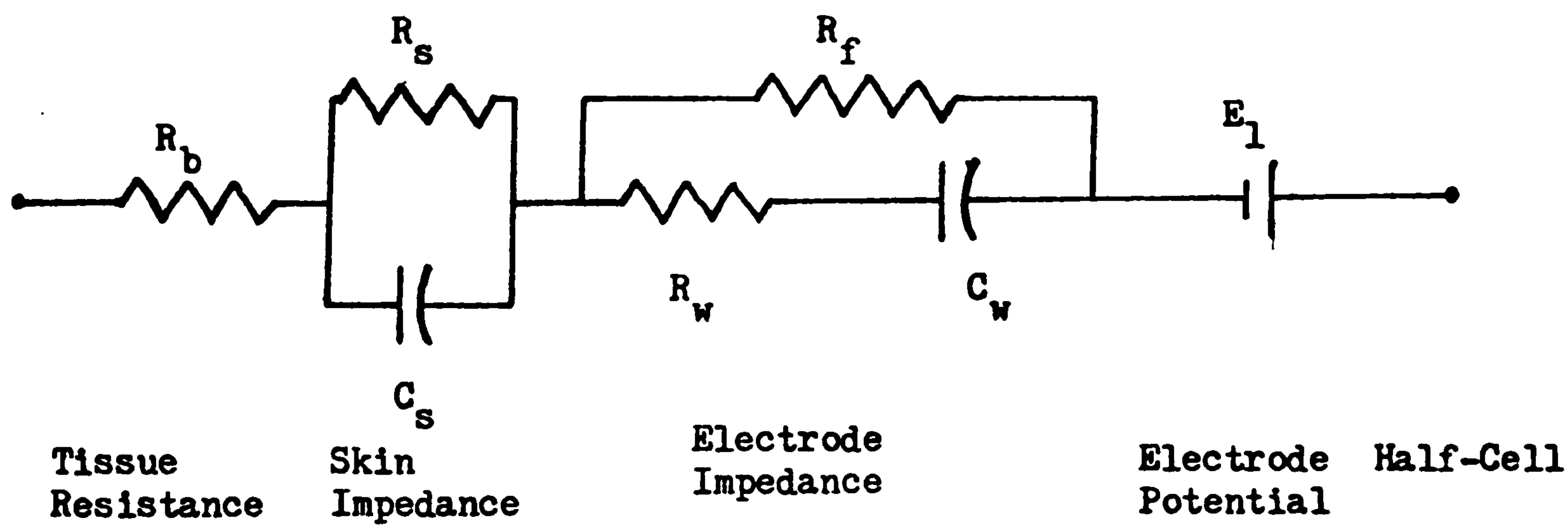


Figure 4. Impedance model for a dry electrode on the skin (Geddes, Valentinuzzi 1974).

Electrode Impedance

The Electrode Double Layer

A metal electrode in contact with the perspiration on the skin represents an electrode-electrolyte interface. At any electrode-electrolyte interface there is a tendency for the electrode to discharge ions into solution and for ions in the electrolyte to combine with the electrode (Strong 1970). The chemical reaction may be represented as

$$\text{metal} \rightleftharpoons \text{electrons} + \text{metal ions}. \quad (1)$$

The result is a charge distribution at the electrode-electrolyte interface. The charge distribution, called an electrode double layer, causes an electrode potential and gives the electrode a capacitance since two planes of charge of opposite sign separated by a distance constitute a charged capacitor. The electrode capacitance is large because the distance between the layers of charge is to the order of angstroms.

The Warburg Model of the Electrode Impedance

In 1901, E. Warburg was probably the first to demonstrate that an electrode-electrolyte interface could be equated to a frequency dependent, series combination of a resistance, R, and a capacitance, C. Warburg also showed that at low current densities the resistance and reactance of the electrode impedance are approximately equal, and that both reactance and resistance vary almost inversely with the square root of the frequency (Geddes, DaCosta, Wise 1971). Figure five represents the electrode impedance model. The model is also shown incorporated in the total electrode to skin impedance model found in figure four. At high current density, the Warburg frequency vs. reactance and resistance relationship does not apply. Although at high current densities both resistance and reactance decrease with increasing frequency, both are not affected to the same degree, and the phase angle of the electrode impedance varies from its usually constant forty-five degrees (Geddes, et. al. 1971). One should also note that at a given frequency, both resistance and reactance decrease as current density is increased. Because a direct current can flow through an electrode on the skin, a resistor is usually shown in an electrode impedance model to shunt across the frequency dependent and current density dependent components of the Warburg impedance.

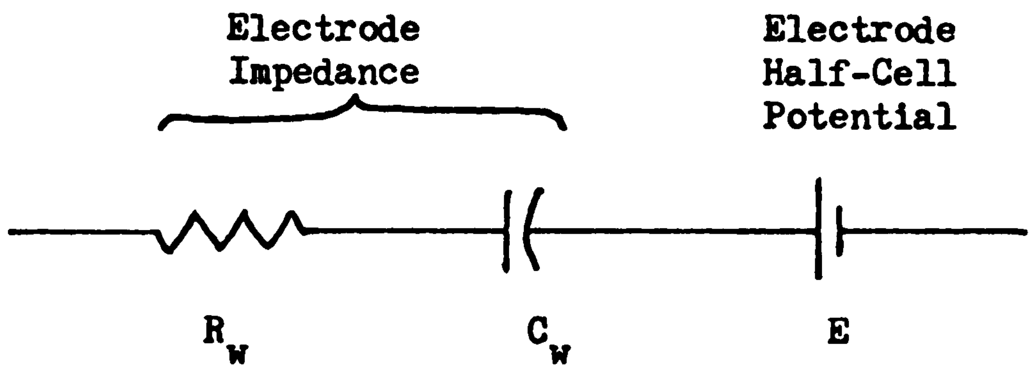


Figure 5. The Warburg electrode impedance model.

As previously mentioned, the electrode-electrolyte interface also exhibits a half-cell galvanic potential. When measuring skin impedance the effect of this galvanic potential on impedance measurements can be eliminated by applying an alternating current instead of a direct current.

<u>Skin Impedance</u>

As previously mentioned, the closely packed cellular layers of the epidermis change progressively from the living, moist environment of the stratum germinativum to the relatively dry, avascular environment of the stratum corneum.

Stratum Corneum Impedance

It is well documented that the dry avascular stratum corneum represents the high impedance layer of the skin. The impedance of the living stratum germinativum and the highly vascular dermis and subcutaneous tissue is low when compared to the impedance of the stratum corneum (Barnett 1938). In fact, numerous researchers as Gildemeister, Einthoven and Bijtel, Hozawa, Barnett, and Tregear interpret skin impedance in terms of the physical parameters of the epidermis (Barnett 1938) (Tregear 1965). Considering the literature concerning skin impedance, the interpretation that skin impedance primarily represents the properties of the epidermis is unquestionable. In fact, much evidence supports the supposition that skin impedance measures the characteristics of the stratum corneum of the epidermis. Skin resistance and reactance is highest on the areas of the skin with the thickest stratum corneum. Hence, skin impedance is high on the palms of the hands and the soles of the feet, and is higher on the dorsal forearm as compared to the ventral forearm.

That the stratum corneum is a high impedance layer of the skin can easily be demonstrated by stripping the stratum corneum away from the epidermis. Gerstner and Gerbstadt showed that the tops of blisters behaved as whole skin, but that denuded skin had almost no impedance (Lawler, et. al. 1960). Results similar to the Gerstner and Gerbstadt study can be easily obtained by a cellulose tape stripping technique. This technique involves repeated cellulose tape strippings of the keratin layers of the stratum corneum until the moist, living epidermis is exposed (Lawler, Lavis, Griffith 1960). As in the Gerstner and Gerbstadt study, the removal of the stratum corneum by this method has a profound effect on the impedance and phase angle of the skin. As the stratum corneum is stripped from the skin, the skin resistance decreases and the skin capacitance increases. The decrease in impedance is due to the removal of the capacitive component of the stratum corneum. It is because of the high impedance of the stratum corneum that those measuring human physiological data with electrodes often clean the skin with an abrasive cleaner. By doing so, the high impedance layer of the stratum corneum is removed and a very low and extremely stable electrode and skin impedance is obtained. Figure six shows the skin resistance and capacitance versus the number of strips of keratin removed obtained in the Lawler, et. al. (1960) study. Two 2-cm in diameter stainless steel electrodes were used in making the skin impedance measurements.

As the stratum corneum is removed, the phase angle between voltage and current is also reduced (Lawler, et. al. 1960). Figure seven shows the relationship between phase angle, 0, and impedance, Z, to resistance, R, and capacitive reactance, X_c. From figure seven, one might conclude that a reduced phase angle is produced when the stratum corneum is removed because the capacitive reactance of the skin decreases to a greater extent than the resistance of the skin.

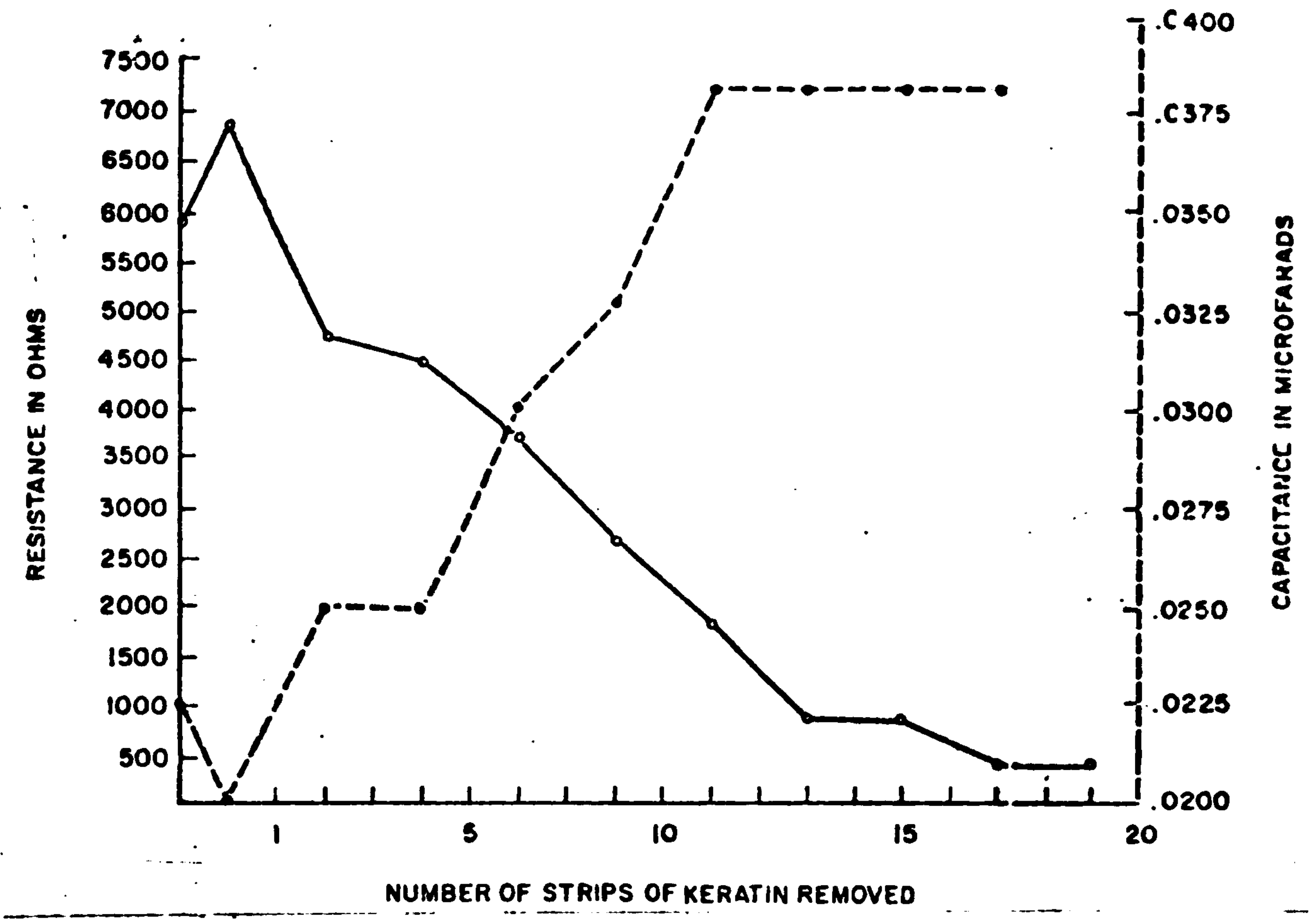


Figure 6. The effect of gradual removal of stratum corneum on resistance and capacitance (Lawler, et. al. 1960).

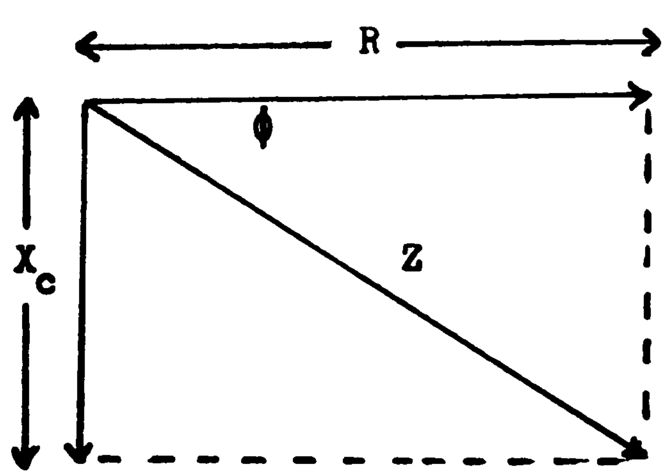


Figure 7. Relationship of phase angle, ϕ, and impedance, Z, to resistance, R, and capacitive reactance, X_c.

The Skin as a Polarization Cell

Skin impedance measured with small electrodes is high, and the impedance as well as the phase angle vary inversely with frequency (Plutchik, Hirsh 1963). Figure eight illustrates graphically the phase angle and frequency relationship. Because the frequency dependence of the skin impedance and capacitance resembles that of a polarization cell, the skin capacitance has been regarded as a polarization capacitance localized to the living cell layer of the stratum germinativum (Rosendal 1944). The model of skin impedance, then, resembles that of a polarization cell. As shown in figure nine, the skin impedance model consists of a series resistance component of the stratum corneum, R_1, a frequency dependent capacitance of the stratum corneum, C, and a shunt resistor, R_2, across the capacitor, C.

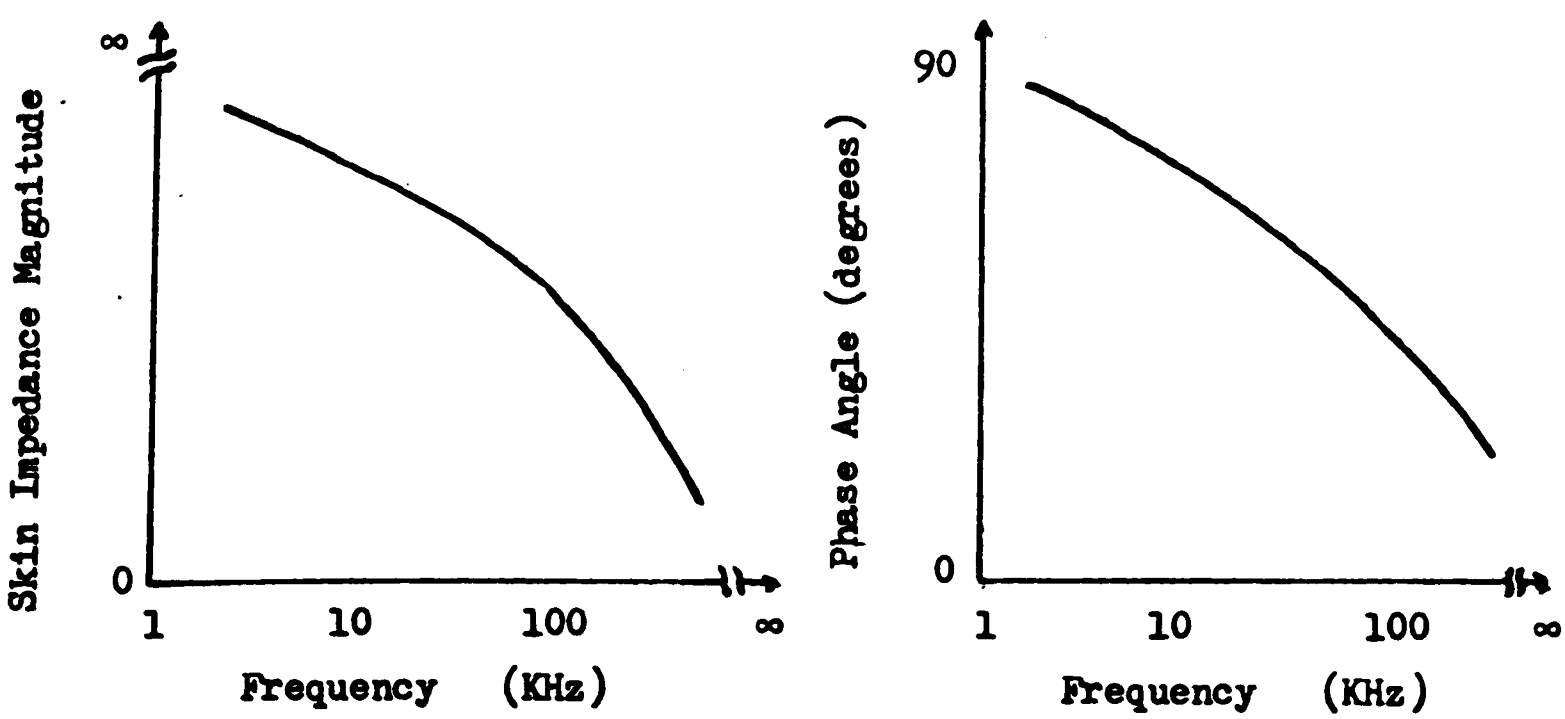


Figure 8. Phase angle and impedance as a function of frequency (Rosendal 1944).

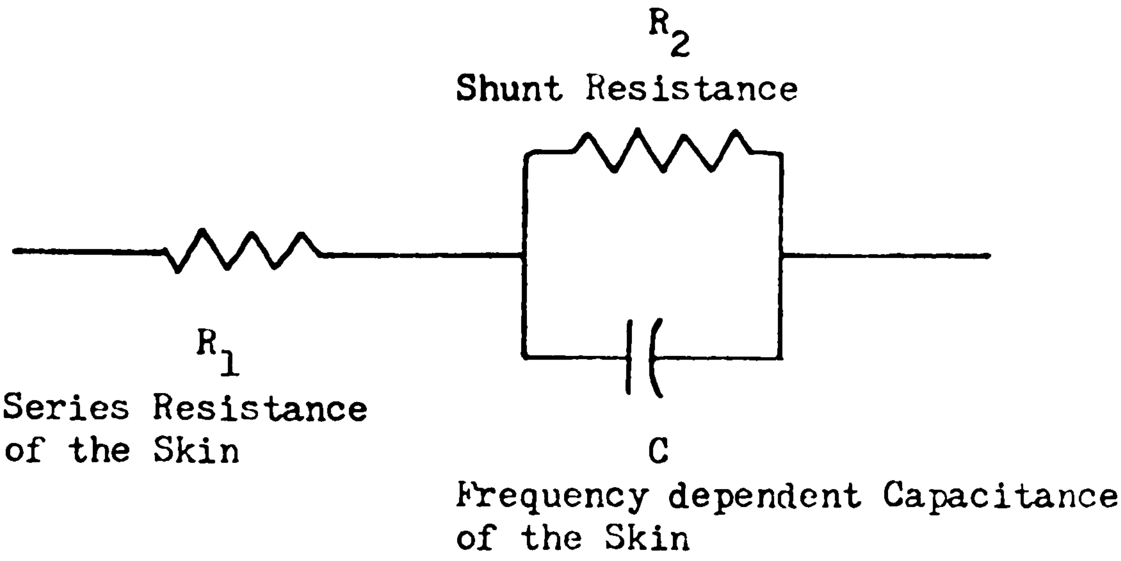


Figure 9. Electrical model for skin impedance

Skin Impedance and the Moisture Content of the Skin

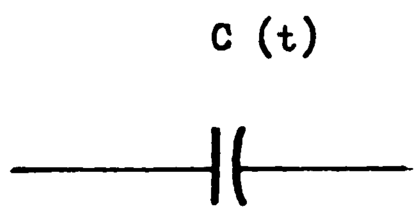
The susceptance of the normally moist stratum corneum is about 230 to 300 times greater than that for pulverized, dry stratum corneum (Rosendal 1944). Therefore, skin impedance is directly related to the moisture content of the stratum corneum. Because perspiration accumulates under an electrode with time, the stratum corneum impedance is reduced with time. To account for the change in resistance with the accumulation of perspiration under the electrode, the resistor, R_2, of figure nine is shown as a time dependent variable resistor. Because the stratum corneum of laboratory animals is thin when compared to that of humans, the skin impedance of laboratory animals will not be nearly as dependent on the condition of the stratum corneum as it is in humans.

Temporal Changes of the Skin Impedance Model

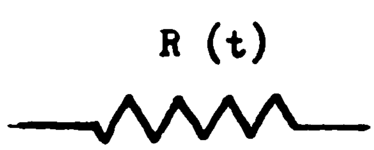
By far the most dominant components of the skin impedance model are the electrode impedance and the skin impedance. In fact, the subject's subcutaneous tissue impedance can be assumed to be negligibly small when compared to the total impedance between two electrodes. Thus, the impedance model of figure four can be simplified by eliminating the tissue and fluid component of the impedance. When using alternating currents, the electrode half-cell potentials can be neglected. An even greater simplification of the impedance model of figure four can be made by including in the model only that component of impedance that dominates at a particular time. For example, when a dry electrode is placed on dry skin, the skin acts as a good insulator. Because the magnitude of the skin impedance is much larger than the other components of impedance, the model of figure four might be substituted for a capacitor, C_s', as shown in figure ten a. One plate of the capacitor represents the underlying body fluids and the other plate represents the relatively dry electrode on the skin (Geddes, Valentinuzzi 1974). C_s' could also include the relatively large capacitive components of the electrode-perspiration interface and the capacitance of the subject's tissues (Geddes, Valentinuzzi 1974).

With time, sweat gland activity moistens the skin under the electrodes, and shunts the skin capacitance. The model for skin and electrode impedance, therefore, has a time-dependent shunt resistor in parallel to the skin and the electrode capacitance. Thus, the skin's impedance decreases as perspiration accumulates under the electrode.

In addition to shunting the skin's capacitance, perspiration under the electrode helps to establish a better ohmic contact of the electrode with the skin. Hence, as perspiration accumulates under the electrode, both the electrode impedance and the skin impedance decrease; and the circuit of figure four becomes more resistive in nature. Therefore, with time the model can be represented by a single resistor representing the resistance of the electrode-perspiration interface, the resistance of the skin, and the relatively small resistance of the subject (Geddes, Valentinuzzi 1974). Figure ten b represents a simplified circuit of figure four after perspiration has accumulated under the electrode. In short, although the subject's tissue impedance remains relatively constant, both the skin impedance and electrode impedance change rapidly as perspiration accumulates.



a. Initial Impedance Model



b. Impedance Model after the passage of time

Figure 10. Simplified equivalent circuits for dry electrodes initially applied (a) and after the passage of time (b) (Geddes, Valentinuzzi 1974).

From the preceding discussion, one might conclude that when a dry electrode is placed on dry skin, initially the skin impedance is much larger than the sum of the other impedances shown in figure four. As perspiration accumulates under the electrode, the skin resistance is reduced, causing the total impedance to become more resistive in nature. The total impedance is comprised primarily of the skin impedance and the electrode impedance. It is difficult, however, to separate the magnitudes of the skin impedance and the electrode impedance from the total impedance.

CHAPTER III

METHODS AND PROCEDURES

Bipolar Impedance Measuring Technique

As previously stated, one of the purposes of this study is to determine if small, low impedance areas of the skin exist at locations corresponding to acupuncture points. [The method used for measuring impedance in this study is a common bipolar technique illustrated in figure 11.

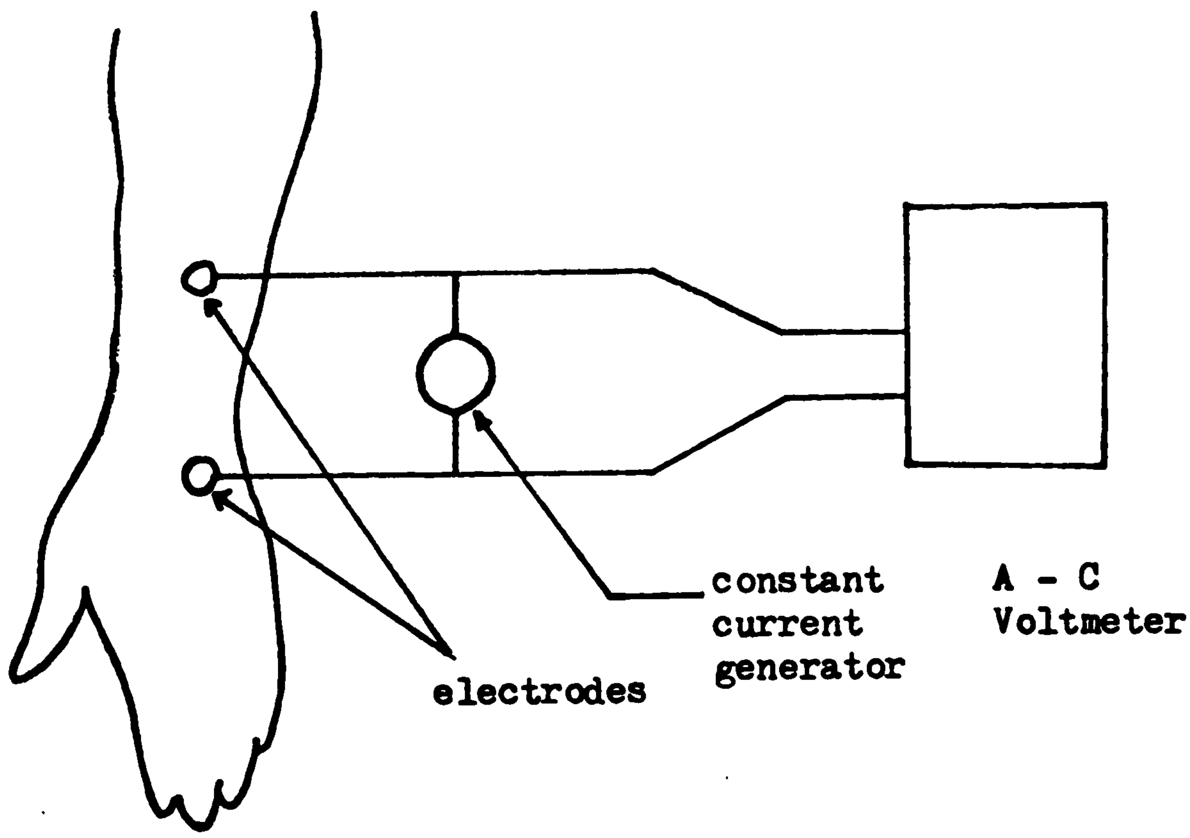


Figure 11. Bipolar technique for measuring skin impedance.

The technique utilizes a constant amplitude current applied by a constant alternating current generator between two electrodes on the skin. By measuring the voltage between the two electrodes and by knowing the applied constant current, the impedance between the two electrodes can be calculated from Ohm's Law.] Figure twelve represents the constant current circuit employed in this study. [As long as the impedance between the two electrodes is low enough to prevent the operational amplifier from saturating, a constant amplitude alternating current with an amplitude of (V_s/220,000) amps flows through the two electrodes.

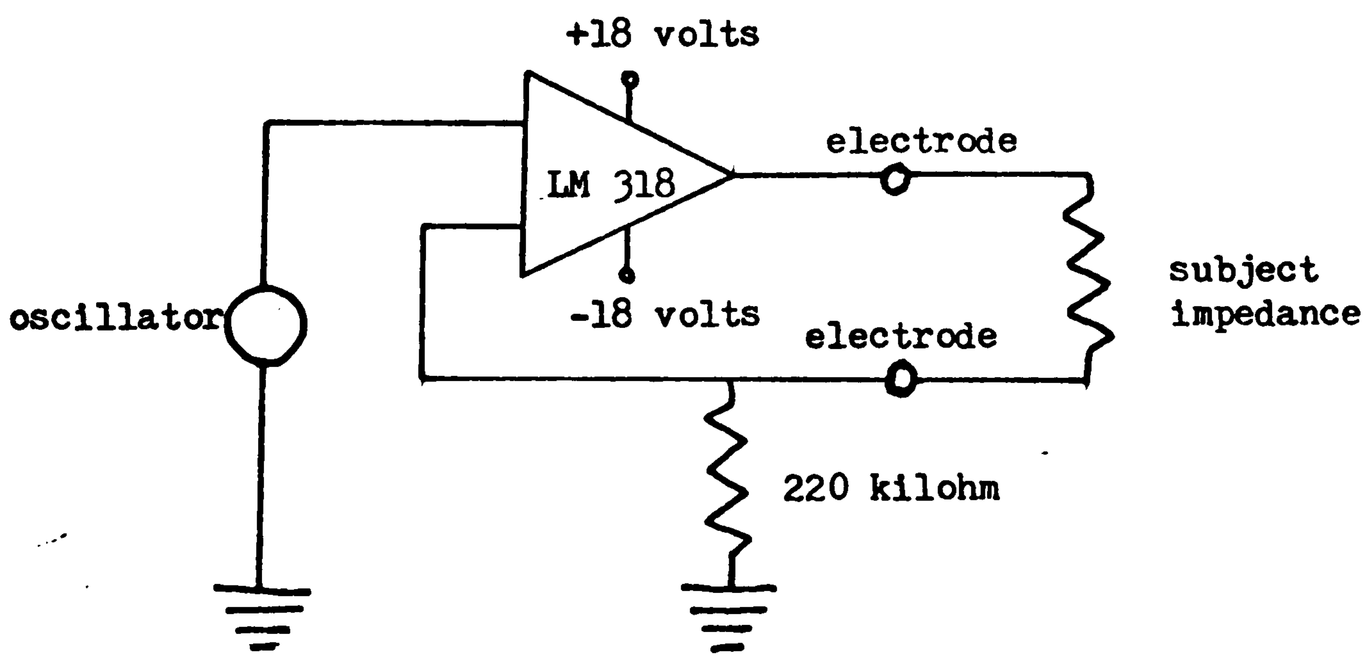


Figure 12. Constant Current Generator

The constant current technique for measuring skin impedance is superior to the commonly used voltage techniques because, as previously mentioned, the electrode impedance changes with current intensity. Hence, when using a constant voltage technique a relatively low skin impedance could be due in part to a reduced electrode impedance caused by the increase in current intensity used to measure the impedance. Secondly, since the innervation of nerve cells allegedly causes the low impedance measurements at acupuncture points, the parameters for the stimulation of nerve cells should be controlled. From the shape of the strength-duration curve of figure thirteen, one can see that nerve cell stimulation is definitely a function of stimulating current intensity. Hence, the application of a constant amplitude, constant frequency alternating current serves as a control for those variables that influence nerve cell innervation.]

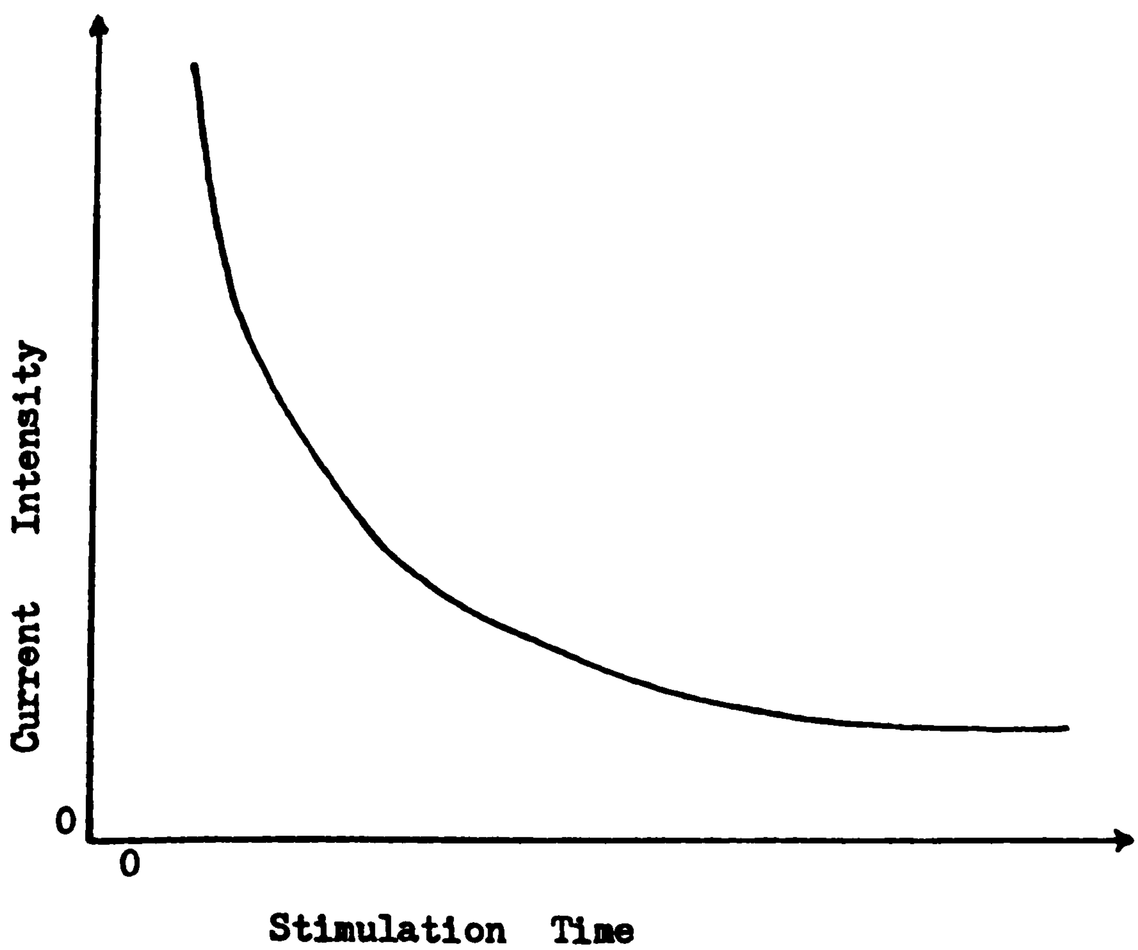


Figure 13. Current strength vs. duration for the activation of an excitable cell (Plonsey 1969).

The Impedance Under an Electrode

If one of the electrodes in the circuit of figure eleven is much larger than the other, then the impedance under the large electrode will be negligible compared to the impedance under the small electrode since the impedance is inversely related to the area of the electrode-electrolyte-subject junction. By assuming that the impedance under the large electrode is negligible, that the electrode impedance under the small electrode is negligible, and that the skin is homogeneous and isotropic with the body tissue, one can show that 90% of the impedance between the two electrodes is located within ten electrode radii lengths of the small, searching electrode. With the electrode of figure fourteen representing the searching electrode, the impedance of the tissue under the electrode can be calculated from equation two.

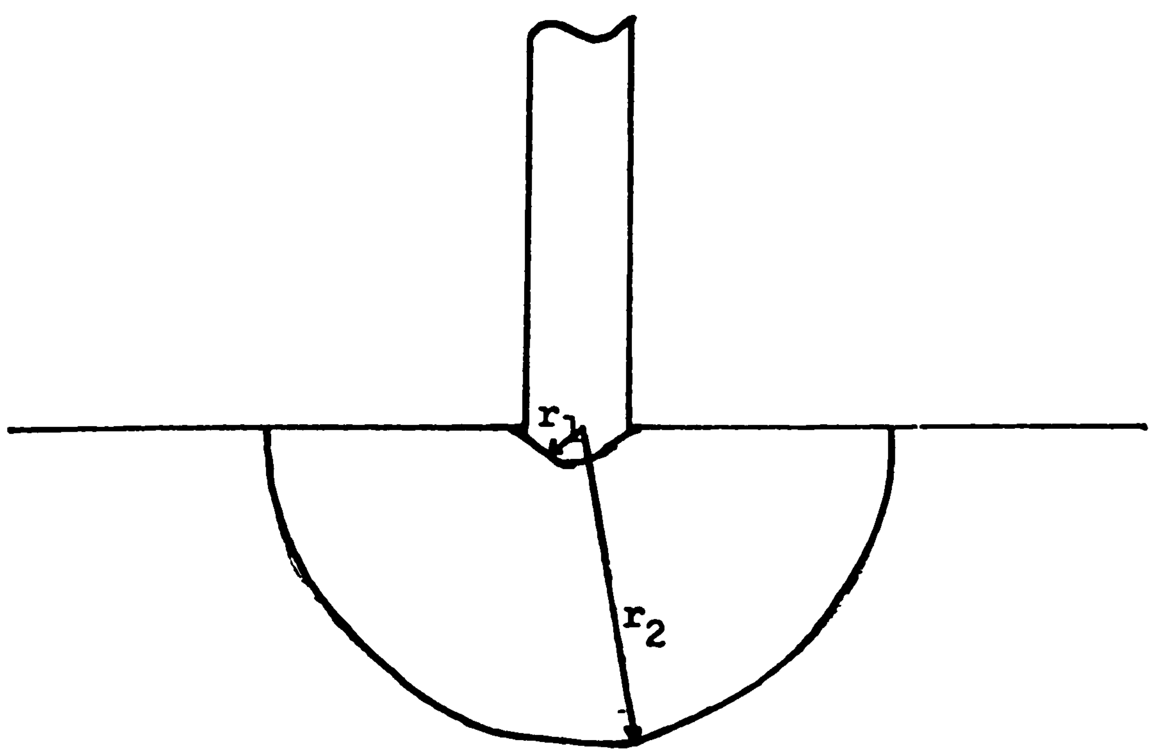


Figure 14. Impedance Under the Searching Electrode.

$$R = \rho l/A \qquad (2)$$

where R = resistance
ρ = resistivity
l = distance for current to flow
A = cross sectional area for current to flow

By differentiating resistance, R, with respect to distance, l, in equation two, one obtains equation three.

$$dR = (\rho dl)/A \qquad (3)$$

By substituting in equation three the equation for the area of a hemisphere for A and the radius of a hemisphere, r, for l, one obtains equation four.

$$dR = \rho \, dr/2\pi r^2 \qquad (4)$$

Equation five represents the result of integrating both sides of equation four.

$$\int_{r_1}^{r_2} dR = R = -\rho/2\pi r \Big|_{r_1}^{r_2} = (\rho/2\pi)\,(1/r_1 - 1/r_2) \qquad (5)$$

where r_1 = radius of the electrode
r_2 = the radial distance from the electrode

By comparing the value of R obtained from equation five when $r_2 = 10r_1$ and when r_2 = infinity, one can see that 90% of the total impedance is located within ten electrode radii lengths from the electrode. However, as pointed out in the previous discussion on the stratum corneum and skin impedance, the skin and tissue under the skin do not represent a homogeneous and isotropic medium, and the electrode impedance of the small electrode is not negligible. Because the impedance of the epidermis is much greater than the impedance of the dermis and the subcutaneous tissue, and because the searching electrode's impedance is not negligible, one might assume that practically all the impedance being measured lies between the small searching electrode and the dermis under the electrode.

Electrodes

The Large Distal Electrode

The large distal electrode used in this study was built from a four inch long piece of $1\frac{1}{2}$ inch in diameter copper pipe. The pipe was coated with sterling silver and then chlorided with an electrolytic deposition of silver chloride of about 500 milliamper-seconds per square centimeter.

The Searching Electrode

The small searching electrode was built from a silver wire rod one millimeter in diameter. The electrode end of the wire was ground smooth and then chlorided originally with an electrolytic deposition of silver chloride of about 500 milliampere-seconds per square centimeter. Because the silver chloride would wear off with use, the searching electrode required periodic rechloriding. The wire was mounted in the case of a "Vu-Thru" high-lighter pen made by the Esterbrook Company. A lead stopper was soldered to the silver wire to provide a mount for the spring that was needed to monitor the force applied to the skin by the searching electrode. Because the measured impedance is to a certain degree dependent on the force applied to the skin by the searching electrode, the wire electrode is mounted in the case so that at the maximum spring deflection, a known force would be applied on the skin by the silver wire electrode. Figure fifteen illustrates the construction of the searching electrode. The force applied by the electrode on the skin at maximum spring deflection was 0.1 kilograms. Since the electrode area in contact with the skin was one square millimeter, the electrode was applied to the skin with a force in the range of 0.1 kilograms per square millimeter.

