Series 50 Fetal Monitors
Series 50 XM (M 1350B)
Series 50 XM O (M 1350C)

INSTALLATION AND SERVICE GUIDE

M 1350-9000S
Printed in Germany  April 2002
Notice

Philips makes no warranty of any kind with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Philips Medical Systems shall not be liable for errors contained herein or for incidental or consequential damages in connection with the furnishing, performance or use of this material.

This document contains proprietary information that is protected by copyright. All rights are reserved. No part of this document may be photocopied, reproduced or translated to another language without prior written consent of Philips Medical Systems.

The information contained in this document is subject to change without notice.

Philips assumes no responsibility for the use or reliability of its software on equipment that is not furnished by Philips.

Purchase of this instrument confers no express or implied license under any Nellcor patent or copyright to use this instrument with any fetal oximetry sensor that is not manufactured or licensed by Nellcor.

TM Dinamap is a trademark of General Electric.

TM Press-Mate is a trademark of the COLIN Corporation.

Federal Law (US) restricts this device to sale by or on the order of a physician.

Caution
Failure on the part of the responsible individual hospital or institution employing the use of this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

© 2002 Philips Medizin systeme Böblingen GmbH
All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright holder.
1. Figures ................................................................. xi
2. Tables ................................................................. xv
3. General Information .............................................. 1
   Introduction ......................................................... 1
   About this Guide .................................................... 1
   Who This Guide is For .............................................. 1
   What to do Next .................................................... 1
   Monitor’s Intended Use ............................................ 2
   Conventions Used in This Guide ................................. 2
   Symbols .............................................................. 2
   Initial Inspection ................................................... 3
   Claims for Damage .................................................. 3
   Repacking ........................................................... 3
   Unpacking and Checking the Shipment ......................... 4
   Optional Accessories .............................................. 6
   Instrument Identification ......................................... 6
   Localization Options ............................................... 6
   Service Philosophy ................................................ 7
   Overview of the Service Tests ................................... 7
   About the Monitor .................................................. 8
   Overview of the Monitor .......................................... 9
   Cardio and Toco Channels ....................................... 10
   Maternal Parameters ............................................. 12
   Recorder Keys ...................................................... 13
   Setting Keys ........................................................ 14
   Rear Panel .......................................................... 15
4. Pre-Installation Checks ........................................... 17
   Power Source Requirements ...................................... 17
   Setting the Required Voltage .................................... 18
5. Installing the Monitor ............................................. 19
   Mounting the Monitor ............................................. 19
   Surface Mounting .................................................. 19
   Cart Mounting ...................................................... 19
   Top Mounting ....................................................... 19
   Fitting the Paper Take-Up Tray ................................. 20
   Carts ..................................................................... 21
   Barcode Reader ........................................................ 22
   Attaching the Reader Holder ..................................... 22
   Connecting the Reader ............................................. 22
   Testing the Reader .................................................. 22
6. Configuring the Monitor ........................................... 25
   Introduction .......................................................... 25
   Configuration Tasks ................................................ 26
   Configuring the Monitor Using Pushbuttons ................. 27
   Printing and Clearing the Error Log ............................ 30
10. Upgrades ............................................................. 73
9. Quick Installation Checks ........................................... 71
8. System Interfaces ................................................. 51
7. Getting Started (Basic Considerations and Operation) .................. 45
6. Using the Service Program ......................................... 36
5. Setting the Paper Speed ............................................. 46
4. Changing the Time Format .......................................... 46
3. Setting the Time and Date ......................................... 45
2. Setting the FHR Paper Scale ...................................... 47
1. Adjusting the Recorder ............................................. 46
0. Using the Service Program ........................................ 35

Changing the Time Format .................................................. 33
Configuring the Monitor Using a PC .................................... 33
Installing the Service Program .......................................... 34
Connecting the PC to the Monitor ...................................... 35
Loading the Service Program ........................................... 35
Using the Service Program ............................................... 36
Main menu .......................................................................... 36
Configuring the Monitor ..................................................... 37
Adjusting the Recorder ....................................................... 38
Service menu .................................................................... 39

7. Getting Started (Basic Considerations and Operation) .................. 45
Setting the Time and Date .................................................. 45
Changing the Time Format .................................................. 46
Setting Paper Speed and Scale .......................................... 46
Setting the Paper Speed ..................................................... 46
Setting the FHR Paper Scale .............................................. 47
Switching Logic Off and On ............................................... 48
Separating FHR traces (“Twins Offset”). .............................. 48
Switching FMP Off and On .................................................. 49

8. System Interfaces ....................................................... 51
Monitor Rear Panel .......................................................... 51
Interface for Philips M 1310A ............................................. 52
Functions for External Parameter Input .................................. 54
Telemetry ........................................................................ 54
External Parameter ........................................................... 55
RS232 System Interface ..................................................... 58
System Interface Option J12 ................................................ 59
RS232 Dual Serial Interface Option J13 .................................. 61
Connecting External Devices ............................................. 62
Philips CMS, Philips 78352C/78354C, Dinamap 1846/8100, Datascope Accutorr Monitor ...................... 63
COLIN BP-8800 .................................................................. 63
Nellcor N-200 or N-400 Monitor .......................................... 64
Philips V24/V26 ............................................................... 64
External Device Baudrate Settings and Configurations .................. 66
Philips CMS ................................................................. 66
Philips 78352C and Philips 78354C ....................................... 66
COLIN BP-8800 ................................................................ 66
Dinamap 1846/8100 ............................................................ 67
Datascope Accutorr ............................................................ 67
Nellcor N-200 and N-400 .................................................... 67
Philips 26/24 .................................................................... 67
External Maternal Measurement on the FHR Trace ...................... 68
Troubleshooting ............................................................... 69

9. Quick Installation Checks ................................................. 71
Carrying Out the Checks ..................................................... 71

10. Upgrades ................................................................. 73
13. Troubleshooting ................................................................. 135
   Introduction .................................................................. 135
   Operator Error Messages .............................................. 137
      LCD Display Warning Messages ................................. 138
   Service Errors ................................................................ 140
      Error 500: General Failure ....................................... 141
      Error 502: Power Supply ......................................... 142
      Error 506: ROM Board ........................................... 144
      Error 507: DSP11 Board .......................................... 145
      Error 513: CPU Board ........................................... 146
      Error 515: D1F Board ............................................. 147
      Error 516 or 517: F1ontend Board .............................. 148
      Error 525 or 527: LED Display Board ...................... 149
      Error 526: LCD Display Board ................................ 150
      Error 532: System Interface Board .......................... 151
      Error 533: Dual Serial Interface Board .................... 152
      Error 534: Maternal SpO2 Board .............................. 153
      Error 535: NIPB Board ......................................... 154
      Error 536: Telemetry Interface Board ....................... 155
      Error 540: Fetal SpO2 Board ................................ 156
      Error 601: Recorder Paperfeed ................................ 157
      Error 602: Incorrect Type of Paper ............................ 158
      Ultrasound Parameter Test ...................................... 158
      Direct ECG Parameter Test ..................................... 159
      Maternal ECG Parameter Test ................................ 159
      Toco Parameter Test ............................................. 160
      Maternal SpO2 Parameter Test .................................. 161
      Fetal SpO2 Parameter Test ...................................... 162
      NIBP Parameter Test ............................................ 163
      External Maternal Parameters ................................. 164
      Recorder Paper Sensing ......................................... 165
      FSPO2 Monitor ..................................................... 166

