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## Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>CE Mark—Signifies compliance with Medical Device Directive 93/42/EEC</td>
</tr>
<tr>
<td>REP</td>
<td>European Community (EC) authorized representative</td>
</tr>
<tr>
<td></td>
<td>Manufacturer—Ventilator manufacturer</td>
</tr>
</tbody>
</table>
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1. Software Enhancements

1.1. Overview
This addendum describes enhancements to the 980 Ventilator System and changes to the 980 Ventilator System Operator’s Manual.

1.2. Update to 4.7.2 NIV Breathing Interfaces
The following non-vented interfaces are compatible with the use of NIV/CPAP on the Puritan Bennett 980 ventilator:
Full-face mask — ResMed Mirage™ non-vented full face mask
Nasal mask — ResMed Ultra Mirage™ non-vented mask
Infant nasal prongs — Argyle™ nasal prongs, Hudson RCI™ Infant Nasal prongs, Fisher & Paykel™ nasal prongs, Medin™ nasal prongs, and Ram cannula
Uncuffed neonatal ET tube — Shiley™ Uncuffed tracheal tube, Murphy (3.0 mm)

1.3. Update to 4.7.3 NIV Setup
To function as intended, $D_{SENS}$ needs to be set between the LEAK data value displayed while the patient is connected, and the LEAK data value displayed when the interface is open to ambient and not connected to the patient.

To set $D_{SENS}$ with NIV interfaces when Leak Sync is enabled
1. After adjusting the patient settings, start ventilation.
2. Ensure that Leak Sync is enabled and set $D_{SENS}$ to the highest setting.
3. Select LEAK (L/min) to be displayed in the patient data banner.
4. With the NIV interface connected to the breathing circuit and open to ambient, use the patient data value called LEAK to quantify the leak in L/min.
5. Set the $D_{SENS}$ (in L/min) below the leak rate (in L/min) to ensure that the disconnect alarm is violated during a disconnect. Note that this will cause a CIRCUIT DISCONNECT alarm.
6. Connect the patient interface to the patient and ensure that the CIRCUIT DISCONNECT alarm is resolved.
7. $D_{SENS}$ needs to be set higher than the LEAK data value displayed while the patient is connected and lower than the LEAK data value displayed when the interface is open to ambient and not connected to the patient.
8. Periodically assess the leak rate, especially with PEEP changes, and adjust the $D_{SENS}$ setting as needed to ensure the presence of an alarm during disconnect and the absence of nuisance alarms while the interface is connected to the patient.
9. Always use alternative methods of monitoring during NIV.
1.4. Update to 4.7.4 Conversion from Invasive to NIV Ventilation Type

Note: Before switching to non-invasive ventilation from invasive ventilation when the EtCO₂ sensor was used, ensure the EtCO₂ option is disabled.

1.5. Update to 5.4.2 Communication Setup

To specify the communication configuration for the ventilator

1. Touch the configure icon in the constant access icons area of the GUI. A menu appears with several tabs.
2. Touch the Comm Setup tab. The Comm Setup screen appears allowing three ports to be configured. These ports can be designated as DCI, DCI 2.0, DCI 3.0, Philips, Spacelabs, or Waveforms.

1.6. Update to 5.4.7 SNDF Command

<table>
<thead>
<tr>
<th>MISCF</th>
<th>1225*</th>
<th>169</th>
<th>&lt;STX&gt;</th>
<th>FIELD 5, … FIELD 173,</th>
<th>&lt;ETX&gt;</th>
<th>&lt;CR&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

1. Response code to SNDF command
2. Number of bytes between <STX> and <CR>
3. Number of data fields between <STX> and <ETX>
4. Start of transmission (02 hex)

*MISCF 1225* if Philips is selected for serial port in communication setup

Note: Ensure your external devices are compatible with the latest DCI software to prevent incompatibilities as data fields may have been modified.