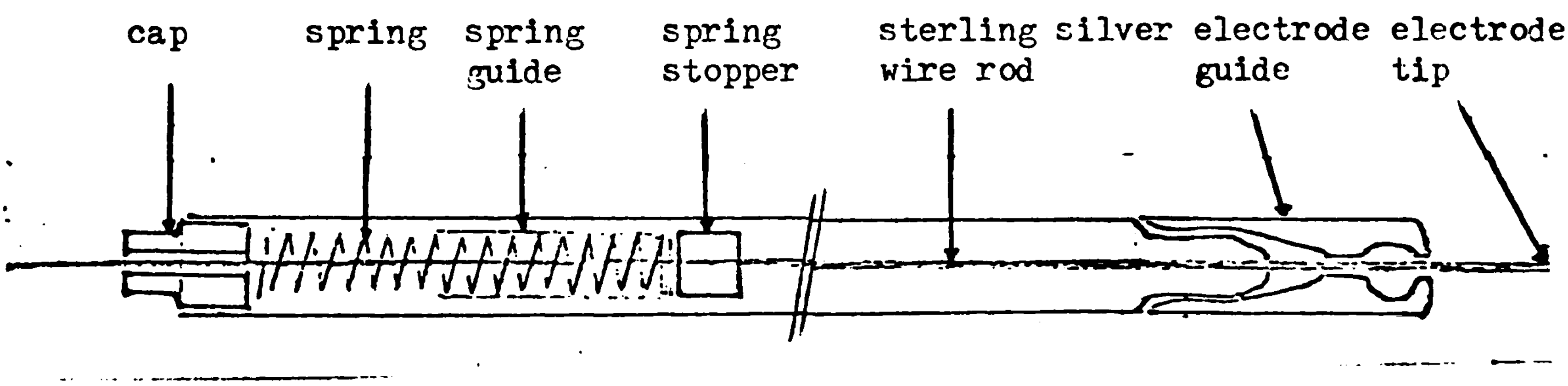


Figure 15. Cross sectional view of a searching electrode constructed from the chassis of a "Vu-Thru" highlighter pen manufactured by the Esterbrook Company, U.S.A.

<u>Experimental Set-up</u>

Figure sixteen represents a schematic of the laboratory set-up used for making impedance measurements. Figure seventeen shows the laboratory set-up in use.

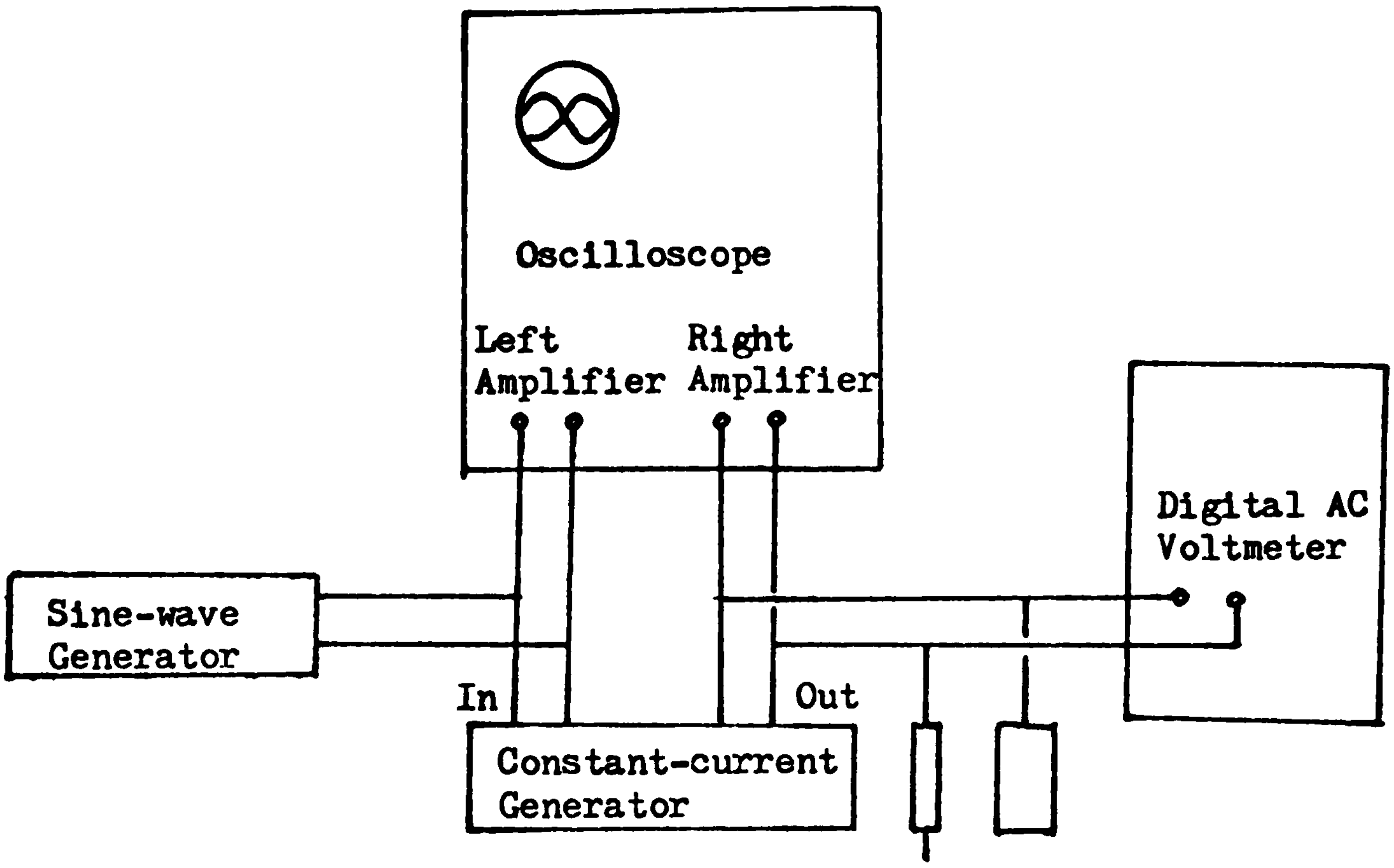


Figure 16. Schematic of the laboratory set-up.

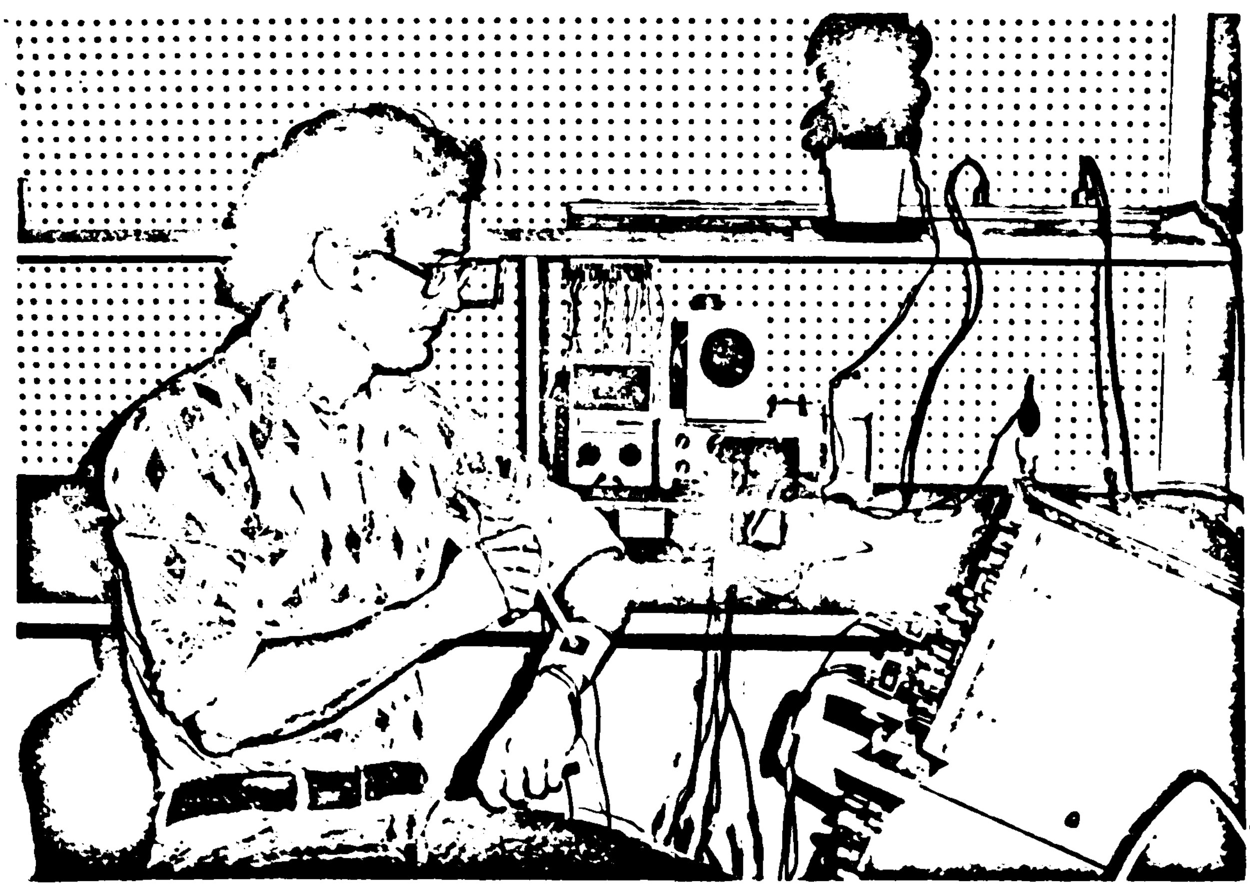


Figure 17. The laboratory set-up in use.

<u>Range of Impedance Measurements</u>

Before collecting any impedance data from the subjects, the instrumentation was calibrated by placing a series of known resistors ranging from fifteen kilohms to 4.7 megohms between the electrodes and measuring the voltage across each resistance. From Ohm's Law, the current was calculated over a range of impedance values to determine the variability of the constant current source. In general, for any impedance measurement greater than one megohm, the current applied to the body was to a certain extent a function of the impedance between the electrodes. As a result, the measured impedance between the electrodes was less than the actual impedance for impedances greater than one megohm.

One would expect the impedance measuring circuit to be inaccurate for impedance values much greater than one megohm since the input impedance of the oscilloscope and the voltmeter are each ten megohms. Together, the parallel combination of both the oscilloscope and the voltmeter input impedance is five megohms. For impedance values much greater than one megohm, then, the oscilloscope and voltmeter begin to load the circuit. Although the constant current generator may still be generating a constant current, a significant amount of the current will be flowing through the oscilloscope and the voltmeter. When all the current can no longer be assumed to be flowing between the electrodes, the impedance between the electrodes can no longer be calculated accurately by the bipolar method. The typical calibration curve of

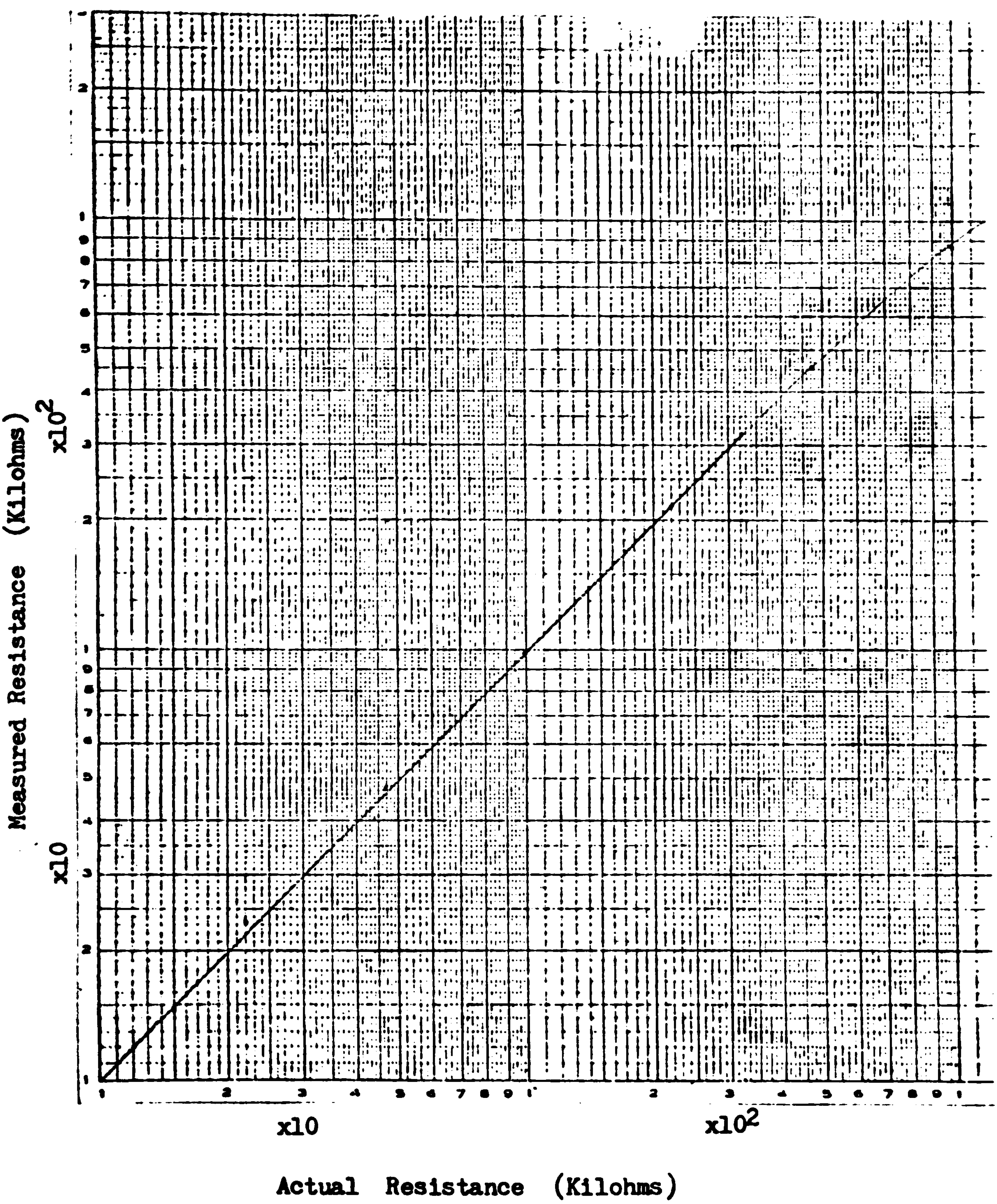


Figure 18. A typical calibration curve for the impedance measuring instrumentation.

figure eighteen illustrates the linear range over which the impedance can be relatively accurately calculated.

Phase Angle Measurements

The oscilloscope is set up to monitor the phase angle between the applied current and the voltage across the two electrodes. Figure nineteen depicts the method used to monitor phase angle. The phase angle is determined by measuring the time difference, t_d, between the zero crossings on the current and voltage waveform when both waveforms were triggered on the current waveform. The phase angle, ϕ, is calculated from equation six.

$$\phi = t_d/T * 360^\circ \qquad (6)$$

where T = period of the waveform

The current waveform and the voltage waveform is represented by the voltages across the resistors R_a and R_s, respectively, in figure twelve.

Controlled Variables

When taking impedance data, a number of variables must be controlled. For example, when placing an electrode on the skin, the force of the electrode on the skin can alter the stratum corneum of the skin to a certain degree. For this reason, skin impedance can be a function of the force applied by the electrode on the skin. The force of the electrode on the skin, then, is one variable that must be controlled.

The design of the electrode used in this study provides for the control of electrode force on the skin. As can be seen from figure fifteen, if all of the impedance measurements are taken at maximum deflection of the spring allowed by the electrode case, then the electrode force on the skin will be the same for all impedance measurements. The force applied to the skin in this study was approximately 0.1 kilograms per square millimeter.

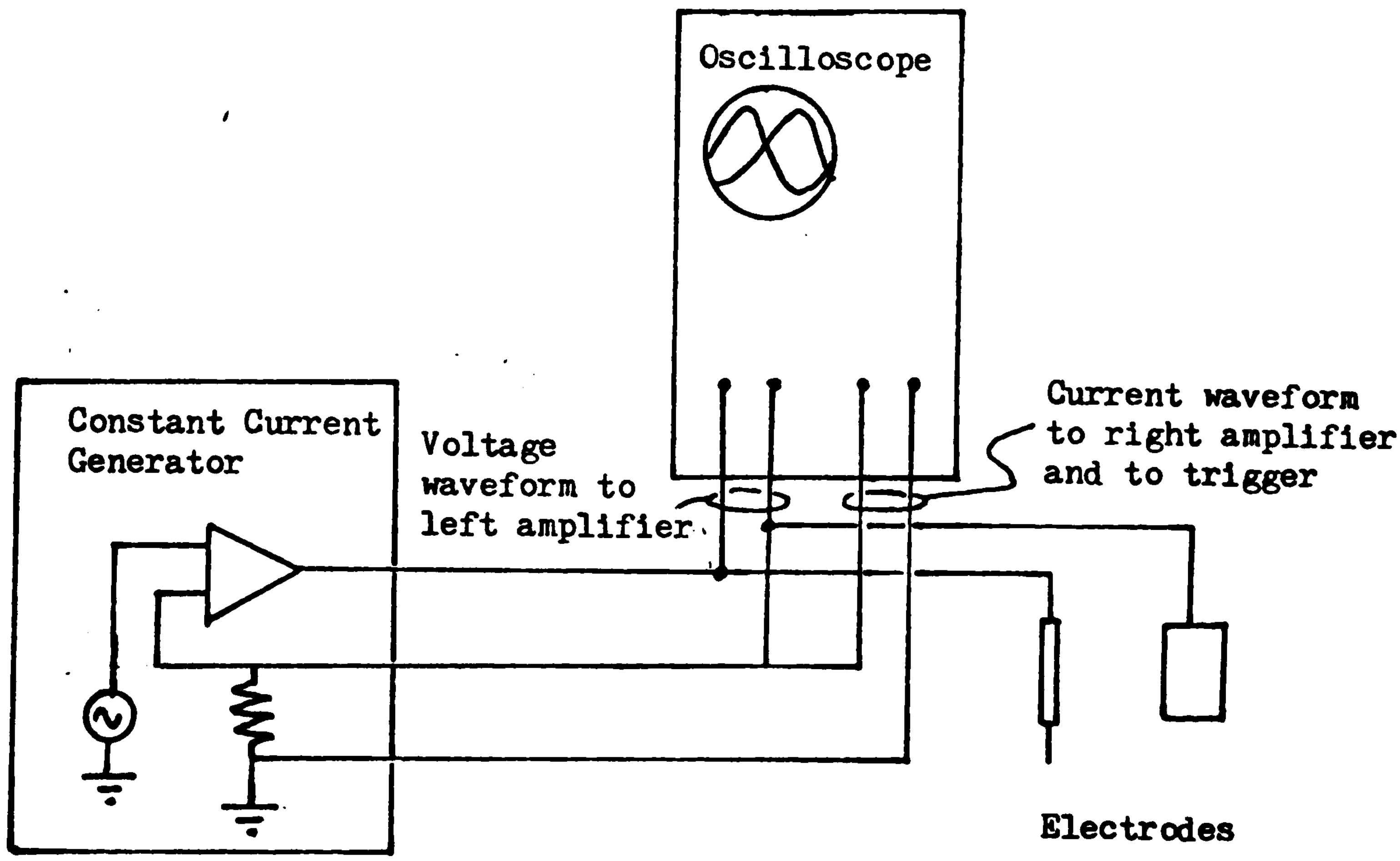


Figure 19. The set-up used for measuring the phase angle between the voltage waveform and the current waveform.

A second variable to be controlled when taking impedance measurements is the time in which the electrode is placed on the skin. As previously discussed, skin impedance is time dependent. In this study, the time the electrode was placed on the skin for each measurement varied between five seconds and ten seconds. The skin-electrode contact time for each set of data to be statistically analyzed was the same, however.

Because it was desirable to control those parameters that affect nerve cell stimulation, the frequency and amplitude of the current stimulation were also controlled variables. The fact that current frequency and amplitude affect nerve cell stimulation is illustrated in the current intensity versus duration curve of figure thirteen. The current amplitude is controlled by the constant current generator of figure twelve. The frequency used to make the impedance measurements was 1000 hertz.

To eliminate the effect that perspiration and skin residues might have on the measured impedance, the skin was cleaned thoroughly with alcohol and cotton swabs before impedance measurements were taken. Because the characteristics of the skin, and thus, the impedance, vary with the location on the body, each set of impedance data to be analyzed statistically was taken from a localized area on the skin of about four square centimeters.

Experimental Design

In order to determine if there are points on the skin that exhibit significantly lower skin impedance than the surrounding areas of skin, impedance data was initially collected in matrix form. A 5x5 grid was taped on an area of the skin which presumably included an acupuncture point. The acupuncture points were located by instructions from acupuncture point charts (Tan, et. al. 1973). Acupuncture points included in this study are Hoku, Chih-kou, Yang-chi, Hsi-men, Chien-shih, Nei-kuan, and Chung-chu. Figures twenty a and twenty b illustrate the locations of the acupuncture points on the body. The procedures used for locating the acupuncture points are shown in Appendix A.

The impedance data over each four square centimeter matrix constitutes an individual data set. Figure twenty-one demonstrates how the grid was marked on the skin. The impedance of the skin at each cell in the grid was measured in a random order. The random orders were determined by randomly drawing the cell numbers out of a box. Between three to five replications of the impedance data were taken in each grid with a different random order used for each replication of impedance data. Each individual data set was analyzed with an analysis of variance technique with the grid row and the grid column being the independent variables and the impedance measurements being the dependent variable. By taking three to five replications of the impedance data, the analysis of variance statistic will determine if there are cells, rows, or columns in a matrix that have a significantly lower or higher impedance than the impedance of the skin in the rest of the cells, rows, and columns in the grid. For sets of data with a significant row, column, or cell effect, the cell impedance means were plotted versus row and column to enable one to visualize how impedance changes over the given area of the skin. By plotting these graphs, one was able to tell whether there are points on the skin that do exhibit significantly lower skin impedances. Appendix B lists the computational formulas for the analysis of variance technique.

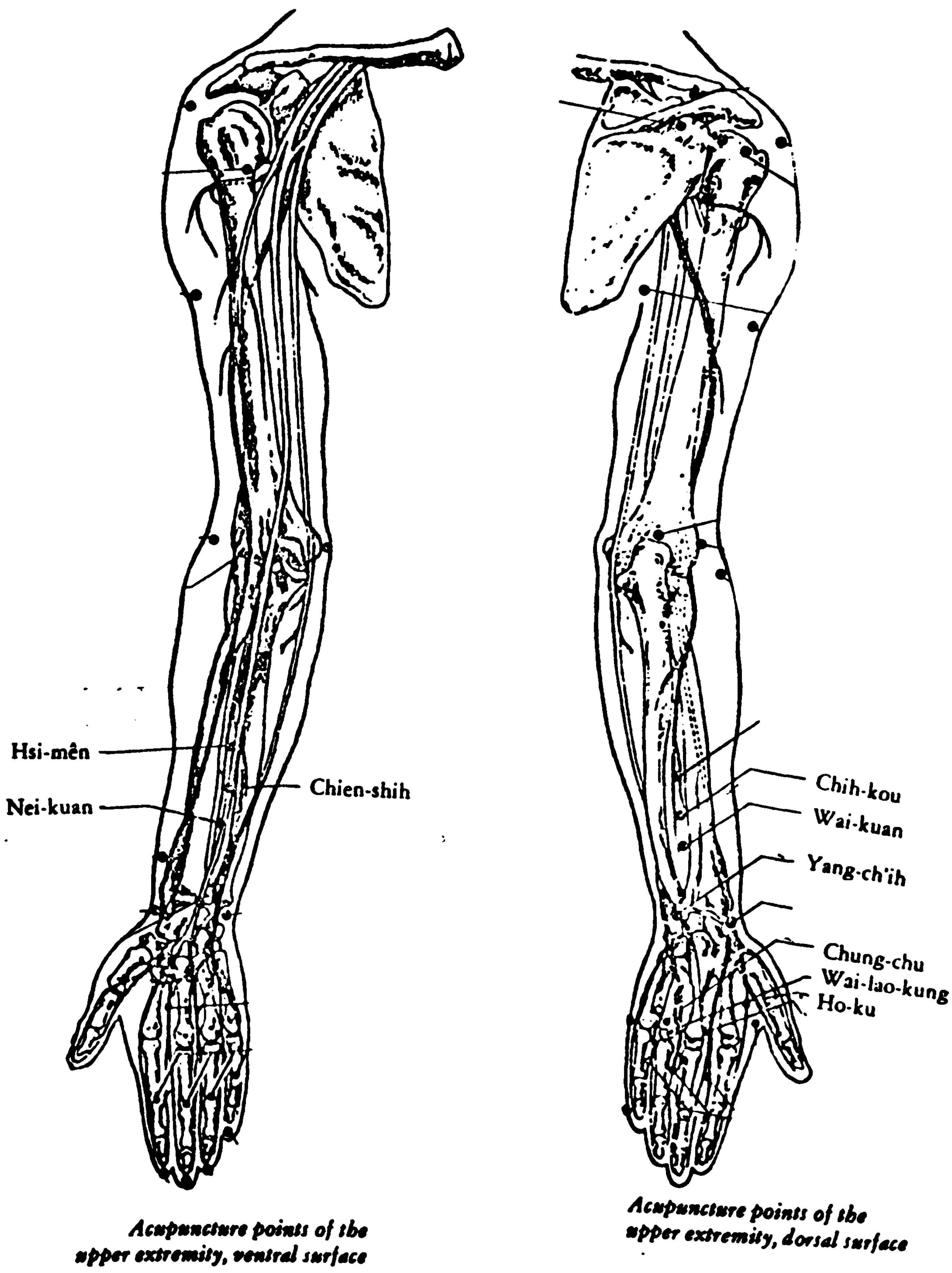


Figure 20. Acupuncture point locations (Tan, et. al. 1974).

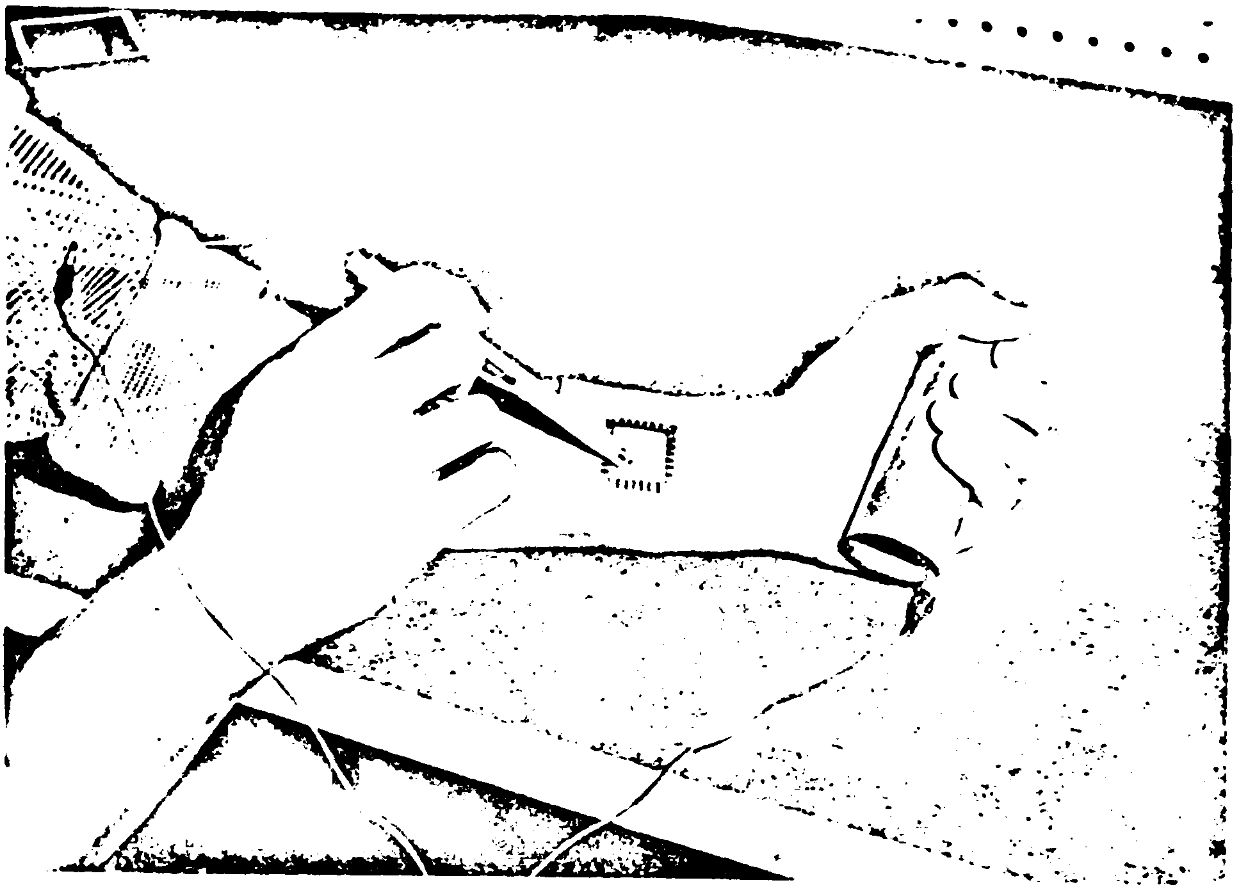


Figure 21. An illustration of the method used to mark the grid on the skin.

As previously mentioned, a large portion of the skin impedance is located at the stratum corneum of the epidermis. In addition to looking for low impedance points on the skin, this study investigates the ease with which the stratum corneum can be broken, and the effect that such a break in the stratum corneum has on skin impedance. To accomplish this, a sharp probe identical to the searching electrode was constructed. The difference in the sharp probe was that instead of grinding the end smooth, the silver wire was cut at a 45 degree angle and the point was left sharp. Impedance and phase angle data were collected randomly over an area of the skin on the forearm and hand on a number of different subjects with the original electrode. The sharp probe was then pressed on the skin at a force of 0.08 kilograms, and the skin impedance was remeasured with the electrode. The 0.08 kilogram force represented a two kilogram per square millimeter force on the skin. The effect that the sharp probe had on impedance could be determined by comparing the skin impedance before and after the pin was pressed against the skin. This comparison gave an indication as to the difficulty of breaking the stratum corneum with a searching electrode. In addition, the data demonstrated the effect that a break in the stratum corneum could have on skin impedance.

CHAPTER IV

RESULTS AND INTERPRETATIONS

Observations of the Skin Impedance Data

Skin Impedance and Time

The impedance data collected in this study verifies the time dependent nature of skin impedance as discussed in Chapter II. As an example, the oscilloscope picture of figure 22 illustrates a typical skin impedance versus time relationship. This picture displays the envelope of the upper half of the voltage waveform measured across the two electrodes placed on the skin. The voltage across the two electrodes is directly proportional to skin impedance, so the envelope also represents the skin impedance versus time relationship. As noted by the picture of figure 22, the initial time rate of change of skin impedance is high. In the particular measurement illustrated in figure 22, the initial time rate of change of skin impedance was approximately 235 kilohms per second. Two seconds after the electrode was placed on the skin, the time rate of change of skin impedance was 188 kilohms per second, or an 11% impedance decrease per second. Most of the impedance data collected in this study was taken after five seconds. At five seconds the impedance measurement of figure 22 was decreasing at a rate of 47 kilohms per second or 3.4% per second. Even after thirty seconds, impedance was changing at a rate of 7.4 kilohms per second.

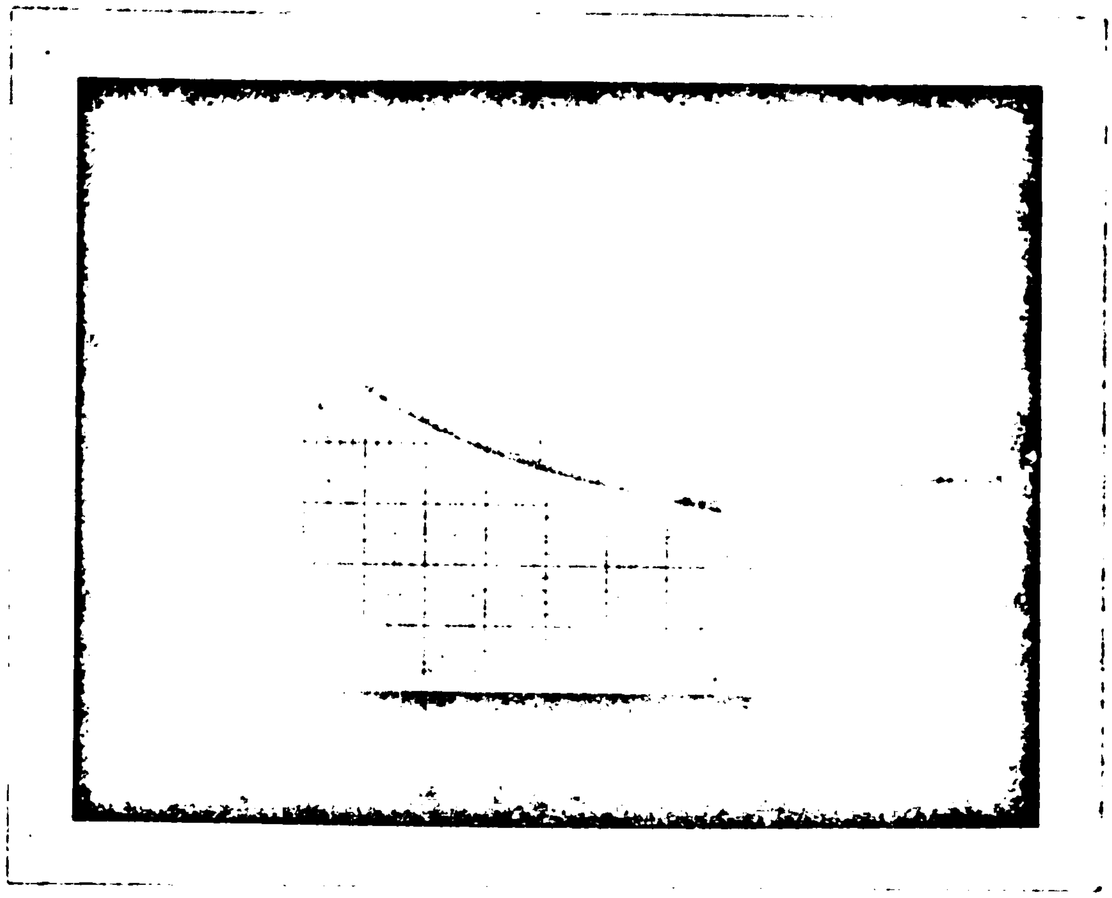


Figure 22. Oscilloscope picture illustrating the time rate of change of skin impedance.

As discussed in Chapter II, the temporal characteristics of skin impedance are attributed to the accumulation of perspiration under the electrode. This accumulation of perspiration reduces the reactance of the skin and electrode impedance in the impedance model. Hence, with the accumulation of perspiration under the electrode, skin impedance changes from being highly reactive to being primarily resistive in nature. The electrode impedance and the stratum corneum impedance represent the reactive components of skin impedance, and these are the components of skin impedance that are reduced as perspiration accumulates under the electrode. It follows, then, that if a number of skin impedance measurements were taken on intact stratum corneum with a searching electrode placed on the skin for precisely the same amount of time, any differences in impedance between the measurements could be attributed to differences in the rate of accumulation of perspiration under the electrode. Certainly any reduced impedance due to nerve cell accumulations in the dermis would be completely masked by the temporally changing stratum corneum and electrode impedance. Thus, the temporal nature of skin impedance discredits the theory that acupuncture points exhibit low skin impedance because of an accumulation of nerve cells in the skin.

Skin Impedance and the Stratum Corneum

The data collected in this study also verifies the fact that skin impedance is to a large degree dependent on the condition of the protein mat of the stratum corneum. For example, consider the oscilloscope picture of figure 23. Like figure 22, figure 23 represents the time relationship of skin impedance for a single impedance measurement. After fifteen seconds, a shear force strong enough to tear the protein mat of the stratum corneum was applied by the searching electrode. After one second the stratum corneum tore, and the shear force was removed. Note the dramatic change in impedance after the stratum corneum tore. In this particular measurement, skin impedance was reduced to 47 kilohms from 800 kilohms immediately after the stratum corneum tear. In other words, the skin impedance was reduced by 94% by the tear in the stratum corneum. This indicates that 94% of the impedance was due to the stratum corneum and 6% of the impedance was

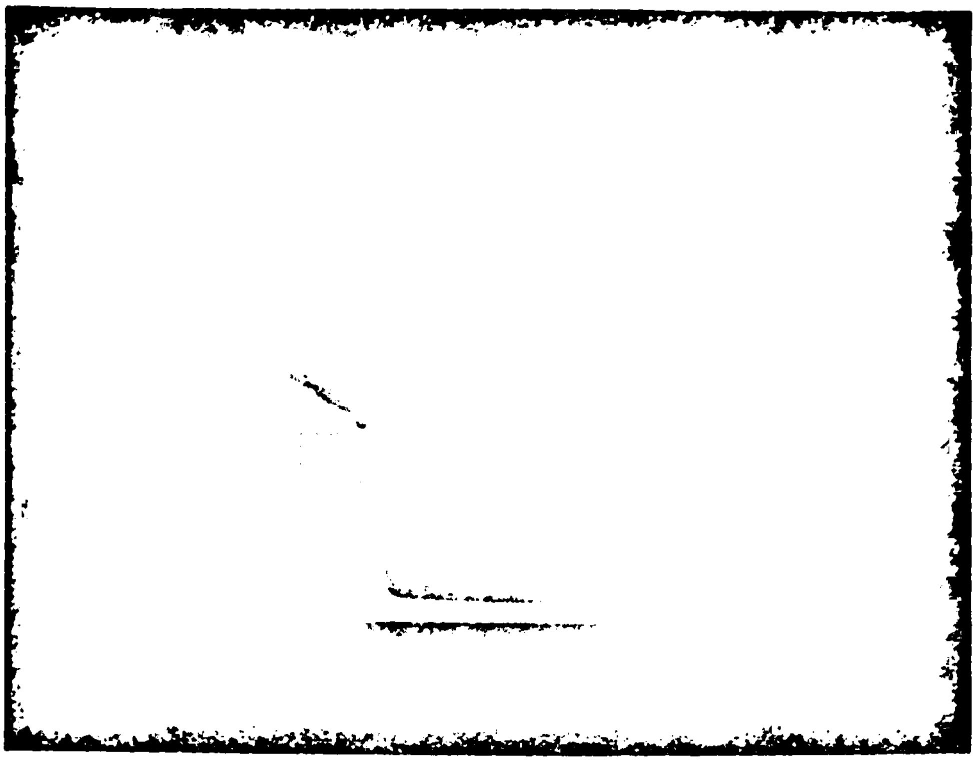


Figure 23. Skin impedance change with a stratum corneum break.

due to the other components consisting of the electrode impedance, the dermal impedance, and the subcutaneous tissue impedance. Therefore, the dermal impedance, the component of skin impedance that is allegedly the cause of the low skin impedance at the acupuncture point, was only a fraction of the remaining 6%. Because the total impedance of skin with an intact stratum corneum is so high in comparison with the dermal component of the skin impedance, and because skin impedance changes so rapidly with time, it is impossible to locate high concentrations of nerve cells under the skin by the impedance method. Obviously, another explanation must be sought to explain the reported relationship between skin impedance and the acupuncture point.