14. Removal and Replacement Procedures .................................. 167
   Introduction ................................................................ 167
   Test/Inspection and Safety Procedures .................................. 168
   Tools ..................................................................... 168
   Removing the Top Cover ............................................. 169
### Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rear Assembly</td>
<td>170</td>
</tr>
<tr>
<td>Power Supply Board</td>
<td>170</td>
</tr>
<tr>
<td>Boards</td>
<td>173</td>
</tr>
<tr>
<td>Backplane</td>
<td>174</td>
</tr>
<tr>
<td>Batteries</td>
<td>175</td>
</tr>
<tr>
<td>Recorder Assembly</td>
<td>176</td>
</tr>
<tr>
<td>Frontend Board</td>
<td>178</td>
</tr>
<tr>
<td>Replacement of Frontend Board</td>
<td>179</td>
</tr>
<tr>
<td>Digital Interface Board</td>
<td>180</td>
</tr>
<tr>
<td>Display Assembly</td>
<td>182</td>
</tr>
<tr>
<td>Removing the Maternal Display Panel</td>
<td>182</td>
</tr>
<tr>
<td>SpO₂ Cable and NIBP Connector Tubing</td>
<td>185</td>
</tr>
<tr>
<td>Front Panel Assembly</td>
<td>186</td>
</tr>
<tr>
<td>Switch Boards</td>
<td>187</td>
</tr>
<tr>
<td>Recorder Keys Board</td>
<td>187</td>
</tr>
<tr>
<td>Function Switches Board</td>
<td>187</td>
</tr>
<tr>
<td>Loudspeaker</td>
<td>187</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>218</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>189</td>
</tr>
<tr>
<td>Replacement Parts</td>
<td>190</td>
</tr>
<tr>
<td><strong>15. Parts Lists</strong></td>
<td>189</td>
</tr>
<tr>
<td>Introduction</td>
<td>189</td>
</tr>
<tr>
<td>Ordering Information</td>
<td>189</td>
</tr>
<tr>
<td>Replacement Parts</td>
<td>190</td>
</tr>
<tr>
<td><strong>16. Recorder Assembly and Disassembly</strong></td>
<td>199</td>
</tr>
<tr>
<td>Introduction</td>
<td>199</td>
</tr>
<tr>
<td>Tools</td>
<td>200</td>
</tr>
<tr>
<td>Replacing Specific Items</td>
<td>202</td>
</tr>
<tr>
<td>Thermal Line Printer Head</td>
<td>202</td>
</tr>
<tr>
<td>Full Disassembly</td>
<td>203</td>
</tr>
<tr>
<td>Paper Table</td>
<td>204</td>
</tr>
<tr>
<td>Thermal Line Printer Assembly (TLP)</td>
<td>204</td>
</tr>
<tr>
<td>Paper Tray</td>
<td>204</td>
</tr>
<tr>
<td>Motor</td>
<td>205</td>
</tr>
<tr>
<td>Right Side Plate</td>
<td>206</td>
</tr>
<tr>
<td>Left Side Plate</td>
<td>206</td>
</tr>
<tr>
<td>Eject Mechanism and Base Assembly</td>
<td>207</td>
</tr>
<tr>
<td>Full Re-assembly</td>
<td>208</td>
</tr>
<tr>
<td>Paper Eject Mechanism and Base Assembly</td>
<td>208</td>
</tr>
<tr>
<td>Left Side Plate and Platen</td>
<td>208</td>
</tr>
<tr>
<td>Motor</td>
<td>210</td>
</tr>
<tr>
<td>Thermal Line Assembly</td>
<td>210</td>
</tr>
<tr>
<td>Paper Box</td>
<td>212</td>
</tr>
<tr>
<td>Final Stages</td>
<td>212</td>
</tr>
<tr>
<td>Recorder Settings</td>
<td>213</td>
</tr>
<tr>
<td>Replaceable Parts</td>
<td>214</td>
</tr>
<tr>
<td><strong>17. Transducers and Patient Modules</strong></td>
<td>217</td>
</tr>
<tr>
<td>Introduction</td>
<td>217</td>
</tr>
<tr>
<td>Ultrasound Transducer (M 1356A)</td>
<td>217</td>
</tr>
<tr>
<td>Description</td>
<td>217</td>
</tr>
<tr>
<td>Specifications</td>
<td>218</td>
</tr>
<tr>
<td>Troubleshooting</td>
<td>218</td>
</tr>
<tr>
<td>Toco Transducer (M 1355A)</td>
<td>219</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>D. Description</td>
<td>219</td>
</tr>
<tr>
<td>specifications Toco Transducer</td>
<td>219</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>219</td>
</tr>
<tr>
<td>DECG Transducer (M 1357A)</td>
<td>220</td>
</tr>
<tr>
<td>Description</td>
<td>220</td>
</tr>
<tr>
<td>Specifications</td>
<td>220</td>
</tr>
<tr>
<td>Parts List</td>
<td>221</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>221</td>
</tr>
<tr>
<td>MECG Transducer (M 1359A)</td>
<td>222</td>
</tr>
<tr>
<td>Description</td>
<td>222</td>
</tr>
<tr>
<td>Specifications</td>
<td>222</td>
</tr>
<tr>
<td>Parts List</td>
<td>223</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>223</td>
</tr>
<tr>
<td>US/M ECG Combi Transducer (M 1358A)</td>
<td>224</td>
</tr>
<tr>
<td>Description</td>
<td>224</td>
</tr>
<tr>
<td>Specifications</td>
<td>225</td>
</tr>
<tr>
<td>Parts List</td>
<td>226</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>226</td>
</tr>
<tr>
<td>IUP Pressure Transducer (CPJ840/5)</td>
<td>227</td>
</tr>
<tr>
<td>Description</td>
<td>227</td>
</tr>
<tr>
<td>Patient Modules (M 1364A and M 1365A)</td>
<td>228</td>
</tr>
<tr>
<td>Description</td>
<td>228</td>
</tr>
<tr>
<td>Specifications</td>
<td>228</td>
</tr>
<tr>
<td>Parts List</td>
<td>230</td>
</tr>
<tr>
<td>troubleshooting</td>
<td>230</td>
</tr>
<tr>
<td>A. Safety</td>
<td>231</td>
</tr>
<tr>
<td>Introduction</td>
<td>231</td>
</tr>
<tr>
<td>General Safety Information</td>
<td>231</td>
</tr>
<tr>
<td>Electrical Safety</td>
<td>231</td>
</tr>
<tr>
<td>ESU, MRI and Defibrillation</td>
<td>232</td>
</tr>
<tr>
<td>Leakage Current</td>
<td>233</td>
</tr>
<tr>
<td>Maximum Input/Output Voltages</td>
<td>233</td>
</tr>
<tr>
<td>Service Socket</td>
<td>234</td>
</tr>
<tr>
<td>Protective Earth</td>
<td>234</td>
</tr>
<tr>
<td>Environment</td>
<td>235</td>
</tr>
<tr>
<td>Spillage</td>
<td>235</td>
</tr>
<tr>
<td>Electromagnetic Compatibility</td>
<td>236</td>
</tr>
<tr>
<td>EMC Testing</td>
<td>236</td>
</tr>
<tr>
<td>System Characteristics</td>
<td>237</td>
</tr>
<tr>
<td>Avoiding Interference</td>
<td>237</td>
</tr>
<tr>
<td>B. Manufacturer's Information</td>
<td>239</td>
</tr>
<tr>
<td>Manufacturer's Responsibility</td>
<td>239</td>
</tr>
<tr>
<td>Manufacturers of Interfacing Monitors</td>
<td>239</td>
</tr>
<tr>
<td>Warranty</td>
<td>239</td>
</tr>
<tr>
<td>USA Law</td>
<td>240</td>
</tr>
<tr>
<td>Specifications</td>
<td>241</td>
</tr>
<tr>
<td>Patient Safety</td>
<td>241</td>
</tr>
<tr>
<td>Operating and Environmental</td>
<td>241</td>
</tr>
</tbody>
</table>
Fetal Display ................................................................. 242
Maternal External Blood Pressure .................................... 242
Maternal Pulse Oximetry ................................................. 243
Maternal ECG and Heart Rate .......................................... 243
Maternal Display Section .................................................. 244
  Numerical Display ......................................................... 244
  Maternal Display .......................................................... 244
Instrument Displays ....................................................... 244
  Mode Display ............................................................... 244
Ultrasound, External and Internal Toco ............................. 244
Recorder ........................................................................... 245
  FHR (Cardio) Scales ......................................................... 245
  Testing Facilities ............................................................ 245
<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Major Parts</td>
<td>9</td>
</tr>
<tr>
<td>1-2</td>
<td>Cardio and Toco Channels</td>
<td>10</td>
</tr>
<tr>
<td>1-3</td>
<td>Maternal Parameters</td>
<td>12</td>
</tr>
<tr>
<td>1-4</td>
<td>Recorder Keys</td>
<td>13</td>
</tr>
<tr>
<td>1-5</td>
<td>Setting Keys</td>
<td>14</td>
</tr>
<tr>
<td>1-6</td>
<td>Rear Panel</td>
<td>15</td>
</tr>
<tr>
<td>2-1</td>
<td>System Voltage and Fuse Values on the Rear Panel</td>
<td>17</td>
</tr>
<tr>
<td>2-2</td>
<td>Opening the Rear Panel</td>
<td>18</td>
</tr>
<tr>
<td>2-3</td>
<td>Voltage Selector Removal and Replacement</td>
<td>18</td>
</tr>
<tr>
<td>3-1</td>
<td>Attaching the Mounting Plate</td>
<td>20</td>
</tr>
<tr>
<td>3-2</td>
<td>Paper Take-Up Tray</td>
<td>20</td>
</tr>
<tr>
<td>3-3</td>
<td>Connecting the Barcode Reader</td>
<td>22</td>
</tr>
<tr>
<td>3-4</td>
<td>Test Barcodes</td>
<td>23</td>
</tr>
<tr>
<td>3-5</td>
<td>Test Annotation on the Recorder Paper</td>
<td>23</td>
</tr>
<tr>
<td>3-6</td>
<td>Cable for an Industry Standard compatible PC</td>
<td>33</td>
</tr>
<tr>
<td>4-1</td>
<td>Service Socket</td>
<td>35</td>
</tr>
<tr>
<td>4-2</td>
<td>Setting the Time and Date</td>
<td>45</td>
</tr>
<tr>
<td>4-3</td>
<td>Power Supply Board (PSU)</td>
<td>51</td>
</tr>
<tr>
<td>4-4</td>
<td>Sockets for Peripheral Devices</td>
<td>52</td>
</tr>
<tr>
<td>4-5</td>
<td>Telemetry Input Signal Allocations</td>
<td>56</td>
</tr>
<tr>
<td>4-6</td>
<td>External Parameter Definition 1</td>
<td>56</td>
</tr>
<tr>
<td>4-7</td>
<td>External Parameter Definition 2</td>
<td>56</td>
</tr>
<tr>
<td>4-8</td>
<td>External Parameter Definition 3</td>
<td>57</td>
</tr>
<tr>
<td>4-9</td>
<td>External Parameter Definition 4</td>
<td>57</td>
</tr>
<tr>
<td>4-10</td>
<td>Telemetry Interface RS232 System Connector</td>
<td>58</td>
</tr>
<tr>
<td>4-11</td>
<td>System Interface Connections</td>
<td>59</td>
</tr>
<tr>
<td>4-12</td>
<td>Interface Cable M1350-61609</td>
<td>63</td>
</tr>
<tr>
<td>4-13</td>
<td>COLIN Interface Cable</td>
<td>63</td>
</tr>
<tr>
<td>4-14</td>
<td>Dual Serial Interface 9-Pin and 25-Pin</td>
<td>65</td>
</tr>
<tr>
<td>4-15</td>
<td>System Overview</td>
<td>94</td>
</tr>
<tr>
<td>4-16</td>
<td>Power Supply Board</td>
<td>98</td>
</tr>
<tr>
<td>4-17</td>
<td>CPU Board</td>
<td>99</td>
</tr>
<tr>
<td>4-18</td>
<td>DSP Board</td>
<td>101</td>
</tr>
<tr>
<td>4-19</td>
<td>ROM Board</td>
<td>102</td>
</tr>
<tr>
<td>4-20</td>
<td>DIF Board</td>
<td>103</td>
</tr>
<tr>
<td>4-21</td>
<td>Frontend Board</td>
<td>105</td>
</tr>
<tr>
<td>4-22</td>
<td>Maternal SpO₂ Board</td>
<td>107</td>
</tr>
<tr>
<td>4-23</td>
<td>External Blood Pressure Board</td>
<td>109</td>
</tr>
<tr>
<td>4-24</td>
<td>Fetal SpO₂ Board</td>
<td>111</td>
</tr>
<tr>
<td>4-25</td>
<td>Telemetry / System Interface</td>
<td>112</td>
</tr>
<tr>
<td>4-26</td>
<td>O B M S Interface Board</td>
<td>114</td>
</tr>
<tr>
<td>4-27</td>
<td>Dual Serial Interface Board</td>
<td>115</td>
</tr>
<tr>
<td>5-1</td>
<td>Recorder Test Pattern</td>
<td>120</td>
</tr>
<tr>
<td>5-2</td>
<td>Testing an Ultrasound Transducer using a Pen</td>
<td>129</td>
</tr>
<tr>
<td>5-3</td>
<td>Position of Crystals in an Ultrasound Transducer</td>
<td>129</td>
</tr>
<tr>
<td>5-4</td>
<td>Checking an Ultrasound Transducer</td>
<td>129</td>
</tr>
<tr>
<td>5-5</td>
<td>Connecting the Pressure Gauge</td>
<td>133</td>
</tr>
<tr>
<td>5-6</td>
<td>Troubleshooting Flowchart for the System</td>
<td>135</td>
</tr>
</tbody>
</table>
Figure 14-5  Eject Mechanism and Base Assembly .............................................. 207
Figure 15-1  Ultrasound Transducer ................................................................. 217
Figure 15-2  Toco Transducer ......................................................................... 219
Figure 15-3  DECG Transducer ......................................................................... 220
Figure 15-4  M ECG Transducer ...................................................................... 222
Figure 15-5  US/MECG Combi Transducer ..................................................... 224
<table>
<thead>
<tr>
<th>Table 1-1</th>
<th>Contents Checklist</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1-2</td>
<td>Optional Accessories</td>
<td>6</td>
</tr>
<tr>
<td>Table 3-1</td>
<td>Philips Carts: Specifications</td>
<td>21</td>
</tr>
<tr>
<td>Table 3-2</td>
<td>Philips Carts Replacement Parts</td>
<td>21</td>
</tr>
<tr>
<td>Table 4-1</td>
<td>Configuring the Monitor</td>
<td>26</td>
</tr>
<tr>
<td>Table 4-2</td>
<td>Configuration Options</td>
<td>27</td>
</tr>
<tr>
<td>Table 4-3</td>
<td>Service Setting C10 Options (DSIF Configuration Options)</td>
<td>29</td>
</tr>
<tr>
<td>Table 4-4</td>
<td>Service Setting C10 = 0 (DIP Switch Settings on the DSIF Board)</td>
<td>29</td>
</tr>
<tr>
<td>Table 4-5</td>
<td>Service Setting C12 Options</td>
<td>30</td>
</tr>
<tr>
<td>Table 4-6</td>
<td>Example of an Error Log</td>
<td>31</td>
</tr>
<tr>
<td>Table 5-1</td>
<td>Types of Trace Paper Available</td>
<td>47</td>
</tr>
<tr>
<td>Table 6-1</td>
<td>Telemetry Interface: Pin Connections</td>
<td>53</td>
</tr>
<tr>
<td>Table 6-2</td>
<td>System Interface: Pin Connections</td>
<td>60</td>
</tr>
<tr>
<td>Table 6-3</td>
<td>Pin 21: Output Voltage Values</td>
<td>61</td>
</tr>
<tr>
<td>Table 6-4</td>
<td>9-Pin Connector</td>
<td>64</td>
</tr>
<tr>
<td>Table 6-5</td>
<td>25-Pin Connector</td>
<td>65</td>
</tr>
<tr>
<td>Table 6-6</td>
<td>External Maternal Measurement Frequency</td>
<td>68</td>
</tr>
<tr>
<td>Table 10-1</td>
<td>Parameter Test</td>
<td>119</td>
</tr>
<tr>
<td>Table 10-2</td>
<td>M1350A/B/C: When to perform safety test blocks</td>
<td>124</td>
</tr>
<tr>
<td>Table 10-3</td>
<td>M1350A/B/C: Test and Inspection Matrix</td>
<td>125</td>
</tr>
<tr>
<td>Table 11-1</td>
<td>Noninvasive Blood Pressure</td>
<td>138</td>
</tr>
<tr>
<td>Table 11-2</td>
<td>Pulse Oximetry</td>
<td>139</td>
</tr>
<tr>
<td>Table 11-3</td>
<td>Service Error Messages</td>
<td>140</td>
</tr>
<tr>
<td>Table 11-4</td>
<td>Power Supply Board: Output from Connector Pins</td>
<td>144</td>
</tr>
<tr>
<td>Table 12-1</td>
<td>Fuses</td>
<td>172</td>
</tr>
<tr>
<td>Table 13-1</td>
<td>Parts List Index</td>
<td>189</td>
</tr>
<tr>
<td>Table 13-2</td>
<td>Replacement Parts List</td>
<td>190</td>
</tr>
<tr>
<td>Table 13-3</td>
<td>Display Assembly</td>
<td>192</td>
</tr>
<tr>
<td>Table 13-4</td>
<td>Replacement Parts: Transducer Connectors</td>
<td>192</td>
</tr>
<tr>
<td>Table 13-5</td>
<td>Part Numbers</td>
<td>194</td>
</tr>
<tr>
<td>Table 14-1</td>
<td>Replaceable Parts</td>
<td>214</td>
</tr>
<tr>
<td>Table 15-1</td>
<td>Cable Connections</td>
<td>221</td>
</tr>
<tr>
<td>Table 15-2</td>
<td>DECG Transducer Parts List</td>
<td>221</td>
</tr>
<tr>
<td>Table 15-3</td>
<td>Cable Connections</td>
<td>223</td>
</tr>
<tr>
<td>Table 15-4</td>
<td>MECG Transducer Parts List</td>
<td>223</td>
</tr>
<tr>
<td>Table 15-5</td>
<td>US/MECG Transducer: Cable Connections</td>
<td>226</td>
</tr>
<tr>
<td>Table 15-6</td>
<td>US/MECG Combi Transducer Parts List</td>
<td>226</td>
</tr>
<tr>
<td>Table 15-7</td>
<td>Parts List</td>
<td>230</td>
</tr>
</tbody>
</table>
General Information