1.7. Update to Table 5-2. MISCF Response

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field 8</td>
<td>Ventilation Type (NIV, Invasive, or HFO2T) (9 characters)</td>
</tr>
<tr>
<td>Field 9</td>
<td>Mode (A/C, SIMV, SPONT, or CPAP) (6 characters)</td>
</tr>
<tr>
<td>Field 11</td>
<td>Spontaneous Type (PS, TC, VS, PA) (6 characters)</td>
</tr>
<tr>
<td>Field 12</td>
<td>Trigger Type setting (V-Trig, P-Trig, IESYNC) (6 characters)</td>
</tr>
<tr>
<td>Field 18</td>
<td>PEEP/CPAP setting in cmH₂O (6 characters)</td>
</tr>
<tr>
<td>Field 56</td>
<td>Disconnect sensitivity (DSENS) setting in %, L/min or OFF (6 characters)</td>
</tr>
<tr>
<td>Field 78</td>
<td>Monitored Inspired tidal volume (V_I) in L (6 characters) *VTL (L), If Leak Sync ON.</td>
</tr>
<tr>
<td>Field 87</td>
<td>Monitored Positive end expiratory pressure (PEEP) in cmH₂O (6 characters)</td>
</tr>
<tr>
<td>Field 91</td>
<td>Monitored total PEEP (PEEPtot) from expiratory pause maneuver in cmH₂O (6 characters)</td>
</tr>
<tr>
<td>Field 101</td>
<td>Proximal Flow Sensor state (ON or OFF) (6 characters)</td>
</tr>
</tbody>
</table>
Component | Description
--- | ---
Field 116 | Inadvertent Power Off alarm* (6 characters)
Field 127 | Procedure error alarm* (6 characters)
Field 128 | Compliance limited tidal volume (V\textsubscript{TI}) alarm* (6 characters)
Field 146\(^1\) | Technical malfunction A50* (6 characters)
Field 147\(^1\) | Technical malfunction A55* (6 characters)
Field 148\(^1\) | Technical malfunction A60* (6 characters)
Field 149\(^1\) | Technical malfunction A65* (6 characters)
Field 150 | Technical malfunction A70* (6 characters)\(^2\)
Field 151 | Technical malfunction A75* (6 characters)\(^3\)
Field 152 | Technical malfunction A80* (6 characters)\(^4\)
Field 153 | High ETCO\(_2\) Alarm* (6 characters)
Field 158 | LEAK in L/min (6 characters)
Field 159 | \(V\text{\_LEAK}\) in mL (6 characters)
Field 161 | ETCO\(_2\) (mmHg) when COM port is set to DCI 2.0 or DCI 3.0 (6 characters). Otherwise Blank
Field 162\(^5\) | Inspiratory Compliance ratio (C20/C) (6 characters)
Field 163\(^5\) | Three times Inspiratory Time Constant (3\(\tau\text{I}\)) in seconds (6 characters)
Field 164\(^5\) | Delivered mL/kg Volume (VTI/PBW)#.
\#\ VTL/PBW (mL/kg), if Leak Sync ON. (6 characters)
Field 165\(^6\) | Monitored Driving Pressure (P\text{\_DRIVE}) in cmH\textsubscript{2}O (6 characters)
Field 166\(^6\) | Monitored Positive End Expiratory Pressure at Patient Interface (PEEP\text{\_IF}) in cmH\textsubscript{2}O (6 characters)
Field 167\(^6\) | Monitored End Inspiratory Pressure at Patient Interface (P\text{\_END\_IF}) in cmH\textsubscript{2}O (6 characters)
Field 168\(^6\) | Monitored Constant Flow (\(\dot{V}\text{\_CONST}\)) in L/min (6 characters)
Field 169\(^6\) | IE Sync Trigger Sensitivity (I\text{\_SYNC}) setting (6 characters)
Field 170\(^6\) | IE Sync Cycle Sensitivity (E\text{\_SYNC}) setting (6 characters)
Field 171\(^6\) | Constant flow (\(\dot{V}\text{\_CONST}\)) setting in L/min (6 characters)
Field 172\(^6\) | Ventilator State\(^6\) (6 characters)
Field 173\(^6\) | Nebulizer State\(^7\) (6 characters)

*Possible responses are: NORMAL, LOW, MEDIUM, HIGH, or RESET.

1 Fields 146 to 149 are blank for DCI 3.0.
2 Nebulizer Inoperative Alarm*, when COM port is set to DCI 3.0.
3 CO\(_2\) Monitor Inoperative Alarm* when COM port is set to DCI 3.0.
4 Low EtCO\(_2\) Alarm*, when COM port is set to DCI 3.0.
5 Fields 162 to 173 are configured for DCI 3.0, otherwise Blank.
6 Possible Ventilator State responses are: STNDBY (Stand-By Mode), SAFPCV (Safety PCV), BREATH (Normal Breathing Mode), DISCON (Circuit Disconnect), OCCLUD ( Occlusion), SVOPEN (Safety Valve Open), BUV (Backup Ventilation), MIX-BUV (Mixer Backup Ventilation), HFO2T, APNEA.
7 Possible Nebulizer State responses are: ON, OFF, SUSPND (Suspended).
1.8. Update to 6.6.21 Driving Pressure ($P_{\text{DRIVE}}$)

While ventilating with PAV+™, Driving Pressure ($P_{\text{DRIVE}}$) is the difference between Plateau pressure and estimated PEEP$_{\text{TOT}}$ and represents the amount of pressure required to overcome the elastic recoil of the lungs. $P_{\text{DRIVE}}$ can also be calculated by dividing $V_T$ by $C_{\text{PAV}}$ ($V_T/C_{\text{PAV}}$).