The Search for Low Impedance Points

While the characteristics of the skin impedance disprove the theory that a low skin impedance is due to a high concentration of nerve cells at a particular location on the skin, it does not disprove the theory that acupuncture points exhibit a low skin impedance. In order to investigate the relationship between skin impedance and the acupuncture point, data was collected in a manner that could be analyzed statistically. Thirty-two sets of data were collected from eight different subjects and over seven different acupuncture points. As discussed in Chapter III, the impedance data was collected in grid form as a 5x5 matrix about four square centimeters in area. Impedance data for the cells of each grid were taken in random order. Between three to five data replications were made over each area of the skin. Each data set was then analyzed using an analysis of variance technique. The analysis of variance of the impedance data was accomplished with the use of an analysis of variance Biomedical Computer Program (Dixon 1975). Each data set was taken over an acupuncture point located by instructions from the book Acupuncture Therapy (Tan, et. al. 1973). With the row and column numbers of the grid as the independent variables, the analysis of variance of each data set indicated whether there were any rows, columns, or cells in each grid that exhibited a significantly different impedance. For those cases where there were areas with a significantly different impedance, the impedance values were plotted versus the location in the grid. The results found in Table 3 of

Appendix C list the analysis of variance tables obtained from each data set analyzed.

The results obtained from this data were difficult to interpret. Of the thirty-two data sets, four had cells within their grids that exhibited a significantly different skin impedance than the remainder of the cells within the grid. In other words, 12.5% of the data sets exhibited a row and column interaction effect at the 5% significance level. Figures 24 through 27 represent the graphs of the mean cell impedance versus cell location of the four data sets that exhibited a row and column interaction effect. [These results support the theory that skin impedance is reduced at the acupuncture point.] Because the experimenter was not knowledgeable in the art of acupuncture, one might argue that he was successful in locating an acupuncture point from his charts only 12.5% of the time. The results of this part of the study do not disagree significantly with the results of similar studies that support the existance of electrically located acupuncture points. The interpretation of this skin impedance data, though, is entirely different from those who support the existance of electrically located acupuncture points. Of the four cells of the four data sets that exhibited a significantly lower skin impedance, none of the cells exhibited a significantly lower impedance on the first replications of the impedance data. This fact suggests that the skin may have been altered by the electrode in some way to cause a significantly lower skin impedance for subsequent measurements at a particular cell. Based on the previous discussion on skin anatomy and skin impedance, one

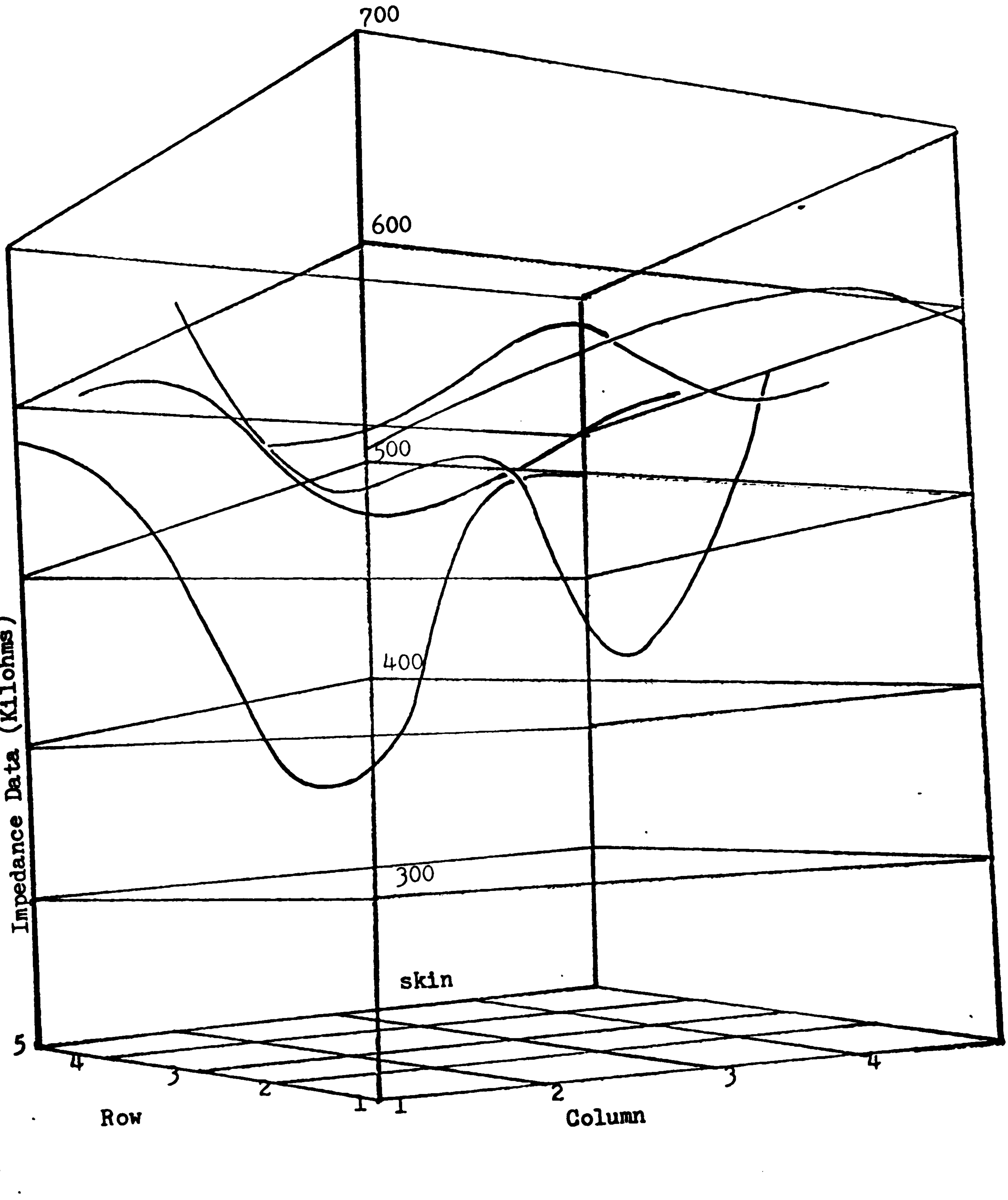


Figure 24. Cell means of impedance data versus cell location. This data set, which includes impedance data over the acupuncture point Nei-kuan, exhibits a significant row and column interaction effect at the 5% level (subject #2).

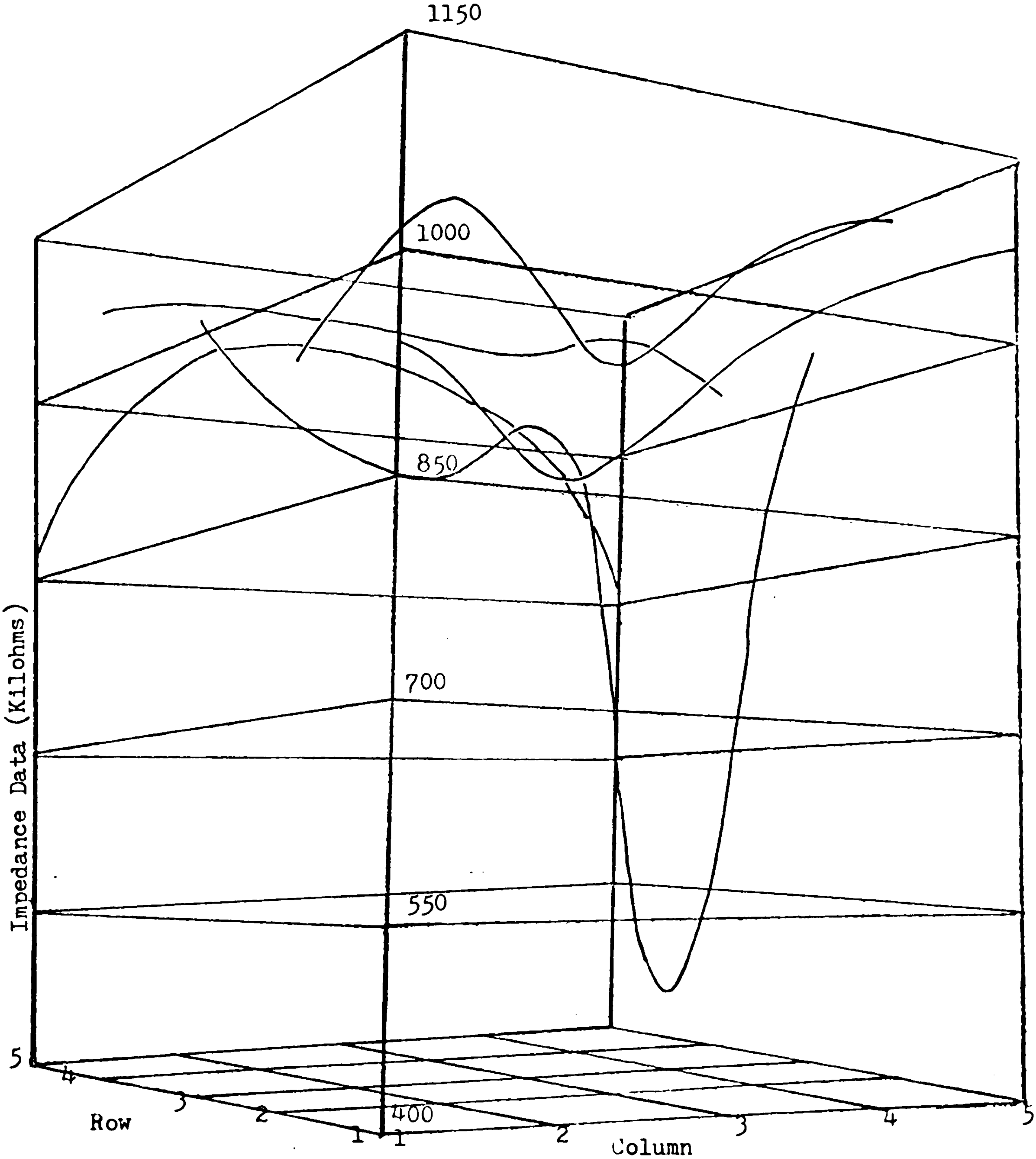


Figure 25. Cell means of impedance data versus cell location. This data set, which includes impedance data over the acupuncture point Chih-kou, exhibits a significant row and column interaction effect at the 5% level.

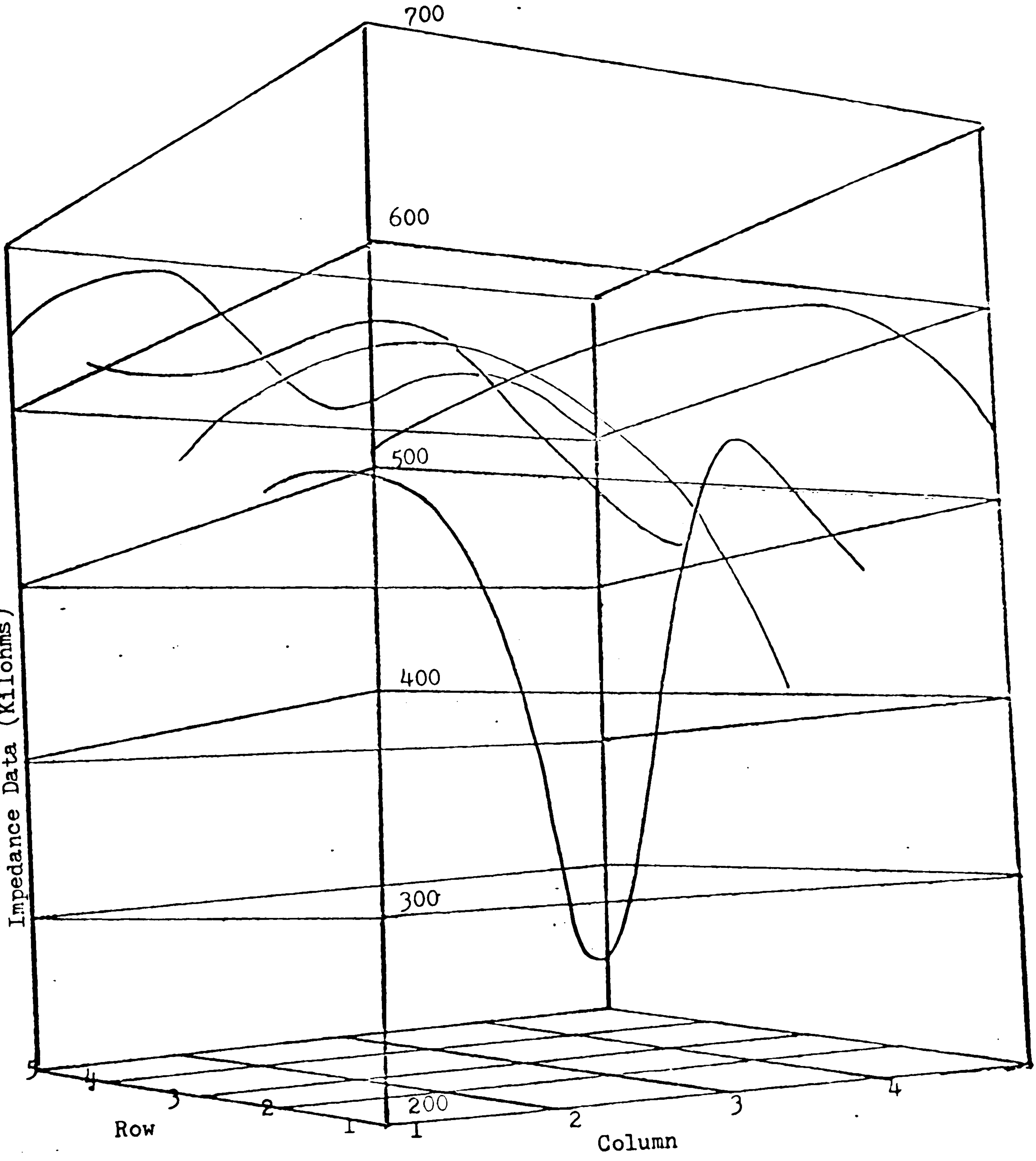


Figure 27. Cell means of impedance data versus cell location. This data set, which includes impedance data over the acupuncture point Nei-kuan, exhibits a significant row and column interaction effect at the 5% level (subject #8).

might suspect a tear in the stratum corneum by the electrode to be the cause of low impedance points of the four data sets. The theory that the low impedance points are the result of a tear in the stratum corneum is supported by the reported size of the acupuncture point. Because the acupuncture points are reportedly to the order of one to two millimeters in diameter, the searching electrodes used to locate the points are feasibly small enough to puncture the stratum corneum when applied at the forces required to measure skin impedance. The theory that low skin impedance points are due to breaks in the stratum corneum is also supported by the fact that laboratory animals reportedly do not exhibit electrically located acupuncture points (Matsumoto, Hayes 1973). Compared to the human stratum corneum, though, the domestic and laboratory animals have a much thinner and less well-developed stratum corneum (Montagna, Parakkal 1974). It seems probable, then, that the laboratory animals did not exhibit electrically located acupuncture points because breaks in the stratum corneum of their skin do not alter the animal's skin impedance significantly.

Although only four of the thirty-two data sets supported the existance of electrically located acupuncture points, sixteen data sets had rows or columns in their grids that exhibited significantly different impedance values at the 5% level from the other rows or columns in the same grid. Since the force of the electrode on the skin was carefully controlled and because the data for each grid was collected in a random order, the significance of the row and column effects might be difficult to interpret. Of the sixteen data sets that exhibited a row or column effect, two of the data sets obviously exhibited a row effect even before the statistical analysis. Both of these data sets were over the acupuncture point Nei-kuan. As indicated in Appendix A, Nei-kuan is located two body inches proximal to the most distal crease of the wrist, on the ventral surface of the forearm, and between the tendons of the flexor carpi radialis and palmaris longus (Tan, et. al. 1973). The grids were placed on the arm so that the rows were parallel to the tendons. Of the two data sets that obviously exhibited a row effect before the data was analyzed, the

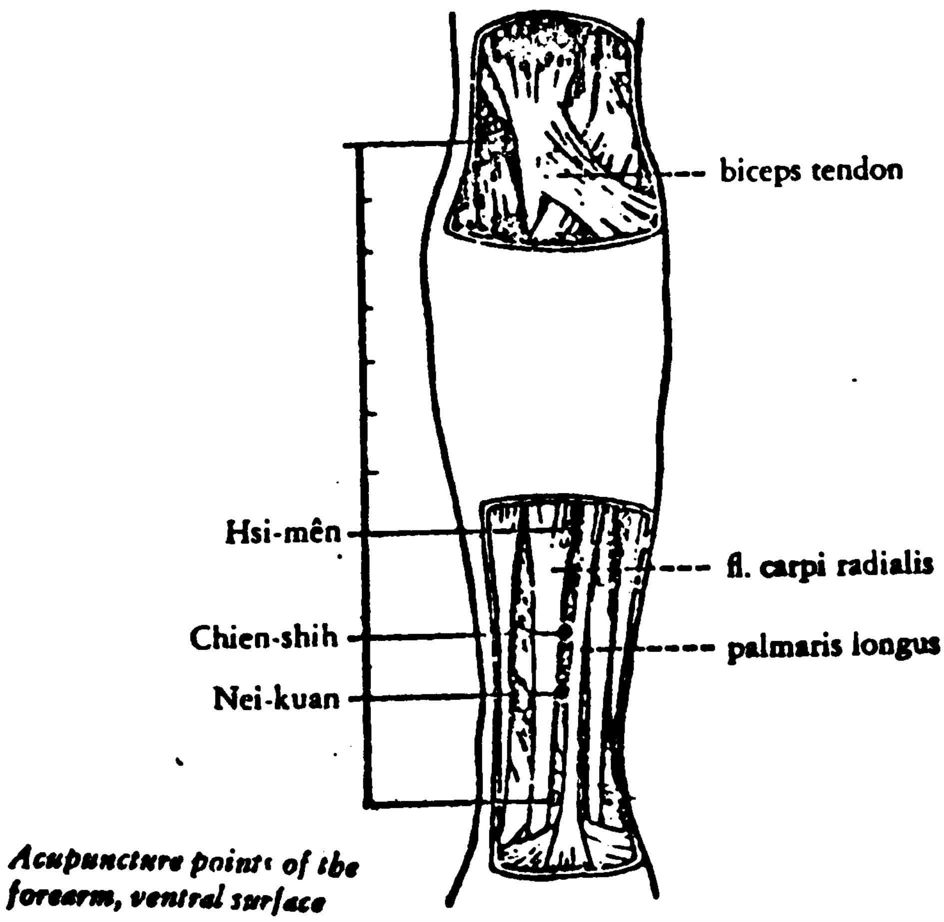


Figure 28. The location of Nei-kuan and Hsi-men (Tan, et. al. 1973).

rows with the reduced impedance were directly over the tendons of the flexor carpi radialis or the palmaris longus. The acupuncture point Hsi-men is also located between the two tendons carpi radialis and the palmaris longus. Of the sixteen data sets that exhibited a row or column effect, eleven of them were over the acupuncture points Nei-kuan and Hsi-men. The remainder of the data sets exhibiting a row or column effect included two sets over the acupuncture point Ho-ku, two sets over Yang-chi, and one set over Chih-kou.

The row and column effects obtained from the data are consistent with the theory that low skin impedance points represent points where the stratum corneum of the skin has been broken or altered in some way. At least two of the data sets exhibiting a row effect over Nei-kuan are known to be due to a reduced impedance of those cells in the grid that were directly over the superficially located tendons of the wrist. Because eleven of the sixteen data sets were over the points Hsi-men and Nei-kuan, one might surmise that the row or column effect exhibited by this data was due to the existence of tendons immediately under the skin. In the case of Ho-ku, Chih-kou, and Yang-chi, the row or column effect could be attributed to the existence of bones immediately under the skin. If this explanation of the row and column effects is correct, the data presented here further illustrates the degree to which skin impedance is a function of the interaction between the electrode and the skin. Those areas of the skin immediately over a tendon or a bone were compressed slightly more than those areas of the skin over soft tissue because the soft tissue cushioned the force of the electrode on the skin. Hence, the stratum corneum of the skin immediately over a tendon or a bone is more likely to be broken or compressed by the force of a searching electrode. Because the tendons and bones of concern in this study were parallel to the rows of the grid, a reduced impedance along a bone or tendon would show up in the analysis as a row effect. Therefore, the row effects and column effects obtained from the impedance data can also be interpreted in terms of the interaction of the electrode on the skin, and particularly on the stratum corneum of the skin.

The Effect of a Probe on the Skin

The data presented up till now discredits the theory that acupuncture points exhibit a low skin impedance due to high nerve cell concentrations and supports the theory that low skin impedance points are due to breaks in the stratum corneum of the skin. The purpose of the final experiment in this study is to demonstrate the ease with which the stratum corneum can be broken and to quantify the effect that such a break has on skin impedance. To do this the sharp probe described in Chapter III was used. The probe was set to apply a force of 80 grams at maximum deflection. This force represented a two kilogram per square centimeter force on the skin. The probe was not painful and could not penetrate the epidermis when applied to the skin at the maximum force of the electrode. The purpose of the sharp electrode was simply to attempt to penetrate the stratum corneum. Impedance measurements were taken at thirty randomly selected points on the forearms and hands of each of eight different individuals. After the initial impedance and phase angle measurements were taken, the probe was pressed against the skin. The probe was removed and the impedance was remeasured with the searching electrode. The impedance data summary is listed in Table 1. The impedance data summary is also graphically shown in figures 29a through 29d.

Obviously, from figure 29, one can see that the probe produced a marked change in skin impedance. By calculating the t values for impedance, resistance, reactance, and phase angle data from the equation

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\left[\left(\frac{1}{n_1} + \frac{1}{n_2}\right)\left(\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}\right)\right]^{\frac{1}{2}}}$$

Where $\bar{x}_1$ = average of the measurements before probing
$\bar{x}_2$ = average of the measurements after probing
n_1 = total number of measurements before probing
n_2 = total number of measurements after probing
s_1 = standard deviation of initial measurements
s_2 = standard deviation of the measurements after probing

one can show that the initial impedance, resistance, reactance, and phase angle is significantly different from those measurements made after applying the sharp probe. Using the data summary listed in Table 1, the t values for the impedance, resistance, reactance, and phase angle data computed to be 26.34, 11.23, 29.61, and 30.66, respectively. As indicated in t distribution tables, these t values show that the initial impedance, resistance, reactance, and phase angle measurements were significantly different from the measurements taken after probing the skin at the 0.001 significance level (Hayes 1973).

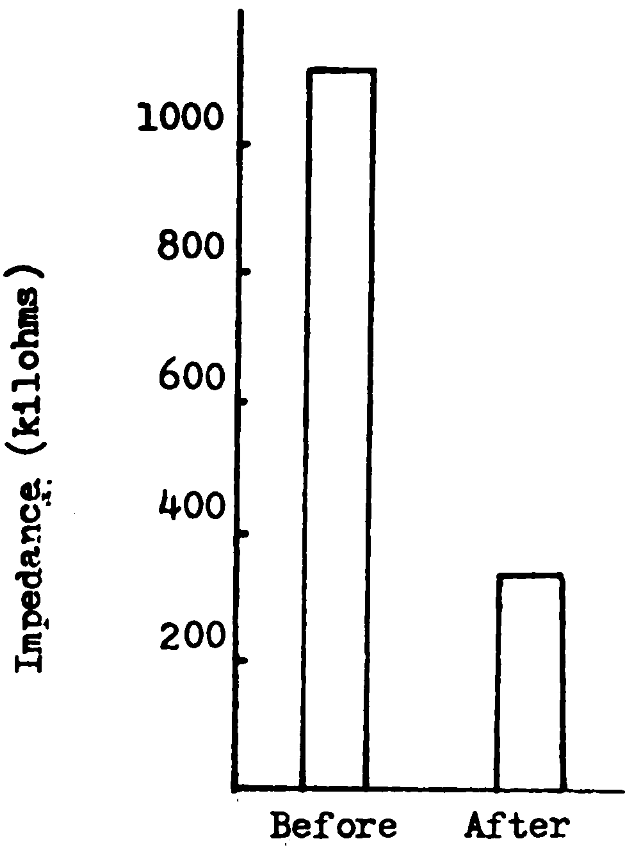
Thus, this data indicates that in many of the 180 trials, the probe succeeded in breaking the stratum corneum. Impedance was reduced by an average of 704 kilohms or by 63% by the probe. Since the acupuncture point reportedly exhibits an impedance in the order of 50% of the impedance of the surrounding skin, this data further supports the theory that low impedance points are due to breaks in the stratum corneum. Even if there was a good reason for acupuncture points to exhibit a low impedance, one would find it difficult to determine if the low impedance point was due to an acupuncture point or whether the low impedance was due to the condition of the stratum corneum. The data also confirms the previously mentioned fact that the stratum corneum impedance has a high reactive component. The average reactance was reduced by 75% or by 722 kilohms by probing the skin, whereas the average resistance was reduced by only 192 kilohms or by 39% by probing the skin. The average phase angle was reduced by 36 degrees or by 58%. The sharp probe was not successful in breaking the stratum corneum in many of the 180 trials, so the effect of a stratum corneum break has an even greater effect than what the data might indicate here.

In short, this data indicates that the stratum corneum of the skin could easily be broken by a searching electrode at the force used to measure skin impedance. The broken stratum corneum would reduce the skin impedance by the same order of magnitude that the acupuncture

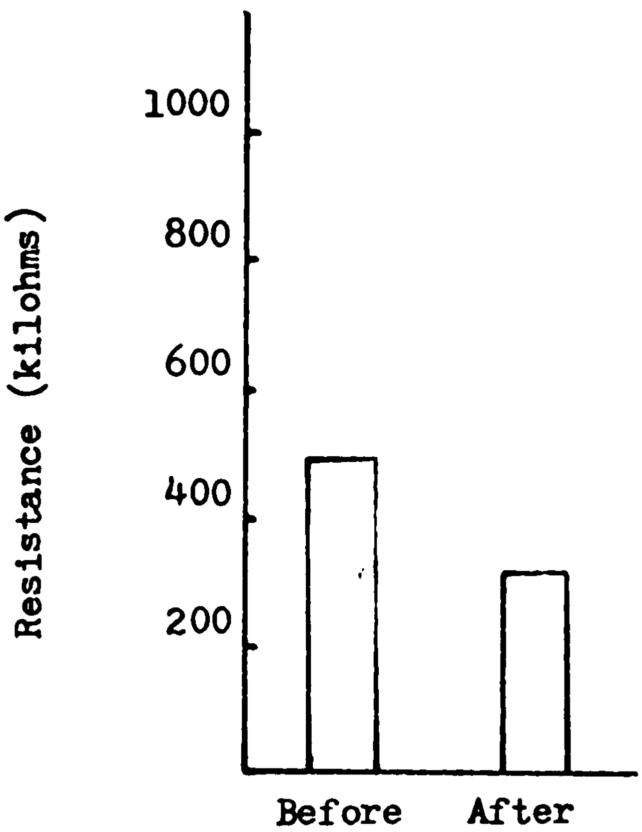
TABLE 1

SKIN IMPEDANCE DATA SUMMARY BEFORE AND AFTER CONTACT WITH THE PROBE

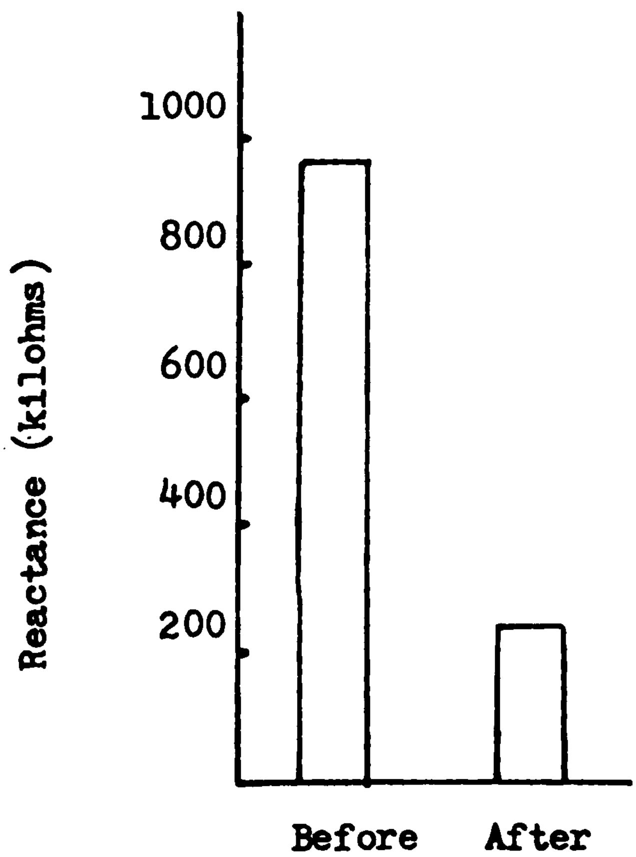
	Before Probe	After Probe	Difference
Impedance (kilohms)			
Mean	1111	407	704
Standard Deviation	330	385	394
Resistance (kilohms)			
Mean	497	306	192
Standard Deviation	218	238	242
Reactance (kilohms)			
Mean	968	245	723
Standard Deviation	334	321	391
Phase Angle (radians)			
Mean	1.069	0.446	0.621
Standard Deviation	0.237	0.304	0.362



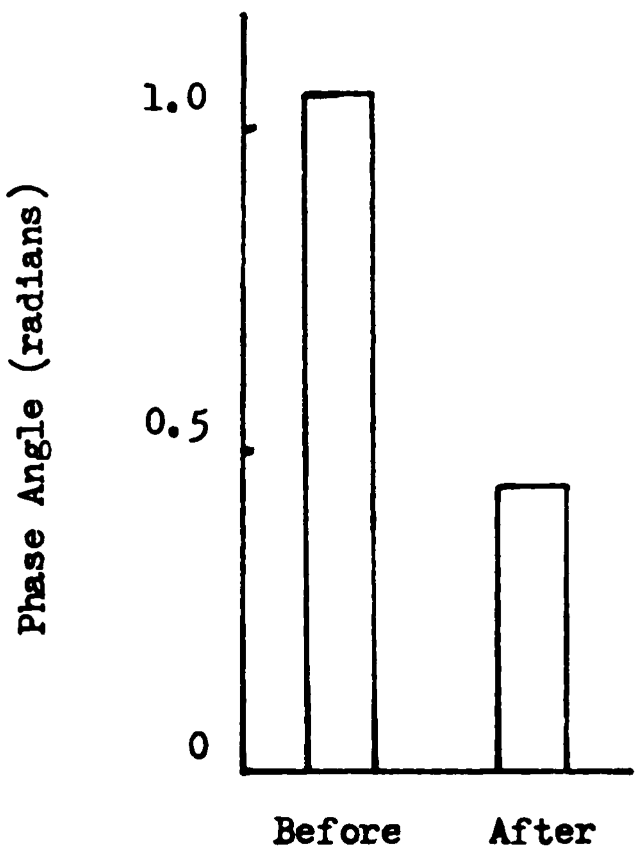
a. Impedance data



b. Resistance data



c. Reactance data



d. Phase angle data

Figure 29. The graphical representation of the impedance data taken before and after the contact with the sharp probe.

point reportedly reduces skin impedance. In addition, the area of the skin whose stratum corneum was broken by a searching electrode would be of the same dimensions as the acupuncture point. Therefore, the reported electrical characteristics of the acupuncture point are similar to the characteristics of a stratum corneum break.'

CHAPTER V

SUMMARY

The impedance data collected in this study verifies what is established in the literature. Specifically, the data verifies that the majority of the measured skin impedance resides in the stratum corneum of the epidermis, and that the skin impedance data changes initially at a high rate due to an accumulation of perspiration under the electrode. Because the impedance of the dermis, the location of the most peripheral nerve supply, is minute when compared to the sum of the impedance of the epidermis and the electrode-skin interface, the theory that acupuncture points exhibit a lower skin impedance due to an accumulation of superficial nerve cells in the skin appears faulty. Skin impedance is not significantly lowered by a high nerve cell concentration in the dermis because the dermis exhibits a very low impedance when compared to the impedance of the epidermis and the electrode. Even if accumulations of nerve cells in the dermis could affect skin impedance significantly, its effect on skin impedance would be completely masked by the temporally changing epidermal and electrode impedance. Another explanation must be sought to explain the lower skin impedance at the acupuncture point.

The fact that a lower skin impedance point can exist in the vicinity of the so-called acupuncture point was verified by the data in this study. Of the thirty-two impedance data sets collected over areas of the skin that supposedly contained acupuncture points, four data sets had points that exhibited statistically lower impedance than the surrounding skin. However, these low impedance points can be interpreted in terms of the condition of the stratum corneum. As shown in this study, the protein mat of the stratum corneum can easily be penetrated or torn, and such a tear dramatically lowers skin impedance. Because the searching electrode is of the order of one millimeter in diameter, the force per square millimeter can be large enough to penetrate or tear the stratum corneum layer of the epidermis.

The theory that low impedance points do not represent acupuncture points but the condition of the stratum corneum is further supported by the fact that laboratory animals reportedly do not exhibit low impedance points. Laboratory animals have a poorly developed stratum corneum, so any alteration of their stratum corneum would not change the skin impedance to the same degree as in humans. The fact that laboratory animals do not exhibit low impedance points and have a poorly developed stratum corneum appears to link the stratum corneum to the existence of low impedance points.

The theory that low impedance points on the skin simply reflect the condition of the stratum corneum is still further supported by the irreproducible and contradictory data appearing in the literature. If low impedance points are interpreted in terms of the impedance of the stratum corneum and not the acupuncture point, the contradictory data would be expected since the impedance data would depend on the impedance measuring technique and the condition of the stratum corneum of the individual from whom the impedance data was collected. Because as indicated in Chapter I, the data supporting the existence of electrically located acupuncture points is quite irreproducible and contradictory, and because the technique for measuring impedance varies considerably between studies, one could logically conclude that the data collected in these studies reflect the impedance of the stratum corneum and not the impedance of the acupuncture point.

Finally, the theory that electrically located acupuncture points do not exist is further supported by the research referred to in Chapter I that indicates that acupuncture points do not represent specific points at all, but that acupuncture points represent relatively large areas on the skin. If the acupuncture points do represent large areas on the skin, one would not expect areas on the skin with dimensions of the order of one millimeter in diameter to be the result of the anatomy of an acupuncture point. That the low impedance points can be a result of the condition of the stratum corneum of the epidermis is easy to demonstrate, and the demonstration is easy to repeat.

In short, the data presented and the literature reviewed in this study indicate that electrically located acupuncture points do not exist. Low impedance points previously reported in the literature can only be accounted for in terms of the impedance of the epidermis of the skin, particularly the stratum corneum layer.

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APPENDIX

A. The Procedure Used for Locating the Acupuncture Points

B. The Analysis of Variance Technique

C. The Control Cards for the BMD Analysis of Variance Computer Program

D. Statistical Results of the Low Impedance Point Search

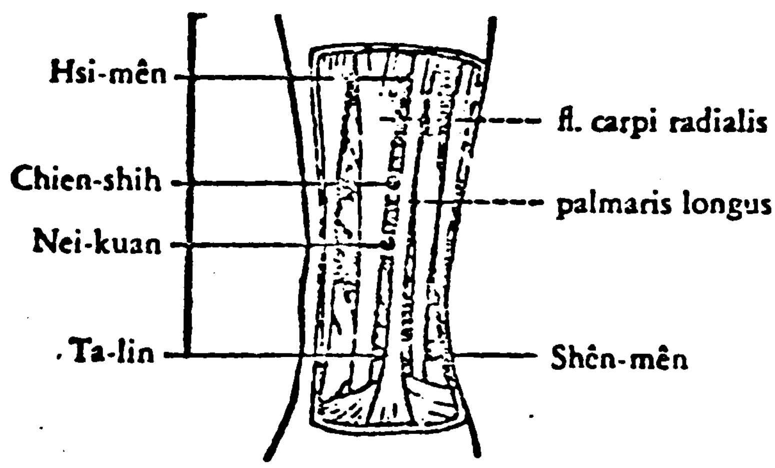
E. Data List for the Low Impedance Point Search

F. Impedance Data List Before and After Application of the Probe

APPENDIX A

The Procedure Used for Locating the Acupuncture Points

All acupuncture points were located with instructions from Acupuncture Therapy by L.T. Tan, et. al. (1973). Figure 30 through figure 32 were copied from the book to illustrate the technique used to locate the points.



Acupuncture points of the forearm, ventral surface

Hsi-mên, *ventral forearm*

Location. 5.0 inches proximal to the most distal crease of the wrist, on the ventral surface of the forearm and between the tendons of the flexor carpi radialis and palmaris longus.

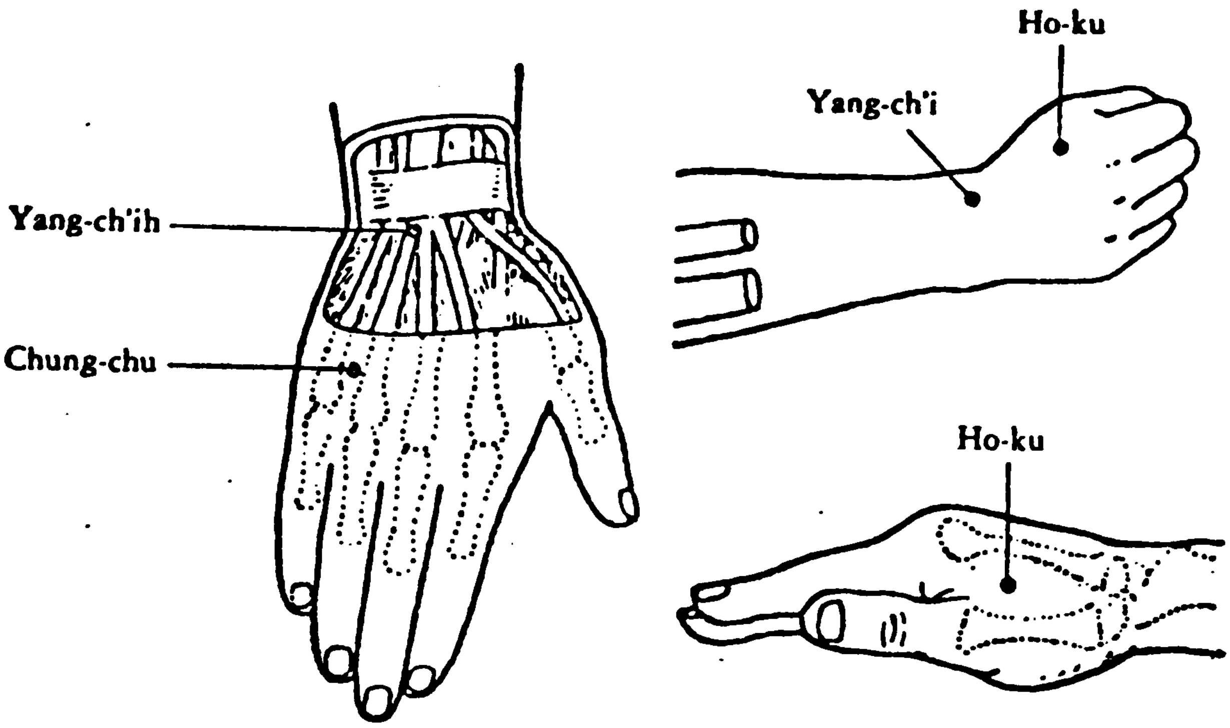
Chien-shih, *ventral forearm*

Location. 3.0 inches proximal to the most distal crease of the wrist, on the ventral surface of the forearm and between the tendons of the flexor carpi radialis and palmaris longus.

Nei-kuan, *ventral forearm*

Location. 2.0 inches proximal to the most distal crease of the wrist on the ventral surface of the forearm and between the tendons of the flexor carpi radialis and palmaris longus.

Figure 30. The location of the acupuncture points Hsi-men, Chien-shih, and Nei-kuan (Tan, et. al. 1973).



Chung-chu, *inter fourth and fifth metacarpals*

Location. On the dorsum of the hand, between the fourth and fifth metacarpals and 0.5 inches proximal to the corresponding metacarpo-phalangeal joints.

Yang-ch'ih, *dorsum of wrist*

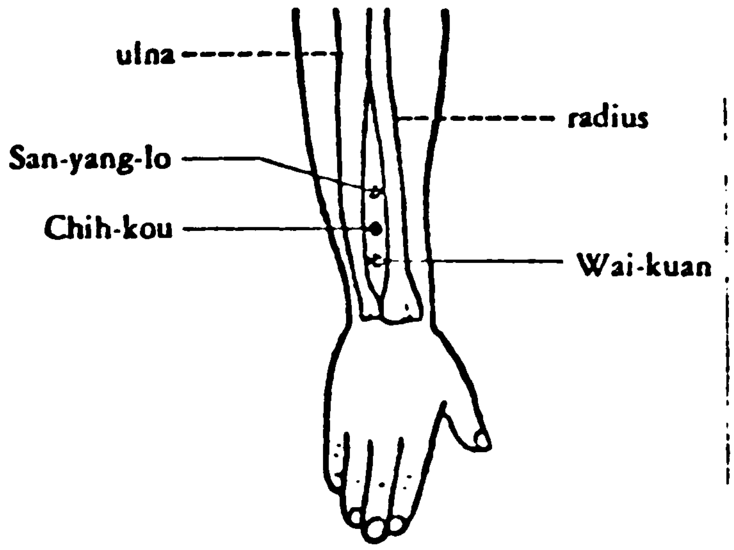
Location. On the dorsum of the wrist, in line with the confluence of the third and fourth metacarpals.