Introduction

About this Guide
This guide tells you how to install, service and repair a Series 50 XM Fetal/Maternal monitor or a Series 50 XMO Fetal/Maternal monitor. It describes all the system hardware and software, and tells you how to test the system and diagnose operating and service problems. It also tells you what upgrade paths are available and how to follow them.

It gives instructions for both a Series 50 XM Fetal/Maternal monitor and a Series 50 XMO Fetal/Maternal monitor. The features available on the monitor you are installing or servicing depend on which options have been purchased. All instructions apply to a fully equipped monitor. If your monitor does not have a described parameter, then you can ignore that part of the instruction and skip to the next point.

The illustrations in this book show the Series 50 XMO Fetal/Maternal monitor, with the fetal pulse oximetry\(^1\) (FSpO\(_2\)) parameter and maternal parameters.

Who This Guide is For
This guide is for technical personnel installing and servicing the monitor. They must have a good understanding of medical equipment installation procedures. Conventional current technical terms are used throughout this guide. Familiarity with such terms is assumed.

What to do Next
Familiarize yourself with the contents of this guide before attempting to install or service the monitor.

---

1. Currently not available in the U.S.A.
Monitor’s Intended Use

The Philips Series 50 XM Fetal/Maternal monitor and the Philips Series 50 XMO Fetal/Maternal monitor are designed for suitably trained healthcare professionals for use in the patient environment to monitor fetal and maternal condition prior to and during labor and delivery.

Conventions Used in This Guide

This guide uses the following conventions for notes, cautions, and warnings.

Warning
A warning alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in death or serious injury to the user or patient.

Caution
A caution alerts you to situations where special care is necessary for the safe and effective use of the product. Failure to observe a caution may result in minor or moderate personal injury or damage to the product or other property, and possibly in a remote risk of more serious injury.

Note— A note calls your attention to an important point in the text.

Symbols

Symbols used in this guide are:

Equiopotential Terminal
This symbol is used to identify terminals which are connected together, bringing various parts of an equipment or system to the same potential, not necessarily being earth potential (the value of potentials of earth may be indicated adjacent to the symbol).

International Caution Symbol
This symbol indicates that the operator should refer to the product instruction manual before beginning a procedure.

Protective Earth Terminal
This symbol identifies the terminal for connection to an external protective earth.
Initial Inspection

The monitor and any supporting options ordered are supplied packed in protective shipping cartons. Before unpacking, visually check the packaging and ensure that there are no signs of mishandling or damage.

Claims for Damage

If the shipping cartons show signs of having been mishandled, contact the carrier and arrange for his agent to make an inspection.

If any of the equipment supplied is damaged, you should contact both the carrier and your local Philips Service Organization. Arrangements will then be made for repair or replacement, as appropriate.

Repacking

You are advised to retain the original packing carton and material. You will find it useful if it becomes necessary to return a piece of equipment to Philips for service. If you need to repack the equipment but cannot locate the original packing materials, Philips can advise you on alternatives.
Unpacking and Checking the Shipment

Open the package carefully and remove the instrument and accessories. Accessories are packed in recesses in the base of the box. A cardboard cover separates the base from the main instrument packing. Ensure that you remove the contents of the base before you dispose of the packing.

When the instrument has been unpacked, check that the contents are complete and that the correct options and accessories have been delivered. You should have:

**Table 1-1 Contents Checklist**

<table>
<thead>
<tr>
<th>Description</th>
<th>Fetal and maternal</th>
<th>Fetal only</th>
<th>Fetal and FSpO₂</th>
<th>Fetal and maternal and FSpO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetal Monitor</td>
<td>M 1350B</td>
<td>M 1350B (Option C03)</td>
<td>M 1350C (Option C03)</td>
<td>M 1350C</td>
</tr>
<tr>
<td><strong>Fetal Accessories</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combined FSpO₂/DECG/M ECG Patient Module M 1365A with DECG adapter cable M 1362A</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>External Toco Transducer (M 1355A)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Ultrasound Transducer (M 1356A)</td>
<td>2¹</td>
<td>2¹</td>
<td>2¹</td>
<td>2¹</td>
</tr>
<tr>
<td>DECG Transducer (M 1357A) or ECG-only Patient Module (M 1364A) with DECG cable M 1362A</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Reusable Transducer Belts (includes belt fastening buttons) (M 1562A)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Transducer Knob Adapters (M 1356-43203)</td>
<td>1 pack of 3 pieces</td>
<td>1 pack of 3 pieces</td>
<td>1 pack of 3 pieces</td>
<td>1 pack of 3 pieces</td>
</tr>
<tr>
<td>Fetal Scalp Electrodes 15133D (Europe) or 15133E (USA)</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fetal Scalp Sensor FS14 (M 1366-60001)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Maternal Accessories</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient Module M 1364A with M ECG adapter cable M 1363A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Adult NIBP Cuff (M 1574A)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Large Adult NIBP Cuff (M 1575A)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>NIBP monitor-to-cuff interconnect tubing (3.0m) (M 1599A)</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Reusable adult finger SpO₂ transducer M 1191A and cable M 1940A</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

