Dear Mr.Ta

I appreciate your patience and I sincerely apolgise for the delay.

I am writing to you as I am probably the only active member of the team that designed and brought to market the Microstim.
The project started in 1985 and the DBS version V 1.0 was released 1991.

When the Microstim DBS was first designed digital storage oscilloscopes were not on every engineers test bench and at that time the hospital engineer could either measure the pause between pulses 750ms or examine the short pulses in detail but not both together.
Also at this time microprocessors were just entering the mainstream of equipment and were only understood by software engineers. So we accepted totally the statement that "timing could not drift" as we expected in the past with discreet components, due to the use of a high frequency crystal control and associated software.

This resulted in engineers checking the system looking independently at the short pulses then the pause. Errors of at least +/- 10 could be expected with the test equipment in normal use at that time. Unfortunately the arrow in the first manual has been placed in the wrong place so subsequent testing with storage oscilloscopes will show a discrepancy. This error has been repeated in subsequent technical manuals. It will be revised and tolerances added.

Due to the high reliability of this product we have had very few failures (mainly due to the user dropping them onto a hard floor) and subsequently very few technical enquiries of this nature.

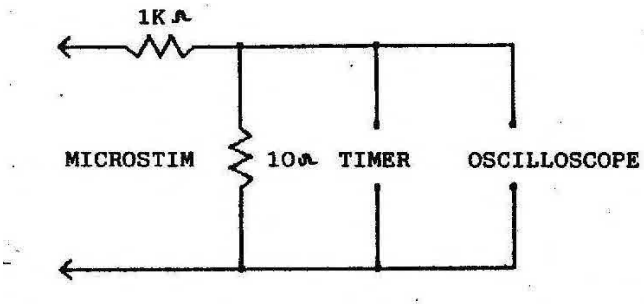
Each Microstim is currently tested as it comes off the production line so theoretically they should all be the same.

From a clinical viewpoint an error of +/- 10 % would have no adverse effect on the use of the instrument as the clinician is an important part of the feedback loop.

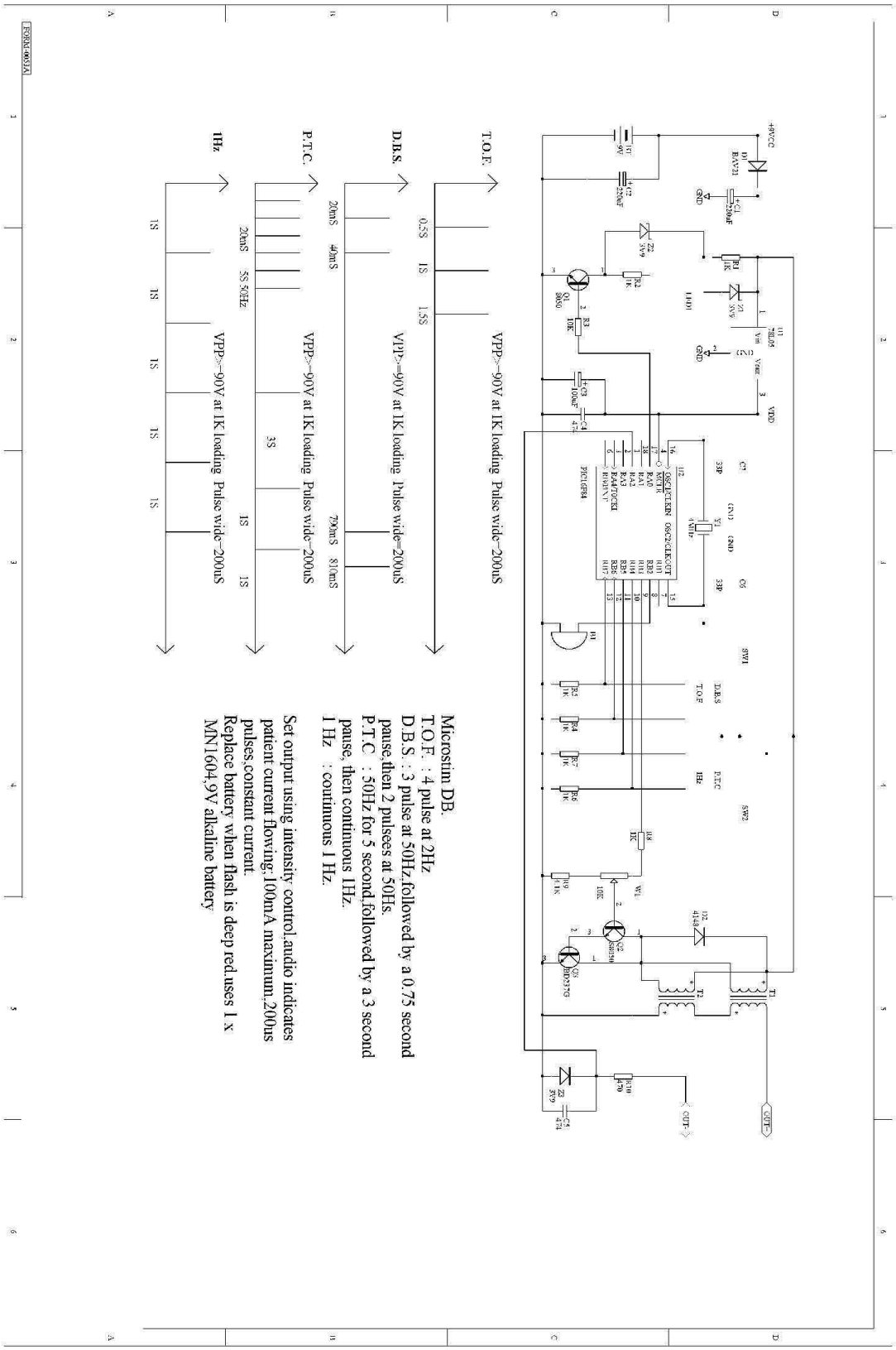
From original design spec 1991

Double-burst:
Consists of either two trains of three pulses at approximately 50 Hz, separated by approximately 0.75 milliseconds, (3.3)
or an initial train of three pulses followed by a train of two pulses (3.2).
The neuromuscular response consists of two short muscle contractions, the second of which is significantly less forceful than the first. The ratio of these contractile forces indicates the degree of patient drug-induced muscular relaxation.
The Micostim consists of 3 pulses at 50Hz followed by a 0.75 second pulse then 2 pulses at 50Hz

Original Microstim 100 Test set up 1986 still used on Microstim DB III



Test procedure



Kind regards
John S. Lamb
Chairman