# 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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Registration No. 1291765 in England

# 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 ±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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| | |
|---|---|
| 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 ±3% |

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| | |
|---|---|
| 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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| | |
|---|---|
| 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 ±3% inaccurate |

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# VIAMED

| | |
|---|---|
| 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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# VIAMED

| | |
|---|---|
| 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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FAX REF 6047 :4 February 1997 Page 1 of 1
TO :Ed Avila
:Teledyne
FROM :John S. Lamb

---

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 :5 February 1997 Page 1 of 1
TO :Ed Avila
:Teledyne
FROM :John S. Lamb

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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 a1% 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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