*Standard Accessories*
### Table 1-1 Contents Checklist

<table>
<thead>
<tr>
<th>Description</th>
<th>Fetal and maternal</th>
<th>Fetal only</th>
<th>Fetal and FSpO₂</th>
<th>Fetal and maternal and FSpO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote Event Marker (15249A)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Power Cord (Part no. depends on country option)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Grounding Cable 8120-2961 (USA) 8120-4808 (Europe)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Fetal Recording Paper M 1910A (USA/Canada) M 1911A (Europe) M 1913A (Japan)</td>
<td>1 pack</td>
<td>1 pack</td>
<td>1 pack</td>
<td>1 pack</td>
</tr>
<tr>
<td>Aquasonic Gel 40483A or Ultrasound Transmission Gel 40404A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Documentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructions for Use (language as appropriate for your country)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Quick Reference Guide (language as appropriate for your country)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Installation and Service Guide (CD-ROM, English only)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Error Reference Card (English only)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sensor Placement Guide</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>FSpO₂ Subscriber's Manual U.S.A. only</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Application Note: Nellcor OxiFirst™ Fetal Oxygen Saturation Monitoring: Technical Issues (language as appropriate for your country)</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pocket Guide to Fetal Monitoring (only supplied with English shipments)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Only one transducer is supplied if option C01 was ordered
Optional Accessories

In addition to the items mentioned in the previous table, the following are delivered when the appropriate option has been ordered:

**Table 1-2  Optional Accessories**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Re-Ordering Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Accessories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IUP Transducer (SuV) and Kit</td>
<td>1</td>
<td>1290C Option #05 Pressure Transducer with IUP Kit 14099C and Transducer Holder</td>
</tr>
<tr>
<td>Barcode Reader</td>
<td>1</td>
<td>HBC R8200 plus Barcode Booklet</td>
</tr>
<tr>
<td>Dual Serial Interface Board</td>
<td>1</td>
<td>M1350-66533</td>
</tr>
<tr>
<td>Cable (Serial)</td>
<td>1</td>
<td>M1350-61609 (for external devices)</td>
</tr>
<tr>
<td>OBM S/ODIS System Interface Board (inc. RS422)</td>
<td>1</td>
<td>M1350-66532</td>
</tr>
</tbody>
</table>

Instrument Identification

Philips uses a two-section serial number ("XXXXGO00000") for instrument identification. This is located on labels attached to the monitor. One label is on the right side of the monitor, the other label is identical and attached to the base of the monitor. The first four digits are the Serial Prefix Number, and identify the modification standard of the instrument. The last five digits are the Serial Number of the instrument. The letter that separates the serial prefix and suffix designates the country in which the instrument was manufactured, "G" = Germany.

```
3650GO2272
   Serial Prefix

   Serial Number

Country of Manufacture
```

Localization Options

When the system is ordered from the factory the respective country option, including local language standards, power cords, voltage, video format and fetal paper will be automatically allocated, apart from Canada, Belgium and Switzerland which have more than one language option. The standard unit is delivered in the USA with 30-240 bpm paper scale selected and in the rest of the world with 50-210 bpm paper scale selected.

The default language option for Canada is English. Option #ABC selects French.

The default language option for Belgium is Dutch. Option #ACL selects French.

The default language option for Switzerland is German. Option #ABQ selects French. Option #ACN selects Italian.
Service Philosophy

Any errors produced are marked on the trace paper with the symbol △ and a specific error message is shown on the monitor display. In addition, the errors are reported on the system error log (see page 30 for instructions on how to print the error log). Read the error messages and system error log to determine whether the fault lies in the hardware or firmware. These problems can be repaired by board replacement or unit exchange. Do not attempt component-level board repair.

Overview of the Service Tests

The system contains resident tests to enable monitoring of system status and errors that occur.

- **Power-On Self Test (see page 96)**
  This is invoked whenever the system is switched on.

- **Performance Assurance Tests**
  - **Parameter Test (see page 118)**
    This checks the processing of the signal from the transducers.
  - **Quick Test (see page 119)**
    This checks the display, recorder and complete instrument hardware and software.

- **Service Tests**
  These are invoked by connecting the monitor to a PC and using a software service tool to assess, test and configure the system.
  - **Cyclic Test (see page 121)**
  - **Permanent Test (see page 121)**

- **Safety Tests**
  These test the electrical safety of the monitoring system and must be carried out after upgrades and repairs. You must use a safety testing tool.
  - **Instrument Safety Test (see page 126)**
  - **System Test (see page 126)**
  - **Safety Test Blocks (see page 125)**
About the Monitor

The monitor has five color- and mechanically-coded input sockets:

- **Cardio 1/Combi** for fetal heart rate (FHR) and fetal oxygen saturation (FSpO$_2$)
- **Cardio 2** for fetal heart rate
- **Toco** for uterine activity
- **N PB** for external blood pressure (NIBP)
- **SpO$_2$** for maternal pulse oximetry

When a transducer is connected, the monitor automatically selects the correct operating mode. The unit can:

- monitor FSpO$_2$
- monitor FHR using both direct ECG (DECG) and ultrasound (US)
- monitor maternal heart rate using ECG
- monitor twins using either DECG and ultrasound or dual ultrasound
- monitor uterine activity (Toco) externally or internally
- detect fetal movements (FMP) using ultrasound
- measure maternal blood pressure externally
- measure maternal pulse oximetry
- display maternal ECG waveform and record “snapshot” ECG waveform.

A series of error messages appear in the instrument's display if certain measurements cannot be carried out. Built-in check facilities give you a greater monitoring confidence because most of the instrument functions can be checked quickly and easily.

The Performance Plus Package signal processing technique used by the instrument ensures that the information provided by the monitor is very accurate. Ultrasound FHR traces are comparable with direct ECG FHR traces and variability recorded in the ultrasound mode is almost identical to that recorded in the DECG mode.

The recorder uses a high resolution thermal array print head which gives a very reliable and good quality trace. Automatic annotation capabilities include time, date, paper speed and monitoring methods. Nursing notes can also be documented using an optional barcode reader.

Either of the monitors can be upgraded to include all parameters, depending on availability within the country of purchase.
Overview of the Monitor

Figure 1-1  Major Parts

1. Monitor On/Off Switch
2. Monitor On/Off Light
3. Recorder Keys
4. Recorder
5. Maternal Parameters
6. Cardio 2 Channel
7. Toco Channel
8. Cardio 1/Combi Channel
9. Function Key
10. Telemetry Indicator
11. FSpO₂ parameter
12. Opening Recess
13. Socket for Remote Event Marker
14. Setting Keys
15. Service Socket
Cardio and Toco Channels

1. **Toco Display** shows uterine activity.
2. **Fetal SpO\textsubscript{2} display** shows fetal pulse indicator, signal quality, alarm status, and cross channel verification plus indicator.
3. **Cardio Display** shows the FHR.
4. **Signal Quality Indicator** shows the quality of heart rate signal detected by the transducer:
   - Green (optimum).
   - Yellow (fair to potentially poor).
   - Red (unacceptable).
5. **Function Key** selects menus for:
   - FMP, twins offset, logic, FHR alert and FSpO\textsubscript{2}
   - returns to normal display.
6. **MECG Indicator** shows when MECG is being measured through this channel. (Indicator location different for Series 50 XM).
7. **Fetal SpO\textsubscript{2} display** shows current value of FSpO\textsubscript{2}.
8. **Speaker Lamp** shows which heartbeat is heard from the loudspeaker.
9. **Volume Keys** set the volume and select the channel to which you are listening. Changes current setting of FMP, twins offset, logic, FHR alert and FSpO\textsubscript{2} alarms.
10. **Recess** for use when tilting the display.
11. **Remote Event Marker Socket** for connecting remote event marker (15249A)
12. **Cardio 1/Combi Transducer Socket.** You can connect:
   - FSpO₂/ECG combined patient module (M 1365A)
   - ECG only patient module (M 1364A)
   - An ultrasound transducer (M 1356A).
   - A DECG transducer (M 1357A).
   - A US/MECG Combi transducer (M 1358A).
   - An M ECG transducer (M 1359A).
13. **Toco Transducer Socket.** You can connect:
   - An external Toco transducer (M 1355A).
   - An IUP transducer (1290C or M 1333A).
14. **Toco Baseline Key** zeroes the Toco display and trace to 20 units (when monitoring uterine activity externally) or 0 units (when monitoring uterine activity internally).
15. **Cardio 2 Transducer Socket** for connecting:
   - ECG only patient module (M 1364A)
   - US transducer (M 1356A)
   - DECG transducer (M 1357A)
   - M ECG transducer (M 1359A)
1. **NBP Cuff Socket.** You can connect:
   - An NBP cuff interconnect tubing (M 1599A) and cuff (M 1574A).

2. **SpO$_2$ Transducer Socket.** You can connect:
   - An SpO$_2$ transducer (M 1940A adapter cable connected to M 1191A transducer).

3. **Softkeys** for operating and setting maternal parameters. They are:
   - [NBP] selects modes and alarm limits for NBP.
   - [mat ♥] selects modes and alarm limits for MHR.
   - [SpO2] selects modes and alarm limits for SpO$_2$.

4. **Reset Key (yellow)**
   - One short press
     - Acknowledges warning message
     - Acknowledges alarm
   - One press, held for two seconds (from maternal main screen only)
     - Accesses volume and contrast setup
   - Two presses within one second (from maternal main screen only)
     - Displays current maternal alarm limits

5. **SpO$_2$ Value** indicates the current reading for patient's oxygen saturation level.
6. **MHR Icon** indicates source of MHR:
   - \( \) indicates heart rate value taken from MECG measurement.
   - \( \) indicates pulse rate value taken from SpO\textsubscript{2} measurement.
   - \( \) indicates average pulse rate taken from NIBP measurement.

7. **Maternal Heart Rate** shows current heart rate or pulse rate.

8. **Systolic Value** shows the value for the systolic parameter of the most recent external blood pressure measurement.

9. **Diastolic Value** shows the value for the diastolic parameter of the most recent external blood pressure measurement.

