

FAX REF 6047

TO

FROM

4 February 1997

Ed Avila

Teledyne

John S. Lamb

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Dear Ed,

We have tested almost 100 Nellcor SpO2 cables from repaired Nellcor probes

The Resistor values are as follows

7.44Kohm	1
7.45	2
7.46	9
7.47	15
7.48	13
7.49	21
7.50	14
4.51	9
7.52	4
7.53	3
7.54	1
7.68	1

This is a typical distribution curve around a resistor value of 7.5Kohm with a +/- 1% tolerance.

It would therefore appear that Nellcor are no longer matching LED's to a resistor value on Finger probes.

We tested 1 Dura Y @ 7.97Kohm

Two Disposable 8.03 Kohm & 8.23 Kohm

These tests are too few in number to be meaningful but it appears that the disposable with a difference of 2% may be using a different or even wider tolerance LED's.

NB

If a 7.5Kohm resistor is added to a BCI probe it will work on a Nellcor instrument

Investigation has shown that on a Nellcor connector Pins 1 & 2 are joined by a 7.5Kohm resistor.

Pin 7 is a screen

On a BCI pins 1, 6 & 7 are shorted out to a screen

We are looking at other DP9 connectors on other models and will keep you informed. However the above information should make life easier for UDT. i.e.

Kind Regards,





VIAMED



FAX REF
TO

:5 February 1997

Page 1 of 1

:Ed Avila

:Teledyne

FROM

:John S. Lamb

Dear Ed,

These are my personal thoughts on the Resistors in SpO2 probes.

Originally it was necessary to use a wide range of LED's in probes to keep the cost down. Nellcor & Ohmeda have used resistors to code the LED to an R curve.

To my knowledge and understanding this resistor is not used to adjust the LED output or input .

On examination of 100 Nellcor finger probes we have scientifically established that only one resistor is now being used i.e. 7.5Kohm. The resistor variations all lie within +/-1% of this value which suggests they are using a 1% tolerance.

Ohmeda still use a range of about 19 resistors.

As this resistor was added in the original designs a resistor is now required in present probes not to adjust the R curves but to tell the instrument a probe is actually present.

Other manufacturers who are using close tolerance LED's do not use resistors .

For instance BCI probes are identical to Nellcor but have a short circuit to the screen across the pins where the resistor would be in a Nellcor. If the resistor is removed from a Nellcor it will work in a BCI monitor.

Other manufacturers use wire links between pins to let the instrument know that a probe is present.

Theoretically it is impossible to join two pins with wire and have zero resistance.

This is not unique to SpO2 probes and is a well used device for differentiating between no signal and a disconnect. It is in fact used by Teledyne on the R22 sensor.

Nellcor Disposables appear to use a range of resistors possibly because for some disposables they claim a +/- 2 Digit accuracy . Finger probes +/- 3 Digits and the Y +/- 4 for Neonates, & +/- 3.5 for the Earclip.

Kind Regards,

John S Lamb.



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 7K

Notes: Resistor set to this value using
an adaptor cable

Reading at 100%: 100
Reading at 99%: 100
Reading at 98%: 99
Reading at 97%: 98
Reading at 96%: 97
Reading at 95%: 96
Reading at 94%: 95
Reading at 93%: 94
Reading at 92%: 93
Reading at 91%: 92
Reading at 90%: 91
Reading at 85%: 86
Reading at 80%: 81
Reading at 75%: 76
Reading at 70%: 72
Reading at 65%: 67
Reading at 60%: 62

Notes: Still within spec., appears
fairly stable and fast to react.



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 7.74K
Notes: Resistor set to this value using
an adaptor cable. This is the
highest the resistor would go
before being more than $\pm 3\%$
inaccurate.

Reading at 100%:	99-100
Reading at 99%:	99
Reading at 98%:	97
Reading at 97%:	96
Reading at 96%:	95
Reading at 95%:	95
Reading at 94%:	93
Reading at 93%:	92
Reading at 92%:	91
Reading at 91%:	90
Reading at 90%:	90
Reading at 85%:	84
Reading at 80%:	79
Reading at 75%:	73
Reading at 70%:	69-70
Reading at 65%:	62-63
Reading at 60%:	57



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 6K
Notes: The resistor on this probe was reduced to 6K using an adaptor cable.