Ho-ku, *first dorsal interosseous*

Do not use this point in pregnant women.

Location. At the midpoint of a line drawn from the web of the thumb to the confluence of the first and second metacarpals or at the proximal point of the crease formed by approximating the thumb and index finger. It can also be identified by pressing the entire distal phalanx of the thumb against the web of the patient's thumb and locating the point at the tip of the thumb.

Figure 31. The location of the acupuncture points Chung-chu, Yang-ch'ih, and Ho-ku (Tan, et. al. 1973).



Chih-kou, *dorsum of mid-forearm*

Location. On the dorsum of the forearm 3.0 inches proximal to the distal tips of the ulna and radius and between these bones.

Figure 32. The location of the acupuncture point Chih-kou (Tan, et. al. 1973).

APPENDIX B

THE ANALYSIS OF VARIANCE TECHNIQUE

Table two lists the computational formulas employed in the analysis of variance technique.

TABLE 2

COMPUTATIONAL FORMULAS FOR THE ANALYSIS OF VARIANCE TECHNIQUE (Hays 1973)

Source	*SS*	*d.f.*	*MS*	*F*
Rows	$\frac{\sum_k \left(\sum_j \sum_i y_{ijk}\right)^2}{Cn} - \frac{\left(\sum_j \sum_k \sum_i y_{ijk}\right)^2}{N}$	$R-1$	$\frac{\text{SS rows}}{R-1}$	$\frac{\text{MS rows}}{\text{MS error}}$
Columns	$\frac{\sum_j \left(\sum_k \sum_i y_{ijk}\right)^2}{Rn} - \frac{\left(\sum_j \sum_k \sum_i y_{ijk}\right)^2}{N}$	$C-1$	$\frac{\text{SS col.}}{C-1}$	$\frac{\text{MS col.}}{\text{MS error}}$
Inter-action	$\frac{\sum_j \sum_k \left(\sum_i y_{ijk}\right)^2}{n} - \frac{\sum_k \left(\sum_j \sum_i y_{ijk}\right)^2}{Cn} - \frac{\sum_j \left(\sum_k \sum_i y_{ijk}\right)^2}{Rn} + \frac{\left(\sum_j \sum_k \sum_i y_{ijk}\right)^2}{N}$	$(R-1)(C-1)$	$\frac{\text{SS int.}}{(R-1)(C-1)}$	$\frac{\text{MS int.}}{\text{MS error}}$
Error (within cells)	$\sum_j \sum_k \sum_i y_{ijk}^2 - \frac{\sum_j \sum_k \left(\sum_i y_{ijk}\right)^2}{n}$	$RC(n-1)$	$\frac{\text{SS error}}{RC(n-1)}$	—
Totals	$\sum_j \sum_k \sum_i y_{ijk}^2 - \frac{\left(\sum_j \sum_k \sum_i y_{ijk}\right)^2}{N}$	$RCn-1$	—	—

For this study,

y = the impedance measurements

i = row number

j = column number

k = replication number

C = number of columns

R = number of rows

n = the number of replications

N = total number of measurements in a data set.

The F ratio calculated in this analysis provides a two tailed test of the null hypothesis in terms of the sampling distribution of F (Hays 1973). In other words, the F ratio allows one to test whether the impedance means for the rows, columns, or cells are equal.

APPENDIX C

THE CONTROL CARDS FOR THE BMD ANALYSIS OF VARIANCE COMPUTER PROGRAM P2V

```
PROGRAM CONTROL INFORMATION

        PROBLEM  TITLE IS 'SKIN IMPEDANCE DATA ANALYSIS WITH LOCATION,
                 FORCE OF THE ELECTRODE, AND CURRENT FREQUENCY AND MAGNITUDE
                 AS THE INDEPENDENT VARIABLES.'./
        INPUT    VARIABLES ARE 10.
                 CASES ARE 100.
                 FORMAT IS '(5X,F1.0,4X,F2.0,3X,F1.0,4X,F4.2,1X,F1.0,4X,
                 F2.0,3X,F1.0,4X,F1.0,2X,F1.0,2X,F5.2)'./
        VARIABLE NAMES ARE SUBJ,APT,PROB,CURR,FREQ,TIME,ROW,COL,REP,Z1./
        DESIGN   FORM IS '6D,2G,1D,Y'./
        END/
```

Figure 33. Control Cards for the Biomedical Computer Program P2V used in this study.

APPENDIX D

STATISTICAL RESULTS OF THE LOW IMPEDANCE POINT SEARCH

Table 3 contains a list of the analysis of variance results that were computed in the search for low impedance points. Each analysis represents an impedance data set taken over a four square centimeter area on the skin.

TABLE 3

ANALYSIS OF VARIANCE RESULTS OF THE LOW IMPEDANCE POINT SEARCH

Analysis Number 1			Acupuncture Point: Hoku		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	269.70	1	269.70	12,716.5	0.000
R	0.55	4	0.14	6.471	0.000 +
C	0.16	4	0.04	1.908	0.115
RC	0.47	16	0.03	1.388	0.163
Error	2.12	100	0.02		

Analysis Number 2			Acupuncture Point: Yang-ch'ih		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	240.899	1	240.899	12,531.941	0.000
R	0.111	4	0.028	1.446	0.224
C	0.074	4	0.018	0.960	0.433
RC	0.119	16	0.007	0.386	0.983
Error	1.922	100	0.019		

Analysis Number 3			Acupuncture Point: Hoku		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	131.287	1	131.287	4795.969	0.000
R	0.127	4	0.032	1.158	0.340
C	0.272	4	0.068	2.487	0.055
RC	0.264	16	0.017	0.603	0.866
Error	1.369	50	0.027		

Analysis Number 4			Acupuncture Point: Hoku		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	108.204	1	108.204	859.510	0.000
R	0.187	4	0.047	0.371	0.829
C	0.072	4	0.018	0.144	0.965
RC	0.696	16	0.043	0.346	0.991
Error	12.589	100	0.126		

Analysis Number 5			Acupuncture Point: Chien-shih		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	72.214	1	72.214	834.852	0.000
R	0.512	4	0.127	1.479	0.214
C	0.178	4	0.044	0.514	0.725
RC	0.223	16	0.014	0.161	1.000
Error	8.650	100	0.087		

Analysis Number 6			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	56.972	1	56.972	4909.12	0.000 +
R	0.136	4	0.034	2.933	0.024
C	0.008	4	0.002	0.187	0.945
RC	0.035	16	0.002	0.190	1.000
Error	1.160	100	0.011		

Analysis Number 7			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	76.789	1	76.789	1328.937	0.000 +
R	0.655	4	0.163	2.834	0.030
C	0.052	4	0.013	0.227	0.923
RC	0.304	16	0.019	0.328	0.992
Error	4.334	75	0.058		

Analysis Number 8			Acupuncture Point: Yang-ch'ih		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	134.320	1	134.320	5392.76	0.000
R	0.105	4	0.026	1.053	0.390
C	0.101	4	0.025	1.012	0.410
RC	0.368	16	0.023	0.924	0.548
Error	1.245	100	0.025		

Analysis Number 9			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	264.352	1	264.352	3508.933	0.000 +
R	0.719	4	0.180	2.385	0.059
C	0.804	4	0.201	2.670	0.039
RC	1.102	16	0.069	0.915	0.556
Error	5.650	75	0.075		

Analysis Number 10			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	270.073	1	270.073	6481.789	0.000 +
R	0.381	4	0.095	2.288	0.068
C	0.350	4	0.088	2.103	0.089
RC	1.874	16	0.117	2.812	0.001
Error	3.125	75	0.042		

Analysis Number 11			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	73.131	1	73.131	635.830	0.000+
R	0.254	4	0.063	0.552	0.699
C	0.136	4	0.034	0.295	0.880
RC	0.434	16	0 .027	0.236	0.999
Error	5.751	50	0.115		

Analysis Number 12 — Acupuncture Point: Hsi-men

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	72.206	1	72.206	1871.993	0.000 +
R	0.357	4	0.090	2.316	0.070
C	0.011	4	0.003	0.071	0.991
RC	0.511	16	0.032	0.829	0.648
Error	1.929	50	0.039		

Analysis Number 13 — Acupuncture Point: Hsi-men

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	3435.37	1	3435.373	4516.449	0.000 +
R	5.360	4	1.340	1.761	0.151
C	9.346	4	2.336	3.072	0.024
RC	11.884	16	0.743	0.977	0.495
Error	38.032	50	0.761		

Analysis Number 14 — Acupuncture Point: Yang-chi

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1670.754	1	1670.754	890.413	0.000 +
R	9.846	4	2.461	1.312	0.271
C	35.693	4	8.923	4.756	0.001
RC	38.728	16	2.420	1.290	0.219
Error	187.638	100	1.876		

Analysis Number 15			Acupuncture Point: Chih-kou		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	4689.059	1	4689.059	4465.055	0.000 +
R	17.631	4	4.408	4.197	0.003
C	3.644	4	0.911	0.868	0.486
RC	54.900	16	3.431	3.267	0.000 +
Error	105.017	100	1.050		

Analysis Number 16			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	115.698	1	115.698	549.889	0.000 +
R	0.444	4	0.111	0.528	0.715
C	5.704	4	1.426	6.777	0.000 +
RC	2.582	16	0.161	0.767	0.718
Error	21.040	100	0.210		

Analysis Number 17			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	210.806	1	210.806	925.298	0.000 +
R	2.694	4	0.673	2.956	0.024
C	1.729	4	0.432	1.898	0.117
RC	2.088	16	0.130	0.573	0.897
Error	22.783	100	0.228		

Analysis Number 18			Acupuncture Point: Chien-shih		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	2393.020	1	2393.020	1152.522	0.000 +
R	16.866	4	4.216	2.031	0.104
C	19.097	4	4.774	2.299	0.072
RC	64.465	16	4.029	1.940	0.038
Error	103.817	50	2.076		

Analysis Number 19			Acupuncture Point: Yang-ch'ih		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	2981.757	1	2981.757	875.513	0.000 +
R	20.455	4	5.114	1.502	0.216
C	37.085	4	9.271	2.722	0.040
RC	42.530	16	2.658	0.780	0.699
Error	170.286	50	3.406		

Analysis Number 20			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	3614.584	1	3614.584	2443.506	0.000 +
R	10.483	4	2.621	1.772	0.149
C	2.945	4	0.736	0.498	0.737
RC	31.731	16	1.983	1.341	0.211
Error	73.963	50	1.479		

Analysis Number 21			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1998.504	1	1998.504	1447.420	0.000 +
R	4.779	4	1.19471	0.865	0.489
C	11.813	4	2.953	2.139	0.084
RC	35.148	16	2.197	1.591	0.092
Error	103.555	75	1.381		

Analysis Number 22			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	3330.388	1	3330.388	8670.617	0.000 +
R	2.287	4	0.572	1.488	0.214
C	1.523	4	0.381	0.992	0.418
RC	5.248	16	0.328	0.854	0.622
Error	28.806	75	0.384		

Analysis Number 23			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1486.673	1	1486.673	2741.612	0.000 +
R	9.419	4	2.355	4.342	0.003
C	6.112	4	1.528	2.818	0.029
RC	13.162	16	0.823	1.517	0.108
Error	54.226	100	0.542		

Analysis Number 24			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	3186.128	1	3186.128	1910.224	0.000 +
R	4.619	4	1.155	0.692	0.599
C	8.192	4	2.048	1.228	0.304
RC	24.804	16	1.550	0.929	0.539
Error	166.794	100	1.668		

Analysis Number 25			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	2268.745	1	2268.745	1131.265	0.000 +
R	6.955	4	1.739	0.867	0.487
C	1.617	4	0.404	0.202	0.937
RC	27.328	16	1.708	0.852	0.625
Error	200.549	100	2.005		

Analysis Number 26			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	3964.847	1	3964.847	4484.200	0.000 +
R	13.678	4	3.420	3.867	0.006
C	3.666	4	0.917	1.037	0.392
RC	7.811	16	0.488	0.552	0.912
Error	88.418	100	0.884		

Analysis Number 27 Acupuncture Point: Nei-kuan

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1996.745	1	1996.745	4608.926	0.000 +
R	3.018	4	0.754	1.742	0.147
C	1.916	4	0.479	1.106	0.358
RC	8.460	16	0.529	1.220	0.266
Error	43.323	100	0.433		

Analysis Number 28 Acupuncture Point: Nei-kuan

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1984.135	1	1984.135	3691.331	0.000 +
R	25.810	4	6.452	12.004	0.000 +
C	4.418	4	1.105	2.055	0.092
RC	17.874	16	1.117	2.078	0.015
Error	53.751	100	0.538		

Analysis Number 29 Acupuncture Point: Hsi-men

Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1869.895	1	1868.895	6977.566	0.000 +
R	3.704	4	0.926	3.458	0.011
C	1.531	4	0.383	1.429	0.230
RC	3.464	16	0.217	0.808	0.673
Error	26.784	100	0.268		

Analysis Number 30			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	4917.152	1	4917.152	5942.969	0.000 +
R	2.481	4	0.620	0.750	0.561
C	0.986	4	0.247	0.298	0.879
RC	12.028	16	0.752	0.909	0.562
Error	82.739	100	0.827		

Analysis Number 31			Acupuncture Point: Hsi-men		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	1646.621	1	1646.621	764.671	0.000
R	84.490	4	21.123	9.809	0.000 +
C	44.599	4	11.150	5.178	0.001
RC	56.719	16	3.545	1.646	0.077
Error	161.503	75	2.153		

Analysis Number 32			Acupuncture Point: Nei-kuan		
Source	Sum of Squares	Degree of Freedom	Mean Square	F	Probability F Exceeded
Mean	749.604	1	749.604	486.188	0.000
R	9.518	4	2.380	1.543	0.198
C	8.619	4	2.155	1.398	0.243
RC	31.205	16	1.950	1.265	0.242
Error	115.635	75	1.542		

APPENDIX E

DATA LIST FOR THE LOW IMPEDANCE POINT SEARCH

Table 4 contains a list of the data collected in the low impedance point search. The variables listed in the heading are defined as follows:

SUB = subject number

= 1 = Brian Pohlmeyer

= 2 = David Baldridge

= 3 = Duncan McCarroll

= 4 = Steve Sypert

= 5 = Blair Rowley

= 6 = John Hanley

= 7 = Tom Tucker

= 8 = Fred Anderson

PT = acupuncture point over which the impedance data was taken

= 11 = Hoku, left side

= 12 = Hoku, right side

= 21 = Chih-kou, left side

= 22 = Chih-kou, right side

= 31 = Yang-ch'ih, left side

= 32 = Yang-ch'ih, right side

= 41 = Hsi-men, left side

= 42 = Hsi-men, right side

= 51 = Chien-shih, left side

= 52 = Chien-shih, right side

= 61 = Nei-kuan, left side

= 62 = Nei-kuan, right side

= 71 = Chung-chu, left side

= 72 = Chung-chu, right side

I = current in microampers generated by the constant current generator

F = the frequency used to measure impedance since frequency equals 10^F

REP = replication number

RO = row number

COL = column number

VOLT = voltage measurement (RMS)

P = probe number

The impedance is calculated from the voltage measurement and the applied current since impedance is equal to voltage divided by current.

TABLE 4

DATA LIST FOR THE LOW IMPEDANCE POINT SEARCH

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VCLT
1	32	1	3.0	3	5	1	1	1	1.20
1	32	1	3.0	3	5	1	1	2	1.43
1	32	1	3.0	3	5	1	1	3	1.59
1	32	1	3.0	3	5	1	1	4	1.51
1	32	1	3.0	3	5	1	1	5	1.22
1	32	1	3.0	3	5	1	2	1	1.25
1	32	1	3.0	3	5	1	2	2	1.40
1	32	1	3.0	3	5	1	2	3	1.38
1	32	1	3.0	3	5	1	2	4	1.46
1	32	1	3.0	3	5	1	2	5	1.12
1	32	1	3.0	3	5	1	3	1	1.25
1	32	1	3.0	3	5	1	3	2	1.50
1	32	1	3.0	3	5	1	3	3	1.56
1	32	1	3.0	3	5	1	3	4	1.50
1	32	1	3.0	3	5	1	3	5	1.32
1	32	1	3.0	3	5	1	4	1	1.25
1	32	1	3.0	3	5	1	4	2	1.35
1	32	1	3.0	3	5	1	4	3	1.45
1	32	1	3.0	3	5	1	4	4	1.47
1	32	1	3.0	3	5	1	4	5	1.17
1	32	1	3.0	3	5	1	5	1	1.15
1	32	1	3.0	3	5	1	5	2	1.42
1	32	1	3.0	3	5	1	5	3	1.46
1	32	1	3.0	3	5	1	5	4	1.32
1	32	1	3.0	3	5	1	5	5	1.14
1	32	1	3.0	3	5	2	1	1	1.20
1	32	1	3.0	3	5	2	1	2	1.43
1	32	1	3.0	3	5	2	1	3	1.50
1	32	1	3.0	3	5	2	1	4	1.51
1	32	1	3.0	3	5	2	1	5	1.26
1	32	1	3.0	3	5	2	2	1	1.30
1	32	1	3.0	3	5	2	2	2	1.59
1	32	1	3.0	3	5	2	2	3	1.45
1	32	1	3.0	3	5	2	2	4	1.53
1	32	1	3.0	3	5	2	2	5	1.25
1	32	1	3.0	3	5	2	3	1	1.30
1	32	1	3.0	3	5	2	3	2	1.59
1	32	1	3.0	3	5	2	3	3	1.57
1	32	1	3.0	3	5	2	3	4	1.40
1	32	1	3.0	3	5	2	3	5	1.36
1	32	1	3.0	3	5	2	4	1	1.40
1	32	1	3.0	3	5	2	4	2	1.38
1	32	1	3.0	3	5	2	4	3	1.30
1	32	1	3.0	3	5	2	4	4	1.43
1	32	1	3.0	3	5	2	4	5	1.14

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VOLT
1	32	1	3.0	3	5	2	5	1	1.20
1	32	1	3.0	3	5	2	5	2	1.48
1	32	1	3.0	3	5	2	5	3	1.50
1	32	1	3.0	3	5	2	5	4	1.34
1	32	1	3.0	3	5	2	5	5	1.25
1	32	1	3.0	3	5	3	1	1	1.20
1	32	1	3.0	3	5	3	1	2	1.48
1	32	1	3.0	3	5	3	1	3	1.50
1	32	1	3.0	3	5	3	1	4	1.34
1	32	1	3.0	3	5	3	1	5	1.25
1	32	1	3.0	3	5	3	2	1	1.35
1	32	1	3.0	3	5	3	2	2	1.41
1	32	1	3.0	3	5	3	2	3	1.16
1	32	1	3.0	3	5	3	2	4	1.41
1	32	1	3.0	3	5	3	2	5	1.12
1	32	1	3.0	3	5	3	3	1	1.20
1	32	1	3.0	3	5	3	3	2	1.54
1	32	1	3.0	3	5	3	3	3	1.59
1	32	1	3.0	3	5	3	3	4	1.52
1	32	1	3.0	3	5	3	3	5	1.34
1	32	1	3.0	3	5	3	4	1	1.35
1	32	1	3.0	3	5	3	4	2	1.35
1	32	1	3.0	3	5	3	4	3	1.24
1	32	1	3.0	3	5	3	4	4	1.43
1	32	1	3.0	3	5	3	4	5	1.19
1	32	1	3.0	3	5	3	5	1	1.30
1	32	1	3.0	3	5	3	5	2	1.42
1	32	1	3.0	3	5	3	5	3	1.52
1	32	1	3.0	3	5	3	5	4	1.47
1	32	1	3.0	3	5	3	5	5	1.23
1	32	1	3.0	3	5	4	1	1	1.24
1	32	1	3.0	3	5	4	1	2	1.45
1	32	1	3.0	3	5	4	1	3	1.60
1	32	1	3.0	3	5	4	1	4	1.50
1	32	1	3.0	3	5	4	1	5	1.29
1	32	1	3.0	3	5	4	2	1	1.15
1	32	1	3.0	3	5	4	2	2	1.55
1	32	1	3.0	3	5	4	2	3	1.40
1	32	1	3.0	3	5	4	2	4	1.60
1	32	1	3.0	3	5	4	2	5	1.37
1	32	1	3.0	3	5	4	3	1	1.45
1	32	1	3.0	3	5	4	3	2	1.51
1	32	1	3.0	3	5	4	3	3	1.30
1	32	1	3.0	3	5	4	3	4	1.58
1	32	1	3.0	3	5	4	3	5	1.19

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
1	32	1	3.0	3	5	4	4	1	1.30
1	32	1	3.0	3	5	4	4	2	1.55
1	32	1	3.0	3	5	4	4	3	1.57
1	32	1	3.0	3	5	4	4	4	1.47
1	32	1	3.0	3	5	4	4	5	1.34
1	32	1	3.0	3	5	4	5	1	1.25
1	32	1	3.0	3	5	4	5	2	1.55
1	32	1	3.0	3	5	4	5	3	1.50
1	32	1	3.0	3	5	4	5	4	1.40
1	32	1	3.0	3	5	4	5	5	1.30
1	32	1	3.0	3	5	5	1	1	1.25
1	32	1	3.0	3	5	5	1	2	1.57
1	32	1	3.0	3	5	5	1	3	1.58
1	32	1	3.0	3	5	5	1	4	1.50
1	32	1	3.0	3	5	5	1	5	1.43
1	32	1	3.0	3	5	5	2	1	1.25
1	32	1	3.0	3	5	5	2	2	1.48
1	32	1	3.0	3	5	5	2	3	1.50
1	32	1	3.0	3	5	5	2	4	1.57
1	32	1	3.0	3	5	5	2	5	1.30
1	32	1	3.0	3	5	5	3	1	1.25
1	32	1	3.0	3	5	5	3	2	1.55
1	32	1	3.0	3	5	5	3	3	1.61
1	32	1	3.0	3	5	5	3	4	1.53
1	32	1	3.0	3	5	5	3	5	1.23
1	32	1	3.0	3	5	5	4	1	1.30
1	32	1	3.0	3	5	5	4	2	1.53
1	32	1	3.0	3	5	5	4	3	1.47
1	32	1	3.0	3	5	5	4	4	1.34
1	32	1	3.0	3	5	5	4	5	1.29
1	32	1	3.0	3	5	5	5	1	1.35
1	32	1	3.0	3	5	5	5	2	1.42
1	32	1	3.0	3	5	5	5	3	1.47
1	32	1	3.0	3	5	5	5	4	1.55
1	32	1	3.0	3	5	5	5	5	1.36
2	11	2	3.0	3	10	1	1	1	1.32
2	11	2	3.0	3	10	1	1	2	1.35
2	11	2	3.0	3	10	1	1	3	1.30
2	11	2	3.0	3	10	1	2	1	1.25
2	11	2	3.0	3	10	1	2	2	1.70
2	11	2	3.0	3	10	1	2	3	1.45
2	11	2	3.0	3	10	1	3	1	1.35
2	11	2	3.0	3	10	1	3	2	1.22
2	11	2	3.0	3	10	1	3	3	1.30
2	11	2	3.0	3	10	1	4	1	1.28

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	11	2	3.0	3	10	1	4	2	1.32
2	11	2	3.0	3	10	1	4	3	1.42
2	11	2	3.0	3	10	1	5	1	0.95
2	11	2	3.0	3	10	1	5	2	1.05
2	11	2	3.0	3	10	1	5	3	1.35
2	11	2	3.0	3	10	2	1	1	1.28
2	11	2	3.0	3	10	2	1	2	1.40
2	11	2	3.0	3	10	2	1	3	1.40
2	11	2	3.0	3	10	2	2	1	1.45
2	11	2	3.0	3	10	2	2	2	1.52
2	11	2	3.0	3	10	2	2	3	1.35
2	11	2	3.0	3	10	2	3	1	1.20
2	11	2	3.0	3	10	2	3	2	1.65
2	11	2	3.0	3	10	2	3	3	1.42
2	11	2	3.0	3	10	2	4	1	1.30
2	11	2	3.0	3	10	2	4	2	1.70
2	11	2	3.0	3	10	2	4	3	1.50
2	11	2	3.0	3	10	2	5	1	1.10
2	11	2	3.0	3	10	2	5	2	1.32
2	11	2	3.0	3	10	2	5	3	1.32
2	11	2	3.0	3	10	3	1	1	1.25
2	11	2	3.0	3	10	3	1	2	1.48
2	11	2	3.0	3	10	3	1	3	1.50
2	11	2	3.0	3	10	3	2	1	1.33
2	11	2	3.0	3	10	3	2	2	1.42
2	11	2	3.0	3	10	3	2	3	1.35
2	11	2	3.0	3	10	3	3	1	1.20
2	11	2	3.0	3	10	3	3	2	1.22
2	11	2	3.0	3	10	3	3	3	1.35
2	11	2	3.0	3	10	3	4	1	1.30
2	11	2	3.0	3	10	3	4	2	1.52
2	11	2	3.0	3	10	3	4	3	1.50
2	11	2	3.0	3	10	3	5	1	1.24
2	11	2	3.0	3	10	3	5	2	1.15
2	11	2	3.0	3	10	3	5	3	1.32
2	11	2	3.0	3	10	4	1	1	0.95
2	11	2	3.0	3	10	4	1	2	1.28
2	11	2	3.0	3	10	4	1	3	1.45
2	11	2	3.0	3	10	4	2	1	1.10
2	11	2	3.0	3	10	4	2	2	1.25
2	11	2	3.0	3	10	4	2	3	1.65
2	11	2	3.0	3	10	4	3	1	1.20
2	11	2	3.0	3	10	4	3	2	1.25
2	11	2	3.0	3	10	4	3	3	1.30
2	11	2	3.0	3	10	4	4	1	1.35

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	11	2	3.0	3	10	4	4	2	1.45
2	11	2	3.0	3	10	4	4	3	1.35
2	11	2	3.0	3	10	4	5	1	1.20
2	11	2	3.0	3	10	4	5	2	1.20
2	11	2	3.0	3	10	4	5	3	1.40
2	11	2	3.0	3	10	5	1	1	0.90
2	11	2	3.0	3	10	5	1	2	1.12
2	11	2	3.0	3	10	5	1	3	1.45
2	11	2	3.0	3	10	5	2	1	1.25
2	11	2	3.0	3	10	5	2	2	1.10
2	11	2	3.0	3	10	5	2	3	1.72
2	11	2	3.0	3	10	5	3	1	1.20
2	11	2	3.0	3	10	5	3	2	1.05
2	11	2	3.0	3	10	5	3	3	1.45
2	11	2	3.0	3	10	5	4	1	1.30
2	11	2	3.0	3	10	5	4	2	1.20
2	11	2	3.0	3	10	5	4	3	1.42
2	11	2	3.0	3	10	5	5	1	1.22
2	11	2	3.0	3	10	5	5	2	1.40
2	11	2	3.0	3	10	5	5	3	1.42
3	11	1	3.0	3	10	1	1	1	1.35
3	11	1	3.0	3	10	1	1	2	1.28
3	11	1	3.0	3	10	1	1	3	1.12
3	11	1	3.0	3	10	1	1	4	1.00
3	11	1	3.0	3	10	1	1	5	0.44
3	11	1	3.0	3	10	1	2	1	1.25
3	11	1	3.0	3	10	1	2	2	1.32
3	11	1	3.0	3	10	1	2	3	1.10
3	11	1	3.0	3	10	1	2	4	0.82
3	11	1	3.0	3	10	1	2	5	0.40
3	11	1	3.0	3	10	1	3	1	1.23
3	11	1	3.0	3	10	1	3	2	1.18
3	11	1	3.0	3	10	1	3	3	1.08
3	11	1	3.0	3	10	1	3	4	0.78
3	11	1	3.0	3	10	1	3	5	0.56
3	11	1	3.0	3	10	1	4	1	1.35
3	11	1	3.0	3	10	1	4	2	1.15
3	11	1	3.0	3	10	1	4	3	0.90
3	11	1	3.0	3	10	1	4	4	0.78
3	11	1	3.0	3	10	1	4	5	0.56
3	11	1	3.0	3	10	1	5	1	1.20
3	11	1	3.0	3	10	1	5	2	1.18
3	11	1	3.0	3	10	1	5	3	0.92
3	11	1	3.0	3	10	1	5	4	0.65
3	11	1	3.0	3	10	1	5	5	0.61

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VOLT
3	11	1	3.0	3	10	2	1	1	1.25
3	11	1	3.0	3	10	2	1	2	1.38
3	11	1	3.0	3	10	2	1	3	1.10
3	11	1	3.0	3	10	2	1	4	0.78
3	11	1	3.0	3	10	2	1	5	0.50
3	11	1	3.0	3	10	2	2	1	1.15
3	11	1	3.0	3	10	2	2	2	1.12
3	11	1	3.0	3	10	2	2	3	0.75
3	11	1	3.0	3	10	2	2	4	0.58
3	11	1	3.0	3	10	2	2	5	0.34
3	11	1	3.0	3	10	2	3	1	1.10
3	11	1	3.0	3	10	2	3	2	1.28
3	11	1	3.0	3	10	2	3	3	1.10
3	11	1	3.0	3	10	2	3	4	0.90
3	11	1	3.0	3	10	2	3	5	0.60
3	11	1	3.0	3	10	2	4	1	1.22
3	11	1	3.0	3	10	2	4	2	1.20
3	11	1	3.0	3	10	2	4	3	0.92
3	11	1	3.0	3	10	2	4	4	0.60
3	11	1	3.0	3	10	2	4	5	0.47
3	11	1	3.0	3	10	2	5	1	1.10
3	11	1	3.0	3	10	2	5	2	1.28
3	11	1	3.0	3	10	2	5	3	0.85
3	11	1	3.0	3	10	2	5	4	0.95
3	11	1	3.0	3	10	2	5	5	0.60
3	11	1	3.0	3	10	3	1	1	1.32
3	11	1	3.0	3	10	3	1	2	1.10
3	11	1	3.0	3	10	3	1	3	0.90
3	11	1	3.0	3	10	3	1	4	0.73
3	11	1	3.0	3	10	3	1	5	0.55
3	11	1	3.0	3	10	3	2	1	1.15
3	11	1	3.0	3	10	3	2	2	1.28
3	11	1	3.0	3	10	3	2	3	0.85
3	11	1	3.0	3	10	3	2	4	0.65
3	11	1	3.0	3	10	3	2	5	0.53
3	11	1	3.0	3	10	3	3	1	1.20
3	11	1	3.0	3	10	3	3	2	1.95
3	11	1	3.0	3	10	3	3	3	1.02
3	11	1	3.0	3	10	3	3	4	0.80
3	11	1	3.0	3	10	3	3	5	0.53
3	11	1	3.0	3	10	3	4	1	1.32
3	11	1	3.0	3	10	3	4	2	1.12
3	11	1	3.0	3	10	3	4	3	0.78
3	11	1	3.0	3	10	3	4	4	0.53
3	11	1	3.0	3	10	3	4	5	0.45

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VOLT
3	11	1	3.0	3	10	3	5	1	1.25
3	11	1	3.0	3	10	3	5	2	1.98
3	11	1	3.0	3	10	3	5	3	1.02
3	11	1	3.0	3	10	3	5	4	0.90
3	11	1	3.0	3	10	3	5	5	0.58
3	11	1	3.0	3	10	4	1	1	0.75
3	11	1	3.0	3	10	4	1	2	1.32
3	11	1	3.0	3	10	4	1	3	0.78
3	11	1	3.0	3	10	4	1	4	0.68
3	11	1	3.0	3	10	4	1	5	0.46
3	11	1	3.0	3	10	4	2	1	1.08
3	11	1	3.0	3	10	4	2	2	1.98
3	11	1	3.0	3	10	4	2	3	0.82
3	11	1	3.0	3	10	4	2	4	0.70
3	11	1	3.0	3	10	4	2	5	0.43
3	11	1	3.0	3	10	4	3	1	1.20
3	11	1	3.0	3	10	4	3	2	1.28
3	11	1	3.0	3	10	4	3	3	0.72
3	11	1	3.0	3	10	4	3	4	0.58
3	11	1	3.0	3	10	4	3	5	0.45
3	11	1	3.0	3	10	4	4	1	1.30
3	11	1	3.0	3	10	4	4	2	1.10
3	11	1	3.0	3	10	4	4	3	1.02
3	11	1	3.0	3	10	4	4	4	0.72
3	11	1	3.0	3	10	4	4	5	0.58
3	11	1	3.0	3	10	4	5	1	1.22
3	11	1	3.0	3	10	4	5	2	1.12
3	11	1	3.0	3	10	4	5	3	1.00
3	11	1	3.0	3	10	4	5	4	0.72
3	11	1	3.0	3	10	4	5	5	0.51
3	11	1	3.0	3	10	5	1	1	0.95
3	11	1	3.0	3	10	5	1	2	1.08
3	11	1	3.0	3	10	5	1	3	0.80
3	11	1	3.0	3	10	5	1	4	0.80
3	11	1	3.0	3	10	5	1	5	0.53
3	11	1	3.0	3	10	5	2	1	1.32
3	11	1	3.0	3	10	5	2	2	1.28
3	11	1	3.0	3	10	5	2	3	1.05
3	11	1	3.0	3	10	5	2	4	0.60
3	11	1	3.0	3	10	5	2	5	0.58
3	11	1	3.0	3	10	5	3	1	1.15
3	11	1	3.0	3	10	5	3	2	1.20
3	11	1	3.0	3	10	5	3	3	0.95
3	11	1	3.0	3	10	5	3	4	0.65
3	11	1	3.0	3	10	5	3	5	0.59

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	11	1	3.0	3	10	5	4	1	1.05
3	11	1	3.0	3	10	5	4	2	1.20
3	11	1	3.0	3	10	5	4	3	0.90
3	11	1	3.0	3	10	5	4	4	0.60
3	11	1	3.0	3	10	5	4	5	0.56
3	11	1	3.0	3	10	5	5	1	1.20
3	11	1	3.0	3	10	5	5	2	1.12
3	11	1	3.0	3	10	5	5	3	0.90
3	11	1	3.0	3	10	5	5	4	0.50
3	11	1	3.0	3	10	5	5	5	0.40
3	51	1	3.0	3	5	1	1	1	1.15
3	51	1	3.0	3	5	1	1	2	0.65
3	51	1	3.0	3	5	1	1	3	0.70
3	51	1	3.0	3	5	1	1	4	0.49
3	51	1	3.0	3	5	1	1	5	0.39
3	51	1	3.0	3	5	1	2	1	0.90
3	51	1	3.0	3	5	1	2	2	0.50
3	51	1	3.0	3	5	1	2	3	0.88
3	51	1	3.0	3	5	1	2	4	0.40
3	51	1	3.0	3	5	1	2	5	0.32
3	51	1	3.0	3	5	1	3	1	1.22
3	51	1	3.0	3	5	1	3	2	1.00
3	51	1	3.0	3	5	1	3	3	0.82
3	51	1	3.0	3	5	1	3	4	0.39
3	51	1	3.0	3	5	1	3	5	0.40
3	51	1	3.0	3	5	1	4	1	1.15
3	51	1	3.0	3	5	1	4	2	0.85
3	51	1	3.0	3	5	1	4	3	0.65
3	51	1	3.0	3	5	1	4	4	0.33
3	51	1	3.0	3	5	1	4	5	0.41
3	51	1	3.0	3	5	1	5	1	1.05
3	51	1	3.0	3	5	1	5	2	0.78
3	51	1	3.0	3	5	1	5	3	0.78
3	51	1	3.0	3	5	1	5	4	0.40
3	51	1	3.0	3	5	1	5	5	0.45
3	51	1	3.0	3	5	2	1	1	1.00
3	51	1	3.0	3	5	2	1	2	0.70
3	51	1	3.0	3	5	2	1	3	0.70
3	51	1	3.0	3	5	2	1	4	0.32
3	51	1	3.0	3	5	2	1	5	0.43
3	51	1	3.0	3	5	2	2	1	1.20
3	51	1	3.0	3	5	2	2	2	0.65
3	51	1	3.0	3	5	2	2	3	0.72
3	51	1	3.0	3	5	2	2	4	0.52
3	51	1	3.0	3	5	2	2	5	0.40

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	51	1	3.0	3	5	2	3	1	0.90
3	51	1	3.0	3	5	2	3	2	0.82
3	51	1	3.0	3	5	2	3	3	0.60
3	51	1	3.0	3	5	2	3	4	0.52
3	51	1	3.0	3	5	2	3	5	0.38
3	51	1	3.0	3	5	2	4	1	1.28
3	51	1	3.0	3	5	2	4	2	0.90
3	51	1	3.0	3	5	2	4	3	0.85
3	51	1	3.0	3	5	2	4	4	0.59
3	51	1	3.0	3	5	2	4	5	0.36
3	51	1	3.0	3	5	2	5	1	0.90
3	51	1	3.0	3	5	2	5	2	0.80
3	51	1	3.0	3	5	2	5	3	0.62
3	51	1	3.0	3	5	2	5	4	0.55
3	51	1	3.0	3	5	2	5	5	0.44
3	51	1	3.0	3	5	3	1	1	1.00
3	51	1	3.0	3	5	3	1	2	0.70
3	51	1	3.0	3	5	3	1	3	0.55
3	51	1	3.0	3	5	3	1	4	0.30
3	51	1	3.0	3	5	3	1	5	0.56
3	51	1	3.0	3	5	3	2	1	1.22
3	51	1	3.0	3	5	3	2	2	0.92
3	51	1	3.0	3	5	3	2	3	0.95
3	51	1	3.0	3	5	3	2	4	0.52
3	51	1	3.0	3	5	3	2	5	0.58
3	51	1	3.0	3	5	3	3	1	1.28
3	51	1	3.0	3	5	3	3	2	1.04
3	51	1	3.0	3	5	3	3	3	0.82
3	51	1	3.0	3	5	3	3	4	0.38
3	51	1	3.0	3	5	3	3	5	0.47
3	51	1	3.0	3	5	3	4	1	1.24
3	51	1	3.0	3	5	3	4	2	0.98
3	51	1	3.0	3	5	3	4	3	0.95
3	51	1	3.0	3	5	3	4	4	0.59
3	51	1	3.0	3	5	3	4	5	0.54
3	51	1	3.0	3	5	3	5	1	1.28
3	51	1	3.0	3	5	3	5	2	1.02
3	51	1	3.0	3	5	3	5	3	0.86
3	51	1	3.0	3	5	3	5	4	0.43
3	51	1	3.0	3	5	3	5	5	0.38
3	51	1	3.0	3	5	4	1	1	0.92
3	51	1	3.0	3	5	4	1	2	1.10
3	51	1	3.0	3	5	4	1	3	0.80
3	51	1	3.0	3	5	4	1	4	0.65
3	51	1	3.0	3	5	4	1	5	0.40