**Recorder Keys**

![Figure 1-4 Recorder Keys](image)

**Figure 1-4 Recorder Keys**

1. **Recorder On/Off Light.** On when the recorder is switched on. Flashes when monitor detects five or fewer pages remaining in the pack or if the paper runs out.

2. **Recorder On/Off Key.**
   - **Single press** turns recorder on/off
   - **2-second press** starts NST timer. Recorder must be off.

3. **Event Marker Key.** Press to record an event on the paper. Acknowledges all alerts and alarms.

4. **Paper Advance Key.** Press once to advance the paper automatically to the next fold. Press a second time to stop paper before fold. Tear paper at fold. Never pull paper to advance it.

5. **Paper-Eject Key.** Press once to unlock the drawer, and then press a second time and hold to remove the paper.
Setting Keys

1. **Time and Date Key.** Used when changing the time and date. Press to show the current time in the Cardio 1/Combi and Toco displays, to cycle through the settings to be changed (hours, minutes, day, month and year) and to return to the normal display.

2. **Paper Speed Key.** Used when changing the paper speed. Press to show the current paper speed in the Cardio 1/Combi display, and to return to the normal display.

3. **Test Key.** Used to start monitor self test.
Figure 1-6  Rear Panel

1. Power Cord Connection
2. Equipotential Grounding Point
3. ROM Board (M 1350-66506)
4. Telemetry Interface Connector (M 1350-66537) and System Interface Connector (RS232) (lower)
5. External Blood Pressure Board (M 1350-66535)
6. Digital Signal Processor (D SPII) (M 1350-66507)
7. Maternal SpO 2 Board (M 1350-66534)
8. OBMS/S DIS Analog Interface (optional) (M 1350-66532)
9. Dual Serial Interface (DSIF) (M 1350-66533) External Fetal Pulse Oximeter or Adult parameter Interface
10. CPU Board with Barcode Reader Interface (M 1350-66513)
### Power Source Requirements

The monitor can be operated from an ac source of 100 to 120 or 220 to 240 volts (±10%) at 50 Hz or 60 Hz (±5%). The system will be set to the correct voltage at the factory.

Prior to installing the system, check that the system's voltage has been set correctly. The voltage and fuse values are shown on the rear panel.

![Figure 2-1 System Voltage and Fuse Values on the Rear Panel](image_url)

**Caution**
If the voltage has been set incorrectly you must reset it before you connect the system to the local line power supply. See “Setting the Required Voltage” on page 2-18.
Setting the Required Voltage

1. Using a flat blade screwdriver, open the panel on the rear of the monitor.

Figure 2-2 Opening the Rear Panel

2. Remove the voltage selector drum, turn it to the voltage required, and replace it.

Figure 2-3 Voltage Selector Removal and Replacement

3. Close the rear panel and check that the correct voltage setting is shown (see 2-1).
Mounting the Monitor

You must carry out the pre-installation checks described in Chapter 2 before installing the monitor.

The Series 50 XM/XMO Monitor can be mounted in a number of ways, for example:

- Surface mounted
- Cart mounted
- Top mounted

Surface Mounting

The XM/XMO can be rested on, but not fixed to, an existing surface.

Cart Mounting

There are three mobile carts (CL, CX, and CM) on which you can mount the Series 50 XM/XMO Monitor. All offer a combined storage and transport unit for the monitor plus accessories and ancillary equipment. See page 21 for carts specifications.

Top Mounting

Top mounting Kit Number M1350-68701 allows you to mount auxiliary equipment on top of the monitor (for example, the M1310A Telemetry Receiver). This equipment must be fitted with a mounting cam kit to allow the equipment to be secured to the mounting plate.

To attach the mounting plate onto the monitor:

1. Remove the two blanking plugs from the top of the monitor.
2. Position the mounting plate on top of the monitor and insert the two screws.
3. Insert the two blanking plugs into the holes above the screws.
4. Clip the four plastic strips into the slots in the mounting plate. These are removed when the ancillary equipment is mounted on top of the monitor.
Fitting the Paper Take-Up Tray

You can fit a paper take-up tray (M 1350-00452) to the base of the monitor using the two pre-fitted bolts located under the recorder module on the base of the monitor. Simply line up the paper take-up tray slots and slide the paper tray into position.
Carts

You can mount the Series 50 XM and the Series 50 XM0 fetal/maternal monitors on the Philips CL, CM, or CX carts. Cleaning instructions for the carts and safety details are provided in the Carts Equipment Note delivered with your cart.

Table 3-1 Philips Carts: Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>CL (M1323A)</th>
<th>CM (M1324A)</th>
<th>CX (M1325A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width (mm)</td>
<td>514</td>
<td>614</td>
<td>614</td>
</tr>
<tr>
<td>Depth (mm)</td>
<td>625</td>
<td>625</td>
<td>625</td>
</tr>
<tr>
<td>Height (mm)</td>
<td>805</td>
<td>989</td>
<td>1117</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>24.2</td>
<td>50.6</td>
<td>63.4</td>
</tr>
</tbody>
</table>

Table 3-2 Philips Carts Replacement Parts

<table>
<thead>
<tr>
<th>Replacement Parts</th>
<th>Part numbers</th>
<th>Cart CL (M1323A)</th>
<th>Cart CM (M1324A)</th>
<th>Cart CX (M1325A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheels</td>
<td>M 1324-42100</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>M 1323-42075</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Drawers</td>
<td>M 1324-68500</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>M 1323-68450</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>CAM Mounting Arm Kit</td>
<td>5061-8340</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mounting Kit IUP Pole</td>
<td>80310-68701</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Infusion Pole Mount</td>
<td>5061-8364</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mounting Rail Kit</td>
<td>5061-8365</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
Barcode Reader

This section tells you how to connect and test the barcode reader (H BSW 8200).

Attaching the Reader Holder

To attach the barcode reader holder to the monitor:

1. Clean the surface of the monitor where you will attach the barcode reader holder thoroughly using ethanol.
2. Peel off the backing from the adhesive strip on the holder, and press the holder firmly into place.
3. Allow 24 hours before using the holder.

Connecting the Reader

1. Plug the barcode reader into the monitor and secure by turning the two thumb screws.

![Figure 3-3 Connecting the Barcode Reader](pin1facl.tif)

Testing the Reader

After installing the barcode reader you must check that it is correctly connected to the monitor and that the monitor is configured to read the barcodes. You can do this using the barcodes printed below or from your barcode booklet kit.

To do this:

1. Be sure that both the monitor and recorder are turned on.
2. Read the Default Configuration barcode.
3. Switch the monitor off then on. Read the TEST OK 5 barcode.
Figure 3-4  Test Barcodes

TEST OK 5 should be written on the recorder paper.

Figure 3-5  Test Annotation on the Recorder Paper

4. If the above test does not work, turn the monitor OFF and ON and repeat the test.
5. If the problem remains, connect a new Barcode Reader.
Installing the Monitor
Introduction

This chapter describes the tasks you must carry out to configure the monitor. This involves the following service tasks:

- Configure the monitor
- Configure the recorder
- Print and clear the error log
- Set the time and date format to the local standard

Some configuration tasks can be completed by connecting a PC to the monitor, some by using pushbuttons on the monitor itself. Most can be performed using whichever method is more convenient for you: see Table 4-1 for a list of tasks and methods. To find out how to set the time, date, and paper speed, see Chapter 5.
**Configuration Tasks**

The following table shows you which configuration actions can be carried out using pushbuttons on the monitor and which can be carried out using a PC connected to the service socket.

**Table 4-1 Configuring the Monitor**

<table>
<thead>
<tr>
<th>Task</th>
<th>Buttons</th>
<th>PC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configure the time format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the date format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the IUP format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the paper format</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the recorder print offset</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the recorder heat adjust</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Alert acknowledgment at marker button</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Run the cyclic test</td>
<td>No(^1)</td>
<td>No</td>
</tr>
<tr>
<td>Read the options installed</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Read the Error Log</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Print the Error Log</td>
<td>Yes(^2)</td>
<td>Yes</td>
</tr>
<tr>
<td>Clear the Error Log</td>
<td>Yes(^2)</td>
<td>Yes</td>
</tr>
<tr>
<td>Write the serial number and set the options</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Configure the language option</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Enable alert acknowledgement</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Note Output to System</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>NIBP paper save mode</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>MECG trigger click volume</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FSpO(_2) response time</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FSpO(_2) Inop alarm</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>FSpO(_2) alarm volume</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

1. However you can run the Permanent Test, which is similar. See “Printing and Clearing the Error Log” on page 30.
2. See “Printing and Clearing the Error Log” on page 30.
Configuring the Monitor Using Pushbuttons

You can set the time format, date format, IUP scale, paper format, recorder scale offset, recorder heat and language option using pushbuttons. To change a setting:

1. Disconnect all transducers from the Monitor and disconnect or switch off Telemetry.

2. While pressing [F.A], press [Test]. The display shows C01 in the US1/US display and 0 or 1 in the Toco display.

3. Toggle through the menu by pressing [+] or [−] until you arrive at the menu item you want to change. The menu items and their settings are shown in Table 4-2.

4. Press [Test] to change the setting (0 or 1).

5. Press [Test] to store the new settings. If you do not press any keys for about 15 seconds, the settings will be automatically stored.

