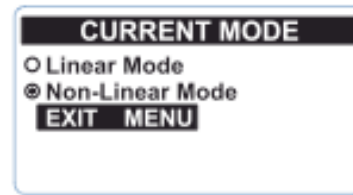


Question What is the purpose of the **Non-Linear Current Adjustment** Mode on the STIMPOD NMS410 and STIMPOD NMS450 Nerve stimulators?



Answer The idea is to offer the anesthetist preset **Current** and **Pulse Width** settings, which will provide a more predictable, **linear progression** of the distance the needle moves from setting to setting.

Explanation The principle of using the required threshold current to estimate the distance from the stimulated nerve forms the basis of nerve locating, when using peripheral nerve stimulation. **Coulomb's law** governs the distance from the nerve vs. the stimulation current required:

$$E = K(Q/r^2)$$

where E is the current required, K is a constant, Q the minimal current, and r the distance.

The presence of the **inverse square** means that a very high stimulus is needed when the needle/probe tip is some distance from the nerve. Thus, the threshold current required to facilitate excitation of a nerve is proportional to the square of the distance from the electrode to the nerve fibre. [1,2,3] This relationship holds true as long as the needle is subjected to a homogenous environment regardless of the distance from the nerve. In reality such a relationship is more complex, due to the fact that every tissue through which the needle moves, presents a different **impedance spectrum**.

Question How can the user use this mode to customize his preferred current settings?

Answer This mode offers the anesthetist a simple way to adjust the **Current** and **Pulse Width** settings by entering his preferred settings in 20 different preset positions.

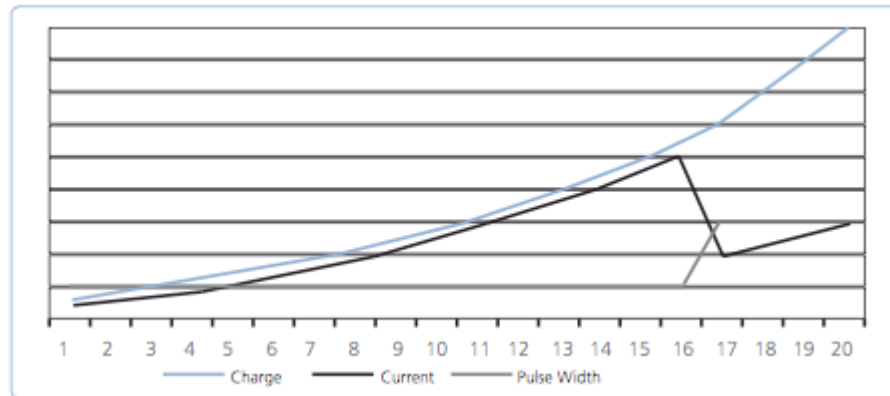
Explanation The STIMPOD has the default values presented in the table programmed for Non-Linear Current Mode. It is up to the user to define different values if they prefer.

Application If you would normally start your Regional Nerve Locating procedure at 1.6 mA at 100µs, then enter those values in position 20. If the lowest value you might use is 0.1mA at 100µs, enter it in position 1. Fill in positions 2 -19 with a progression of other preferred values. When the unit starts up it will be set at 0.0mA and 100µs. When the user turns the wheel clockwise it will start to progress through settings from position 1 up to 20. If the user turns the wheel anti-clockwise the setting will progress the other way i.e. from position 20 down to 1.

The default settings are listed below:

Position	Current (mA)	Pulse Width (ms)	Charge (μC)
1	0.30	0.1	0.030
2	0.43	0.1	0.043
3	0.58	0.1	0.058
4	0.76	0.1	0.076
5	0.97	0.1	0.097
6	1.20	0.1	0.12
7	1.40	0.1	0.14
8	1.70	0.1	0.17
9	2.00	0.1	0.20
10	2.30	0.1	0.23
11	2.70	0.1	0.27
12	3.00	0.1	0.30
13	3.40	0.1	0.34
14	3.80	0.1	0.38
15	4.30	0.1	0.43
16	4.80	0.1	0.48
17	1.80	0.3	0.54
18	2.10	0.3	0.63
19	2.40	0.3	0.72
20	2.70	0.3	0.81

It should be noted that the charge of the default values shows a typical **quadratic curve**.



Question How do I know the STIMPOD is in **Non-Linear Mode**?

Answer The **Non-Linear indicator** on the top right of the display of the STIMPOD nerve stimulator tells the user that the STIMPOD is in Non-Linear Mode.

Application To select a specific current mode, hold the Menu (Pulse Width) Key down until the STIMPOD displays the Menu Options. Choose Current Adjustment Mode and follow the prompts.

- Question** Can I adjust **Pulse Width** while operating in **Non-Linear mode**?
- Answer** No, the Pulse Width button is disabled in this mode. This is because the preset adjustment values contain both Current and Pulse Width preset values.
- Application** If you would like to be able to change the Pulse Width individually, the only option is to revert back to **Linear Current Mode**.
-

References

- 1] Pither CE, Raj PP, Ford DJ. The use of peripheral nerve stimulators for regional anesthesia: A review of experimental characteristics. *Regional Anesthesia* 1985;10:49-58.
- 2] Yeomans J, Prior P, Bateman F. Current-distance relations of axons mediating circling elicited by midbrain stimulation. *Brain Research* 1986;372:95-106
- 3] Follet K A, Man M D. Effective stimulation distance for current from macro electrodes. *Experimental Neurology* 1986;92:75-91



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