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VCLT
3	51	1	3.0	3	5	4	2	1	1.05
3	51	1	3.0	3	5	4	2	2	1.10
3	51	1	3.0	3	5	4	2	3	0.88
3	51	1	3.0	3	5	4	2	4	0.50
3	51	1	3.0	3	5	4	2	5	0.48
3	51	1	3.0	3	5	4	3	1	1.38
3	51	1	3.0	3	5	4	3	2	0.90
3	51	1	3.0	3	5	4	3	3	0.80
3	51	1	3.0	3	5	4	3	4	0.70
3	51	1	3.0	3	5	4	3	5	0.54
3	51	1	3.0	3	5	4	4	1	1.35
3	51	1	3.0	3	5	4	4	2	0.98
3	51	1	3.0	3	5	4	4	3	0.82
3	51	1	3.0	3	5	4	4	4	0.55
3	51	1	3.0	3	5	4	4	5	0.51
3	51	1	3.0	3	5	4	5	1	1.30
3	51	1	3.0	3	5	4	5	2	0.95
3	51	1	3.0	3	5	4	5	3	0.80
3	51	1	3.0	3	5	4	5	4	0.52
3	51	1	3.0	3	5	4	5	5	0.50
3	51	1	3.0	3	5	5	1	1	0.92
3	51	1	3.0	3	5	5	1	2	1.00
3	51	1	3.0	3	5	5	1	3	0.80
3	51	1	3.0	3	5	5	1	4	0.58
3	51	1	3.0	3	5	5	1	5	0.48
3	51	1	3.0	3	5	5	2	1	1.12
3	51	1	3.0	3	5	5	2	2	0.98
3	51	1	3.0	3	5	5	2	3	0.92
3	51	1	3.0	3	5	5	2	4	0.61
3	51	1	3.0	3	5	5	2	5	0.63
3	51	1	3.0	3	5	5	3	1	1.25
3	51	1	3.0	3	5	5	3	2	0.80
3	51	1	3.0	3	5	5	3	3	0.78
3	51	1	3.0	3	5	5	3	4	0.65
3	51	1	3.0	3	5	5	3	5	0.62
3	51	1	3.0	3	5	5	4	1	1.10
3	51	1	3.0	3	5	5	4	2	1.10
3	51	1	3.0	3	5	5	4	3	0.83
3	51	1	3.0	3	5	5	4	4	0.66
3	51	1	3.0	3	5	5	4	5	0.56
3	51	1	3.0	3	5	5	5	1	1.28
3	51	1	3.0	3	5	5	5	2	0.95
3	51	1	3.0	3	5	5	5	3	0.92
3	51	1	3.0	3	5	5	5	4	0.68
3	51	1	3.0	3	5	5	5	5	0.54

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	41	3	3.0	2	8	1	1	1	3.90
2	41	3	3.0	2	8	1	2	1	7.10
2	41	3	3.0	2	8	1	3	1	7.60
2	41	3	3.0	2	8	1	4	1	6.10
2	41	3	3.0	2	8	1	5	1	6.80
2	41	3	3.0	2	8	2	1	1	7.20
2	41	3	3.0	2	8	2	2	1	7.50
2	41	3	3.0	2	8	2	3	1	7.60
2	41	3	3.0	2	8	2	4	1	5.60
2	41	3	3.0	2	8	2	5	1	7.20
2	41	3	3.0	2	8	3	1	1	7.10
2	41	3	3.0	2	8	3	2	1	7.90
2	41	3	3.0	2	8	3	3	1	6.60
2	41	3	3.0	2	8	3	4	1	6.50
2	41	3	3.0	2	8	3	5	1	5.60
2	41	3	3.0	2	8	4	1	1	6.40
2	41	3	3.0	2	8	4	2	1	7.60
2	41	3	3.0	2	8	4	3	1	6.20
2	41	3	3.0	2	8	4	4	1	6.80
2	41	3	3.0	2	8	4	5	1	7.00
2	41	3	3.0	2	8	5	1	1	7.90
2	41	3	3.0	2	8	5	2	1	7.10
2	41	3	3.0	2	8	5	3	1	6.90
2	41	3	3.0	2	8	5	4	1	7.80
2	41	3	3.0	2	8	5	5	1	7.20
2	41	3	3.0	2	8	1	1	2	8.60
2	41	3	3.0	2	8	1	2	2	8.00
2	41	3	3.0	2	8	1	3	2	8.80
2	41	3	3.0	2	8	1	4	2	6.80
2	41	3	3.0	2	8	1	5	2	6.80
2	41	3	3.0	2	8	2	1	2	7.00
2	41	3	3.0	2	8	2	2	2	7.70
2	41	3	3.0	2	8	2	3	2	7.20
2	41	3	3.0	2	8	2	4	2	7.20
2	41	3	3.0	2	8	2	5	2	6.70
2	41	3	3.0	2	8	3	1	2	5.60
2	41	3	3.0	2	8	3	2	2	8.60
2	41	3	3.0	2	8	3	3	2	6.40
2	41	3	3.0	2	8	3	4	2	4.20
2	41	3	3.0	2	8	3	5	2	6.90
2	41	3	3.0	2	8	4	1	2	6.30
2	41	3	3.0	2	8	4	2	2	7.40
2	41	3	3.0	2	8	4	3	2	7.40
2	41	3	3.0	2	8	4	4	2	6.80
2	41	3	3.0	2	8	4	5	2	7.30

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VOLT
2	41	3	3.0	2	8	5	1	2	5.80
2	41	3	3.0	2	8	5	2	2	7.70
2	41	3	3.0	2	8	5	3	2	7.70
2	41	3	3.0	2	8	5	4	2	7.20
2	41	3	3.0	2	8	5	5	2	8.60
2	41	3	3.0	2	8	1	1	3	6.00
2	41	3	3.0	2	8	1	2	3	7.10
2	41	3	3.0	2	8	1	3	3	7.90
2	41	3	3.0	2	8	1	4	3	6.30
2	41	3	3.0	2	8	1	5	3	5.90
2	41	3	3.0	2	8	2	1	3	6.90
2	41	3	3.0	2	8	2	2	3	6.00
2	41	3	3.0	2	8	2	3	3	6.70
2	41	3	3.0	2	8	2	4	3	5.60
2	41	3	3.0	2	8	2	5	3	5.80
2	41	3	3.0	2	8	3	1	3	6.40
2	41	3	3.0	2	8	3	2	3	6.00
2	41	3	3.0	2	8	3	3	3	6.40
2	41	3	3.0	2	8	3	4	3	4.20
2	41	3	3.0	2	8	3	5	3	5.80
2	41	3	3.0	2	8	4	1	3	7.00
2	41	3	3.0	2	8	4	2	3	6.30
2	41	3	3.0	2	8	4	3	3	6.40
2	41	3	3.0	2	8	4	4	3	6.30
2	41	3	3.0	2	8	4	5	3	6.40
2	41	3	3.0	2	8	5	1	3	6.40
2	41	3	3.0	2	8	5	2	3	6.50
2	41	3	3.0	2	8	5	3	3	6.80
2	41	3	3.0	2	8	5	4	3	6.80
2	41	3	3.0	2	8	5	5	3	5.80
2	61	3	3.0	2	5	1	1	1	7.80
2	61	3	3.0	2	5	1	2	1	7.70
2	61	3	3.0	2	5	1	3	1	6.90
2	61	3	3.0	2	5	1	4	1	8.10
2	61	3	3.0	2	5	1	5	1	8.80
2	61	3	3.0	2	5	2	1	1	5.90
2	61	3	3.0	2	5	2	2	1	6.20
2	61	3	3.0	2	5	2	3	1	7.90
2	61	3	3.0	2	5	2	4	1	7.30
2	61	3	3.0	2	5	2	5	1	7.90
2	61	3	3.0	2	5	3	1	1	7.20
2	61	3	3.0	2	5	3	2	1	6.20
2	61	3	3.0	2	5	3	3	1	7.90
2	61	3	3.0	2	5	3	4	1	7.30
2	61	3	3.0	2	5	3	5	1	7.90

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	61	3	3.0	2	5	4	1	1	7.20
2	61	3	3.0	2	5	4	2	1	6.20
2	61	3	3.0	2	5	4	3	1	3.20
2	61	3	3.0	2	5	4	4	1	7.80
2	61	3	3.0	2	5	4	5	1	8.50
2	61	3	3.0	2	5	5	1	1	8.00
2	61	3	3.0	2	5	5	2	1	6.60
2	61	3	3.0	2	5	5	3	1	7.60
2	61	3	3.0	2	5	5	4	1	4.40
2	61	3	3.0	2	5	5	5	1	4.20
2	61	3	3.0	2	5	1	1	2	3.82
2	61	3	3.0	2	5	1	2	2	7.80
2	61	3	3.0	2	5	1	3	2	8.10
2	61	3	3.0	2	5	1	4	2	7.60
2	61	3	3.0	2	5	1	5	2	5.20
2	61	3	3.0	2	5	2	1	2	8.20
2	61	3	3.0	2	5	2	2	2	8.30
2	61	3	3.0	2	5	2	3	2	8.40
2	61	3	3.0	2	5	2	4	2	7.40
2	61	3	3.0	2	5	2	5	2	8.00
2	61	3	3.0	2	5	3	1	2	7.80
2	61	3	3.0	2	5	3	2	2	8.20
2	61	3	3.0	2	5	3	3	2	8.00
2	61	3	3.0	2	5	3	4	2	7.20
2	61	3	3.0	2	5	3	5	2	8.20
2	61	3	3.0	2	5	4	1	2	8.40
2	61	3	3.0	2	5	4	2	2	6.25
2	61	3	3.0	2	5	4	3	2	8.20
2	61	3	3.0	2	5	4	4	2	7.30
2	61	3	3.0	2	5	4	5	2	8.00
2	61	3	3.0	2	5	5	1	2	8.00
2	61	3	3.0	2	5	5	2	2	8.10
2	61	3	3.0	2	5	5	3	2	6.40
2	61	3	3.0	2	5	5	4	2	5.20
2	61	3	3.0	2	5	5	5	2	7.60
2	61	3	3.0	2	5	1	1	3	7.60
2	61	3	3.0	2	5	1	2	3	6.80
2	61	3	3.0	2	5	1	3	3	6.20
2	61	3	3.0	2	5	1	4	3	6.60
2	61	3	3.0	2	5	1	5	3	6.00
2	61	3	3.0	2	5	2	1	3	7.10
2	61	3	3.0	2	5	2	2	3	7.20
2	61	3	3.0	2	5	2	3	3	7.00
2	61	3	3.0	2	5	2	4	3	6.80
2	61	3	3.0	2	5	2	5	3	5.40

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	61	3	3.0	2	5	3	1	3	6.20
2	61	3	3.0	2	5	3	2	3	6.20
2	61	3	3.0	2	5	3	3	3	7.50
2	61	3	3.0	2	5	3	4	3	6.80
2	61	3	3.0	2	5	3	5	3	7.30
2	61	3	3.0	2	5	4	1	3	8.80
2	61	3	3.0	2	5	4	2	3	5.40
2	61	3	3.0	2	5	4	3	3	5.00
2	61	3	3.0	2	5	4	4	3	5.00
2	61	3	3.0	2	5	4	5	3	7.20
2	61	3	3.0	2	5	5	1	3	7.40
2	61	3	3.0	2	5	5	2	3	5.60
2	61	3	3.0	2	5	5	3	3	4.00
2	61	3	3.0	2	5	5	4	3	6.20
2	61	3	3.0	2	5	5	5	3	5.00
3	32	5	6.0	3	5	1	1	1	4.60
3	32	5	6.0	3	5	1	2	1	4.00
3	32	5	6.0	3	5	1	3	1	3.40
3	32	5	6.0	3	5	1	4	1	2.80
3	32	5	6.0	3	5	1	5	1	4.60
3	32	5	6.0	3	5	2	1	1	5.00
3	32	5	6.0	3	5	2	2	1	4.80
3	32	5	6.0	3	5	2	3	1	4.60
3	32	5	6.0	3	5	2	4	1	5.60
3	32	5	6.0	3	5	2	5	1	0.90
3	32	5	6.0	3	5	3	1	1	4.20
3	32	5	6.0	3	5	3	2	1	3.80
3	32	5	6.0	3	5	3	3	1	2.60
3	32	5	6.0	3	5	3	4	1	1.80
3	32	5	6.0	3	5	3	5	1	2.20
3	32	5	6.0	3	5	4	1	1	4.20
3	32	5	6.0	3	5	4	2	1	4.80
3	32	5	6.0	3	5	4	3	1	2.00
3	32	5	6.0	3	5	4	4	1	2.20
3	32	5	6.0	3	5	4	5	1	3.80
3	32	5	6.0	3	5	5	1	1	5.20
3	32	5	6.0	3	5	5	2	1	4.70
3	32	5	6.0	3	5	5	3	1	2.40
3	32	5	6.0	3	5	5	4	1	2.20
3	32	5	6.0	3	5	5	5	1	3.60
3	32	5	6.0	3	5	1	1	2	4.60
3	32	5	6.0	3	5	1	2	2	1.80
3	32	5	6.0	3	5	1	3	2	2.40
3	32	5	6.0	3	5	1	4	2	4.20
3	32	5	6.0	3	5	1	5	2	4.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	32	5	6.0	3	5	2	1	2	2.00
3	32	5	6.0	3	5	2	2	2	4.40
3	32	5	6.0	3	5	2	3	2	3.40
3	32	5	6.0	3	5	2	4	2	1.80
3	32	5	6.0	3	5	2	5	2	2.00
3	32	5	6.0	3	5	3	1	2	2.00
3	32	5	6.0	3	5	3	2	2	3.40
3	32	5	6.0	3	5	3	3	2	4.50
3	32	5	6.0	3	5	3	4	2	1.90
3	32	5	6.0	3	5	3	5	2	3.80
3	32	5	6.0	3	5	4	1	2	3.60
3	32	5	6.0	3	5	4	2	2	5.00
3	32	5	6.0	3	5	4	3	2	1.60
3	32	5	6.0	3	5	4	4	2	4.90
3	32	5	6.0	3	5	4	5	2	2.50
3	32	5	6.0	3	5	5	1	2	2.00
3	32	5	6.0	3	5	5	2	2	4.60
3	32	5	6.0	3	5	5	3	2	4.60
3	32	5	6.0	3	5	5	4	2	2.00
3	32	5	6.0	3	5	5	5	2	2.80
3	32	5	6.0	3	5	1	1	3	4.80
3	32	5	6.0	3	5	1	2	3	3.50
3	32	5	6.0	3	5	1	3	3	4.50
3	32	5	6.0	3	5	1	4	3	3.80
3	32	5	6.0	3	5	1	5	3	1.50
3	32	5	6.0	3	5	2	1	3	4.70
3	32	5	6.0	3	5	2	2	3	3.60
3	32	5	6.0	3	5	2	3	3	6.00
3	32	5	6.0	3	5	2	4	3	5.80
3	32	5	6.0	3	5	2	5	3	4.80
3	32	5	6.0	3	5	3	1	3	5.10
3	32	5	6.0	3	5	3	2	3	4.00
3	32	5	6.0	3	5	3	3	3	4.20
3	32	5	6.0	3	5	3	4	3	2.60
3	32	5	6.0	3	5	3	5	3	5.80
3	32	5	6.0	3	5	4	1	3	5.00
3	32	5	6.0	3	5	4	2	3	4.40
3	32	5	6.0	3	5	4	3	3	1.20
3	32	5	6.0	3	5	4	4	3	2.60
3	32	5	6.0	3	5	4	5	3	1.40
3	32	5	6.0	3	5	5	1	3	5.00
3	32	5	6.0	3	5	5	2	3	5.80
3	32	5	6.0	3	5	5	3	3	5.80
3	32	5	6.0	3	5	5	4	3	1.80
3	32	5	6.0	3	5	5	5	3	2.40

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	32	5	6.0	3	5	1	1	4	5.80
3	32	5	6.0	3	5	1	2	4	3.00
3	32	5	6.0	3	5	1	3	4	5.20
3	32	5	6.0	3	5	1	4	4	4.60
3	32	5	6.0	3	5	1	5	4	1.50
3	32	5	6.0	3	5	2	1	4	6.00
3	32	5	6.0	3	5	2	2	4	4.40
3	32	5	6.0	3	5	2	3	4	5.70
3	32	5	6.0	3	5	2	4	4	1.50
3	32	5	6.0	3	5	2	5	4	1.20
3	32	5	6.0	3	5	3	1	4	1.60
3	32	5	6.0	3	5	3	2	4	4.40
3	32	5	6.0	3	5	3	3	4	2.00
3	32	5	6.0	3	5	3	4	4	4.50
3	32	5	6.0	3	5	3	5	4	4.40
3	32	5	6.0	3	5	4	1	4	5.00
3	32	5	6.0	3	5	4	2	4	6.20
3	32	5	6.0	3	5	4	3	4	5.20
3	32	5	6.0	3	5	4	4	4	1.40
3	32	5	6.0	3	5	4	5	4	0.80
3	32	5	6.0	3	5	5	1	4	5.30
3	32	5	6.0	3	5	5	2	4	5.60
3	32	5	6.0	3	5	5	3	4	5.20
3	32	5	6.0	3	5	5	4	4	6.60
3	32	5	6.0	3	5	5	5	4	1.20
3	32	5	6.0	3	5	1	1	5	3.60
3	32	5	6.0	3	5	1	2	5	2.60
3	32	5	6.0	3	5	1	3	5	1.00
3	32	5	6.0	3	5	1	4	5	1.80
3	32	5	6.0	3	5	1	5	5	0.60
3	32	5	6.0	3	5	2	1	5	3.80
3	32	5	6.0	3	5	2	2	5	4.60
3	32	5	6.0	3	5	2	3	5	5.00
3	32	5	6.0	3	5	2	4	5	2.50
3	32	5	6.0	3	5	2	5	5	1.20
3	32	5	6.0	3	5	3	1	5	3.80
3	32	5	6.0	3	5	3	2	5	3.10
3	32	5	6.0	3	5	3	3	5	4.30
3	32	5	6.0	3	5	3	4	5	4.20
3	32	5	6.0	3	5	3	5	5	2.80
3	32	5	6.0	3	5	4	1	5	3.20
3	32	5	6.0	3	5	4	2	5	4.40
3	32	5	6.0	3	5	4	3	5	3.50
3	32	5	6.0	3	5	4	4	5	3.20
3	32	5	6.0	3	5	4	5	5	4.40

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	32	5	6.0	3	5	5	1	5	3.90
3	32	5	6.0	3	5	5	2	5	4.50
3	32	5	6.0	3	5	5	3	5	5.00
3	32	5	6.0	3	5	5	4	5	5.20
3	32	5	6.0	3	5	5	5	5	6.00
3	22	5	6.0	3	5	1	1	1	5.80
3	22	5	6.0	3	5	1	2	1	6.20
3	22	5	6.0	3	5	1	3	1	6.10
3	22	5	6.0	3	5	1	4	1	6.40
3	22	5	6.0	3	5	1	5	1	6.20
3	22	5	6.0	3	5	2	1	1	5.00
3	22	5	6.0	3	5	2	2	1	6.50
3	22	5	6.0	3	5	2	3	1	5.60
3	22	5	6.0	3	5	2	4	1	5.90
3	22	5	6.0	3	5	2	5	1	6.00
3	22	5	6.0	3	5	3	1	1	5.60
3	22	5	6.0	3	5	3	2	1	5.70
3	22	5	6.0	3	5	3	3	1	5.40
3	22	5	6.0	3	5	3	4	1	5.00
3	22	5	6.0	3	5	3	5	1	5.90
3	22	5	6.0	3	5	4	1	1	6.00
3	22	5	6.0	3	5	4	2	1	6.00
3	22	5	6.0	3	5	4	3	1	5.80
3	22	5	6.0	3	5	4	4	1	6.00
3	22	5	6.0	3	5	4	5	1	5.40
3	22	5	6.0	3	5	5	1	1	5.80
3	22	5	6.0	3	5	5	2	1	6.00
3	22	5	6.0	3	5	5	3	1	6.90
3	22	5	6.0	3	5	5	4	1	5.70
3	22	5	6.0	3	5	5	5	1	5.00
3	22	5	6.0	3	5	1	1	2	6.00
3	22	5	6.0	3	5	1	2	2	1.60
3	22	5	6.0	3	5	1	3	2	6.20
3	22	5	6.0	3	5	1	4	2	6.40
3	22	5	6.0	3	5	1	5	2	6.50
3	22	5	6.0	3	5	2	1	2	6.00
3	22	5	6.0	3	5	2	2	2	6.60
3	22	5	6.0	3	5	2	3	2	6.00
3	22	5	6.0	3	5	2	4	2	6.40
3	22	5	6.0	3	5	2	5	2	6.80
3	22	5	6.0	3	5	3	1	2	6.10
3	22	5	6.0	3	5	3	2	2	6.10
3	22	5	6.0	3	5	3	3	2	6.30
3	22	5	6.0	3	5	3	4	2	1.00
3	22	5	6.0	3	5	3	5	2	6.70

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	22	5	6.0	3	5	3	1	4	6.80
3	22	5	6.0	3	5	3	2	4	6.20
3	22	5	6.0	3	5	3	3	4	6.80
3	22	5	6.0	3	5	3	4	4	0.20
3	22	5	6.0	3	5	3	5	4	6.30
3	22	5	6.0	3	5	4	1	4	7.20
3	22	5	6.0	3	5	4	2	4	7.00
3	22	5	6.0	3	5	4	3	4	7.00
3	22	5	6.0	3	5	4	4	4	7.00
3	22	5	6.0	3	5	4	5	4	6.90
3	22	5	6.0	3	5	5	1	4	7.40
3	22	5	6.0	3	5	5	2	4	6.90
3	22	5	6.0	3	5	5	3	4	6.80
3	22	5	6.0	3	5	5	4	4	6.80
3	22	5	6.0	3	5	5	5	4	6.50
3	22	5	6.0	3	5	1	1	5	4.90
3	22	5	6.0	3	5	1	2	5	6.30
3	22	5	6.0	3	5	1	3	5	5.50
3	22	5	6.0	3	5	1	4	5	6.40
3	22	5	6.0	3	5	1	5	5	6.90
3	22	5	6.0	3	5	2	1	5	6.60
3	22	5	6.0	3	5	2	2	5	6.50
3	22	5	6.0	3	5	2	3	5	5.80
3	22	5	6.0	3	5	2	4	5	6.70
3	22	5	6.0	3	5	2	5	5	6.50
3	22	5	6.0	3	5	3	1	5	6.80
3	22	5	6.0	3	5	3	2	5	4.00
3	22	5	6.0	3	5	3	3	5	5.00
3	22	5	6.0	3	5	3	4	5	1.20
3	22	5	6.0	3	5	3	5	5	6.20
3	22	5	6.0	3	5	4	1	5	6.10
3	22	5	6.0	3	5	4	2	5	6.80
3	22	5	6.0	3	5	4	3	5	6.30
3	22	5	6.0	3	5	4	4	5	7.00
3	22	5	6.0	3	5	4	5	5	7.00
3	22	5	6.0	3	5	5	1	5	6.00
3	22	5	6.0	3	5	5	2	5	6.80
3	22	5	6.0	3	5	5	3	5	7.00
3	22	5	6.0	3	5	5	4	5	6.70
3	22	5	6.0	3	5	5	5	5	4.80
3	62	5	4.8	3	5	1	1	1	1.32
3	62	5	4.8	3	5	1	2	1	1.70
3	62	5	4.8	3	5	1	3	1	1.00
3	62	5	4.8	3	5	1	4	1	1.80
3	62	5	4.8	3	5	1	5	1	1.75

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	62	5	4.8	3	5	1	1	3	1.00
3	62	5	4.8	3	5	1	2	3	0.81
3	62	5	4.8	3	5	1	3	3	1.28
3	62	5	4.8	3	5	1	4	3	1.15
3	62	5	4.8	3	5	1	5	3	0.80
3	62	5	4.8	3	5	2	1	3	1.35
3	62	5	4.8	3	5	2	2	3	1.45
3	62	5	4.8	3	5	2	3	3	1.28
3	62	5	4.8	3	5	2	4	3	0.90
3	62	5	4.8	3	5	2	5	3	1.00
3	62	5	4.8	3	5	3	1	3	0.90
3	62	5	4.8	3	5	3	2	3	0.90
3	62	5	4.8	3	5	3	3	3	1.30
3	62	5	4.8	3	5	3	4	3	1.00
3	62	5	4.8	3	5	3	5	3	0.05
3	62	5	4.8	3	5	4	1	3	1.22
3	62	5	4.8	3	5	4	2	3	1.10
3	62	5	4.8	3	5	4	3	3	0.70
3	62	5	4.8	3	5	4	4	3	0.75
3	62	5	4.8	3	5	4	5	3	0.20
3	62	5	4.8	3	5	5	1	3	1.38
3	62	5	4.8	3	5	5	2	3	0.34
3	62	5	4.8	3	5	5	3	3	0.55
3	62	5	4.8	3	5	5	4	3	0.24
3	62	5	4.8	3	5	5	5	3	0.12
3	62	5	4.8	3	5	1	1	4	1.42
3	62	5	4.8	3	5	1	2	4	1.00
3	62	5	4.8	3	5	1	3	4	1.20
3	62	5	4.8	3	5	1	4	4	1.02
3	62	5	4.8	3	5	1	5	4	0.75
3	62	5	4.8	3	5	2	1	4	0.55
3	62	5	4.8	3	5	2	2	4	1.20
3	62	5	4.8	3	5	2	3	4	1.02
3	62	5	4.8	3	5	2	4	4	1.42
3	62	5	4.8	3	5	2	5	4	0.52
3	62	5	4.8	3	5	3	1	4	1.65
3	62	5	4.8	3	5	3	2	4	1.20
3	62	5	4.8	3	5	3	3	4	1.50
3	62	5	4.8	3	5	3	4	4	1.18
3	62	5	4.8	3	5	3	5	4	0.72
3	62	5	4.8	3	5	4	1	4	1.58
3	62	5	4.8	3	5	4	2	4	1.42
3	62	5	4.8	3	5	4	3	4	1.22
3	62	5	4.8	3	5	4	4	4	0.95
3	62	5	4.8	3	5	4	5	4	0.30

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
3	62	5	4.8	3	5	5	1	4	1.40
3	62	5	4.8	3	5	5	2	4	1.28
3	62	5	4.8	3	5	5	3	4	1.12
3	62	5	4.8	3	5	5	4	4	1.10
3	62	5	4.8	3	5	5	5	4	0.90
3	62	5	4.8	3	5	1	1	5	0.60
3	62	5	4.8	3	5	1	2	5	1.40
3	62	5	4.8	3	5	1	3	5	0.98
3	62	5	4.8	3	5	1	4	5	1.48
3	62	5	4.8	3	5	1	5	5	0.22
3	62	5	4.8	3	5	2	1	5	1.15
3	62	5	4.8	3	5	2	2	5	1.36
3	62	5	4.8	3	5	2	3	5	0.95
3	62	5	4.8	3	5	2	4	5	0.90
3	62	5	4.8	3	5	2	5	5	0.13
3	62	5	4.8	3	5	3	1	5	0.92
3	62	5	4.8	3	5	3	2	5	1.10
3	62	5	4.8	3	5	3	3	5	1.05
3	62	5	4.8	3	5	3	4	5	0.40
3	62	5	4.8	3	5	3	5	5	0.24
3	62	5	4.8	3	5	4	1	5	1.18
3	62	5	4.8	3	5	4	2	5	0.78
3	62	5	4.8	3	5	4	3	5	0.82
3	62	5	4.8	3	5	4	4	5	0.21
3	62	5	4.8	3	5	4	5	5	0.50
3	62	5	4.8	3	5	5	1	5	0.85
3	62	5	4.8	3	5	5	2	5	1.18
3	62	5	4.8	3	5	5	3	5	1.12
3	62	5	4.8	3	5	5	4	5	1.20
3	62	5	4.8	3	5	5	5	5	0.30
3	42	5	4.8	3	5	1	1	1	1.95
3	42	5	4.8	3	5	1	2	1	2.20
3	42	5	4.8	3	5	1	3	1	2.00
3	42	5	4.8	3	5	1	4	1	2.75
3	42	5	4.8	3	5	1	5	1	1.92
3	42	5	4.8	3	5	2	1	1	1.42
3	42	5	4.8	3	5	2	2	1	1.90
3	42	5	4.8	3	5	2	3	1	1.65
3	42	5	4.8	3	5	2	4	1	1.30
3	42	5	4.8	3	5	2	5	1	1.88
3	42	5	4.8	3	5	3	1	1	1.82
3	42	5	4.8	3	5	3	2	1	0.90
3	42	5	4.8	3	5	3	3	1	1.86
3	42	5	4.8	3	5	3	4	1	1.30
3	42	5	4.8	3	5	3	5	1	0.92

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	42	5	4.8	3	5	4	1	1	2.40
3	42	5	4.8	3	5	4	2	1	1.96
3	42	5	4.8	3	5	4	3	1	2.15
3	42	5	4.8	3	5	4	4	1	2.75
3	42	5	4.8	3	5	4	5	1	1.48
3	42	5	4.8	3	5	5	1	1	1.28
3	42	5	4.8	3	5	5	2	1	1.30
3	42	5	4.8	3	5	5	3	1	2.05
3	42	5	4.8	3	5	5	4	1	1.12
3	42	5	4.8	3	5	5	5	1	1.28
3	42	5	4.8	3	5	1	1	2	1.25
3	42	5	4.8	3	5	1	2	2	1.42
3	42	5	4.8	3	5	1	3	2	1.45
3	42	5	4.8	3	5	1	4	2	0.37
3	42	5	4.8	3	5	1	5	2	1.20
3	42	5	4.8	3	5	2	1	2	1.40
3	42	5	4.8	3	5	2	2	2	0.70
3	42	5	4.8	3	5	2	3	2	1.48
3	42	5	4.8	3	5	2	4	2	1.45
3	42	5	4.8	3	5	2	5	2	1.10
3	42	5	4.8	3	5	3	1	2	1.30
3	42	5	4.8	3	5	3	2	2	0.82
3	42	5	4.8	3	5	3	3	2	1.20
3	42	5	4.8	3	5	3	4	2	1.45
3	42	5	4.8	3	5	3	5	2	0.80
3	42	5	4.8	3	5	4	1	2	1.45
3	42	5	4.8	3	5	4	2	2	1.60
3	42	5	4.8	3	5	4	3	2	1.42
3	42	5	4.8	3	5	4	4	2	0.70
3	42	5	4.8	3	5	4	5	2	0.52
3	42	5	4.8	3	5	5	1	2	0.10
3	42	5	4.8	3	5	5	2	2	1.30
3	42	5	4.8	3	5	5	3	2	1.30
3	42	5	4.8	3	5	5	4	2	0.58
3	42	5	4.8	3	5	5	5	2	0.50
3	42	5	4.8	3	5	1	1	3	1.60
3	42	5	4.8	3	5	1	2	3	0.25
3	42	5	4.8	3	5	1	3	3	1.25
3	42	5	4.8	3	5	1	4	3	1.20
3	42	5	4.8	3	5	1	5	3	1.60
3	42	5	4.8	3	5	2	1	3	2.00
3	42	5	4.8	3	5	2	2	3	1.70
3	42	5	4.8	3	5	2	3	3	0.95
3	42	5	4.8	3	5	2	4	3	0.50
3	42	5	4.8	3	5	2	5	3	0.90

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	42	5	4.8	3	5	3	1	3	1.40
3	42	5	4.8	3	5	3	2	3	1.48
3	42	5	4.8	3	5	3	3	3	1.58
3	42	5	4.8	3	5	3	4	3	1.42
3	42	5	4.8	3	5	3	5	3	1.30
3	42	5	4.8	3	5	4	1	3	1.60
3	42	5	4.8	3	5	4	2	3	1.38
3	42	5	4.8	3	5	4	3	3	1.65
3	42	5	4.8	3	5	4	4	3	1.55
3	42	5	4.8	3	5	4	5	3	1.35
3	42	5	4.8	3	5	5	1	3	1.25
3	42	5	4.8	3	5	5	2	3	1.30
3	42	5	4.8	3	5	5	3	3	1.20
3	42	5	4.8	3	5	5	4	3	1.25
3	42	5	4.8	3	5	5	5	3	0.90
3	42	5	4.8	3	5	1	1	4	1.28
3	42	5	4.8	3	5	1	2	4	1.52
3	42	5	4.8	3	5	1	3	4	1.20
3	42	5	4.8	3	5	1	4	4	0.50
3	42	5	4.8	3	5	1	5	4	0.90
3	42	5	4.8	3	5	2	1	4	1.55
3	42	5	4.8	3	5	2	2	4	1.60
3	42	5	4.8	3	5	2	3	4	1.60
3	42	5	4.8	3	5	2	4	4	1.00
3	42	5	4.8	3	5	2	5	4	1.30
3	42	5	4.8	3	5	3	1	4	1.28
3	42	5	4.8	3	5	3	2	4	1.78
3	42	5	4.8	3	5	3	3	4	1.20
3	42	5	4.8	3	5	3	4	4	1.65
3	42	5	4.8	3	5	3	5	4	1.00
3	42	5	4.8	3	5	4	1	4	1.55
3	42	5	4.8	3	5	4	2	4	1.20
3	42	5	4.8	3	5	4	3	4	1.45
3	42	5	4.8	3	5	4	4	4	0.70
3	42	5	4.8	3	5	4	5	4	0.70
3	42	5	4.8	3	5	5	1	4	1.50
3	42	5	4.8	3	5	5	2	4	0.20
3	42	5	4.8	3	5	5	3	4	0.25
3	42	5	4.8	3	5	5	4	4	0.95
3	42	5	4.8	3	5	5	5	4	0.60
3	42	5	4.8	3	5	1	1	5	1.12
3	42	5	4.8	3	5	1	2	5	1.24
3	42	5	4.8	3	5	1	3	5	1.55
3	42	5	4.8	3	5	1	4	5	1.20
3	42	5	4.8	3	5	1	5	5	1.25

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	42	5	4.8	3	5	2	1	5	0.70
3	42	5	4.8	3	5	2	2	5	0.95
3	42	5	4.8	3	5	2	3	5	1.42
3	42	5	4.8	3	5	2	4	5	0.75
3	42	5	4.8	3	5	2	5	5	0.95
3	42	5	4.8	3	5	3	1	5	1.35
3	42	5	4.8	3	5	3	2	5	1.85
3	42	5	4.8	3	5	3	3	5	1.55
3	42	5	4.8	3	5	3	4	5	1.80
3	42	5	4.8	3	5	3	5	5	1.05
3	42	5	4.8	3	5	4	1	5	1.45
3	42	5	4.8	3	5	4	2	5	1.55
3	42	5	4.8	3	5	4	3	5	1.60
3	42	5	4.8	3	5	4	4	5	1.45
3	42	5	4.8	3	5	4	5	5	0.72
3	42	5	4.8	3	5	5	1	5	0.11
3	42	5	4.8	3	5	5	2	5	1.50
3	42	5	4.8	3	5	5	3	5	1.10
3	42	5	4.8	3	5	5	4	5	1.20
3	42	5	4.8	3	5	5	5	5	1.50
3	52	5	6.0	3	5	1	1	1	5.40
3	52	5	6.0	3	5	1	2	1	5.60
3	52	5	6.0	3	5	1	3	1	5.40
3	52	5	6.0	3	5	1	4	1	2.80
3	52	5	6.0	3	5	1	5	1	3.40
3	52	5	6.0	3	5	2	1	1	5.80
3	52	5	6.0	3	5	2	2	1	7.00
3	52	5	6.0	3	5	2	3	1	5.80
3	52	5	6.0	3	5	2	4	1	2.00
3	52	5	6.0	3	5	2	5	1	1.20
3	52	5	6.0	3	5	3	1	1	6.20
3	52	5	6.0	3	5	3	2	1	4.80
3	52	5	6.0	3	5	3	3	1	5.00
3	52	5	6.0	3	5	3	4	1	4.60
3	52	5	6.0	3	5	3	5	1	6.60
3	52	5	6.0	3	5	4	1	1	5.20
3	52	5	6.0	3	5	4	2	1	6.60
3	52	5	6.0	3	5	4	3	1	6.00
3	52	5	6.0	3	5	4	4	1	4.00
3	52	5	6.0	3	5	4	5	1	5.30
3	52	5	6.0	3	5	5	1	1	1.20
3	52	5	6.0	3	5	5	2	1	6.10
3	52	5	6.0	3	5	5	3	1	6.10
3	52	5	6.0	3	5	5	4	1	6.40
3	52	5	6.0	3	5	5	5	1	1.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	52	5	6.0	3	5	1	1	2	5.20
3	52	5	6.0	3	5	1	2	2	6.40
3	52	5	6.0	3	5	1	3	2	6.80
3	52	5	6.0	3	5	1	4	2	4.40
3	52	5	6.0	3	5	1	5	2	1.65
3	52	5	6.0	3	5	2	1	2	6.80
3	52	5	6.0	3	5	2	2	2	6.20
3	52	5	6.0	3	5	2	3	2	1.50
3	52	5	6.0	3	5	2	4	2	6.60
3	52	5	6.0	3	5	2	5	2	6.60
3	52	5	6.0	3	5	3	1	2	7.00
3	52	5	6.0	3	5	3	2	2	7.20
3	52	5	6.0	3	5	3	3	2	7.40
3	52	5	6.0	3	5	3	4	2	5.90
3	52	5	6.0	3	5	3	5	2	6.90
3	52	5	6.0	3	5	4	1	2	7.00
3	52	5	6.0	3	5	4	2	2	6.50
3	52	5	6.0	3	5	4	3	2	6.80
3	52	5	6.0	3	5	4	4	2	7.10
3	52	5	6.0	3	5	4	5	2	7.00
3	52	5	6.0	3	5	5	1	2	4.80
3	52	5	6.0	3	5	5	2	2	6.20
3	52	5	6.0	3	5	5	3	2	6.60
3	52	5	6.0	3	5	5	4	2	6.80
3	52	5	6.0	3	5	5	5	2	4.40
3	52	5	6.0	3	5	1	1	3	6.70
3	52	5	6.0	3	5	1	2	3	6.70
3	52	5	6.0	3	5	1	3	3	6.10
3	52	5	6.0	3	5	1	4	3	5.40
3	52	5	6.0	3	5	1	5	3	6.20
3	52	5	6.0	3	5	2	1	3	6.90
3	52	5	6.0	3	5	2	2	3	6.80
3	52	5	6.0	3	5	2	3	3	6.60
3	52	5	6.0	3	5	2	4	3	6.50
3	52	5	6.0	3	5	2	5	3	6.40
3	52	5	6.0	3	5	3	1	3	6.90
3	52	5	6.0	3	5	3	2	3	5.70
3	52	5	6.0	3	5	3	3	3	6.40
3	52	5	6.0	3	5	3	4	3	7.00
3	52	5	6.0	3	5	3	5	3	6.60
3	52	5	6.0	3	5	4	1	3	6.20
3	52	5	6.0	3	5	4	2	3	6.20
3	52	5	6.0	3	5	4	3	3	4.60
3	52	5	6.0	3	5	4	4	3	6.10
3	52	5	6.0	3	5	4	5	3	7.30

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
3	52	5	6.0	3	5	5	1	3	4.80
3	52	5	6.0	3	5	5	2	3	6.80
3	52	5	6.0	3	5	5	3	3	7.00
3	52	5	6.0	3	5	5	4	3	7.30
3	52	5	6.0	3	5	5	5	3	0.60
3	32	5	6.0	3	5	1	1	1	7.60
3	32	5	6.0	3	5	1	2	1	7.40
3	32	5	6.0	3	5	1	3	1	5.00
3	32	5	6.0	3	5	1	4	1	2.80
3	32	5	6.0	3	5	1	5	1	7.00
3	32	5	6.0	3	5	2	1	1	7.30
3	32	5	6.0	3	5	2	2	1	6.00
3	32	5	6.0	3	5	2	3	1	7.40
3	32	5	6.0	3	5	2	4	1	7.40
3	32	5	6.0	3	5	2	5	1	4.20
3	32	5	6.0	3	5	3	1	1	7.80
3	32	5	6.0	3	5	3	2	1	4.40
3	32	5	6.0	3	5	3	3	1	3.40
3	32	5	6.0	3	5	3	4	1	5.50
3	32	5	6.0	3	5	3	5	1	1.50
3	32	5	6.0	3	5	4	1	1	6.00
3	32	5	6.0	3	5	4	2	1	6.20
3	32	5	6.0	3	5	4	3	1	3.40
3	32	5	6.0	3	5	4	4	1	6.80
3	32	5	6.0	3	5	4	5	1	3.00
3	32	5	6.0	3	5	5	1	1	6.60
3	32	5	6.0	3	5	5	2	1	7.50
3	32	5	6.0	3	5	5	3	1	6.40
3	32	5	6.0	3	5	5	4	1	8.00
3	32	5	6.0	3	5	5	5	1	7.00
3	32	5	6.0	3	5	1	1	2	7.50
3	32	5	6.0	3	5	1	2	2	7.60
3	32	5	6.0	3	5	1	3	2	4.80
3	32	5	6.0	3	5	1	4	2	5.60
3	32	5	6.0	3	5	1	5	2	5.00
3	32	5	6.0	3	5	2	1	2	7.60
3	32	5	6.0	3	5	2	2	2	7.30
3	32	5	6.0	3	5	2	3	2	6.80
3	32	5	6.0	3	5	2	4	2	4.80
3	32	5	6.0	3	5	2	5	2	6.90
3	32	5	6.0	3	5	3	1	2	8.10
3	32	5	6.0	3	5	3	2	2	8.20
3	32	5	6.0	3	5	3	3	2	7.00
3	32	5	6.0	3	5	3	4	2	8.50
3	32	5	6.0	3	5	3	5	2	8.20