**Table 4-2 Configuration Options**

<table>
<thead>
<tr>
<th>Menu</th>
<th>Setting</th>
<th>Options</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>Time Format</td>
<td>0=AM/PM</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=24-hour</td>
<td></td>
</tr>
<tr>
<td>C02</td>
<td>Date Format</td>
<td>0=US (month/day/year)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=Europe (day.month.year)</td>
<td></td>
</tr>
<tr>
<td>C03</td>
<td>IUP Format</td>
<td>0=mmHg</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=kPa</td>
<td></td>
</tr>
<tr>
<td>C04</td>
<td>Paper Format</td>
<td>0=US (30-240)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=Europe (50-210)</td>
<td></td>
</tr>
<tr>
<td>C05</td>
<td>Recorder Print Offset</td>
<td>0=right 1=left</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 11</td>
<td></td>
</tr>
<tr>
<td>C06</td>
<td>Recorder Heat Adjust</td>
<td>0=minimum 1=maximum</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 11</td>
<td></td>
</tr>
<tr>
<td>C07</td>
<td>Language Option</td>
<td>1=US International</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=French</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=German</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4=Dutch</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5=Spanish</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6=Italian</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10=Japanese</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>13=Chinese (simplified)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>17=Russian</td>
<td></td>
</tr>
<tr>
<td>C08</td>
<td>Recorder Marker</td>
<td>0=normal 1=system acknowledge</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 11</td>
<td></td>
</tr>
<tr>
<td>C09</td>
<td>Note Output to System (Roman 8)</td>
<td>0=transmission off 1=transmission on</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 to 11</td>
<td></td>
</tr>
<tr>
<td>C10</td>
<td>DSIF</td>
<td>Refer to Table 4-3</td>
<td>0</td>
</tr>
<tr>
<td>Menu</td>
<td>Setting</td>
<td>Options</td>
<td>Default</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------</td>
<td>----------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>C11</td>
<td>External Toco gain</td>
<td>0=100% External Toco gain</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=50%</td>
<td></td>
</tr>
<tr>
<td>C12</td>
<td>Refer to Table 4-5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C13</td>
<td>O B M S and Telemetry/</td>
<td>0=RS422 System Interface on O B M S</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>System boards</td>
<td>board active</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=RS232 System Interface on Telemetry/System board active</td>
<td></td>
</tr>
<tr>
<td>C14</td>
<td>Analog fetal movements</td>
<td>0=off</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=on</td>
<td></td>
</tr>
<tr>
<td>C16</td>
<td>N I BP paper save mode</td>
<td>0=off</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=on</td>
<td></td>
</tr>
<tr>
<td>C17</td>
<td>M E C G trigger click volume</td>
<td>0=off</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=quiet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=loud</td>
<td></td>
</tr>
<tr>
<td>C18</td>
<td>FSpO₂ response time³</td>
<td>0=slow</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=fast</td>
<td></td>
</tr>
<tr>
<td>C19</td>
<td>FSpO₂ Inop alarm</td>
<td>0=off</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=on</td>
<td></td>
</tr>
<tr>
<td>C20</td>
<td>FSpO₂ alarm volume</td>
<td>0=off</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=quiet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=medium</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3=loud</td>
<td></td>
</tr>
</tbody>
</table>

1. To find the correct setting, connect a Toco transducer to the monitor and then change the setting until the trace is recording 20 units on the paper. Because of the 8-second time-out feature, and the delay between changing the setting and seeing the change on the paper, you may have to repeat this procedure to set the offset.

2. If the alert acknowledgement function is on, the fetal monitor adds the alert acknowledgement function on the recorder marker button. This alert acknowledgement is given only to the central station after a request from the central station (communication is via the digital interface.)

3. With this setting you can switch the control between the RS232 port on the new Telemetry/System board M1350-66536 and the RS422 port implemented on the System Interface board M1350-66532. If only one of them is built into the fetal monitor this one will be active regardless of the setting.

4. Response mode is an output-average filter. You can select whether the monitor averages samples over a short time (approximately 10 seconds) or longer period (approximately 50 seconds). The times vary according to the heart rate and signal quality and those quoted here are valid for good signal quality and a heart rate in the 120 bpm range. The fast response mode, because it requires fewer samples, allows you to see sudden changes in output more easily. Fast response mode is indicated on the trace by "_."
### Table 4-3  Service Setting C10 Options (DSIF Configuration Options)

<table>
<thead>
<tr>
<th>Connector 1 (9pin)</th>
<th>Connector 2 (25 pin)</th>
<th>C10 Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>See Table Table 4-4</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Dinamap 1846/8100</td>
<td>Nellcor N-200</td>
<td>1</td>
</tr>
<tr>
<td>Colin BP-8800</td>
<td>Nellcor N-200</td>
<td>2</td>
</tr>
<tr>
<td>78352/4C</td>
<td>Nellcor N-200</td>
<td>3</td>
</tr>
<tr>
<td>Acutorr - all models</td>
<td>Nellcor N-200</td>
<td>4</td>
</tr>
<tr>
<td>Philips CM S, all models Philips 26/24 Series</td>
<td>Nellcor N-200</td>
<td>5</td>
</tr>
<tr>
<td>Dinamap 1846/8100</td>
<td>Nellcor N-400</td>
<td>11</td>
</tr>
<tr>
<td>Colin BP-8800</td>
<td>Nellcor N-400</td>
<td>12</td>
</tr>
<tr>
<td>78352/4C</td>
<td>Nellcor N-400</td>
<td>13</td>
</tr>
<tr>
<td>Acutorr - all models</td>
<td>Nellcor N-400</td>
<td>14</td>
</tr>
<tr>
<td>Philips CM S Philips 26/24 Series</td>
<td>Nellcor N-400</td>
<td>15</td>
</tr>
</tbody>
</table>

1. The service setting C10=0 ensures the compatibility of older monitors with external devices and will not normally be needed with the M 1350B and M 1350C

### Table 4-4  Service Setting C10 = 0 (DIP Switch Settings on the DSIF Board)

<table>
<thead>
<tr>
<th>Connector 1 9 pin female</th>
<th>Connector 2 25 pin female</th>
<th>Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dinamap 1846 (600Bd)</td>
<td>Nellcor N-200 (2400Bd)</td>
<td>s s s s X X X</td>
</tr>
<tr>
<td>Philips CM S and Philips 26/24 Series (9600Bd)</td>
<td>Nellcor N-200 (2400Bd)</td>
<td>▼ ▼ ▼ ▼ ▼ X X X</td>
</tr>
<tr>
<td>Acutorr (9600Bd)</td>
<td>Nellcor N-200 (2400Bd)</td>
<td>▲ ▲ ▲ ▲ X X X</td>
</tr>
<tr>
<td>Colin BP-8800 (4800Bd)</td>
<td>Nellcor N-200 (2400Bd)</td>
<td>▼ ▼ ▼ ▼ ▼ X X X</td>
</tr>
<tr>
<td>78352/4C (9600Bd)</td>
<td>Nellcor N-200 (2400Bd)</td>
<td>▲ ▲ ▲ ▲ X X X</td>
</tr>
</tbody>
</table>
### Table 4-5  Service Setting C12 Options

<table>
<thead>
<tr>
<th>NST Timer</th>
<th>Auto Recording Off</th>
<th>Acoustic Paper Out Alert</th>
<th>Option Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>1</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>3</td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>4 (default)</td>
</tr>
<tr>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>5 (Japan)</td>
</tr>
</tbody>
</table>

#### Printing and Clearing the Error Log

To print or clear the error log:

1. Disconnect all transducers from the monitor and disconnect, or switch off, Telemetry.
2. Make sure the recorder is on.
3. While pressing **F.4** press **Test**
   - **C01** is shown in the US1/US display.
   - 0 or 1 is shown in the Toco display.
4. Press **F.4** again to select the Function Menu:
   - **A01** (Print the Error Log) is shown in the US1/US display.
     To print the Error Log, press **—**. The display shows nnn nnn nnn.
   - Press **—** again to select **A02** (Clear the Error Log).
     To clear the Error Log, press **—**. The display shows nnn nnn nnn.
The following shows an example of an error log.

<table>
<thead>
<tr>
<th>Code</th>
<th>Field1</th>
<th>Date1</th>
<th>Time1</th>
<th>Date2</th>
<th>Time2</th>
</tr>
</thead>
<tbody>
<tr>
<td>506</td>
<td>0005</td>
<td>98/09/14</td>
<td>11:27</td>
<td>98/09/14</td>
<td>16:53</td>
</tr>
<tr>
<td>FIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0540</td>
<td>0008</td>
<td>98/09/14</td>
<td>11:27</td>
<td>98/09/14</td>
<td>16:54</td>
</tr>
<tr>
<td>E1C6</td>
<td>0005</td>
<td>98/09/14</td>
<td>11:27</td>
<td>98/09/14</td>
<td>16:53</td>
</tr>
<tr>
<td>021A</td>
<td>0002</td>
<td>98/09/14</td>
<td>16:24</td>
<td>98/09/14</td>
<td>16:25</td>
</tr>
</tbody>
</table>

OPTIONS FM P U St win, F et.Add et,

DATE: SW _REV  INSTR_ID
95/09/15/ C.01.00 M1350C 2445G 35213

BOARDS

<table>
<thead>
<tr>
<th>Pos</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>515</td>
</tr>
<tr>
<td>01</td>
<td>502</td>
</tr>
<tr>
<td>02</td>
<td>506</td>
</tr>
<tr>
<td>03</td>
<td>513</td>
</tr>
<tr>
<td>04</td>
<td>536</td>
</tr>
<tr>
<td>05</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>507</td>
</tr>
<tr>
<td>08</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>540</td>
</tr>
<tr>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

SERVICE SETT INGS:

C01  01
C02  01
C03  00
C04  00
C05  00
C06  02
C07  03
C08  00
C09  01
C010 02
C011 01
C012 02
C013 00
C014 00
C016 01
C017 00
C018 01
C019 00
C20  00

FSP02 SW _REV:
NBP FM H P 5.0.1

NBP F SP02 ERRORS:

<table>
<thead>
<tr>
<th>Code</th>
<th>Field1</th>
<th>Date1</th>
<th>Time1</th>
<th>Date2</th>
<th>Time2</th>
</tr>
</thead>
<tbody>
<tr>
<td>540</td>
<td>0002</td>
<td>98/09/14</td>
<td>11:27</td>
<td>98/09/14</td>
<td>16:53</td>
</tr>
</tbody>
</table>
The error log is divided into seven sections that contain the following information:

**Section 1**
1. The error code
   For example 506
2. The number of times the error has occurred.
   For example 0005 (note that the error counter uses hexadecimal notation)
3. The date and time the error first occurred.
   For example 98/09/14 11:27
4. The date and time the error last occurred.
   For example 98/09/14 16:23
The remaining lines in section 1 (if any) beneath the factory information code (FIC) are not errors. Take no action.

**Section 2**
All built in options in the fetal monitor are written. For example Fet.Alert indicates fetal alerting.

**Section 3**
This shows information about the monitor itself:

<table>
<thead>
<tr>
<th>DATE</th>
<th>SW_REV</th>
<th>INSTR_ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current date¹</td>
<td>Software revision</td>
<td>Product number and monitor serial number</td>
</tr>
</tbody>
</table>

¹ This is taken from the monitor’s internal clock.

**Section 4**
The final three digits of all boards connected into the fetal monitor. For example in Pos.05 is board M 1350-66536.