PAV+™ software automatically performs a 300 ms end-inspiratory hold in a random pattern every four to ten PAV+™ breaths. Each time the end-inspiratory hold is conducted this pressure change is measured from the end expiratory lung pressure at the beginning of the breath to the pressure at the end of the plateau maneuver.

1.9. Update to Table 11-9. Ventilator Settings Range and Resolution

<table>
<thead>
<tr>
<th>Setting</th>
<th>Description</th>
<th>Range and resolution</th>
</tr>
</thead>
</table>
| Disconnect sensitivity ($D_{\text{SENS}}$) | **Leak Sync disabled**: The percentage of returned volume lost, above which the ventilator declares a CIRCUIT DISCONNECT alarm.  
**Leak Sync enabled**: The leak at PEEP value in L/min, above which the ventilator declares a CIRCUIT DISCONNECT alarm. | Range (Leak Sync disabled): 20% to 95% or OFF  
Range (Leak Sync enabled):  
NEONATAL: Invasive: 1 L/min to 15 L/min  
NIV: 1 L/min to 30 L/min  
PEDIATRIC: 1 L/min to 40 L/min  
ADULT: 1 L/min to 65 L/min  
Resolution (Leak Sync disabled): 1%  
Resolution (Leak Sync enabled): 0.5 L/min for values < 10 L/min; 1 L/min for values ≥ 10 L/min |

1.10. Update to Table 11-11. Patient Data Range and Resolution

<table>
<thead>
<tr>
<th>Data value</th>
<th>Description</th>
<th>Range and resolution</th>
</tr>
</thead>
</table>
| Driving Pressure ($P_{\text{DRIVE}}$) | During PAV+™, $P_{\text{DRIVE}}$ is computed as the pressure difference between Plateau Pressure and the estimated PEEP$_{\text{TOT}}$. | Range: 0 cmH$_2$O to 90 cmH$_2$O  
Resolution: 0.1 cmH$_2$O for 0 cmH$_2$O to 9.9 cmH$_2$O; 1.0 cmH$_2$O for values 10 cmH$_2$O to 90 cmH$_2$O |

1.11. Update to Table B-1. Maximum Leak Compensation Flow Based on Patient Type

<table>
<thead>
<tr>
<th>Patient type</th>
<th>Maximum leak compensation flow at PEEP</th>
<th>Maximum total flow</th>
</tr>
</thead>
</table>
| Neonatal             | Invasive: 15 L/min  
NIV: 30 L/min (25 L/min if compressor is the air source) | 50 L/min                                                                      |
1.12. Update to Table B-2. $D_{SENS}$ Settings

<table>
<thead>
<tr>
<th>Breathing circuit type</th>
<th>$D_{SENS}$ setting</th>
<th>Maximum total flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neonatal</td>
<td>Range: Invasive: 1 L/min to 15 L/min NIV: 1 L/min to 30 L/min Default: 2 L/min (Invasive ventilation) 5 L/min (NIV)</td>
<td>50 L/min</td>
</tr>
<tr>
<td>Pediatric</td>
<td>Range: 1 L/min to 40 L/min Default: 20 L/min</td>
<td>120 L/min</td>
</tr>
<tr>
<td>Adult</td>
<td>Range: 1 L/min to 65 L/min Default: 40 L/min</td>
<td>200 L/min</td>
</tr>
</tbody>
</table>

1.13. Update to Table D-3. Humidifier Volumes—Neonatal Patients

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Description</th>
<th>SST humidifier volume setting (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fisher &amp; Paykel™*</td>
<td>MR290</td>
<td>Neo/adult, disposable, auto-feed</td>
<td>550¹</td>
</tr>
<tr>
<td>Teleflex™* (Concha)</td>
<td>382-10</td>
<td>ConchaSmart</td>
<td>390</td>
</tr>
<tr>
<td>AirLife™*</td>
<td>AH290</td>
<td>Disposable, autofeed</td>
<td>520</td>
</tr>
</tbody>
</table>

¹If the following neonatal patient circuits are used with a Fisher & Paykel™* MR850 humidifier, enter 500 mL as the humidifier volume:

- DAR neonatal patient circuit with single heated wire (DAR 307S9910)–for incubator use
- DAR neonatal patient circuit with single heated wire (DAR 307/8682)–not for incubator use