

## American Clinical Neurophysiology Society

### Guideline 5: Guidelines for Standard Electrode Position Nomenclature<sup>1</sup>

These guidelines propose a method for combining a slight modification of the International 10—20 System with a slight modification of a strict combinatorial rule that allows for an extension of the present 10—20 System to designate the 10% electrode positions that are currently unnamed. This extension is designated the 10-10 System.

This report is divided into the following sections:

(1) desirable characteristics of an alphanumeric nomenclature; (2) head diagram of proposed “modified combinatorial nomenclature”; (3) explanation of the modification of the 10-20 nomenclature within the modified combinatorial 10-10 system; (4) explanation of the deviation from a strict combinatorial nomenclature in the modified system proposed herein; and (5) extension of combinatorial nomenclature to positions inferior to those demonstrated in Fig. 1.

#### I. DESIRABLE CHARACTERISTICS OF AN ALPHANUMERIC NOMENCLATURE

1. The alphabetical part should consist preferably of one but no more than two letters.
2. The letters should be derived from names of underlying lobes of the brain or other anatomic landmarks.
3. The complete alphanumeric term should serve as a system of coordinates locating the designated electrode according to the following rules.
  - a. Each letter should appear on only one coronal line. (In standard 10-20 terminology, the only outstanding exception to this rule are the “T” (temporal) names that appear on both the central and parietal coronal lines. For reasons explained in Section III, this exception is replaced by a more consistent terminology within the nomenclature recommended by the Committee. For emphasis, this modification is displayed on the head diagram in Section II with white lettering on a black background.)
  - b. Each number should designate a sagittal line so the same postscripted number identifies all positions lying on that sagittal line. (Again, the only outstanding exception to this rule in the current 10—20 System is in the “T” numbering. For example, this results in the F7, T3, and T5 designations all appearing on a single sagittal line. This exception is also eliminated within the recommended nomenclature. Once more for emphasis, this modification is displayed in the head diagram in Fig. 1 with white lettering on a black background.)

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<sup>1</sup> This topic was previously published as Guideline 13.

## II. HEAD DIAGRAM OF PROPOSED 10-10 SYSTEM

In Fig. 1, the modifications of the current 10-20 terminology, instituted for reasons explained in Section III, are emphasized by displaying them with white lettering on a black background.

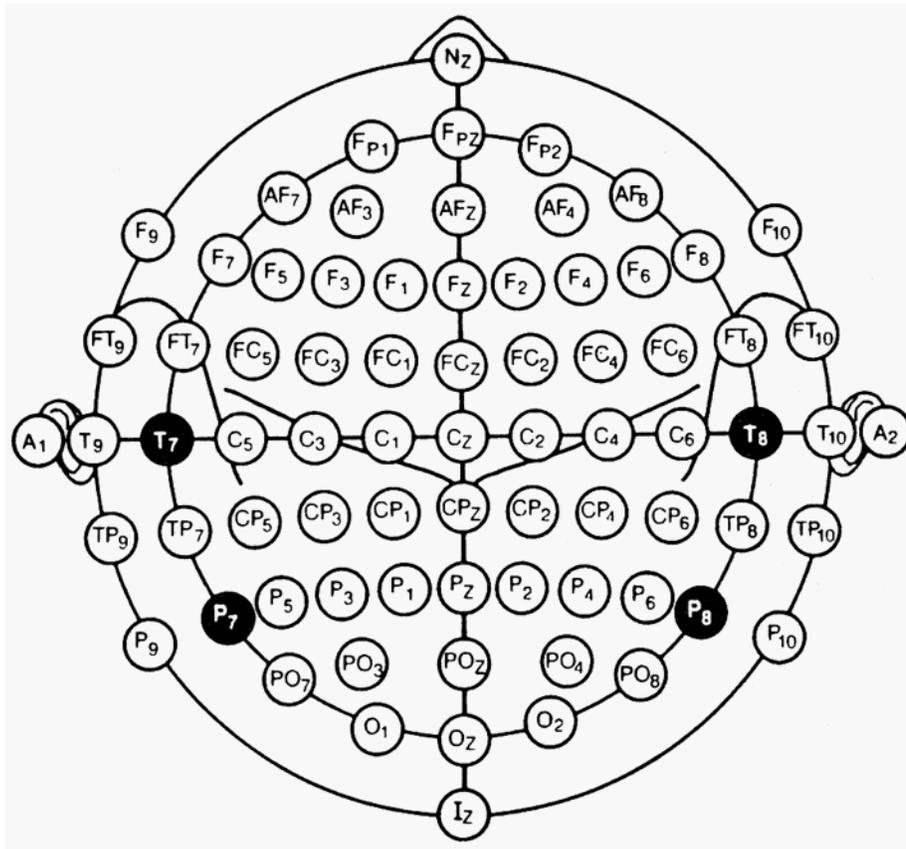


FIG.1. Modified combinatorial nomenclature for the 10-10 system.