**Section 5**
The complete configuration made using the monitor’s push buttons is listed for easy validation and documentation.

**Section 6**
The revision number of the FSpO₂ software.

**Section 7**
The error code, occurrences, and times and dates thereof are shown specifically for the FSpO₂ board in exactly the same way as other boards are displayed in Section 1 of the error log.
Changing the Time Format

To change the time format from AM/PM format to 24-hour format, do the following:

1. Disconnect all transducers from the Monitor and disconnect or switch off Telemetry.

2. While pressing **F2** press **Test**.

3. Press **↑** to change the setting to 1.

4. Press **Test** to store the new settings.

Full details about changing the time and date formats are given in Chapter 5.

Configuring the Monitor Using a PC

The service software kit (M1360C Option 875, part number M1360-68875) allows you to carry out various extended configuration and service functions on the monitor. Contact your Philips Sales Office for details.

The service software disk can be run on an industry standard PC. There is also an adapter cable to connect the monitor to the PC.

![Figure 4-1 Cable for an Industry Standard compatible PC](image)

Configuring the Monitor
**Installing the Service Program**

Before you install the program, ensure that the serial port COM 1 is set up as follows:

- **Transmission Rate**: 9600 BPS
- **Parity**: None
- **Word length (bits)**: 8
- **Stop-bits**: 1

This is done by giving the mode command (`mode com1:96,N,8,1`) at the DOS prompt. Refer to your MS-DOS Manual for details.

To install the program:
1. Switch on the PC.
2. Create a directory for the program files. For example, to create a directory called `service`, at the DOS prompt type in:
   ```
   md service
   ```
   and press enter.
3. Insert the program disk into drive A.
4. At the DOS prompt type `A:` and press enter.
5. At the `A:` prompt, type:
   ```
   copy pegserv.exe c:\service
   ```
   and press enter. Where `service` is the directory you created to contain the program files. The program is copied to `c:\service`.

**Serial Interface Connection**

Make sure that the serial interface configuration on the PC is set up as follows:

- **Parameter**
- **Transmission Rate (BPS)**: 9600
- **Word Length (bits)**: 8
- **Stop-Bits**: 1
- **Parity**: None
- **%ON / %OFF Pacing**: Off
- **CTS Line**: Regard
- **DSR Line**: Regard
- **DCD Line**: Ignore
- **Power to Interface**: Off
Connecting the PC to the Monitor

Connect the cable from the PC to the service socket (1). If you are using an HP PC, use only the COM 1 port.

Loading the Service Program

1. Switch on both the monitor and the PC.
2. Now load the program.

If you are using the PC in DOS mode, do one of the following.

- If the program files are contained in a directory, change to that directory and enter:
  ```
  pegserv
  ```
- If you want to load the program from drive A (or another drive):
  i. Insert the program disk into drive A (or other).
  ii. Select **DOS-Commands** and press **Enter**.
  iii. At the DOS prompt type **A:** and press **Enter**.
  iv. Type **pegserv** and press **Enter**.

If you are using Windows 95/98/NT:

- Start the service program by double-clicking on the **pegserv** icon or on the filename **pegserv.exe**

3. The program is now loaded and ready for use.
Using the Service Program

When the program has been loaded onto your PC, the main menu is displayed. (If the menu is not displayed, an error message is displayed along the bottom of the screen.)

Main Menu

MESSAGES:
Select with >cursor keys< or >E, S, D, X< then press <ENTER> to execute!!

To select an item from the menu, move the cursor to the item you require and press Enter:

- Use the arrow keys ▲, ▼, ◄, ► keys on the keypad, or the E, S, D or X keys to move the cursor.

Messages are displayed along the bottom of the screen while the Service Program is working, for example:

  Reading Recorder Adjustments from the Monitor.

  Reading Serial Number from the Monitor.

  Clearing the Error Log.
Configuring the Monitor

To change a setting:

1. Using the appropriate keys, move the cursor to the selection you require.
2. Press Enter.

To return to the Main Menu:

1. Move the cursor to Return to Main Menu.
2. Press Enter.

Example

On the screen above, the actual setting of the paper scale is US. To change this to EU, move the cursor to EU in the Select column and press Enter. The program will reconfigure the monitor for the European paper scale.

The settings on your monitor may be different from those shown.
Adjusting the Recorder

The Recorder Heat-Adjust is to compensate for different tolerances in the paper.

---

Series 50 Fetal Monitor Configuration and Service Software Rev A.nn.nn

Recorder Adjustments:

- Recorder Heat Adjust: Actual Value is: 
  Selected Value is 
  
- Recorder Zero Adjust: Actual Value is: 
  Selected Value is 

Return to Main Menu

MESSAGE:
Select with >cursor keys< or >E, S, D, X< then press <ENTER> to execute!!

To change a setting:

1. Using the appropriate keys, move the cursor to the new value you require.
   
2. Press Enter.

To return to the Main Menu:

1. Move the cursor to Return to Main Menu.
   
2. Press Enter.

Example

On the screen above, the actual value of the recorder zero-adjust is Left. To change this to Right, move the cursor to Right in the Selected Value is: column and press Enter. The program will adjust the recorder accordingly. The values shown on your monitor may be different from those shown.
To select an item from the menu, move the cursor to the item you require and press Enter.

**Note**
Before you select **Cyclic Test**, you must connect ultrasound, Toco and DECG transducers to the monitor.

The serial number and software revision of your monitor may be different from those shown.

---

**Running the Cyclic Test**
The Cyclic Test is a continuous Self Test. Any errors are written to the Error Log and can be read using Read ErrorLog. Press any key to stop the test and return to the Service Menu. During the test the keys on the front of the monitor are disabled.

---

**MESSAGE:**
Select with >cursor keys< or >E, S, D, X< then press <ENTER> to execute!!

---

**CYCLIC TEST is started**
It starts a continuous self test of the monitor

Press any key to stop this test
Read ErrorLog to see the errors that occurred while self testing

---
Reading the Options  
This lists the options installed on the monitor. Press any key to return to the Service Menu. The options on your monitor may be different from those shown.

---

Series 50 Fetal Monitor Configuration and Service Software Rev A.nn.nn

Implemented Options:

- Fetal Movement Profile
- External Twin Monitoring

MESSAGE:
Press any KEY to continue!

---

Reading the Error Log  
This displays the error log. (See Chapter 11 for a list of error log messages.)

Use >W< to Write ErrorLog Data to File >ErrLog.DAT<
use CursorKey >Down< or >X< to see next Page, <ENTER> to leave

The error log lists:
- The monitor's serial number.
- The error code and the number of times the error has occurred.
- The date and time the error first occurred.
- The date and time the error last occurred.

Up to 16 error messages can be displayed on a screen. To see the next or previous screen, use the ▲ or ▼ keys on the keypad, or the E or X keys. At the end of the Error Log, No more Data.
available is displayed.

Press **SHIFT** **PrtSc** to print a page on LPT1.

Press **Enter** to return to the Service Menu.

To write the error log data to a file, press the **W** key. The data is then stored as **ERRLOG.DAT** in the directory containing **PEGSERV.EXE**. The data is stored as ASCII characters, and therefore the file can be printed using the DOS Command **print ERRLOG.DAT**. The file is overwritten each time you press the **W** key.

**Clearing the Error Log**

The confirmation message **Are You Sure?** asks if you do want to clear the error log:

- Press **Y** to clear the error log, **O R**
- Press **N**.

You then return to the Service Menu.
Writing the Serial Number  You can write the serial number to the monitor only if you have replaced the CPU Board with an exchange board. The serial number can be written only once to the exchanged board. If you accidently enter the wrong serial number, you can reset it using an access code obtainable from your Philips Response Center or from the Philips Technical Marketing Intranet page, "Softserver."

To write the serial number:

1. Using the keyboard, type in the serial number of the monitor. This is printed on the side and on the bottom of the monitor

2. Press Enter.
   
   A confirmation message asks if the serial number is correct:
   
   • Press Y if it is, OR
   • Press N and retype the serial number.

You then go to the Set Options Screen to reset the options for the monitor.
To select an option:

1. Using the appropriate keys, move the cursor to the selection you require.
2. Press Enter.

To write the options to the monitor and return to the Main Menu:

1. Move the cursor to Write Options.
2. Press Enter.

A confirmation message asks if the selected options are correct.
Enabling/Disabling FHR Alerting

This screen enables you to enable or disable the fetal heart rate alerting. To change this configuration you must enter an access code, which is available from your Philips Response Center or from the Technical Marketing “Softserver” page on the Philips Intranet. There are two different access codes, one enables the alerting, and the second disables alerting.

NOTE: Changing the Alert Option is protected by Access Code!

Alert Option is ENABLED. Do you want to DISABLE the Alert option?

Press <Y> for YES or <N> for NO!

MESSAGE:

To enable or disable the alerting, enter the specific code to enable or disable the alerting.
Getting Started (Basic Considerations and Operation)

Setting the Time and Date

You can view and change the time, the date and the paper speed using the following keys:

![Figure 5-1 Setting the Time and Date](image)

- **Clock key** displays the time (1).
- **Paper speed** displays the paper speed (2).
- **Volume keys** change the time, date and paper speed (3).

To set the time and date:

1. Press and release (Clock) to display the current time. The Cardio 1/Combi display flashes to show that the hour can be changed.

2. Press (−) or (+) to set the hour. Press and hold the keys to change the setting more quickly.

3. Press and release (Paper speed) and the Toco display flashes to show that the minutes can be changed.

4. Press (−) or (+) to set the minutes.

5. Repeat the procedure:
   - To set the month (in North America) or the day (in other countries).
   - To set the day (in North America) or the month (in other countries).
   - To set the year.

6. Press and release (Volume keys) to return to the normal display.

You can also change the format of the time and date using the optional Barcode Reader and the feature setting barcodes supplied with it.
Changing the Time Format

To change from 12-hour to 24-hour format, enter `TIME FORMAT 24H (MILITARY)` from the feature setting sheet.

To change from 24-hour to 12-hour format, enter `TIME FORMAT AM/PM` from the feature setting sheet.

To change from Day.Month.Year to Month/Day/Year format, enter `DATE FORMAT NORTH AMERICAN` from the feature setting sheet.

To change from Month/Day/Year to Day.Month.Year format, enter `DATE FORMAT EUROPEAN` from the feature setting sheet.