SUB	PT	SIDE	I	F	P	REP	RC	COL	VCLT
3	32	5	6.0	3	5	4	1	2	3.20
3	32	5	6.0	3	5	4	2	2	8.10
3	32	5	6.0	3	5	4	3	2	7.60
3	32	5	6.0	3	5	4	4	2	6.30
3	32	5	6.0	3	5	4	5	2	8.30
3	32	5	6.0	3	5	5	1	2	8.00
3	32	5	6.0	3	5	5	2	2	8.00
3	32	5	6.0	3	5	5	3	2	8.20
3	32	5	6.0	3	5	5	4	2	8.50
3	32	5	6.0	3	5	5	5	2	8.20
3	32	5	6.0	3	5	1	1	3	6.40
3	32	5	6.0	3	5	1	2	3	7.60
3	32	5	6.0	3	5	1	3	3	4.20
3	32	5	6.0	3	5	1	4	3	6.80
3	32	5	6.0	3	5	1	5	3	4.80
3	32	5	6.0	3	5	2	1	3	4.20
3	32	5	6.0	3	5	2	2	3	7.10
3	32	5	6.0	3	5	2	3	3	5.50
3	32	5	6.0	3	5	2	4	3	7.50
3	32	5	6.0	3	5	2	5	3	8.20
3	32	5	6.0	3	5	3	1	3	6.20
3	32	5	6.0	3	5	3	2	3	6.20
3	32	5	6.0	3	5	3	3	3	1.60
3	32	5	6.0	3	5	3	4	3	7.50
3	32	5	6.0	3	5	3	5	3	1.20
3	32	5	6.0	3	5	4	1	3	8.20
3	32	5	6.0	3	5	4	2	3	7.60
3	32	5	6.0	3	5	4	3	3	7.50
3	32	5	6.0	3	5	4	4	3	6.20
3	32	5	6.0	3	5	4	5	3	3.00
3	32	5	6.0	3	5	5	1	3	6.40
3	32	5	6.0	3	5	5	2	3	7.40
3	32	5	6.0	3	5	5	3	3	8.00
3	32	5	6.0	3	5	5	4	3	8.20
3	32	5	6.0	3	5	5	5	3	1.50
3	22	6	6.8	2	5	1	1	1	5.30
3	22	6	6.8	2	5	1	2	1	5.20
3	22	6	6.8	2	5	1	3	1	6.00
3	22	6	6.8	2	5	1	4	1	6.30
3	22	6	6.8	2	5	1	5	1	7.10
3	22	6	6.8	2	5	2	1	1	6.10
3	22	6	6.8	2	5	2	2	1	5.50
3	22	6	6.8	2	5	2	3	1	6.30
3	22	6	6.8	2	5	2	4	1	6.40
3	22	6	6.8	2	5	2	5	1	6.60

SUB	PT	SIDE	I	F	P	REP	PO	COL	VOLT
3	22	6	6.8	2	5	3	1	1	6.30
3	22	6	6.8	2	5	3	2	1	6.10
3	22	6	6.8	2	5	3	3	1	6.30
3	22	6	6.8	2	5	3	4	1	7.10
3	22	6	6.8	2	5	3	5	1	5.40
3	22	6	6.8	2	5	4	1	1	6.80
3	22	6	6.8	2	5	4	2	1	7.00
3	22	6	6.8	2	5	4	3	1	6.60
3	22	6	6.8	2	5	4	4	1	7.10
3	22	6	6.8	2	5	4	5	1	7.10
3	22	6	6.8	2	5	5	1	1	6.60
3	22	6	6.8	2	5	5	2	1	6.50
3	22	6	6.8	2	5	5	3	1	5.70
3	22	6	6.8	2	5	5	4	1	5.40
3	22	6	6.8	2	5	5	5	1	6.60
3	22	6	6.8	2	5	1	1	2	6.50
3	22	6	6.8	2	5	1	2	2	7.20
3	22	6	6.8	2	5	1	3	2	7.00
3	22	6	6.8	2	5	1	4	2	7.10
3	22	6	6.8	2	5	1	5	2	6.80
3	22	6	6.8	2	5	2	1	2	7.30
3	22	6	6.8	2	5	2	2	2	7.30
3	22	6	6.8	2	5	2	3	2	6.60
3	22	6	6.8	2	5	2	4	2	5.40
3	22	6	6.8	2	5	2	5	2	6.50
3	22	6	6.8	2	5	3	1	2	8.00
3	22	6	6.8	2	5	3	2	2	6.40
3	22	6	6.8	2	5	3	3	2	8.20
3	22	6	6.8	2	5	3	4	2	7.10
3	22	6	6.8	2	5	3	5	2	7.10
3	22	6	6.8	2	5	4	1	2	7.30
3	22	6	6.8	2	5	4	2	2	7.40
3	22	6	6.8	2	5	4	3	2	8.00
3	22	6	6.8	2	5	4	4	2	7.70
3	22	6	6.8	2	5	4	5	2	7.50
3	22	6	6.8	2	5	5	1	2	7.50
3	22	6	6.8	2	5	5	2	2	7.60
3	22	6	6.8	2	5	5	3	2	5.60
3	22	6	6.8	2	5	5	4	2	4.80
3	22	6	6.8	2	5	5	5	2	7.40
3	22	6	6.8	2	5	1	1	3	5.30
3	22	6	6.8	2	5	1	2	3	6.90
3	22	6	6.8	2	5	1	3	3	7.40
3	22	6	6.8	2	5	1	4	3	7.70
3	22	6	6.8	2	5	1	5	3	7.80

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
3	22	6	6.8	2	5	2	1	3	7.80
3	22	6	6.8	2	5	2	2	3	7.90
3	22	6	6.8	2	5	2	3	3	7.80
3	22	6	6.8	2	5	2	4	3	5.60
3	22	6	6.8	2	5	2	5	3	7.90
3	22	6	6.8	2	5	3	1	3	8.00
3	22	6	6.8	2	5	3	2	3	8.10
3	22	6	6.8	2	5	3	3	3	8.10
3	22	6	6.8	2	5	3	4	3	8.20
3	22	6	6.8	2	5	3	5	3	8.40
3	22	6	6.8	2	5	4	1	3	7.80
3	22	6	6.8	2	5	4	2	3	7.50
3	22	6	6.8	2	5	4	3	3	8.30
3	22	6	6.8	2	5	4	4	3	8.10
3	22	6	6.8	2	5	4	5	3	8.50
3	22	6	6.8	2	5	5	1	3	8.20
3	22	6	6.8	2	5	5	2	3	8.40
3	22	6	6.8	2	5	5	3	3	8.00
3	22	6	6.8	2	5	5	4	3	8.00
3	22	6	6.8	2	5	5	5	3	8.20
3	22	6	6.8	2	5	1	1	4	7.40
3	22	6	6.8	2	5	1	2	4	6.20
3	22	6	6.8	2	5	1	3	4	8.00
3	22	6	6.8	2	5	1	4	4	7.50
3	22	6	6.8	2	5	1	5	4	7.40
3	22	6	6.8	2	5	2	1	4	6.40
3	22	6	6.8	2	5	2	2	4	6.70
3	22	6	6.8	2	5	2	3	4	5.60
3	22	6	6.8	2	5	2	4	4	6.90
3	22	6	6.8	2	5	2	5	4	7.20
3	22	6	6.8	2	5	3	1	4	7.60
3	22	6	6.8	2	5	3	2	4	7.80
3	22	6	6.8	2	5	3	3	4	7.70
3	22	6	6.8	2	5	3	4	4	7.20
3	22	6	6.8	2	5	3	5	4	5.80
3	22	6	6.8	2	5	4	1	4	7.60
3	22	6	6.8	2	5	4	2	4	7.90
3	22	6	6.8	2	5	4	3	4	8.00
3	22	6	6.8	2	5	4	4	4	7.80
3	22	6	6.8	2	5	4	5	4	8.20
3	22	6	6.8	2	5	5	1	4	7.70
3	22	6	6.8	2	5	5	2	4	8.10
3	22	6	6.8	2	5	5	3	4	7.00
3	22	6	6.8	2	5	5	4	4	7.60
3	22	6	6.8	2	5	5	5	4	8.00

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	22	6	6.8	2	5	1	1	5	7.10
3	22	6	6.8	2	5	1	2	5	6.20
3	22	6	6.8	2	5	1	3	5	7.10
3	22	6	6.8	2	5	1	4	5	7.10
3	22	6	6.8	2	5	1	5	5	7.20
3	22	6	6.8	2	5	2	1	5	7.50
3	22	6	6.8	2	5	2	2	5	6.80
3	22	6	6.8	2	5	2	3	5	7.60
3	22	6	6.8	2	5	2	4	5	7.50
3	22	6	6.8	2	5	2	5	5	7.60
3	22	6	6.8	2	5	3	1	5	7.60
3	22	6	6.8	2	5	3	2	5	7.40
3	22	6	6.8	2	5	3	3	5	7.50
3	22	6	6.8	2	5	3	4	5	7.80
3	22	6	6.8	2	5	3	5	5	7.60
3	22	6	6.8	2	5	4	1	5	7.50
3	22	6	6.8	2	5	4	2	5	7.50
3	22	6	6.8	2	5	4	3	5	7.70
3	22	6	6.8	2	5	4	4	5	8.00
3	22	6	6.8	2	5	4	5	5	7.00
3	22	6	6.8	2	5	5	1	5	7.80
3	22	6	6.8	2	5	5	2	5	8.00
3	22	6	6.8	2	5	5	3	5	7.70
3	22	6	6.8	2	5	5	4	5	7.40
3	22	6	6.8	2	5	5	5	5	7.90
5	61	6	6.8	3	5	1	1	1	3.60
5	61	6	6.8	3	5	1	2	1	3.70
5	61	6	6.8	3	5	1	3	1	3.90
5	61	6	6.8	3	5	1	4	1	3.20
5	61	6	6.8	3	5	1	5	1	4.00
5	61	6	6.8	3	5	2	1	1	4.20
5	61	6	6.8	3	5	2	2	1	3.40
5	61	6	6.8	3	5	2	3	1	2.60
5	61	6	6.8	3	5	2	4	1	4.30
5	61	6	6.8	3	5	2	5	1	4.20
5	61	6	6.8	3	5	3	1	1	4.50
5	61	6	6.8	3	5	3	2	1	3.20
5	61	6	6.8	3	5	3	3	1	3.60
5	61	6	6.8	3	5	3	4	1	3.60
5	61	6	6.8	3	5	3	5	1	2.80
5	61	6	6.8	3	5	4	1	1	3.60
5	61	6	6.8	3	5	4	2	1	4.10
5	61	6	6.8	3	5	4	3	1	4.90
5	61	6	6.8	3	5	4	4	1	0.55
5	61	6	6.8	3	5	4	5	1	4.70

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VCLT
5	61	6	6.8	3	5	5	1	1	3.50
5	61	6	6.8	3	5	5	2	1	4.40
5	61	6	6.8	3	5	5	3	1	3.00
5	61	6	6.8	3	5	5	4	1	3.80
5	61	6	6.8	3	5	5	5	1	4.00
5	61	6	6.8	3	5	1	1	2	3.00
5	61	6	6.8	3	5	1	2	2	5.10
5	61	6	6.8	3	5	1	3	2	5.40
5	61	6	6.8	3	5	1	4	2	4.40
5	61	6	6.8	3	5	1	5	2	5.10
5	61	6	6.8	3	5	2	1	2	4.70
5	61	6	6.8	3	5	2	2	2	0.60
5	61	6	6.8	3	5	2	3	2	4.80
5	61	6	6.8	3	5	2	4	2	5.50
5	61	6	6.8	3	5	2	5	2	5.80
5	61	6	6.8	3	5	3	1	2	4.80
5	61	6	6.8	3	5	3	2	2	5.20
5	61	6	6.8	3	5	3	3	2	5.00
5	61	6	6.8	3	5	3	4	2	5.10
5	61	6	6.8	3	5	3	5	2	5.20
5	61	6	6.8	3	5	4	1	2	5.40
5	61	6	6.8	3	5	4	2	2	4.50
5	61	6	6.8	3	5	4	3	2	4.50
5	61	6	6.8	3	5	4	4	2	0.50
5	61	6	6.8	3	5	4	5	2	5.30
5	61	6	6.8	3	5	5	1	2	0.50
5	61	6	6.8	3	5	5	2	2	4.20
5	61	6	6.8	3	5	5	3	2	5.60
5	61	6	6.8	3	5	5	4	2	4.50
5	61	6	6.8	3	5	5	5	2	5.30
5	61	6	6.8	3	5	1	1	3	5.60
5	61	6	6.8	3	5	1	2	3	5.00
5	61	6	6.8	3	5	1	3	3	5.60
5	61	6	6.8	3	5	1	4	3	6.10
5	61	6	6.8	3	5	1	5	3	4.60
5	61	6	6.8	3	5	2	1	3	5.00
5	61	6	6.8	3	5	2	2	3	2.60
5	61	6	6.8	3	5	2	3	3	5.60
5	61	6	6.8	3	5	2	4	3	5.30
5	61	6	6.8	3	5	2	5	3	5.80
5	61	6	6.8	3	5	3	1	3	5.10
5	61	6	6.8	3	5	3	2	3	5.00
5	61	6	6.8	3	5	3	3	3	5.00
5	61	6	6.8	3	5	3	4	3	5.20
5	61	6	6.8	3	5	3	5	3	5.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
5	61	6	6.8	3	5	4	1	3	1.40
5	61	6	6.8	3	5	4	2	3	5.80
5	61	6	6.8	3	5	4	3	3	4.20
5	61	6	6.8	3	5	4	4	3	4.40
5	61	6	6.8	3	5	4	5	3	5.50
5	61	6	6.8	3	5	5	1	3	4.00
5	61	6	6.8	3	5	5	2	3	5.00
5	61	6	6.8	3	5	5	3	3	5.20
5	61	6	6.8	3	5	5	4	3	5.50
5	61	6	6.8	3	5	5	5	3	5.90
5	61	6	6.8	3	5	1	1	4	5.20
5	61	6	6.8	3	5	1	2	4	5.60
5	61	6	6.8	3	5	1	3	4	5.60
5	61	6	6.8	3	5	1	4	4	5.20
5	61	6	6.8	3	5	1	5	4	5.60
5	61	6	6.8	3	5	2	1	4	4.60
5	61	6	6.8	3	5	2	2	4	5.20
5	61	6	6.8	3	5	2	3	4	4.60
5	61	6	6.8	3	5	2	4	4	5.60
5	61	6	6.8	3	5	2	5	4	5.20
5	61	6	6.8	3	5	3	1	4	5.10
5	61	6	6.8	3	5	3	2	4	5.20
5	61	6	6.8	3	5	3	3	4	3.50
5	61	6	6.8	3	5	3	4	4	5.00
5	61	6	6.8	3	5	3	5	4	5.40
5	61	6	6.8	3	5	4	1	4	5.60
5	61	6	6.8	3	5	4	2	4	4.00
5	61	6	6.8	3	5	4	3	4	4.80
5	61	6	6.8	3	5	4	4	4	4.70
5	61	6	6.8	3	5	4	5	4	5.80
5	61	6	6.8	3	5	5	1	4	4.00
5	61	6	6.8	3	5	5	2	4	0.70
5	61	6	6.8	3	5	5	3	4	5.10
5	61	6	6.8	3	5	5	4	4	5.00
5	61	6	6.8	3	5	5	5	4	5.70
5	41	6	6.8	3	5	1	1	1	5.50
5	41	6	6.8	3	5	1	2	1	5.60
5	41	6	6.8	3	5	1	3	1	6.00
5	41	6	6.8	3	5	1	4	1	4.60
5	41	6	6.8	3	5	1	5	1	5.30
5	41	6	6.8	3	5	2	1	1	5.60
5	41	6	6.8	3	5	2	2	1	5.00
5	41	6	6.8	3	5	2	3	1	5.60
5	41	6	6.8	3	5	2	4	1	5.20
5	41	6	6.8	3	5	2	5	1	4.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
5	41	6	6.8	3	5	3	1	1	4.80
5	41	6	6.8	3	5	3	2	1	5.40
5	41	6	6.8	3	5	3	3	1	5.50
5	41	6	6.8	3	5	3	4	1	5.30
5	41	6	6.8	3	5	3	5	1	6.00
5	41	6	6.8	3	5	4	1	1	4.90
5	41	6	6.8	3	5	4	2	1	5.80
5	41	6	6.8	3	5	4	3	1	5.50
5	41	6	6.8	3	5	4	4	1	6.10
5	41	6	6.8	3	5	4	5	1	5.30
5	41	6	6.8	3	5	5	1	1	5.90
5	41	6	6.8	3	5	5	2	1	5.90
5	41	6	6.8	3	5	5	3	1	5.90
5	41	6	6.8	3	5	5	4	1	6.10
5	41	6	6.8	3	5	5	5	1	5.60
5	41	6	6.8	3	5	1	1	2	4.50
5	41	6	6.8	3	5	1	2	2	5.40
5	41	6	6.8	3	5	1	3	2	6.30
5	41	6	6.8	3	5	1	4	2	5.20
5	41	6	6.8	3	5	1	5	2	5.40
5	41	6	6.8	3	5	2	1	2	5.50
5	41	6	6.8	3	5	2	2	2	5.20
5	41	6	6.8	3	5	2	3	2	5.70
5	41	6	6.8	3	5	2	4	2	5.90
5	41	6	6.8	3	5	2	5	2	4.60
5	41	6	6.8	3	5	3	1	2	5.40
5	41	6	6.8	3	5	3	2	2	5.90
5	41	6	6.8	3	5	3	3	2	6.30
5	41	6	6.8	3	5	3	4	2	5.30
5	41	6	6.8	3	5	3	5	2	5.80
5	41	6	6.8	3	5	4	1	2	5.80
5	41	6	6.8	3	5	4	2	2	6.00
5	41	6	6.8	3	5	4	3	2	6.20
5	41	6	6.8	3	5	4	4	2	6.00
5	41	6	6.8	3	5	4	5	2	5.50
5	41	6	6.8	3	5	5	1	2	6.00
5	41	6	6.8	3	5	5	2	2	5.90
5	41	6	6.8	3	5	5	3	2	5.90
5	41	6	6.8	3	5	5	4	2	6.40
5	41	6	6.8	3	5	5	5	2	6.50
5	41	6	6.8	3	5	1	1	3	6.60
5	41	6	6.8	3	5	1	2	3	5.60
5	41	6	6.8	3	5	1	3	3	6.10
5	41	6	6.8	3	5	1	4	3	6.50
5	41	6	6.8	3	5	1	5	3	6.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
5	41	6	6.8	3	5	2	1	3	6.20
5	41	6	6.8	3	5	2	2	3	6.40
5	41	6	6.8	3	5	2	3	3	6.90
5	41	6	6.8	3	5	2	4	3	6.00
5	41	6	6.8	3	5	2	5	3	5.90
5	41	6	6.8	3	5	3	1	3	6.80
5	41	6	6.8	3	5	3	2	3	5.80
5	41	6	6.8	3	5	3	3	3	5.70
5	41	6	6.8	3	5	3	4	3	7.00
5	41	6	6.8	3	5	3	5	3	7.00
5	41	6	6.8	3	5	4	1	3	5.00
5	41	6	6.8	3	5	4	2	3	6.80
5	41	6	6.8	3	5	4	3	3	6.40
5	41	6	6.8	3	5	4	4	3	6.60
5	41	6	6.8	3	5	4	5	3	6.40
5	41	6	6.8	3	5	5	1	3	7.00
5	41	6	6.8	3	5	5	2	3	6.60
5	41	6	6.8	3	5	5	3	3	5.90
5	41	6	6.8	3	5	5	4	3	6.80
5	41	6	6.8	3	5	5	5	3	5.40
5	41	6	6.8	3	5	1	1	4	5.00
5	41	6	6.8	3	5	1	2	4	5.50
5	41	6	6.8	3	5	1	3	4	5.90
5	41	6	6.8	3	5	1	4	4	4.50
5	41	6	6.8	3	5	1	5	4	5.90
5	41	6	6.8	3	5	2	1	4	5.70
5	41	6	6.8	3	5	2	2	4	4.50
5	41	6	6.8	3	5	2	3	4	6.10
5	41	6	6.8	3	5	2	4	4	6.50
5	41	6	6.8	3	5	2	5	4	6.00
5	41	6	6.8	3	5	3	1	4	5.30
5	41	6	6.8	3	5	3	2	4	6.00
5	41	6	6.8	3	5	3	3	4	5.80
5	41	6	6.8	3	5	3	4	4	5.90
5	41	6	6.8	3	5	3	5	4	5.90
5	41	6	6.8	3	5	4	1	4	5.70
5	41	6	6.8	3	5	4	2	4	4.00
5	41	6	6.8	3	5	4	3	4	5.70
5	41	6	6.8	3	5	4	4	4	5.20
5	41	6	6.8	3	5	4	5	4	6.10
5	41	6	6.8	3	5	5	1	4	5.60
5	41	6	6.8	3	5	5	2	4	5.20
5	41	6	6.8	3	5	5	3	4	5.50
5	41	6	6.8	3	5	5	4	4	6.00
5	41	6	6.8	3	5	5	5	4	6.30

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VOLT
6	61	6	6.8	3	5	1	1	1	3.20
6	61	6	6.8	3	5	1	2	1	3.10
6	61	6	6.8	3	5	1	3	1	2.75
6	61	6	6.8	3	5	1	4	1	2.80
6	61	6	6.8	3	5	1	5	1	2.00
6	61	6	6.8	3	5	2	1	1	2.40
6	61	6	6.8	3	5	2	2	1	1.68
6	61	6	6.8	3	5	2	3	1	2.90
6	61	6	6.8	3	5	2	4	1	3.30
6	61	6	6.8	3	5	2	5	1	3.40
6	61	6	6.8	3	5	3	1	1	3.80
6	61	6	6.8	3	5	3	2	1	2.40
6	61	6	6.8	3	5	3	3	1	3.50
6	61	6	6.8	3	5	3	4	1	4.10
6	61	6	6.8	3	5	3	5	1	3.30
6	61	6	6.8	3	5	4	1	1	3.90
6	61	6	6.8	3	5	4	2	1	2.30
6	61	6	6.8	3	5	4	3	1	3.00
6	61	6	6.8	3	5	4	4	1	2.65
6	61	6	6.8	3	5	4	5	1	3.80
6	61	6	6.8	3	5	5	1	1	3.50
6	61	6	6.8	3	5	5	2	1	2.55
6	61	6	6.8	3	5	5	3	1	3.30
6	61	6	6.8	3	5	5	4	1	2.70
6	61	6	6.8	3	5	5	5	1	2.50
6	61	6	6.8	3	5	1	1	2	3.50
6	61	6	6.8	3	5	1	2	2	3.20
6	61	6	6.8	3	5	1	3	2	3.00
6	61	6	6.8	3	5	1	4	2	3.20
6	61	6	6.8	3	5	1	5	2	2.40
6	61	6	6.8	3	5	2	1	2	3.20
6	61	6	6.8	3	5	2	2	2	2.80
6	61	6	6.8	3	5	2	3	2	3.40
6	61	6	6.8	3	5	2	4	2	3.90
6	61	6	6.8	3	5	2	5	2	3.60
6	61	6	6.8	3	5	3	1	2	4.00
6	61	6	6.8	3	5	3	2	2	3.40
6	61	6	6.8	3	5	3	3	2	3.60
6	61	6	6.8	3	5	3	4	2	3.60
6	61	6	6.8	3	5	3	5	2	3.80
6	61	6	6.8	3	5	4	1	2	3.70
6	61	6	6.8	3	5	4	2	2	3.70
6	61	6	6.8	3	5	4	3	2	2.60
6	61	6	6.8	3	5	4	4	2	3.30
6	61	6	6.8	3	5	4	5	2	3.80

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
6	61	6	6.8	3	5	5	1	2	3.00
6	61	6	6.8	3	5	5	2	2	3.00
6	61	6	6.8	3	5	5	3	2	3.60
6	61	6	6.8	3	5	5	4	2	3.40
6	61	6	6.8	3	5	5	5	2	2.40
6	61	6	6.8	3	5	1	1	3	4.40
6	61	6	6.8	3	5	1	2	3	2.70
6	61	6	6.8	3	5	1	3	3	4.00
6	61	6	6.8	3	5	1	4	3	4.00
6	61	6	6.8	3	5	1	5	3	4.00
6	61	6	6.8	3	5	2	1	3	4.40
6	61	6	6.8	3	5	2	2	3	3.40
6	61	6	6.8	3	5	2	3	3	2.80
6	61	6	6.8	3	5	2	4	3	3.80
6	61	6	6.8	3	5	2	5	3	4.40
6	61	6	6.8	3	5	3	1	3	4.50
6	61	6	6.8	3	5	3	2	3	4.50
6	61	6	6.8	3	5	3	3	3	3.60
6	61	6	6.8	3	5	3	4	3	3.50
6	61	6	6.8	3	5	3	5	3	4.10
6	61	6	6.8	3	5	4	1	3	4.30
6	61	6	6.8	3	5	4	2	3	4.20
6	61	6	6.8	3	5	4	3	3	3.30
6	61	6	6.8	3	5	4	4	3	3.20
6	61	6	6.8	3	5	4	5	3	3.80
6	61	6	6.8	3	5	5	1	3	3.80
6	61	6	6.8	3	5	5	2	3	3.50
6	61	6	6.8	3	5	5	3	3	3.80
6	61	6	6.8	3	5	5	4	3	3.40
6	61	6	6.8	3	5	5	5	3	0.36
6	61	6	6.8	3	5	1	1	4	4.80
6	61	6	6.8	3	5	1	2	4	3.80
6	61	6	6.8	3	5	1	3	4	4.40
6	61	6	6.8	3	5	1	4	4	4.20
6	61	6	6.8	3	5	1	5	4	3.10
6	61	6	6.8	3	5	2	1	4	3.90
6	61	6	6.8	3	5	2	2	4	2.80
6	61	6	6.8	3	5	2	3	4	5.10
6	61	6	6.8	3	5	2	4	4	4.20
6	61	6	6.8	3	5	2	5	4	4.80
6	61	6	6.8	3	5	3	1	4	4.20
6	61	6	6.8	3	5	3	2	4	4.60
6	61	6	6.8	3	5	3	3	4	4.90
6	61	6	6.8	3	5	3	4	4	4.60
6	61	6	6.8	3	5	3	5	4	3.90

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
6	61	6	6.8	3	5	4	1	4	4.50
6	61	6	6.8	3	5	4	2	4	3.90
6	61	6	6.8	3	5	4	3	4	3.80
6	61	6	6.8	3	5	4	4	4	3.90
6	61	6	6.8	3	5	4	5	4	4.00
6	61	6	6.8	3	5	5	1	4	3.90
6	61	6	6.8	3	5	5	2	4	3.90
6	61	6	6.8	3	5	5	3	4	4.00
6	61	6	6.8	3	5	5	4	4	4.50
6	61	6	6.8	3	5	5	5	4	3.00
6	61	6	6.8	3	5	1	1	5	4.00
6	61	6	6.8	3	5	1	2	5	2.40
6	61	6	6.8	3	5	1	3	5	3.40
6	61	6	6.8	3	5	1	4	5	4.20
6	61	6	6.8	3	5	1	5	5	2.40
6	61	6	6.8	3	5	2	1	5	3.30
6	61	6	6.8	3	5	2	2	5	3.40
6	61	6	6.8	3	5	2	3	5	3.90
6	61	6	6.8	3	5	2	4	5	3.60
6	61	6	6.8	3	5	2	5	5	3.30
6	61	6	6.8	3	5	3	1	5	4.20
6	61	6	6.8	3	5	3	2	5	3.50
6	61	6	6.8	3	5	3	3	5	3.70
6	61	6	6.8	3	5	3	4	5	4.40
6	61	6	6.8	3	5	3	5	5	4.40
6	61	6	6.8	3	5	4	1	5	3.70
6	61	6	6.8	3	5	4	2	5	3.70
6	61	6	6.8	3	5	4	3	5	0.50
6	61	6	6.8	3	5	4	4	5	2.90
6	61	6	6.8	3	5	4	5	5	0.70
6	61	6	6.8	3	5	5	1	5	2.60
6	61	6	6.8	3	5	5	2	5	2.80
6	61	6	6.8	3	5	5	3	5	2.20
6	61	6	6.8	3	5	5	4	5	2.80
6	61	6	6.8	3	5	5	5	5	2.70
4	61	6	6.8	3	5	1	1	1	3.00
4	61	6	6.8	3	5	1	2	1	2.60
4	61	6	6.8	3	5	1	3	1	2.00
4	61	6	6.8	3	5	1	4	1	5.00
4	61	6	6.8	3	5	1	5	1	5.60
4	61	6	6.8	3	5	2	1	1	4.10
4	61	6	6.8	3	5	2	2	1	4.40
4	61	6	6.8	3	5	2	3	1	5.40
4	61	6	6.8	3	5	2	4	1	5.60
4	61	6	6.8	3	5	2	5	1	4.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	61	6	6.8	3	5	3	1	1	5.00
4	61	6	6.8	3	5	3	2	1	4.60
4	61	6	6.8	3	5	3	3	1	5.00
4	61	6	6.8	3	5	3	4	1	1.00
4	61	6	6.8	3	5	3	5	1	1.60
4	61	6	6.8	3	5	4	1	1	2.40
4	61	6	6.8	3	5	4	2	1	2.40
4	61	6	6.8	3	5	4	3	1	3.80
4	61	6	6.8	3	5	4	4	1	1.20
4	61	6	6.8	3	5	4	5	1	4.40
4	61	6	6.8	3	5	5	1	1	3.10
4	61	6	6.8	3	5	5	2	1	4.10
4	61	6	6.8	3	5	5	3	1	2.80
4	61	6	6.8	3	5	5	4	1	4.60
4	61	6	6.8	3	5	5	5	1	2.60
4	61	6	6.8	3	5	1	1	2	5.50
4	61	6	6.8	3	5	1	2	2	5.80
4	61	6	6.8	3	5	1	3	2	5.80
4	61	6	6.8	3	5	1	4	2	6.30
4	61	6	6.8	3	5	1	5	2	5.60
4	61	6	6.8	3	5	2	1	2	6.00
4	61	6	6.8	3	5	2	2	2	6.40
4	61	6	6.8	3	5	2	3	2	6.40
4	61	6	6.8	3	5	2	4	2	6.10
4	61	6	6.8	3	5	2	5	2	6.10
4	61	6	6.8	3	5	3	1	2	6.20
4	61	6	6.8	3	5	3	2	2	6.00
4	61	6	6.8	3	5	3	3	2	6.00
4	61	6	6.8	3	5	3	4	2	5.60
4	61	6	6.8	3	5	3	5	2	6.60
4	61	6	6.8	3	5	4	1	2	4.00
4	61	6	6.8	3	5	4	2	2	5.10
4	61	6	6.8	3	5	4	3	2	6.30
4	61	6	6.8	3	5	4	4	2	5.00
4	61	6	6.8	3	5	4	5	2	5.50
4	61	6	6.8	3	5	5	1	2	5.00
4	61	6	6.8	3	5	5	2	2	5.60
4	61	6	6.8	3	5	5	3	2	5.10
4	61	6	6.8	3	5	5	4	2	5.20
4	61	6	6.8	3	5	5	5	2	5.30
4	61	6	6.8	3	5	1	1	3	5.50
4	61	6	6.8	3	5	1	2	3	6.00
4	61	6	6.8	3	5	1	3	3	4.50
4	61	6	6.8	3	5	1	4	3	4.60
4	61	6	6.8	3	5	1	5	3	6.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	61	6	6.8	3	5	2	1	3	5.20
4	61	6	6.8	3	5	2	2	3	5.60
4	61	6	6.8	3	5	2	3	3	6.00
4	61	6	6.8	3	5	2	4	3	0.30
4	61	6	6.8	3	5	2	5	3	6.00
4	61	6	6.8	3	5	3	1	3	6.00
4	61	6	6.8	3	5	3	2	3	5.40
4	61	6	6.8	3	5	3	3	3	6.40
4	61	6	6.8	3	5	3	4	3	5.60
4	61	6	6.8	3	5	3	5	3	5.70
4	61	6	6.8	3	5	4	1	3	3.40
4	61	6	6.8	3	5	4	2	3	5.80
4	61	6	6.8	3	5	4	3	3	5.50
4	61	6	6.8	3	5	4	4	3	5.60
4	61	6	6.8	3	5	4	5	3	5.40
4	61	6	6.8	3	5	5	1	3	5.50
4	61	6	6.8	3	5	5	2	3	5.00
4	61	6	6.8	3	5	5	3	3	5.60
4	61	6	6.8	3	5	5	4	3	5.20
4	61	6	6.8	3	5	5	5	3	5.00
4	61	6	6.8	3	5	1	1	4	5.60
4	61	6	6.8	3	5	1	2	4	5.30
4	61	6	6.8	3	5	1	3	4	4.50
4	61	6	6.8	3	5	1	4	4	5.60
4	61	6	6.8	3	5	1	5	4	5.90
4	61	6	6.8	3	5	2	1	4	6.30
4	61	6	6.8	3	5	2	2	4	6.00
4	61	6	6.8	3	5	2	3	4	5.50
4	61	6	6.8	3	5	2	4	4	0.29
4	61	6	6.8	3	5	2	5	4	5.80
4	61	6	6.8	3	5	3	1	4	3.80
4	61	6	6.8	3	5	3	2	4	6.10
4	61	6	6.8	3	5	3	3	4	4.90
4	61	6	6.8	3	5	3	4	4	5.70
4	61	6	6.8	3	5	3	5	4	5.70
4	61	6	6.8	3	5	4	1	4	5.90
4	61	6	6.8	3	5	4	2	4	5.40
4	61	6	6.8	3	5	4	3	4	4.90
4	61	6	6.8	3	5	4	4	4	5.40
4	61	6	6.8	3	5	4	5	4	5.00
4	61	6	6.8	3	5	5	1	4	5.60
4	61	6	6.8	3	5	5	2	4	4.80
4	61	6	6.8	3	5	5	3	4	5.40
4	61	6	6.8	3	5	5	4	4	4.80
4	61	6	6.8	3	5	5	5	4	5.00

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	61	6	6.8	3	5	1	1	5	2.40
4	61	6	6.8	3	5	1	2	5	5.60
4	61	6	6.8	3	5	1	3	5	6.20
4	61	6	6.8	3	5	1	4	5	5.60
4	61	6	6.8	3	5	1	5	5	5.70
4	61	6	6.8	3	5	2	1	5	6.30
4	61	6	6.8	3	5	2	2	5	6.00
4	61	6	6.8	3	5	2	3	5	5.80
4	61	6	6.8	3	5	2	4	5	5.00
4	61	6	6.8	3	5	2	5	5	6.20
4	61	6	6.8	3	5	3	1	5	5.60
4	61	6	6.8	3	5	3	2	5	6.00
4	61	6	6.8	3	5	3	3	5	5.50
4	61	6	6.8	3	5	3	4	5	5.80
4	61	6	6.8	3	5	3	5	5	5.60
4	61	6	6.8	3	5	4	1	5	5.80
4	61	6	6.8	3	5	4	2	5	5.50
4	61	6	6.8	3	5	4	3	5	5.00
4	61	6	6.8	3	5	4	4	5	5.20
4	61	6	6.8	3	5	4	5	5	5.00
4	61	6	6.8	3	5	5	1	5	5.60
4	61	6	6.8	3	5	5	2	5	6.00
4	61	6	6.8	3	5	5	3	5	5.60
4	61	6	6.8	3	5	5	4	5	4.90
4	61	6	6.8	3	5	5	5	5	5.50
4	41	6	6.8	3	5	1	1	1	5.20
4	41	6	6.8	3	5	1	2	1	2.20
4	41	6	6.8	3	5	1	3	1	2.00
4	41	6	6.8	3	5	1	4	1	5.20
4	41	6	6.8	3	5	1	5	1	5.60
4	41	6	6.8	3	5	2	1	1	5.20
4	41	6	6.8	3	5	2	2	1	3.60
4	41	6	6.8	3	5	2	3	1	2.80
4	41	6	6.8	3	5	2	4	1	5.60
4	41	6	6.8	3	5	2	5	1	1.60
4	41	6	6.8	3	5	3	1	1	4.80
4	41	6	6.8	3	5	3	2	1	4.80
4	41	6	6.8	3	5	3	3	1	4.00
4	41	6	6.8	3	5	3	4	1	5.20
4	41	6	6.8	3	5	3	5	1	1.60
4	41	6	6.8	3	5	4	1	1	3.80
4	41	6	6.8	3	5	4	2	1	4.20
4	41	6	6.8	3	5	4	3	1	4.80
4	41	6	6.8	3	5	4	4	1	3.20
4	41	6	6.8	3	5	4	5	1	4.40

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	41	6	6.8	3	5	5	1	1	0.80
4	41	6	6.8	3	5	5	2	1	2.50
4	41	6	6.8	3	5	5	3	1	0.64
4	41	6	6.8	3	5	5	4	1	3.40
4	41	6	6.8	3	5	5	5	1	1.10
4	41	6	6.8	3	5	1	1	2	5.40
4	41	6	6.8	3	5	1	2	2	6.00
4	41	6	6.8	3	5	1	3	2	1.60
4	41	6	6.8	3	5	1	4	2	3.00
4	41	6	6.8	3	5	1	5	2	5.20
4	41	6	6.8	3	5	2	1	2	5.60
4	41	6	6.8	3	5	2	2	2	4.80
4	41	6	6.8	3	5	2	3	2	4.80
4	41	6	6.8	3	5	2	4	2	5.80
4	41	6	6.8	3	5	2	5	2	5.00
4	41	6	6.8	3	5	3	1	2	4.60
4	41	6	6.8	3	5	3	2	2	5.00
4	41	6	6.8	3	5	3	3	2	5.00
4	41	6	6.8	3	5	3	4	2	5.50
4	41	6	6.8	3	5	3	5	2	0.80
4	41	6	6.8	3	5	4	1	2	4.00
4	41	6	6.8	3	5	4	2	2	3.30
4	41	6	6.8	3	5	4	3	2	4.20
4	41	6	6.8	3	5	4	4	2	2.80
4	41	6	6.8	3	5	4	5	2	2.60
4	41	6	6.8	3	5	5	1	2	3.80
4	41	6	6.8	3	5	5	2	2	4.20
4	41	6	6.8	3	5	5	3	2	4.60
4	41	6	6.8	3	5	5	4	2	4.40
4	41	6	6.8	3	5	5	5	2	3.80
4	41	6	6.8	3	5	1	1	3	4.70
4	41	6	6.8	3	5	1	2	3	2.20
4	41	6	6.8	3	5	1	3	3	1.80
4	41	6	6.8	3	5	1	4	3	5.10
4	41	6	6.8	3	5	1	5	3	5.20
4	41	6	6.8	3	5	2	1	3	5.00
4	41	6	6.8	3	5	2	2	3	5.00
4	41	6	6.8	3	5	2	3	3	3.00
4	41	6	6.8	3	5	2	4	3	1.80
4	41	6	6.8	3	5	2	5	3	5.60
4	41	6	6.8	3	5	3	1	3	3.20
4	41	6	6.8	3	5	3	2	3	1.40
4	41	6	6.8	3	5	3	3	3	3.40
4	41	6	6.8	3	5	3	4	3	2.60
4	41	6	6.8	3	5	3	5	3	3.00