### III. EXPLANATION OF THE MODIFICATION OF THE 10-20 NOMENCLATURE WITHIN THE MODIFIED COMBINATORIAL SYSTEM

The modified 10-10 terminology replaces the inconsistent T3/T4 and T5/T6 terms with the consistent T7/T8 and P7/P8. The head diagram in Fig. 1 emphasizes consistency of the terms T7/T8 and P7/P8 by showing them with white lettering on black circles. The value of this becomes evident when inspecting the head diagram, which shows that, except for Fp1/Fp2 and O1/O2, all electrode positions along the same sagittal line have the same postscribed number and that all electrodes designated by the same letter(s) lie on the same coronal line. Thus, the alphanumeric nomenclature for each electrode

specifies its coordinate location within the 10-20 grid system. Once this is done, the positions *10% inferior* to the standard frontotemporal electrodes are easily designated as F9/F10, T9/T10, and P9/P10, respectively.

As indicated above, the straightforward designation of an electrode's coordinate localization by its nomenclature requires replacement of the inconsistent T3/4 by T7/8, which is a readily understandable modification. A more radical modification replaces T5/6 by P7/8. However, even with this more radical departure, P can easily be recognized as representing parietal when it is associated with a postscripted number with a value of 6 or less, whereas it can be readily recognized as implying posterior temporal if P is associated with a number with a value of 7 or greater.

However, even though T7/8 and P7/8 in the head diagram *emphasize the internally consistent logic* of the system, it would clearly be *an acceptable alternative* to continue to use T3/4 and T5/6 without detracting from the logic of the remaining system.

#### **IV. EXPLANATION OF THE DEVIATION FROM A STRICT COMBINATORIAL NOMENCLATURE IN THE MODIFIED SYSTEM PROPOSED HEREIN**

The 10-20 System does not name electrode positions forming the four 10% intermediate coronal lines lying between the five standard coronal lines containing currently named electrode positions. The strict combinatorial system designates the currently unnamed positions by combining the names or letters for the two standard electrode positions that surround a currently undesignated 10% intermediate electrode position.

Thus, positions in the second intermediate coronal line are designated as either the frontotemporal positions (FT) or the frontocentral positions (FC), depending on their location as noted in the head diagram.

The electrode positions in the third intermediate coronal line are designated as temporal-posterior temporal (TP) or centroparietal (CP) as noted in Fig. 1.

The positions in the fourth and final intermediate coronal line are designated as posterior temporo-occipital (PO) or parieto-occipital (PO).

The *only proposed deviation* from the strict combinatorial rule discussed above is in naming the first intermediate transverse positions as anterior frontal (AF) electrodes rather than frontopolar-frontal electrodes. The latter terminology would designate the electrodes with either three letters (FpF) or the same two letters (FF). Since neither of these letter designations is desirable (the first because it uses three letters and the second because it uses the same letter twice), the Committee proposes using the readily understandable anterior frontal (AF) designation displayed in Fig. 1.

Once the above letters are assigned to the currently unnamed 10% intermediate positions, then their alphanumeric designation is completed by post-scripting the letters assigned to an electrode by the number designating the sagittal line upon which the electrode lies. For example, in Fig. 1 AF3, FC3, CP3, and PO3 all lie on the same sagittal line designated by the number 3.

When this is done, each new alphanumeric designation not only is directly related to a

slight modification of the 10-20 terminology but serves as an internally consistent coordinate system that locates each newly designated electrode position at the intersection of a specified coronal (identified by the prefixed letter) and sagittal (identified by the postfixed number) line.

#### **V. EXTENSION OF THE 10-10 COMBINATORIAL NOMENCLATURE TO POSITIONS INFERIOR TO THOSE DEMONSTRATED IN FIG. 1**

Positions posterior to electrodes displayed in the ninth and tenth rows would be designated as PO9 (10% inferior to PO7), PO10(10% inferior to PO8), O9 (10% inferior to O1), and O10 (10% inferior to O2). Electrodes 10% inferior to the ninth row would be designated with the postscripted number 11 (F11, FT11, T11, TP11, P11, PO11, O11), and those 10% inferior to the tenth row would be designated with a postscripted number 12 (F12, FT12, T12, TP12, P12, and O12).