Reading at 100%: 100
Reading at 99%: 100
Reading at 98%: 99
Reading at 97%: 99
Reading at 96%: 98
Reading at 95%: 97
Reading at 94%: 97
Reading at 93%: 95
Reading at 92%: 94
Reading at 91%: 94
Reading at 90%: 92
Reading at 85%: 88
Reading at 80%: 83
Reading at 75%: 78
Reading at 70%: 73
Reading at 65%: 68
Reading at 60%: 63

Notes: Still just within $\pm 3\%$



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 0
Notes: Resistor turned down to zero
using an adaptor cable

Reading at 100%:	98
Reading at 99%:	97
Reading at 98%:	96
Reading at 97%:	94
Reading at 96%:	93
Reading at 95%:	92
Reading at 94%:	91
Reading at 93%:	90
Reading at 92%:	89
Reading at 91%:	88
Reading at 90%:	88
Reading at 85%:	84
Reading at 80%:	80
Reading at 75%:	77
Reading at 70%:	75
Reading at 65%:	72
Reading at 60%:	70



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 2K
Notes: Resistor reduced to 2K using an adaptor cable.

Reading at 100%: 98
Reading at 99%: 97
Reading at 98%: 96
Reading at 97%: 95
Reading at 96%: 94
Reading at 95%: 92
Reading at 94%: 91
Reading at 93%: 90
Reading at 92%: 89
Reading at 91%: 88
Reading at 90%: 88
Reading at 85%: 83
Reading at 80%: 80
Reading at 75%: 77
Reading at 70%: 75
Reading at 65%: 72
Reading at 60%: 70

Notes: More than $\pm 3\%$ inaccurate



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Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 3K

Notes: Resistor reduced to 3K using an adaptor cable.

Reading at 100%: 100
Reading at 99%: 100
Reading at 98%: 99
Reading at 97%: 99
Reading at 96%: 98
Reading at 95%: 97
Reading at 94%: 96
Reading at 93%: 95
Reading at 92%: 94
Reading at 91%: 93
Reading at 90%: 92
Reading at 85%: 88
Reading at 80%: 83
Reading at 75%: 78
Reading at 70%: 74
Reading at 65%: 69
Reading at 60%: 64

Notes: No longer accurate at this resistor value.



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Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 9.51K
Notes: This was the maximum value the resistor could be taken to before the oximeter refused to accept the probe.

Reading at 100%: 99
Reading at 99%: 98
Reading at 98%: 97
Reading at 97%: 95
Reading at 96%: 93-94
Reading at 95%: 92
Reading at 94%: 91
Reading at 93%: 89
Reading at 92%: 88
Reading at 91%: 86
Reading at 90%: 85
Reading at 85%: 78
Reading at 80%: 70
Reading at 75%: 63
Reading at 70%: 57
Reading at 65%: 50
Reading at 60%: 44

Notes: Extremely inaccurate at this resistor value.



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VIAMED



Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 4K
Notes: Resistor reduced to 4K using an adaptor cable.

Reading at 100%: 100
Reading at 99%: 100
Reading at 98%: 99
Reading at 97%: 98
Reading at 96%: 97
Reading at 95%: 96
Reading at 94%: 95
Reading at 93%: 94
Reading at 92%: 94
Reading at 91%: 93
Reading at 90%: 92
Reading at 85%: 87
Reading at 80%: 83
Reading at 75%: 78
Reading at 70%: 73
Reading at 65%: 68
Reading at 60%: 63

Notes: Just within ± 3 spec.



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Date: 3/11/97
Manufacturer: Nellcor
Oximeter Model: N200
Probe Type: Finger
Probe Resistor: 5K

Notes: Resistor altered to 5K using an adaptor cable.

Reading at 100%: 100
Reading at 99%: 100
Reading at 98%: 99
Reading at 97%: 98
Reading at 96%: 97
Reading at 95%: 96
Reading at 94%: 95
Reading at 93%: 94
Reading at 92%: 94
Reading at 91%: 93
Reading at 90%: 92
Reading at 85%: 87
Reading at 80%: 82
Reading at 75%: 78
Reading at 70%: 73
Reading at 65%: 68
Reading at 60%: 63

Notes: Within ± 3 spec.



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