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	41	6	6.8	3	5	4	1	3	3.80
4	41	6	6.8	3	5	4	2	3	3.40
4	41	6	6.8	3	5	4	3	3	4.80
4	41	6	6.8	3	5	4	4	3	4.80
4	41	6	6.8	3	5	4	5	3	4.80
4	41	6	6.8	3	5	5	1	3	4.40
4	41	6	6.8	3	5	5	2	3	4.60
4	41	6	6.8	3	5	5	3	3	4.60
4	41	6	6.8	3	5	5	4	3	4.40
4	41	6	6.8	3	5	5	5	3	3.40
4	41	6	6.8	3	5	1	1	4	4.40
4	41	6	6.8	3	5	1	2	4	4.00
4	41	6	6.8	3	5	1	3	4	5.60
4	41	6	6.8	3	5	1	4	4	5.00
4	41	6	6.8	3	5	1	5	4	6.80
4	41	6	6.8	3	5	2	1	4	5.00
4	41	6	6.8	3	5	2	2	4	5.20
4	41	6	6.8	3	5	2	3	4	5.80
4	41	6	6.8	3	5	2	4	4	6.30
4	41	6	6.8	3	5	2	5	4	5.10
4	41	6	6.8	3	5	3	1	4	4.00
4	41	6	6.8	3	5	3	2	4	5.80
4	41	6	6.8	3	5	3	3	4	5.70
4	41	6	6.8	3	5	3	4	4	3.10
4	41	6	6.8	3	5	3	5	4	4.00
4	41	6	6.8	3	5	4	1	4	5.40
4	41	6	6.8	3	5	4	2	4	4.80
4	41	6	6.8	3	5	4	3	4	5.00
4	41	6	6.8	3	5	4	4	4	2.40
4	41	6	6.8	3	5	4	5	4	5.00
4	41	6	6.8	3	5	5	1	4	4.00
4	41	6	6.8	3	5	5	2	4	5.40
4	41	6	6.8	3	5	5	3	4	5.20
4	41	6	6.8	3	5	5	4	4	5.20
4	41	6	6.8	3	5	5	5	4	5.00
4	41	6	6.8	3	5	1	1	5	3.00
4	41	6	6.8	3	5	1	2	5	5.00
4	41	6	6.8	3	5	1	3	5	6.40
4	41	6	6.8	3	5	1	4	5	6.50
4	41	6	6.8	3	5	1	5	5	5.30
4	41	6	6.8	3	5	2	1	5	0.60
4	41	6	6.8	3	5	2	2	5	6.50
4	41	6	6.8	3	5	2	3	5	4.20
4	41	6	6.8	3	5	2	4	5	5.40
4	41	6	6.8	3	5	2	5	5	4.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	41	6	6.8	3	5	3	1	5	5.20
4	41	6	6.8	3	5	3	2	5	4.60
4	41	6	6.8	3	5	3	3	5	5.00
4	41	6	6.8	3	5	3	4	5	5.70
4	41	6	6.8	3	5	3	5	5	6.10
4	41	6	6.8	3	5	4	1	5	4.00
4	41	6	6.8	3	5	4	2	5	5.20
4	41	6	6.8	3	5	4	3	5	2.70
4	41	6	6.8	3	5	4	4	5	5.30
4	41	6	6.8	3	5	4	5	5	5.50
4	41	6	6.8	3	5	5	1	5	4.30
4	41	6	6.8	3	5	5	2	5	4.20
4	41	6	6.8	3	5	5	3	5	5.40
4	41	6	6.8	3	5	5	4	5	3.40
4	41	6	6.8	3	5	5	5	5	5.20
2	61	6	6.8	3	5	1	1	1	4.60
2	61	6	6.8	3	5	1	2	1	5.00
2	61	6	6.8	3	5	1	3	1	3.20
2	61	6	6.8	3	5	1	4	1	3.60
2	61	6	6.8	3	5	1	5	1	3.60
2	61	6	6.8	3	5	2	1	1	2.00
2	61	6	6.8	3	5	2	2	1	1.80
2	61	6	6.8	3	5	2	3	1	5.50
2	61	6	6.8	3	5	2	4	1	5.20
2	61	6	6.8	3	5	2	5	1	5.40
2	61	6	6.8	3	5	3	1	1	5.30
2	61	6	6.8	3	5	3	2	1	4.40
2	61	6	6.8	3	5	3	3	1	5.50
2	61	6	6.8	3	5	3	4	1	5.70
2	61	6	6.8	3	5	3	5	1	6.00
2	61	6	6.8	3	5	4	1	1	5.30
2	61	6	6.8	3	5	4	2	1	3.40
2	61	6	6.8	3	5	4	3	1	5.10
2	61	6	6.8	3	5	4	4	1	2.90
2	61	6	6.8	3	5	4	5	1	5.20
2	61	6	6.8	3	5	5	1	1	5.40
2	61	6	6.8	3	5	5	2	1	3.60
2	61	6	6.8	3	5	5	3	1	5.00
2	61	6	6.8	3	5	5	4	1	3.60
2	61	6	6.8	3	5	5	5	1	4.10
2	61	6	6.8	3	5	1	1	2	5.80
2	61	6	6.8	3	5	1	2	2	4.90
2	61	6	6.8	3	5	1	3	2	5.30
2	61	6	6.8	3	5	1	4	2	5.60
2	61	6	6.8	3	5	1	5	2	6.20

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	61	6	6.8	3	5	2	1	2	5.80
2	61	6	6.8	3	5	2	2	2	6.00
2	61	6	6.8	3	5	2	3	2	5.90
2	61	6	6.8	3	5	2	4	2	5.40
2	61	6	6.8	3	5	2	5	2	5.00
2	61	6	6.8	3	5	3	1	2	6.50
2	61	6	6.8	3	5	3	2	2	5.50
2	61	6	6.8	3	5	3	3	2	6.20
2	61	6	6.8	3	5	3	4	2	6.70
2	61	6	6.8	3	5	3	5	2	6.60
2	61	6	6.8	3	5	4	1	2	6.30
2	61	6	6.8	3	5	4	2	2	6.20
2	61	6	6.8	3	5	4	3	2	5.80
2	61	6	6.8	3	5	4	4	2	6.10
2	61	6	6.8	3	5	4	5	2	6.60
2	61	6	6.8	3	5	5	1	2	6.50
2	61	6	6.8	3	5	5	2	2	5.00
2	61	6	6.8	3	5	5	3	2	5.30
2	61	6	6.8	3	5	5	4	2	5.50
2	61	6	6.8	3	5	5	5	2	5.60
2	61	6	6.8	3	5	1	1	3	5.60
2	61	6	6.8	3	5	1	2	3	6.60
2	61	6	6.8	3	5	1	3	3	5.60
2	61	6	6.8	3	5	1	4	3	6.20
2	61	6	6.8	3	5	1	5	3	5.70
2	61	6	6.8	3	5	2	1	3	6.10
2	61	6	6.8	3	5	2	2	3	5.50
2	61	6	6.8	3	5	2	3	3	5.60
2	61	6	6.8	3	5	2	4	3	6.30
2	61	6	6.8	3	5	2	5	3	6.00
2	61	6	6.8	3	5	3	1	3	6.00
2	61	6	6.8	3	5	3	2	3	6.40
2	61	6	6.8	3	5	3	3	3	5.50
2	61	6	6.8	3	5	3	4	3	6.40
2	61	6	6.8	3	5	3	5	3	6.80
2	61	6	6.8	3	5	4	1	3	6.60
2	61	6	6.8	3	5	4	2	3	6.00
2	61	6	6.8	3	5	4	3	3	6.40
2	61	6	6.8	3	5	4	4	3	6.40
2	61	6	6.8	3	5	4	5	3	6.60
2	61	6	6.8	3	5	5	1	3	5.70
2	61	6	6.8	3	5	5	2	3	5.70
2	61	6	6.8	3	5	5	3	3	6.20
2	61	6	6.8	3	5	5	4	3	6.10
2	61	6	6.8	3	5	5	5	3	5.70

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	61	6	6.8	3	5	1	1	4	6.10
2	61	6	6.8	3	5	1	2	4	6.00
2	61	6	6.8	3	5	1	3	4	6.20
2	61	6	6.8	3	5	1	4	4	3.10
2	61	6	6.8	3	5	1	5	4	6.60
2	61	6	6.8	3	5	2	1	4	5.60
2	61	6	6.8	3	5	2	2	4	5.60
2	61	6	6.8	3	5	2	3	4	5.10
2	61	6	6.8	3	5	2	4	4	5.80
2	61	6	6.8	3	5	2	5	4	5.40
2	61	6	6.8	3	5	3	1	4	6.60
2	61	6	6.8	3	5	3	2	4	6.20
2	61	6	6.8	3	5	3	3	4	6.00
2	61	6	6.8	3	5	3	4	4	6.40
2	61	6	6.8	3	5	3	5	4	6.70
2	61	6	6.8	3	5	4	1	4	6.50
2	61	6	6.8	3	5	4	2	4	6.30
2	61	6	6.8	3	5	4	3	4	6.50
2	61	6	6.8	3	5	4	4	4	6.80
2	61	6	6.8	3	5	4	5	4	6.60
2	61	6	6.8	3	5	5	1	4	5.50
2	61	6	6.8	3	5	5	2	4	5.90
2	61	6	6.8	3	5	5	3	4	5.80
2	61	6	6.8	3	5	5	4	4	6.10
2	61	6	6.8	3	5	5	5	4	5.80
2	61	6	6.8	3	5	1	1	5	3.70
2	61	6	6.8	3	5	1	2	5	5.40
2	61	6	6.8	3	5	1	3	5	5.50
2	61	6	6.8	3	5	1	4	5	5.20
2	61	6	6.8	3	5	1	5	5	5.90
2	61	6	6.8	3	5	2	1	5	5.50
2	61	6	6.8	3	5	2	2	5	6.20
2	61	6	6.8	3	5	2	3	5	6.40
2	61	6	6.8	3	5	2	4	5	5.60
2	61	6	6.8	3	5	2	5	5	5.80
2	61	6	6.8	3	5	3	1	5	6.10
2	61	6	6.8	3	5	3	2	5	6.00
2	61	6	6.8	3	5	3	3	5	5.80
2	61	6	6.8	3	5	3	4	5	6.40
2	61	6	6.8	3	5	3	5	5	7.00
2	61	6	6.8	3	5	4	1	5	6.00
2	61	6	6.8	3	5	4	2	5	6.00
2	61	6	6.8	3	5	4	3	5	5.60
2	61	6	6.8	3	5	4	4	5	6.40
2	61	6	6.8	3	5	4	5	5	6.70

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	61	6	6.8	3	5	5	1	5	6.00
2	61	6	6.8	3	5	5	2	5	5.00
2	61	6	6.8	3	5	5	3	5	6.20
2	61	6	6.8	3	5	5	4	5	5.70
2	61	6	6.8	3	5	5	5	5	6.30
2	41	6	6.8	3	5	1	1	1	1.60
2	41	6	6.8	3	5	1	2	1	6.80
2	41	6	6.8	3	5	1	3	1	3.00
2	41	6	6.8	3	5	1	4	1	3.70
2	41	6	6.8	3	5	1	5	1	4.40
2	41	6	6.8	3	5	2	1	1	4.00
2	41	6	6.8	3	5	2	2	1	4.80
2	41	6	6.8	3	5	2	3	1	6.20
2	41	6	6.8	3	5	2	4	1	4.40
2	41	6	6.8	3	5	2	5	1	3.30
2	41	6	6.8	3	5	3	1	1	4.10
2	41	6	6.8	3	5	3	2	1	3.80
2	41	6	6.8	3	5	3	3	1	3.90
2	41	6	6.8	3	5	3	4	1	5.60
2	41	6	6.8	3	5	3	5	1	6.30
2	41	6	6.8	3	5	4	1	1	4.00
2	41	6	6.8	3	5	4	2	1	5.80
2	41	6	6.8	3	5	4	3	1	3.30
2	41	6	6.8	3	5	4	4	1	5.70
2	41	6	6.8	3	5	4	5	1	1.70
2	41	6	6.8	3	5	5	1	1	6.00
2	41	6	6.8	3	5	5	2	1	4.60
2	41	6	6.8	3	5	5	3	1	4.40
2	41	6	6.8	3	5	5	4	1	5.10
2	41	6	6.8	3	5	5	5	1	5.00
2	41	6	6.8	3	5	1	1	2	5.80
2	41	6	6.8	3	5	1	2	2	5.50
2	41	6	6.8	3	5	1	3	2	4.00
2	41	6	6.8	3	5	1	4	2	5.70
2	41	6	6.8	3	5	1	5	2	6.30
2	41	6	6.8	3	5	2	1	2	1.20
2	41	6	6.8	3	5	2	2	2	3.00
2	41	6	6.8	3	5	2	3	2	4.50
2	41	6	6.8	3	5	2	4	2	5.90
2	41	6	6.8	3	5	2	5	2	6.20
2	41	6	6.8	3	5	3	1	2	4.80
2	41	6	6.8	3	5	3	2	2	5.00
2	41	6	6.8	3	5	3	3	2	6.10
2	41	6	6.8	3	5	3	4	2	3.20
2	41	6	6.8	3	5	3	5	2	6.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	41	6	6.8	3	5	4	1	2	6.00
2	41	6	6.8	3	5	4	2	2	5.40
2	41	6	6.8	3	5	4	3	2	5.80
2	41	6	6.8	3	5	4	4	2	5.80
2	41	6	6.8	3	5	4	5	2	6.80
2	41	6	6.8	3	5	5	1	2	4.80
2	41	6	6.8	3	5	5	2	2	4.60
2	41	6	6.8	3	5	5	3	2	5.80
2	41	6	6.8	3	5	5	4	2	5.50
2	41	6	6.8	3	5	5	5	2	5.00
2	41	6	6.8	3	5	1	1	3	6.40
2	41	6	6.8	3	5	1	2	3	6.00
2	41	6	6.8	3	5	1	3	3	3.20
2	41	6	6.8	3	5	1	4	3	2.20
2	41	6	6.8	3	5	1	5	3	6.30
2	41	6	6.8	3	5	2	1	3	4.80
2	41	6	6.8	3	5	2	2	3	6.10
2	41	6	6.8	3	5	2	3	3	5.60
2	41	6	6.8	3	5	2	4	3	3.70
2	41	6	6.8	3	5	2	5	3	4.00
2	41	6	6.8	3	5	3	1	3	5.10
2	41	6	6.8	3	5	3	2	3	6.70
2	41	6	6.8	3	5	3	3	3	3.60
2	41	6	6.8	3	5	3	4	3	5.60
2	41	6	6.8	3	5	3	5	3	6.50
2	41	6	6.8	3	5	4	1	3	5.80
2	41	6	6.8	3	5	4	2	3	5.50
2	41	6	6.8	3	5	4	3	3	5.60
2	41	6	6.8	3	5	4	4	3	5.70
2	41	6	6.8	3	5	4	5	3	5.70
2	41	6	6.8	3	5	5	1	3	5.70
2	41	6	6.8	3	5	5	2	3	5.70
2	41	6	6.8	3	5	5	3	3	5.00
2	41	6	6.8	3	5	5	4	3	6.20
2	41	6	6.8	3	5	5	5	3	5.10
2	41	6	6.8	3	5	1	1	4	6.70
2	41	6	6.8	3	5	1	2	4	6.00
2	41	6	6.8	3	5	1	3	4	6.00
2	41	6	6.8	3	5	1	4	4	2.00
2	41	6	6.8	3	5	1	5	4	6.20
2	41	6	6.8	3	5	2	1	4	3.60
2	41	6	6.8	3	5	2	2	4	6.00
2	41	6	6.8	3	5	2	3	4	5.60
2	41	6	6.8	3	5	2	4	4	5.60
2	41	6	6.8	3	5	2	5	4	3.50

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VOLT
2	41	6	6.8	3	5	3	1	4	5.60
2	41	6	6.8	3	5	3	2	4	4.40
2	41	6	6.8	3	5	3	3	4	6.00
2	41	6	6.8	3	5	3	4	4	3.60
2	41	6	6.8	3	5	3	5	4	6.10
2	41	6	6.8	3	5	4	1	4	5.10
2	41	6	6.8	3	5	4	2	4	5.50
2	41	6	6.8	3	5	4	3	4	5.00
2	41	6	6.8	3	5	4	4	4	5.80
2	41	6	6.8	3	5	4	5	4	5.60
2	41	6	6.8	3	5	5	1	4	3.00
2	41	6	6.8	3	5	5	2	4	6.00
2	41	6	6.8	3	5	5	3	4	6.20
2	41	6	6.8	3	5	5	4	4	5.60
2	41	6	6.8	3	5	5	5	4	1.80
2	41	6	6.8	3	5	1	1	5	5.80
2	41	6	6.8	3	5	1	2	5	5.80
2	41	6	6.8	3	5	1	3	5	3.20
2	41	6	6.8	3	5	1	4	5	5.00
2	41	6	6.8	3	5	1	5	5	6.00
2	41	6	6.8	3	5	2	1	5	3.30
2	41	6	6.8	3	5	2	2	5	5.60
2	41	6	6.8	3	5	2	3	5	6.40
2	41	6	6.8	3	5	2	4	5	5.90
2	41	6	6.8	3	5	2	5	5	2.00
2	41	6	6.8	3	5	3	1	5	5.60
2	41	6	6.8	3	5	3	2	5	5.00
2	41	6	6.8	3	5	3	3	5	4.60
2	41	6	6.8	3	5	3	4	5	5.70
2	41	6	6.8	3	5	3	5	5	6.40
2	41	6	6.8	3	5	4	1	5	5.00
2	41	6	6.8	3	5	4	2	5	4.60
2	41	6	6.8	3	5	4	3	5	5.30
2	41	6	6.8	3	5	4	4	5	5.90
2	41	6	6.8	3	5	4	5	5	6.00
2	41	6	6.8	3	5	5	1	5	4.80
2	41	6	6.8	3	5	5	2	5	5.40
2	41	6	6.8	3	5	5	3	5	5.50
2	41	6	6.8	3	5	5	4	5	5.90
2	41	6	6.8	3	5	5	5	5	3.40
7	61	6	6.8	3	5	1	1	1	3.80
7	61	6	6.8	3	5	1	2	1	4.30
7	61	6	6.8	3	5	1	3	1	3.80
7	61	6	6.8	3	5	1	4	1	2.40
7	61	6	6.8	3	5	1	5	1	2.80

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
7	61	6	6.8	3	5	2	1	1	4.10
7	61	6	6.8	3	5	2	2	1	1.10
7	61	6	6.8	3	5	2	3	1	3.00
7	61	6	6.8	3	5	2	4	1	4.00
7	61	6	6.8	3	5	2	5	1	2.20
7	61	6	6.8	3	5	3	1	1	3.60
7	61	6	6.8	3	5	3	2	1	3.00
7	61	6	6.8	3	5	3	3	1	3.70
7	61	6	6.8	3	5	3	4	1	4.10
7	61	6	6.8	3	5	3	5	1	3.00
7	61	6	6.8	3	5	4	1	1	3.40
7	61	6	6.8	3	5	4	2	1	1.80
7	61	6	6.8	3	5	4	3	1	3.60
7	61	6	6.8	3	5	4	4	1	3.70
7	61	6	6.8	3	5	4	5	1	3.60
7	61	6	6.8	3	5	5	1	1	3.80
7	61	6	6.8	3	5	5	2	1	3.90
7	61	6	6.8	3	5	5	3	1	3.60
7	61	6	6.8	3	5	5	4	1	3.20
7	61	6	6.8	3	5	5	5	1	3.80
7	61	6	6.8	3	5	1	1	2	4.80
7	61	6	6.8	3	5	1	2	2	4.60
7	61	6	6.8	3	5	1	3	2	4.60
7	61	6	6.8	3	5	1	4	2	4.30
7	61	6	6.8	3	5	1	5	2	4.10
7	61	6	6.8	3	5	2	1	2	3.00
7	61	6	6.8	3	5	2	2	2	3.80
7	61	6	6.8	3	5	2	3	2	4.20
7	61	6	6.8	3	5	2	4	2	4.70
7	61	6	6.8	3	5	2	5	2	4.90
7	61	6	6.8	3	5	3	1	2	4.00
7	61	6	6.8	3	5	3	2	2	4.00
7	61	6	6.8	3	5	3	3	2	4.50
7	61	6	6.8	3	5	3	4	2	4.30
7	61	6	6.8	3	5	3	5	2	4.30
7	61	6	6.8	3	5	4	1	2	4.30
7	61	6	6.8	3	5	4	2	2	3.90
7	61	6	6.8	3	5	4	3	2	4.10
7	61	6	6.8	3	5	4	4	2	3.90
7	61	6	6.8	3	5	4	5	2	3.80
7	61	6	6.8	3	5	5	1	2	4.40
7	61	6	6.8	3	5	5	2	2	4.80
7	61	6	6.8	3	5	5	3	2	4.10
7	61	6	6.8	3	5	5	4	2	4.20
7	61	6	6.8	3	5	5	5	2	5.00

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
7	61	6	6.8	3	5	1	1	3	5.00
7	61	6	6.8	3	5	1	2	3	4.30
7	61	6	6.8	3	5	1	3	3	4.20
7	61	6	6.8	3	5	1	4	3	4.50
7	61	6	6.8	3	5	1	5	3	4.80
7	61	6	6.8	3	5	2	1	3	4.80
7	61	6	6.8	3	5	2	2	3	4.40
7	61	6	6.8	3	5	2	3	3	4.30
7	61	6	6.8	3	5	2	4	3	5.00
7	61	6	6.8	3	5	2	5	3	4.50
7	61	6	6.8	3	5	3	1	3	4.00
7	61	6	6.8	3	5	3	2	3	4.00
7	61	6	6.8	3	5	3	3	3	3.50
7	61	6	6.8	3	5	3	4	3	4.50
7	61	6	6.8	3	5	3	5	3	4.40
7	61	6	6.8	3	5	4	1	3	4.20
7	61	6	6.8	3	5	4	2	3	3.60
7	61	6	6.8	3	5	4	3	3	4.60
7	61	6	6.8	3	5	4	4	3	4.80
7	61	6	6.8	3	5	4	5	3	4.10
7	61	6	6.8	3	5	5	1	3	4.80
7	61	6	6.8	3	5	5	2	3	5.30
7	61	6	6.8	3	5	5	3	3	3.90
7	61	6	6.8	3	5	5	4	3	4.90
7	61	6	6.8	3	5	5	5	3	4.70
7	61	6	6.8	3	5	1	1	4	4.40
7	61	6	6.8	3	5	1	2	4	4.60
7	61	6	6.8	3	5	1	3	4	4.10
7	61	6	6.8	3	5	1	4	4	4.50
7	61	6	6.8	3	5	1	5	4	4.50
7	61	6	6.8	3	5	2	1	4	3.40
7	61	6	6.8	3	5	2	2	4	4.20
7	61	6	6.8	3	5	2	3	4	4.10
7	61	6	6.8	3	5	2	4	4	4.60
7	61	6	6.8	3	5	2	5	4	4.00
7	61	6	6.8	3	5	3	1	4	4.00
7	61	6	6.8	3	5	3	2	4	3.00
7	61	6	6.8	3	5	3	3	4	4.10
7	61	6	6.8	3	5	3	4	4	4.60
7	61	6	6.8	3	5	3	5	4	4.80
7	61	6	6.8	3	5	4	1	4	4.30
7	61	6	6.8	3	5	4	2	4	4.20
7	61	6	6.8	3	5	4	3	4	4.00
7	61	6	6.8	3	5	4	4	4	4.60
7	61	6	6.8	3	5	4	5	4	4.30

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
7	61	6	6.8	3	5	5	1	4	4.50
7	61	6	6.8	3	5	5	2	4	4.90
7	61	6	6.8	3	5	5	3	4	4.70
7	61	6	6.8	3	5	5	4	4	4.20
7	61	6	6.8	3	5	5	5	4	2.70
7	61	6	6.8	3	5	1	1	5	4.10
7	61	6	6.8	3	5	1	2	5	4.10
7	61	6	6.8	3	5	1	3	5	3.30
7	61	6	6.8	3	5	1	4	5	3.80
7	61	6	6.8	3	5	1	5	5	3.20
7	61	6	6.8	3	5	2	1	5	3.60
7	61	6	6.8	3	5	2	2	5	2.80
7	61	6	6.8	3	5	2	3	5	3.80
7	61	6	6.8	3	5	2	4	5	3.90
7	61	6	6.8	3	5	2	5	5	4.10
7	61	6	6.8	3	5	3	1	5	3.20
7	61	6	6.8	3	5	3	2	5	3.00
7	61	6	6.8	3	5	3	3	5	3.90
7	61	6	6.8	3	5	3	4	5	3.80
7	61	6	6.8	3	5	3	5	5	2.80
7	61	6	6.8	3	5	4	1	5	4.50
7	61	6	6.8	3	5	4	2	5	3.60
7	61	6	6.8	3	5	4	3	5	4.00
7	61	6	6.8	3	5	4	4	5	3.90
7	61	6	6.8	3	5	4	5	5	3.30
7	61	6	6.8	3	5	5	1	5	4.60
7	61	6	6.8	3	5	5	2	5	4.30
7	61	6	6.8	3	5	5	3	5	4.00
7	61	6	6.8	3	5	5	4	5	3.60
7	61	6	6.8	3	5	5	5	5	4.10
8	61	6	6.8	3	5	1	1	1	2.20
8	61	6	6.8	3	5	1	2	1	4.00
8	61	6	6.8	3	5	1	3	1	4.20
8	61	6	6.8	3	5	1	4	1	3.60
8	61	6	6.8	3	5	1	5	1	3.70
8	61	6	6.8	3	5	2	1	1	3.00
8	61	6	6.8	3	5	2	2	1	2.90
8	61	6	6.8	3	5	2	3	1	3.20
8	61	6	6.8	3	5	2	4	1	2.00
8	61	6	6.8	3	5	2	5	1	4.00
8	61	6	6.8	3	5	3	1	1	4.20
8	61	6	6.8	3	5	3	2	1	4.00
8	61	6	6.8	3	5	3	3	1	3.80
8	61	6	6.8	3	5	3	4	1	2.80
8	61	6	6.8	3	5	3	5	1	1.50

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VCLT
8	61	6	6.8	3	5	4	1	1	4.60
8	61	6	6.8	3	5	4	2	1	4.60
8	61	6	6.8	3	5	4	3	1	4.50
8	61	6	6.8	3	5	4	4	1	3.00
8	61	6	6.8	3	5	4	5	1	2.40
8	61	6	6.8	3	5	5	1	1	4.30
8	61	6	6.8	3	5	5	2	1	5.10
8	61	6	6.8	3	5	5	3	1	3.50
8	61	6	6.8	3	5	5	4	1	4.00
8	61	6	6.8	3	5	5	5	1	4.10
8	61	6	6.8	3	5	1	1	2	5.00
8	61	6	6.8	3	5	1	2	2	4.70
8	61	6	6.8	3	5	1	3	2	4.80
8	61	6	6.8	3	5	1	4	2	4.60
8	61	6	6.8	3	5	1	5	2	4.90
8	61	6	6.8	3	5	2	1	2	4.00
8	61	6	6.8	3	5	2	2	2	3.70
8	61	6	6.8	3	5	2	3	2	2.60
8	61	6	6.8	3	5	2	4	2	4.40
8	61	6	6.8	3	5	2	5	2	4.20
8	61	6	6.8	3	5	3	1	2	3.80
8	61	6	6.8	3	5	3	2	2	4.80
8	61	6	6.8	3	5	3	3	2	4.90
8	61	6	6.8	3	5	3	4	2	4.50
8	61	6	6.8	3	5	3	5	2	2.40
8	61	6	6.8	3	5	4	1	2	5.00
8	61	6	6.8	3	5	4	2	2	5.00
8	61	6	6.8	3	5	4	3	2	4.80
8	61	6	6.8	3	5	4	4	2	2.80
8	61	6	6.8	3	5	4	5	2	4.40
8	61	6	6.8	3	5	5	1	2	5.10
8	61	6	6.8	3	5	5	2	2	5.50
8	61	6	6.8	3	5	5	3	2	5.30
8	61	6	6.8	3	5	5	4	2	5.20
8	61	6	6.8	3	5	5	5	2	5.00
8	61	6	6.8	3	5	1	1	3	4.40
8	61	6	6.8	3	5	1	2	3	3.80
8	61	6	6.8	3	5	1	3	3	3.70
8	61	6	6.8	3	5	1	4	3	4.20
8	61	6	6.8	3	5	1	5	3	3.00
8	61	6	6.8	3	5	2	1	3	3.00
8	61	6	6.8	3	5	2	2	3	3.60
8	61	6	6.8	3	5	2	3	3	1.90
8	61	6	6.8	3	5	2	4	3	4.00
8	61	6	6.8	3	5	2	5	3	2.40

SUB	PT	SIDE	I	F	P	REP	RO	CCL	VOLT
8	61	6	6.8	3	5	3	1	3	3.30
8	61	6	6.8	3	5	3	2	3	4.50
8	61	6	6.8	3	5	3	3	3	4.00
8	61	6	6.8	3	5	3	4	3	4.00
8	61	6	6.8	3	5	3	5	3	3.50
8	61	6	6.8	3	5	4	1	3	4.10
8	61	6	6.8	3	5	4	2	3	2.50
8	61	6	6.8	3	5	4	3	3	3.80
8	61	6	6.8	3	5	4	4	3	5.20
8	61	6	6.8	3	5	4	5	3	3.90
8	61	6	6.8	3	5	5	1	3	4.90
8	61	6	6.8	3	5	5	2	3	5.20
8	61	6	6.8	3	5	5	3	3	4.80
8	61	6	6.8	3	5	5	4	3	4.80
8	61	6	6.8	3	5	5	5	3	4.00
8	61	6	6.8	3	5	1	1	4	3.10
8	61	6	6.8	3	5	1	2	4	3.30
8	61	6	6.8	3	5	1	3	4	3.90
8	61	6	6.8	3	5	1	4	4	2.60
8	61	6	6.8	3	5	1	5	4	3.90
8	61	6	6.8	3	5	2	1	4	3.50
8	61	6	6.8	3	5	2	2	4	4.50
8	61	6	6.8	3	5	2	3	4	1.40
8	61	6	6.8	3	5	2	4	4	4.00
8	61	6	6.8	3	5	2	5	4	3.00
8	61	6	6.8	3	5	3	1	4	4.20
8	61	6	6.8	3	5	3	2	4	3.10
8	61	6	6.8	3	5	3	3	4	3.90
8	61	6	6.8	3	5	3	4	4	4.30
8	61	6	6.8	3	5	3	5	4	4.30
8	61	6	6.8	3	5	4	1	4	4.50
8	61	6	6.8	3	5	4	2	4	4.80
8	61	6	6.8	3	5	4	3	4	4.80
8	61	6	6.8	3	5	4	4	4	4.80
8	61	6	6.8	3	5	4	5	4	3.80
8	61	6	6.8	3	5	5	1	4	4.20
8	61	6	6.8	3	5	5	2	4	4.80
8	61	6	6.8	3	5	5	3	4	4.00
8	61	6	6.8	3	5	5	4	4	4.60
8	61	6	6.8	3	5	5	5	4	4.30
8	61	6	6.8	3	5	1	1	5	3.60
8	61	6	6.8	3	5	1	2	5	4.20
8	61	6	6.8	3	5	1	3	5	4.60
8	61	6	6.8	3	5	1	4	5	3.10
8	61	6	6.8	3	5	1	5	5	4.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
6	41	6	6.8	3	5	4	1	5	0.44
6	41	6	6.8	3	5	4	2	5	4.00
6	41	6	6.8	3	5	4	3	5	4.30
6	41	6	6.8	3	5	4	4	5	4.30
6	41	6	6.8	3	5	4	5	5	4.00
6	41	6	6.8	3	5	5	1	5	3.90
6	41	6	6.8	3	5	5	2	5	3.80
6	41	6	6.8	3	5	5	3	5	4.00
6	41	6	6.8	3	5	5	4	5	4.10
6	41	6	6.8	3	5	5	5	5	3.80
7	41	6	6.8	3	5	1	1	1	6.00
7	41	6	6.8	3	5	1	2	1	5.00
7	41	6	6.8	3	5	1	3	1	4.50
7	41	6	6.8	3	5	1	4	1	4.40
7	41	6	6.8	3	5	1	5	1	1.50
7	41	6	6.8	3	5	2	1	1	6.50
7	41	6	6.8	3	5	2	2	1	3.80
7	41	6	6.8	3	5	2	3	1	5.10
7	41	6	6.8	3	5	2	4	1	6.60
7	41	6	6.8	3	5	2	5	1	7.00
7	41	6	6.8	3	5	3	1	1	4.40
7	41	6	6.8	3	5	3	2	1	6.50
7	41	6	6.8	3	5	3	3	1	5.70
7	41	6	6.8	3	5	3	4	1	6.00
7	41	6	6.8	3	5	3	5	1	5.40
7	41	6	6.8	3	5	4	1	1	6.20
7	41	6	6.8	3	5	4	2	1	5.20
7	41	6	6.8	3	5	4	3	1	5.60
7	41	6	6.8	3	5	4	4	1	6.00
7	41	6	6.8	3	5	4	5	1	5.20
7	41	6	6.8	3	5	5	1	1	6.20
7	41	6	6.8	3	5	5	2	1	4.80
7	41	6	6.8	3	5	5	3	1	5.30
7	41	6	6.8	3	5	5	4	1	4.60
7	41	6	6.8	3	5	5	5	1	5.60
7	41	6	6.8	3	5	1	1	2	6.30
7	41	6	6.8	3	5	1	2	2	6.40
7	41	6	6.8	3	5	1	3	2	6.50
7	41	6	6.8	3	5	1	4	2	6.50
7	41	6	6.8	3	5	1	5	2	5.10
7	41	6	6.8	3	5	2	1	2	6.40
7	41	6	6.8	3	5	2	2	2	6.10
7	41	6	6.8	3	5	2	3	2	6.20
7	41	6	6.8	3	5	2	4	2	5.60
7	41	6	6.8	3	5	2	5	2	5.60

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
7	41	6	6.8	3	5	3	1	2	6.40
7	41	6	6.8	3	5	3	2	2	6.30
7	41	6	6.8	3	5	3	3	2	6.60
7	41	6	6.8	3	5	3	4	2	6.70
7	41	6	6.8	3	5	3	5	2	5.80
7	41	6	6.8	3	5	4	1	2	6.10
7	41	6	6.8	3	5	4	2	2	5.40
7	41	6	6.8	3	5	4	3	2	4.80
7	41	6	6.8	3	5	4	4	2	5.60
7	41	6	6.8	3	5	4	5	2	6.10
7	41	6	6.8	3	5	5	1	2	6.50
7	41	6	6.8	3	5	5	2	2	6.80
7	41	6	6.8	3	5	5	3	2	6.20
7	41	6	6.8	3	5	5	4	2	6.30
7	41	6	6.8	3	5	5	5	2	6.60
7	41	6	6.8	3	5	1	1	3	6.50
7	41	6	6.8	3	5	1	2	3	7.00
7	41	6	6.8	3	5	1	3	3	5.50
7	41	6	6.8	3	5	1	4	3	6.80
7	41	6	6.8	3	5	1	5	3	6.30
7	41	6	6.8	3	5	2	1	3	6.00
7	41	6	6.8	3	5	2	2	3	6.90
7	41	6	6.8	3	5	2	3	3	5.70
7	41	6	6.8	3	5	2	4	3	7.50
7	41	6	6.8	3	5	2	5	3	6.70
7	41	6	6.8	3	5	3	1	3	6.30
7	41	6	6.8	3	5	3	2	3	6.50
7	41	6	6.8	3	5	3	3	3	6.50
7	41	6	6.8	3	5	3	4	3	6.70
7	41	6	6.8	3	5	3	5	3	6.40
7	41	6	6.8	3	5	4	1	3	6.20
7	41	6	6.8	3	5	4	2	3	6.40
7	41	6	6.8	3	5	4	3	3	5.50
7	41	6	6.8	3	5	4	4	3	5.50
7	41	6	6.8	3	5	4	5	3	6.60
7	41	6	6.8	3	5	5	1	3	6.90
7	41	6	6.8	3	5	5	2	3	7.00
7	41	6	6.8	3	5	5	3	3	7.50
7	41	6	6.8	3	5	5	4	3	5.50
7	41	6	6.8	3	5	5	5	3	6.70
7	41	6	6.8	3	5	1	1	4	5.80
7	41	6	6.8	3	5	1	2	4	7.40
7	41	6	6.8	3	5	1	3	4	6.20
7	41	6	6.8	3	5	1	4	4	6.80
7	41	6	6.8	3	5	1	5	4	6.00

SUB	PT	SIDE	I	F	P	REP	RC	CCL	VCLT
1	41	6	6.8	3	5	5	1	2	2.20
1	41	6	6.8	3	5	5	2	2	4.10
1	41	6	6.8	3	5	5	3	2	3.20
1	41	6	6.8	3	5	5	4	2	2.50
1	41	6	6.8	3	5	5	5	2	1.90
1	41	6	6.8	3	5	1	1	3	5.10
1	41	6	6.8	3	5	1	2	3	7.20
1	41	6	6.8	3	5	1	3	3	6.10
1	41	6	6.8	3	5	1	4	3	5.30
1	41	6	6.8	3	5	1	5	3	4.40
1	41	6	6.8	3	5	2	1	3	4.80
1	41	6	6.8	3	5	2	2	3	6.20
1	41	6	6.8	3	5	2	3	3	5.70
1	41	6	6.8	3	5	2	4	3	6.10
1	41	6	6.8	3	5	2	5	3	4.60
1	41	6	6.8	3	5	3	1	3	5.30
1	41	6	6.8	3	5	3	2	3	5.60
1	41	6	6.8	3	5	3	3	3	2.00
1	41	6	6.8	3	5	3	4	3	3.20
1	41	6	6.8	3	5	3	5	3	3.00
1	41	6	6.8	3	5	4	1	3	4.00
1	41	6	6.8	3	5	4	2	3	3.00
1	41	6	6.8	3	5	4	3	3	3.00
1	41	6	6.8	3	5	4	4	3	1.80
1	41	6	6.8	3	5	4	5	3	1.00
1	41	6	6.8	3	5	5	1	3	3.20
1	41	6	6.8	3	5	5	2	3	4.40
1	41	6	6.8	3	5	5	3	3	2.20
1	41	6	6.8	3	5	5	4	3	0.90
1	41	6	6.8	3	5	5	5	3	1.10
1	41	6	6.8	3	5	1	1	4	5.00
1	41	6	6.8	3	5	1	2	4	7.40
1	41	6	6.8	3	5	1	3	4	6.80
1	41	6	6.8	3	5	1	4	4	1.80
1	41	6	6.8	3	5	1	5	4	2.00
1	41	6	6.8	3	5	2	1	4	6.40
1	41	6	6.8	3	5	2	2	4	5.30
1	41	6	6.8	3	5	2	3	4	6.20
1	41	6	6.8	3	5	2	4	4	5.30
1	41	6	6.8	3	5	2	5	4	4.60
1	41	6	6.8	3	5	3	1	4	6.20
1	41	6	6.8	3	5	3	2	4	6.60
1	41	6	6.8	3	5	3	3	4	6.20
1	41	6	6.8	3	5	3	4	4	5.60
1	41	6	6.8	3	5	3	5	4	5.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	41	1	3.0	3	5	2	3	1	0.58
3	41	1	3.0	3	5	2	3	2	0.67
3	41	1	3.0	3	5	2	3	3	0.74
3	41	1	3.0	3	5	2	3	4	0.66
3	41	1	3.0	3	5	2	3	5	0.66
3	41	1	3.0	3	5	2	4	1	0.48
3	41	1	3.0	3	5	2	4	2	0.65
3	41	1	3.0	3	5	2	4	3	0.67
3	41	1	3.0	3	5	2	4	4	0.76
3	41	1	3.0	3	5	2	4	5	0.60
3	41	1	3.0	3	5	2	5	1	0.46
3	41	1	3.0	3	5	2	5	2	0.75
3	41	1	3.0	3	5	2	5	3	0.60
3	41	1	3.0	3	5	2	5	4	0.58
3	41	1	3.0	3	5	2	5	5	0.60
3	41	1	3.0	3	5	3	1	1	0.58
3	41	1	3.0	3	5	3	1	2	0.74
3	41	1	3.0	3	5	3	1	3	0.66
3	41	1	3.0	3	5	3	1	4	0.86
3	41	1	3.0	3	5	3	1	5	0.64
3	41	1	3.0	3	5	3	2	1	0.46
3	41	1	3.0	3	5	3	2	2	0.72
3	41	1	3.0	3	5	3	2	3	0.76
3	41	1	3.0	3	5	3	2	4	0.82
3	41	1	3.0	3	5	3	2	5	0.64
3	41	1	3.0	3	5	3	3	1	0.58
3	41	1	3.0	3	5	3	3	2	0.62
3	41	1	3.0	3	5	3	3	3	0.63
3	41	1	3.0	3	5	3	3	4	0.82
3	41	1	3.0	3	5	3	3	5	0.73
3	41	1	3.0	3	5	3	4	1	0.56
3	41	1	3.0	3	5	3	4	2	0.64
3	41	1	3.0	3	5	3	4	3	0.60
3	41	1	3.0	3	5	3	4	4	0.78
3	41	1	3.0	3	5	3	4	5	0.64
3	41	1	3.0	3	5	3	5	1	0.52
3	41	1	3.0	3	5	3	5	2	0.68
3	41	1	3.0	3	5	3	5	3	0.60
3	41	1	3.0	3	5	3	5	4	0.76
3	41	1	3.0	3	5	3	5	5	0.68
3	41	1	3.0	3	5	4	1	1	0.52
3	41	1	3.0	3	5	4	1	2	0.62
3	41	1	3.0	3	5	4	1	3	0.85
3	41	1	3.0	3	5	4	1	4	0.76
3	41	1	3.0	3	5	4	1	5	0.78

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
3	41	1	3.0	3	5	4	2	1	0.46
3	41	1	3.0	3	5	4	2	2	0.82
3	41	1	3.0	3	5	4	2	3	0.83
3	41	1	3.0	3	5	4	2	4	0.76
3	41	1	3.0	3	5	4	2	5	0.80
3	41	1	3.0	3	5	4	3	1	0.54
3	41	1	3.0	3	5	4	3	2	0.78
3	41	1	3.0	3	5	4	3	3	0.80
3	41	1	3.0	3	5	4	3	4	0.78
3	41	1	3.0	3	5	4	3	5	0.80
3	41	1	3.0	3	5	4	4	1	0.56
3	41	1	3.0	3	5	4	4	2	0.80
3	41	1	3.0	3	5	4	4	3	0.71
3	41	1	3.0	3	5	4	4	4	0.88
3	41	1	3.0	3	5	4	4	5	0.67
3	41	1	3.0	3	5	4	5	1	0.58
3	41	1	3.0	3	5	4	5	2	0.74
3	41	1	3.0	3	5	4	5	3	0.81
3	41	1	3.0	3	5	4	5	4	0.88
3	41	1	3.0	3	5	4	5	5	0.68
3	41	1	3.0	3	5	5	1	1	0.52
3	41	1	3.0	3	5	5	1	2	0.78
3	41	1	3.0	3	5	5	1	3	0.62
3	41	1	3.0	3	5	5	1	4	0.74
3	41	1	3.0	3	5	5	1	5	0.81
3	41	1	3.0	3	5	5	2	1	0.62
3	41	1	3.0	3	5	5	2	2	0.80
3	41	1	3.0	3	5	5	2	3	0.68
3	41	1	3.0	3	5	5	2	4	0.81
3	41	1	3.0	3	5	5	2	5	0.68
3	41	1	3.0	3	5	5	3	1	0.43
3	41	1	3.0	3	5	5	3	2	0.74
3	41	1	3.0	3	5	5	3	3	0.72
3	41	1	3.0	3	5	5	3	4	0.82
3	41	1	3.0	3	5	5	3	5	0.68
3	41	1	3.0	3	5	5	4	1	0.54
3	41	1	3.0	3	5	5	4	2	0.78
3	41	1	3.0	3	5	5	4	3	0.72
3	41	1	3.0	3	5	5	4	4	0.72
3	41	1	3.0	3	5	5	4	5	0.64
3	41	1	3.0	3	5	5	5	1	0.54
3	41	1	3.0	3	5	5	5	2	0.70
3	41	1	3.0	3	5	5	5	3	0.70
3	41	1	3.0	3	5	5	5	4	0.81
3	41	1	3.0	3	5	5	5	5	0.76

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
3	61	1	3.0	3	5	1	1	1	1.05
3	61	1	3.0	3	5	1	1	2	1.05
3	61	1	3.0	3	5	1	1	3	0.74
3	61	1	3.0	3	5	1	1	4	0.70
3	61	1	3.0	3	5	1	2	1	0.60
3	61	1	3.0	3	5	1	2	2	0.90
3	61	1	3.0	3	5	1	2	3	0.51
3	61	1	3.0	3	5	1	2	4	0.59
3	61	1	3.0	3	5	1	3	1	0.90
3	61	1	3.0	3	5	1	3	2	1.00
3	61	1	3.0	3	5	1	3	3	0.65
3	61	1	3.0	3	5	1	3	4	0.56
3	61	1	3.0	3	5	1	4	1	0.72
3	61	1	3.0	3	5	1	4	2	1.00
3	61	1	3.0	3	5	1	4	3	0.55
3	61	1	3.0	3	5	1	4	4	0.67
3	61	1	3.0	3	5	1	5	1	0.70
3	61	1	3.0	3	5	1	5	2	1.08
3	61	1	3.0	3	5	1	5	3	0.45
3	61	1	3.0	3	5	1	5	4	0.58
3	61	1	3.0	3	5	2	1	1	0.92
3	61	1	3.0	3	5	2	1	2	1.05
3	61	1	3.0	3	5	2	1	3	0.68
3	61	1	3.0	3	5	2	1	4	0.72
3	61	1	3.0	3	5	2	2	1	1.05
3	61	1	3.0	3	5	2	2	2	1.10
3	61	1	3.0	3	5	2	2	3	0.66
3	61	1	3.0	3	5	2	2	4	0.78
3	61	1	3.0	3	5	2	3	1	0.95
3	61	1	3.0	3	5	2	3	2	0.82
3	61	1	3.0	3	5	2	3	3	0.85
3	61	1	3.0	3	5	2	3	4	0.59
3	61	1	3.0	3	5	2	4	1	1.12
3	61	1	3.0	3	5	2	4	2	1.12
3	61	1	3.0	3	5	2	4	3	0.59
3	61	1	3.0	3	5	2	4	4	0.78
3	61	1	3.0	3	5	2	5	1	0.68
3	61	1	3.0	3	5	2	5	2	1.00
3	61	1	3.0	3	5	2	5	3	0.45
3	61	1	3.0	3	5	2	5	4	0.52
3	61	1	3.0	3	5	3	1	1	1.10
3	61	1	3.0	3	5	3	1	2	1.30
3	61	1	3.0	3	5	3	1	3	0.68
3	61	1	3.0	3	5	3	1	4	0.90
3	61	1	3.0	3	5	3	2	1	1.30

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
2	41	2	3.0	3	5	2	4	4	1.35
2	41	2	3.0	3	5	2	5	1	1.60
2	41	2	3.0	3	5	2	5	2	1.75
2	41	2	3.0	3	5	2	5	3	1.90
2	41	2	3.0	3	5	2	5	4	1.65
2	41	2	3.0	3	5	3	1	1	1.80
2	41	2	3.0	3	5	3	1	2	1.72
2	41	2	3.0	3	5	3	1	3	1.70
2	41	2	3.0	3	5	3	1	4	1.52
2	41	2	3.0	3	5	3	2	1	1.65
2	41	2	3.0	3	5	3	2	2	0.62
2	41	2	3.0	3	5	3	2	3	1.62
2	41	2	3.0	3	5	3	2	4	1.30
2	41	2	3.0	3	5	3	3	1	1.38
2	41	2	3.0	3	5	3	3	2	2.10
2	41	2	3.0	3	5	3	3	3	0.66
2	41	2	3.0	3	5	3	3	4	0.09
2	41	2	3.0	3	5	3	4	1	1.82
2	41	2	3.0	3	5	3	4	2	1.92
2	41	2	3.0	3	5	3	4	3	1.50
2	41	2	3.0	3	5	3	4	4	1.10
2	41	2	3.0	3	5	3	5	1	1.65
2	41	2	3.0	3	5	3	5	2	1.98
2	41	2	3.0	3	5	3	5	3	1.82
2	41	2	3.0	3	5	3	5	4	1.72
2	41	2	3.0	3	5	4	1	1	1.72
2	41	2	3.0	3	5	4	1	2	1.72
2	41	2	3.0	3	5	4	1	3	2.00
2	41	2	3.0	3	5	4	1	4	1.55
2	41	2	3.0	3	5	4	2	1	1.72
2	41	2	3.0	3	5	4	2	2	1.88
2	41	2	3.0	3	5	4	2	3	1.44
2	41	2	3.0	3	5	4	2	4	1.38
2	41	2	3.0	3	5	4	3	1	1.88
2	41	2	3.0	3	5	4	3	2	1.92
2	41	2	3.0	3	5	4	3	3	1.72
2	41	2	3.0	3	5	4	3	4	1.55
2	41	2	3.0	3	5	4	4	1	1.66
2	41	2	3.0	3	5	4	4	2	1.80
2	41	2	3.0	3	5	4	4	3	1.64
2	41	2	3.0	3	5	4	4	4	1.20
2	41	2	3.0	3	5	4	5	1	1.82
2	41	2	3.0	3	5	4	5	2	1.90
2	41	2	3.0	3	5	4	5	3	1.45
2	41	2	3.0	3	5	4	5	4	1.72

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
2	41	2	3.0	3	5	5	1	1	1.70
2	41	2	3.0	3	5	5	1	2	2.00
2	41	2	3.0	3	5	5	1	3	2.02
2	41	2	3.0	3	5	5	1	4	1.92
2	41	2	3.0	3	5	5	2	1	1.30
2	41	2	3.0	3	5	5	2	2	2.00
2	41	2	3.0	3	5	5	2	3	1.82
2	41	2	3.0	3	5	5	2	4	1.52
2	41	2	3.0	3	5	5	3	1	1.62
2	41	2	3.0	3	5	5	3	2	1.80
2	41	2	3.0	3	5	5	3	3	1.66
2	41	2	3.0	3	5	5	3	4	1.78
2	41	2	3.0	3	5	5	4	1	1.68
2	41	2	3.0	3	5	5	4	2	1.60
2	41	2	3.0	3	5	5	4	3	1.70
2	41	2	3.0	3	5	5	4	4	1.62
2	41	2	3.0	3	5	5	5	1	1.82
2	41	2	3.0	3	5	5	5	2	2.05
2	41	2	3.0	3	5	5	5	3	1.80
2	41	2	3.0	3	5	5	5	4	1.30
2	41	2	3.0	3	5	1	1	1	1.40
2	41	2	3.0	3	5	1	1	2	1.48
2	41	2	3.0	3	5	1	1	3	1.72
2	41	2	3.0	3	5	1	1	4	1.42
2	41	2	3.0	3	5	1	2	1	1.65
2	41	2	3.0	3	5	1	2	2	1.75
2	41	2	3.0	3	5	1	2	3	1.64
2	41	2	3.0	3	5	1	2	4	1.52
2	41	2	3.0	3	5	1	3	1	1.65
2	41	2	3.0	3	5	1	3	2	1.90
2	41	2	3.0	3	5	1	3	3	1.72
2	41	2	3.0	3	5	1	3	4	1.78
2	41	2	3.0	3	5	1	4	1	1.65
2	41	2	3.0	3	5	1	4	2	1.82
2	41	2	3.0	3	5	1	4	3	2.00
2	41	2	3.0	3	5	1	4	4	1.80
2	41	2	3.0	3	5	1	5	1	1.62
2	41	2	3.0	3	5	1	5	2	1.82
2	41	2	3.0	3	5	1	5	3	1.88
2	41	2	3.0	3	5	1	5	4	1.58
2	41	2	3.0	3	5	2	1	1	1.50
2	41	2	3.0	3	5	2	1	2	1.78
2	41	2	3.0	3	5	2	1	3	1.48
2	41	2	3.0	3	5	2	1	4	1.50
2	41	2	3.0	3	5	2	2	1	1.45

SUB	PT	SIDE	I	F	P	REP	RC	COL	VOLT
2	41	2	3.0	3	5	2	2	2	1.66
2	41	2	3.0	3	5	2	2	3	1.80
2	41	2	3.0	3	5	2	2	4	1.46
2	41	2	3.0	3	5	2	3	1	1.55
2	41	2	3.0	3	5	2	3	2	1.72
2	41	2	3.0	3	5	2	3	3	1.98
2	41	2	3.0	3	5	2	3	4	1.84
2	41	2	3.0	3	5	2	4	1	1.85
2	41	2	3.0	3	5	2	4	2	1.80
2	41	2	3.0	3	5	2	4	3	1.60
2	41	2	3.0	3	5	2	4	4	1.52
2	41	2	3.0	3	5	2	5	1	1.70
2	41	2	3.0	3	5	2	5	2	1.90
2	41	2	3.0	3	5	2	5	3	1.28
2	41	2	3.0	3	5	2	5	4	1.88
2	41	2	3.0	3	5	3	1	1	1.68
2	41	2	3.0	3	5	3	1	2	2.00
2	41	2	3.0	3	5	3	1	3	1.85
2	41	2	3.0	3	5	3	1	4	1.75
2	41	2	3.0	3	5	3	2	1	1.52
2	41	2	3.0	3	5	3	2	2	1.68
2	41	2	3.0	3	5	3	2	3	1.72
2	41	2	3.0	3	5	3	2	4	1.32
2	41	2	3.0	3	5	3	3	1	1.32
2	41	2	3.0	3	5	3	3	2	1.68
2	41	2	3.0	3	5	3	3	3	1.68
2	41	2	3.0	3	5	3	3	4	1.62
2	41	2	3.0	3	5	3	4	1	1.35
2	41	2	3.0	3	5	3	4	2	1.52
2	41	2	3.0	3	5	3	4	3	1.72
2	41	2	3.0	3	5	3	4	4	0.52
2	41	2	3.0	3	5	3	5	1	1.62
2	41	2	3.0	3	5	3	5	2	1.70
2	41	2	3.0	3	5	3	5	3	1.84
2	41	2	3.0	3	5	3	5	4	1.85
2	41	2	3.0	3	5	4	1	1	1.50
2	41	2	3.0	3	5	4	1	2	1.85
2	41	2	3.0	3	5	4	1	3	1.82
2	41	2	3.0	3	5	4	1	4	1.92
2	41	2	3.0	3	5	4	2	1	1.62
2	41	2	3.0	3	5	4	2	2	1.72
2	41	2	3.0	3	5	4	2	3	1.84
2	41	2	3.0	3	5	4	2	4	1.74
2	41	2	3.0	3	5	4	3	1	1.52
2	41	2	3.0	3	5	4	3	2	1.62

SUB	PT	SIDE	I	F	P	REP	RO	COL	VOLT
4	41	1	3.0	3	5	3	1	1	1.00
4	41	1	3.0	3	5	3	1	2	0.65
4	41	1	3.0	3	5	3	1	3	0.92
4	41	1	3.0	3	5	3	2	1	0.90
4	41	1	3.0	3	5	3	2	2	0.72
4	41	1	3.0	3	5	3	2	3	1.10
4	41	1	3.0	3	5	3	3	1	1.32
4	41	1	3.0	3	5	3	3	2	0.72
4	41	1	3.0	3	5	3	3	3	0.90
4	41	1	3.0	3	5	3	4	1	0.90
4	41	1	3.0	3	5	3	4	2	0.68
4	41	1	3.0	3	5	3	4	3	1.00
4	41	1	3.0	3	5	3	5	1	1.12
4	41	1	3.0	3	5	3	5	2	0.78
4	41	1	3.0	3	5	3	5	3	0.75
4	41	1	3.0	3	5	4	1	1	1.08
4	41	1	3.0	3	5	4	1	2	1.48
4	41	1	3.0	3	5	4	1	3	0.92
4	41	1	3.0	3	5	4	2	1	1.40
4	41	1	3.0	3	5	4	2	2	0.95
4	41	1	3.0	3	5	4	2	3	0.82
4	41	1	3.0	3	5	4	3	1	1.15
4	41	1	3.0	3	5	4	3	2	0.92
4	41	1	3.0	3	5	4	3	3	1.10
4	41	1	3.0	3	5	4	4	1	1.30
4	41	1	3.0	3	5	4	4	2	1.02
4	41	1	3.0	3	5	4	4	3	0.90
4	41	1	3.0	3	5	4	5	1	1.12
4	41	1	3.0	3	5	4	5	2	0.79
4	41	1	3.0	3	5	4	5	3	0.92
4	41	1	3.0	3	5	5	1	1	1.02
4	41	1	3.0	3	5	5	1	2	1.22
4	41	1	3.0	3	5	5	1	3	1.18
4	41	1	3.0	3	5	5	2	1	1.20
4	41	1	3.0	3	5	5	2	2	0.98
4	41	1	3.0	3	5	5	2	3	1.30
4	41	1	3.0	3	5	5	3	1	1.20
4	41	1	3.0	3	5	5	3	2	0.78
4	41	1	3.0	3	5	5	3	3	1.08
4	41	1	3.0	3	5	5	4	1	1.12
4	41	1	3.0	3	5	5	4	2	0.95
4	41	1	3.0	3	5	5	4	3	1.20
4	41	1	3.0	3	5	5	5	1	1.08
4	41	1	3.0	3	5	5	5	2	0.72
4	41	1	3.0	3	5	5	5	3	1.00

APPENDIX F

IMPEDANCE DATA LIST BEFORE AND AFTER APPLICATION OF THE PROBE

Table 5 contains a list of the data collected in the low impedance point search. The variables listed are defined as follows:

SUB = subject number

= 1 = Brian Pohlmeyer

= 2 = David Baldridge

= 3 = Duncan McCarroll

= 4 = Steve Sypert

= 5 = Blair Rowley

= 6 = John Hanley

= 7 = Tom Tucker

= 8 = Fred Anderson

LOC = location on the body

= 1 = dorsal forearm

= 2 = ventral forearm

= 3 = dorsal hand

PHI = initial phase angle measurement (radians)

Z1 = initial impedance measurement (kilohms)

R1 = initial resistance (kilohms)

X1 = initial reactance (kilohms)

PHI2 = phase angle after application of sharp probe (radians)

Z2 = impedance after application of sharp probe (kilohms)

TABLE 5

IMPEDANCE DATA LIST BEFORE AND AFTER PROBE APPLICATION

```
SUB LOC PHI      Z1       R1       X1
 8  2  1.26      869.     268.     826.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.31      131.     125.     41.      0.94      738.     144.     786.
SUB LOC PHI      Z1       R1       X1
 8  2  1.26      836.     258.     795.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.47      230.     204.     104.     0.79      607.     54.      691.
SUB LOC PHI      Z1       R1       X1
 8  2  1.10      803.     365.     716.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.94      738.     434.     597.     0.16      66.      -69.     119.
SUB LOC PHI      Z1       R1       X1
 8  2  1.10      934.     424.     833.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.47      244.     218.     111.     0.63      690.     207.     722.
SUB LOC PHI      Z1       R1       X1
 8  2  1.10      852.     387.     760.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.63      426.     345.     251.     0.47      426.     42.      509.
SUB LOC PHI      Z1       R1       X1
 8  2  1.10      918.     417.     818.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.79      623.     440.     440.     0.31      295.     -24.     377.
SUB LOC PHI      Z1       R1       X1
 8  2  1.10      902.     409.     803.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.31      70.      67.      22.      0.79      831.     342.     782.
SUB LOC PHI      Z1       R1       X1
 8  2  1.01      951.     509.     803.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.31      221.     210.     68.      0.69      730.     299.     734.
SUB LOC PHI      Z1       R1       X1
 8  3  1.26      918.     284.     873.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.94      639.     376.     517.     0.31      279.     -92.     356.
SUB LOC PHI      Z1       R1       X1
 8  3  1.26      574.     177.     546.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.63      307.     248.     180.     0.63      267.     -71.     365.
SUB LOC PHI      Z1       R1       X1
 8  3  0.94      656.     385.     531.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.31      208.     198.     64.      0.63      448.     187.     466.
SUB LOC PHI      Z1       R1       X1
 8  3  1.26      869.     268.     826.
PHI2      Z2       R2       X2       DPHI      DZ       DR       DX
0.44      213.     193.     91.      0.82      656.     76.      736.
```

SUB LOC PHI	Z1	R1	X1				
8 3 0.94	590.	347.	477.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.31	262.	249.	81.	0.63	328.	97.	396.
SUB LOC PHI	Z1	R1	X1				
8 3 1.26	918.	284.	873.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	639.	376.	517.	0.31	279.	-92.	356.
SUB LOC PHI	Z1	R1	X1				
8 3 1.26	574.	177.	546.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.63	307.	248.	180.	0.63	267.	-71.	365.
SUB LOC PHI	Z1	R1	X1				
8 3 0.94	656.	385.	531.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.31	208.	198.	64.	0.63	448.	187.	466.
SUB LOC PHI	Z1	R1	X1				
8 3 1.26	869.	268.	826.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.44	262.	237.	112.	0.82	607.	31.	715.
SUB LOC PHI	Z1	R1	X1				
8 3 0.94	590.	347.	477.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.31	262.	249.	81.	0.63	328.	97.	396.
SUB LOC PHI	Z1	R1	X1				
6 1 1.26	1300.	402.	1236.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.16	67.	66.	10.	1.10	1233.	336.	1226.
SUB LOC PHI	Z1	R1	X1				
6 1 0.94	1100.	647.	890.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.31	183.	174.	57.	0.63	917.	472.	833.
SUB LOC PHI	Z1	R1	X1				
6 1 0.88	1000.	637.	771.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.19	140.	138.	26.	0.69	860.	500.	744.
SUB LOC PHI	Z1	R1	X1				
6 1 1.26	1267.	391.	1205.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.13	63.	63.	8.	1.13	1203.	329.	1197.
SUB LOC PHI	Z1	R1	X1				
6 1 1.10	1133.	515.	1010.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.03	22.	22.	1.	1.07	1112.	493.	1009.
SUB LOC PHI	Z1	R1	X1				
6 1 1.26	1217.	376.	1157.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.79	833.	589.	589.	0.47	383.	-213.	568.

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SUB LOC PHI        Z1        R1        X1
 6  1  0.94      1100.      647.      890.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.13       50.       50.        6.      0.82      1050.      597.      884.
SUB LOC PHI        Z1        R1        X1
 6  1  1.26      1167.      361.     1110.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.13      125.      124.       16.      1.13      1042.      237.     1094.
SUB LOC PHI        Z1        R1        X1
 6  1  1.26      1100.      340.     1046.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.03        2.        2.        0.      1.23      1098.      338.     1046.
SUB LOC PHI        Z1        R1        X1
 6  1  1.26      1300.      402.     1236.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
1.26       67.       21.       63.      0.0       1233.      381.     1173.
SUB LOC PHI        Z1        R1        X1
 6  2  1.10      1117.      507.      995.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.06       28.       28.        2.      1.04      1088.      479.      993.
SUB LOC PHI        Z1        R1        X1
 6  2  1.26      1033.      319.      983.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.63      500.      405.      294.      0.63       533.      -85.      689.
SUB LOC PHI        Z1        R1        X1
 6  2  1.10      1067.      484.      950.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.44      397.      359.      169.      0.66       670.      125.      782.
SUB LOC PHI        Z1        R1        X1
 6  2  0.63       833.      674.      490.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.31      300.      285.       93.      0.31       533.      389.      397.
SUB LOC PHI        Z1        R1        X1
 6  2  0.63       833.      674.      490.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.19      167.      164.       31.      0.44       667.      510.      459.
SUB LOC PHI        Z1        R1        X1
 6  2  1.10      1067.      484.      950.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.19      283.      278.       53.      0.91       783.      206.      897.
SUB LOC PHI        Z1        R1        X1
 6  2  1.26      1083.      335.     1030.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.31      500.      476.      155.      0.94       583.     -141.      876.
SUB LOC PHI        Z1        R1        X1
 6  2  1.26      1133.      350.     1078.
PHI2        Z2        R2        X2      DPHI        DZ        DR        DX
0.44      417.      377.      177.      0.82       717.      -27.      900.
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SUB LOC PHI      Z1       R1       X1
 6  2  1.26    1117.     345.    1062.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.44     492.     445.     209.    0.82     625.    -100.     853.
SUB LOC PHI      Z1       R1       X1
 6  2  1.10    1117.     507.     995.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.06      28.      28.       2.    1.04    1088.     479.     993.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1250.     386.    1189.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.31     333.     317.     103.    0.94     917.      69.    1086.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1250.     386.    1189.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.06      23.      23.       1.    1.19    1227.     363.    1187.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1150.     355.    1094.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.19     283.     278.      53.    1.07     867.      77.    1041.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1400.     433.    1331.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.13     200.     198.      25.    1.13    1200.     234.    1306.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1350.     417.    1284.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.50     567.     497.     273.    0.75     783.     -79.    1011.
SUB LOC PHI      Z1       R1       X1
 6  3  0.50     708.     621.     341.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.03      12.      12.       0.    0.47     697.     609.     341.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1083.     335.    1030.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.13     167.     165.      21.    1.13     917.     169.    1009.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1017.     314.     967.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.06      50.      50.       3.    1.19     967.     264.     964.
SUB LOC PHI      Z1       R1       X1
 6  3  0.06     167.     166.      10.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.03      20.      20.       1.    0.03     147.     146.      10.
SUB LOC PHI      Z1       R1       X1
 6  3  1.26    1250.     386.    1189.
PHI2      Z2       R2       X2     DPHI      DZ       DR       DX
0.31     333.     317.     103.    0.94     917.      69.    1086.
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SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1439.     653.     1282.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.31      488.     464.      151.     0.79      951.       189.      1131.
SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1585.     720.     1413.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.31      451.     429.      139.     0.79     1134.       291.      1273.
SUB LOC PHI      Z1       R1        X1
 4  1  0.79    1171.     828.      828.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.03       35.      35.        1.     0.75     1135.       792.       827.
SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1341.     609.     1195.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.63      732.     592.      430.     0.47      610.        17.       765.
SUB LOC PHI      Z1       R1        X1
 4  1  0.94    1317.     774.     1066.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.03       16.      16.        0.     0.91     1301.       759.      1065.
SUB LOC PHI      Z1       R1        X1
 4  1  0.94    1463.     860.     1184.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.03       49.      49.        2.     0.91     1415.       811.      1182.
SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1439.     653.     1282.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.03       27.      27.        1.     1.07     1412.       626.      1281.
SUB LOC PHI      Z1       R1        X1
 4  1  0.31     244.     232.       75.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.03       17.      17.        1.     0.28      227.       215.        75.
SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1439.     653.     1282.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.31      488.     464.      151.     0.79      951.       189.      1131.
SUB LOC PHI      Z1       R1        X1
 4  1  1.10    1585.     720.     1413.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.31      451.     429.      139.     0.79     1134.       291.      1273.
SUB LOC PHI      Z1       R1        X1
 4  2  0.31     134.     128.       41.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.31      171.     162.       53.     0.0       -37.       -35.       -11.
SUB LOC PHI      Z1       R1        X1
 4  2  1.10    1317.     598.     1174.
PHI2        Z2       R2        X2     DPHI        DZ         DR         DX
0.19      171.     168.       32.     0.91     1146.       430.      1142.
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SUB LOC PHI      Z1       R1      X1
 4  2  0.94     1000.     588.    809.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.31     317.     302.      98.   0.63    683.    286.    711.
SUB LOC PHI      Z1       R1      X1
 4  2  1.10     1220.     554.   1087.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.31     141.     135.      44.   0.79   1078.    419.   1043.
SUB LOC PHI      Z1       R1      X1
 4  2  0.94      610.     358.    493.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.19      98.      96.      18.   0.75    512.    263.    475.
SUB LOC PHI      Z1       R1      X1
 4  2  0.63     1000.     809.    588.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.25     146.     142.      36.   0.38    854.    667.    551.
SUB LOC PHI      Z1       R1      X1
 4  2  0.94     1220.     717.    987.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.31     244.     232.      75.   0.63    976.    485.    911.
SUB LOC PHI      Z1       R1      X1
 4  2  0.94     1220.     717.    987.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.03      20.      20.       1.   0.91   1200.    697.    986.
SUB LOC PHI      Z1       R1      X1
 4  2  0.31      122.     116.     38.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.31     171.     162.      53.   0.0     -49.    -46.    -15.
SUB LOC PHI      Z1       R1      X1
 4  2  1.10     1220.     554.   1087.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.19     171.     168.      32.   0.91   1049.    386.   1055.
SUB LOC PHI      Z1       R1      X1
 4  3  1.10     1488.     675.   1326.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.63     537.     434.     315.   0.47    951.    241.   1010.
SUB LOC PHI      Z1       R1      X1
 4  3  1.10     1390.     631.   1239.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.31     337.     320.     104.   0.79   1054.    311.   1135.
SUB LOC PHI      Z1       R1      X1
 4  3  0.79      561.     397.    397.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.25     112.     109.      28.   0.53    449.    288.    369.
SUB LOC PHI      Z1       R1      X1
 4  3  0.94     1220.     717.    987.
PHI2      Z2       R2       X2    DPHI     DZ      DR      DX
0.25     195.     189.      49.   0.69   1024.    528.    938.
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SUB LOC PHI       Z1        R1        X1
 4  3  0.94     1073.      631.      868.
PHI2        Z2        R2        X2      DPHI        CZ         DR         DX
0.19        98.       96.       18.     0.75       976.       535.       850.
SUB LOC PHI       Z1        R1        X1
 4  3  0.94      732.      430.      592.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.38       298.      277.      110.     0.57       434.       153.       482.
SUB LOC PHI       Z1        R1        X1
 4  3  1.10     1415.      642.     1260.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.31       198.      188.       61.     0.79      1217.       454.      1199.
SUB LOC PHI       Z1        R1        X1
 4  3  0.79     1220.      862.      862.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.63       683.      552.      401.     0.16       537.       310.       461.
SUB LOC PHI       Z1        R1        X1
 4  3  0.79     1122.      793.      793.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.63       561.      454.      330.     0.16       561.       340.       464.
SUB LOC PHI       Z1        R1        X1
 4  3  1.10     1488.      675.     1326.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.63       537.      434.      315.     0.47       951.       241.      1010.
SUB LOC PHI       Z1        R1        X1
 7  1  1.07     1000.      482.      876.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.31       218.      208.       67.     0.75       782.       274.       809.
SUB LOC PHI       Z1        R1        X1
 7  1  1.10      909.      413.      810.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.50       273.      239.      131.     0.60       636.       174.       679.
SUB LOC PHI       Z1        R1        X1
 7  1  1.26     1127.      348.     1072.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.63       545.      441.      321.     0.63       582.       -93.       751.
SUB LOC PHI       Z1        R1        X1
 7  1  1.10      909.      413.      810.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.13        13.       13.        2.     0.97       896.       400.       808.
SUB LOC PHI       Z1        R1        X1
 7  1  1.10      909.      413.      810.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.63       364.      294.      214.     0.47       545.       119.       596.
SUB LOC PHI       Z1        R1        X1
 7  1  1.26     1145.      354.     1089.
PHI2        Z2        R2        X2      DPHI        DZ         DR         DX
0.06        31.       31.        2.     1.19      1115.       323.      1087.
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SUB LOC PHI	Z1	R1	X1				
7 1 1.13	1018.	434.	921.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.79	545.	386.	386.	0.35	473.	48.	536.
SUB LOC PHI	Z1	R1	X1				
7 1 1.13	909.	387.	823.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.82	600.	411.	437.	0.31	309.	-24.	385.
SUB LOC PHI	Z1	R1	X1				
7 1 1.07	782.	377.	685.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.44	164.	148.	70.	0.63	618.	229.	615.
SUB LOC PHI	Z1	R1	X1				
7 1 1.26	1145.	354.	1089.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.03	9.	9.	0.	1.23	1136.	345.	1089.
SUB LOC PHI	Z1	R1	X1				
7 2 0.94	800.	470.	647.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.69	455.	350.	290.	0.25	345.	120.	357.
SUB LOC PHI	Z1	R1	X1				
7 2 1.13	818.	348.	740.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.06	18.	18.	1.	1.07	800.	330.	739.
SUB LOC PHI	Z1	R1	X1				
7 2 1.10	727.	330.	648.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.88	418.	267.	322.	0.22	309.	64.	326.
SUB LOC PHI	Z1	R1	X1				
7 2 1.26	836.	258.	795.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.13	73.	72.	9.	1.13	764.	186.	786.
SUB LOC PHI	Z1	R1	X1				
7 2 1.26	855.	264.	813.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	473.	278.	382.	0.31	382.	-14.	430.
SUB LOC PHI	Z1	R1	X1				
7 2 1.26	945.	292.	899.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.82	400.	274.	292.	0.44	545.	18.	608.
SUB LOC PHI	Z1	R1	X1				
7 2 1.26	836.	258.	795.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.63	364.	294.	214.	0.63	473.	-36.	582.
SUB LOC PHI	Z1	R1	X1				
7 2 1.26	891.	275.	847.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.50	291.	255.	140.	0.75	600.	20.	707.

SUB LOC PHI	Z1	R1	X1				
7 2 1.26	909.	281.	865.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.13	55.	54.	7.	1.13	855.	227.	858.
SUB LOC PHI	Z1	R1	X1				
7 2 0.94	800.	470.	647.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.69	455.	350.	290.	0.25	345.	120.	357.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1091.	337.	1038.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
1.01	782.	419.	660.	0.25	309.	-82.	377.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1273.	393.	1210.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.25	182.	176.	45.	1.01	1091.	217.	1165.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1182.	365.	1124.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.19	55.	54.	10.	1.07	1127.	312.	1114.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	982.	303.	934.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	727.	427.	588.	0.31	255.	-124.	345.
SUB LOC PHI	Z1	R1	X1				
7 3 1.38	927.	174.	911.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.13	9.	9.	1.	1.26	918.	165.	910.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1127.	348.	1072.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	691.	406.	559.	0.31	436.	-58.	513.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1145.	354.	1089.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.06	36.	36.	2.	1.19	1109.	318.	1087.
SUB LOC PHI	Z1	R1	X1				
7 3 1.13	982.	418.	888.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.63	455.	368.	267.	0.50	527.	50.	621.
SUB LOC PHI	Z1	R1	X1				
7 3 1.26	1127.	348.	1072.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.75	600.	437.	411.	0.50	527.	-89.	661.
SUB LOC PHI	Z1	R1	X1				
7 3 1.10	855.	388.	761.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.79	509.	360.	360.	0.31	345.	28.	401.

SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1719.	781.	1532.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
1.10	1579.	717.	1407.	0.0	140.	64.	125.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1702.	773.	1516.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
1.07	1579.	761.	1384.	0.03	123.	12.	133.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1579.	717.	1407.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.31	474.	451.	146.	0.79	1105.	266.	1260.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1649.	749.	1469.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.69	877.	676.	559.	0.41	772.	73.	910.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1649.	749.	1469.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.63	772.	625.	454.	0.47	877.	124.	1016.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1579.	717.	1407.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.63	1053.	852.	619.	0.47	526.	-135.	788.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1649.	749.	1469.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
1.07	1474.	710.	1291.	0.03	175.	39.	178.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1579.	717.	1407.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.79	1228.	868.	868.	0.31	351.	-152.	538.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1579.	717.	1407.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	1439.	846.	1164.	0.16	140.	-129.	243.
SUB LOC PHI	Z1	R1	X1				
2 1 1.10	1579.	717.	1407.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
1.07	1456.	702.	1276.	0.03	123.	15.	131.
SUB LOC PHI	Z1	R1	X1				
2 2 0.94	1526.	897.	1235.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.79	1053.	744.	744.	0.16	474.	153.	490.
SUB LOC PHI	Z1	R1	X1				
2 2 0.94	1614.	949.	1306.				
PHI2	Z2	R2	X2	DPHI	DZ	DR	DX
0.94	1404.	825.	1135.	0.0	211.	124.	170.

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SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1439.      846.     1164.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.94    1439.      846.     1164.     0.0         0.        0.        0.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1439.      846.     1164.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.82    1386.      949.     1010.     0.13       53.     -103.      154.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1491.      877.     1206.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.31     439.      417.      136.     0.63     1053.      459.     1071.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1491.      877.     1206.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.94    1368.      804.     1107.     0.0       123.       72.       99.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1509.      887.     1221.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.94    1404.      825.     1135.     0.0       105.       62.       85.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1491.      877.     1206.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.94    1228.      722.      994.     0.0       263.      155.      213.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1509.      887.     1221.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.79    1316.      930.      930.     0.16      193.      -44.      290.
SUB LOC PHI      Z1        R1        X1
 2  2  0.94    1368.      804.     1107.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.88    1228.      783.      946.     0.06      140.       22.      161.
SUB LOC PHI      Z1        R1        X1
 2  3  0.75     579.      422.      396.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.63     491.      397.      289.     0.13       88.       25.      108.
SUB LOC PHI      Z1        R1        X1
 2  3  0.75     632.      460.      432.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.75     684.      499.      468.     0.0       -53.      -38.      -36.
SUB LOC PHI      Z1        R1        X1
 2  3  0.75    1140.      831.      781.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.50     579.      507.      279.     0.25      561.      324.      502.
SUB LOC PHI      Z1        R1        X1
 2  3  0.79    1070.      757.      757.
PHI2      Z2        R2        X2      DPHI        DZ        DR        DX
0.50     649.      569.      313.     0.28      421.      188.      444.
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SUB LOC PHI      Z1        R1        X1
 2  3  0.79    1193.      844.      844.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.63    1000.      809.      588.     0.16       193.         35.        256.
SUB LOC PHI      Z1        R1        X1
 2  3  0.94    1281.      753.     1036.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.63     930.      752.      547.     0.31       351.          1.        490.
SUB LOC PHI      Z1        R1        X1
 2  3  0.94    1561.      918.     1263.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.31     246.      234.       76.     0.63      1316.        684.       1187.
SUB LOC PHI      Z1        R1        X1
 2  3  0.94    1298.      763.     1050.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.94    1193.      701.      965.     0.0        105.         62.         85.
SUB LOC PHI      Z1        R1        X1
 2  3  0.94    1368.      804.     1107.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.63    1140.      923.      670.     0.31       228.       -118.        437.
SUB LOC PHI      Z1        R1        X1
 2  3  0.94    1368.      804.     1107.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.63    1088.      880.      639.     0.31       281.        -76.        468.
SUB LOC PHI      Z1        R1        X1
 3  1  1.26    1514.      468.     1439.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.06      36.       36.        2.     1.19      1477.        432.       1437.
SUB LOC PHI      Z1        R1        X1
 3  1  1.13    1081.      460.      978.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.06      54.       54.        3.     1.07      1027.        406.        975.
SUB LOC PHI      Z1        R1        X1
 3  1  0.50     523.      458.      252.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.31      90.       86.       28.     0.19       432.        372.        224.
SUB LOC PHI      Z1        R1        X1
 3  1  1.26    1586.      490.     1508.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.31     288.      274.       89.     0.94      1297.        216.       1419.
SUB LOC PHI      Z1        R1        X1
 3  1  1.26    1261.      390.     1200.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.06      18.       18.        1.     1.19      1243.        372.       1198.
SUB LOC PHI      Z1        R1        X1
 3  1  1.10     991.      450.      883.
PHI2       Z2        R2        X2      DPHI        DZ          DR          DX
0.38     360.      335.      133.     0.72       631.        115.        750.
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SUB LOC PHI      Z1        R1        X1
 3  1  1.26   1477.      457.     1405.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.06       90.       90.        6.     1.19     1387.       367.      1400.
SUB LOC PHI      Z1        R1        X1
 3  1  1.38   1477.      277.     1451.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.31      270.      257.       84.     1.07     1207.        20.      1368.
SUB LOC PHI      Z1        R1        X1
 3  1  1.26   1441.      445.     1371.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.44      162.      147.       69.     0.82     1279.       299.      1302.
SUB LOC PHI      Z1        R1        X1
 3  1  1.38   1550.      290.     1522.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.38      360.      335.      133.     1.01     1189.       -45.      1389.
SUB LOC PHI      Z1        R1        X1
 3  2  1.38   1333.      250.     1310.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.38      270.      251.       99.     1.01     1063.        -1.      1210.
SUB LOC PHI      Z1        R1        X1
 3  2  1.26   1441.      445.     1371.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.38      360.      335.      133.     0.88     1081.       110.      1238.
SUB LOC PHI      Z1        R1        X1
 3  2  0.75    901.      657.      617.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.31      288.      274.       89.     0.44      613.       383.       528.
SUB LOC PHI      Z1        R1        X1
 3  2  1.45   1586.      199.     1573.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.38      306.      285.      113.     1.07     1279.       -86.      1460.
SUB LOC PHI      Z1        R1        X1
 3  2  0.79   1081.      764.      764.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.06        5.        5.        0.     0.72     1076.       759.       764.
SUB LOC PHI      Z1        R1        X1
 3  2  1.45   1441.      181.     1430.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.06       45.       45.        3.     1.38     1396.       136.      1427.
SUB LOC PHI      Z1        R1        X1
 3  2  1.45   1315.      165.     1305.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.63       90.       73.       53.     0.82     1225.        92.      1252.
SUB LOC PHI      Z1        R1        X1
 3  2  1.38   1441.      270.     1416.
PHI2       Z2        R2        X2      DPHI       DZ         DR         DX
0.44      541.      489.      230.     0.94      901.      -219.      1186.
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