If the batteries are not changed when they become low or empty of charge, the settings will return to their default values: the date is set to 04.04.44 and the time is set to either 00.00 (European Format) or 12:00A (US Format).

Setting Paper Speed and Scale

Setting the Paper Speed

The paper speed can be 1, 2 or 3 cm/min. The default for North America is 3 cm/min; the default for other countries is 2 cm/min. A change in paper speed will result in a change in the appearance of an FHR trace, care must be taken to ensure ALL monitors in your institution are consistently set at the same speed.

The ACOG technical bulletin on FHR monitoring states that “accurate pattern recognition is difficult if not impossible at 1 cm/min and that 1 cm/min is only recommended for more economic screening. When FHR abnormalities arise, the faster paper speeds will enhance FHR pattern recognition.”

Use the Paper Speed Key to display the current paper speed and to return to the normal display. You also return to the normal display automatically if you don’t press any key for a few seconds. When you return to the normal display, the new paper speed is set, and the time, date, speed and monitoring modes are printed on the paper.

To set the paper speed:

1. Press and release `\[\text{\~} \]min` to display the current speed.
2. Press `\(-\)` or `\(+\)` to set the speed.
3. Press and release `\[\text{\~} \]min` to return to the normal display.
Setting the FHR Paper Scale

All chart paper available for the monitor is 2-channel chem/thermal paper, containing 150 numbered pages per pack. Each page is 100mm long and 151mm wide. Several configurations are available, each with a 0 - 100 labor scale.

Table 5-1 Types of Trace Paper Available

<table>
<thead>
<tr>
<th>Product Number</th>
<th>FHR Scale</th>
<th>Color of Grid</th>
<th>FMR Filing System</th>
<th>Packs per Case</th>
<th>European KPa scale</th>
<th>Highlighted Three Lines</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1910A</td>
<td>30 - 240</td>
<td>Orange</td>
<td>No</td>
<td>40</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>M 1911A</td>
<td>50 - 210</td>
<td>Green</td>
<td>No</td>
<td>40</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>M 1913A</td>
<td>50 - 210</td>
<td>Green</td>
<td>No</td>
<td>40</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Caution
Using recorder paper that is not approved by Philips can damage the monitor. This type of damage will not be covered by warranty.

Some monitor configurations come with a fetal monitoring record (FMR) management system. Included in the FMR system are labels that facilitate a total management system for organized storage and retrieval of patient records.

If you wish to use paper with a different FHR scale (for example, 50 - 210 bpm instead of 30 - 240 bpm) you can change the paper scale settings:

1. Using the service software (see “Using the Service Program” on page 4-36).
2. Using pushbuttons (see “Configuring the Monitor Using Pushbuttons” on page 4-27).
Switching Logic Off and On

The default setting for arrhythmia logic is on. To change the setting, do the following:

- Connect a DECG transducer to the Cardio 1/Combi or Cardio 2 socket.
- Press repeatedly until is displayed.
- The Signal Quality Indicator shows:
  - RED if logic is OFF.
  - GREEN if logic is ON.
- Press or to change the setting.
- Press repeatedly to return to the normal display.

You also return to the normal display automatically if you do not press a key for a few seconds.

Separating FHR Traces (“Twins Offset”)

To help with the interpretation of traces with similar baselines, you can separate them.

Using Keys

- Connect two fetal heart rate transducers to the Cardio 1/Combi and Cardio 2 sockets.
- Press repeatedly to display .
- The Signal Quality Indicator shows:
  - RED if the traces are NOT SEPARATED.
  - GREEN if the traces are SEPARATED.
- Press or to change the setting.
- Press repeatedly to return to the normal display.

You also return to the normal display automatically if you do not press a key for a few seconds.

Using the Barcode Reader

Enter “Twins Offset” from the barcode sheet.
Switching FMP Off and On

The default setting for FMP is on. (FMP is an option.)

**Using Keys** To change the setting, do the following:

- Connect a transducer to the Cardio 1/Combi socket.
- Press \texttt{FMP} repeatedly until \texttt{FMP} is displayed.
- The Signal Quality Indicator shows:
  - RED if FMP is OFF.
  - GREEN if FMP is ON.
- Press \texttt{−} or \texttt{+} to change the setting.
- Press \texttt{FMP} repeatedly to return to the normal display.

You also return to the normal display automatically if you do not press a key for a few seconds.

**Using the Barcode Reader** Enter **FMP Off** or **FMP On** from the barcode sheet.
Figure 6-1 Sockets for Peripheral Devices

1. Interface for optional barcode reader.
2. Interface for Philips Series 50 T Fetal Telemetry System (M 1310A) and external device. See “Connecting External Devices” on page 62 and “Interface for Philips M 1310A” on page 52 for details.
3. System interface for connection to 80225A/80235A OBMS System and/or M 1340A Fetal Trace Transmitter or M 1370A ODIS System (optional). See “System Interface Option J12” on page 59 for details.
4. Serial RS232/RS422 system interface for connection of maternal monitors such as Philips CMS. See “RS232 Dual Serial Interface Option J13” on page 61 for details.
5. RS232 digital system interface for connection to a Philips OB TraceVue system or an IBM compatible PC. See the table “Telemetry Interface: Pin Connections” on page 53 for details.

See “Rear Panel” on page 1-15 for a table of the board-slot positions.
Interface for Philips M1310A

The Telemetry input allows connection to the Philips Fetal Telemetry Systems. Full functionality is provided by the Philips Series 50 T Fetal Telemetry System (M1310A) and monitor software revision higher than A.04.00.

The pin allocations for the various signals are shown below.

Figure 6-2  Telemetry Input Signal Allocations
<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Function 1 (Telemetry)</th>
<th>Function 2 (External Parameter)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HR2</td>
<td>HR-LF 2 MECG Analog: Input</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>-12V</td>
<td>Max. 100mA: Output</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>+5V</td>
<td>Max. 100mA: Output</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>+12V</td>
<td>Max. 100mA: Output</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>S1</td>
<td>Telemetry on (L): Input</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>S2</td>
<td>Ext Par On (L): Input</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>S3</td>
<td>DECG Inop (L): Input</td>
<td>INOP (L): Input</td>
</tr>
<tr>
<td>8</td>
<td>S4</td>
<td>DECG Mode</td>
<td>Ext Par Code MSB (scaling): Input</td>
</tr>
<tr>
<td>9</td>
<td>S5</td>
<td>Reserved Mode</td>
<td>Ext Par Code LSB (scaling): Input</td>
</tr>
<tr>
<td>10</td>
<td>S6</td>
<td>US M ode (L): Input</td>
<td>Cardio Channel (L): Input</td>
</tr>
<tr>
<td>11</td>
<td>S7</td>
<td>Toco Channel (L): Input</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>S8</td>
<td>IUP Mode (L)</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>S9</td>
<td>Toco Ext Mode (L): Input</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>HR1 (HR-LF)</td>
<td>FH R low frequency 1</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Toco</td>
<td>Toco dc: Input</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Ext Par</td>
<td>Ext Par Analog: Input</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Gnd Analog</td>
<td>Signal G nd</td>
<td>Signal G nd</td>
</tr>
<tr>
<td>18</td>
<td>Gnd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Mark</td>
<td>Telemetry Marker on (L): Input</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>FM P on</td>
<td>Telemetry FM P on</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>FM</td>
<td>Telemetry Fetal Movement event on</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td>reserved (L): Input</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>N.C. (if ID)</td>
<td>New Interface= Do not connect</td>
<td>Old Interface= connect to Gnd</td>
</tr>
<tr>
<td>24</td>
<td>Gnd</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>S10</td>
<td>HR2 Mode = MECG Mode (L)</td>
<td></td>
</tr>
</tbody>
</table>

1. If pin 5 is high (telemetry is off) the other inputs have different functions. Tele On (pin 5=L) and Ext.par.on (pin 6=L) are not allowed at the same time.

HCMOS threshold:
L = Low = 0 to 1.5V
H = High = 3.5 to 5V
### Functions for External Parameter Input

#### Telemetry

**Pin 1** HR 2-M ECG Analog Input.

Analog Signal Specification:

- $R_i > 10 \, k\Omega$
- $U_{\text{max}} = \pm 6 \, \text{Vpp}$, $min = 40 \, \text{mVpp}$

**MECG Mode (L) Input (pin 25) should be set to L (0V).**

**Pins 2, 3 and 4.** Supplies for small peripheral instruments, earth connections through pins 18 and 24. Maximum current allowed 100mA.

**Pin 5 (S1) Telemetry on (L).** monitor goes to Telemetry Mode.

- Telemetry display field is lit.
- Transducer must be removed from the front panel connectors. If they are not removed, appears in the display above the transducer socket.
- Status bits pin 7 (S3) to pin 13 (S9) and pin 25 (S10) are activated through the connection to ground (pins 18 to 24) and have function 1 (Telemetry).
- Pin 6 (S2) must be High, if not appears in the display.
- Each transition of S1 starts a complete mode annotation at the recorder.

**Pin 7 (S3) DECG inop.**

**Pin 8 (S4) DECG Mode.**

**Pin 9 (S5) Reserved Mode.**

**Pin 10 (S6).** US-Heart rate mode programming for Telemetry input signal.

**Pin 11 (S7).** Not used with Telemetry.

**Pin 12 (S8).** IUP Mode (L).

**Pin 13 (S9).** Toco Ext Mode (L). Toco mode programming. Activated Toco mode will be displayed on the front panel.

---

<table>
<thead>
<tr>
<th>Ext. Par. Code</th>
<th>Recorder Toco scale</th>
<th>Recorder Philips scale (US) (EU)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MSB</td>
<td>LSB</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
**Pin 14 HR 1 Fetal Heart Rate Input.** Input signal depends upon the selected HR mode. The table below gives details of the input signals for each of the HR modes.

<table>
<thead>
<tr>
<th>Fetal Heart Rate Mode</th>
<th>Input signal Pin 14</th>
</tr>
</thead>
<tbody>
<tr>
<td>US (S6 Low level)</td>
<td>Doppler LF signal</td>
</tr>
<tr>
<td></td>
<td>Ri &gt; 10 kΩ</td>
</tr>
<tr>
<td></td>
<td>U max = ±3.5 Vpp</td>
</tr>
<tr>
<td></td>
<td>min = 35 mVpp</td>
</tr>
</tbody>
</table>

**Pin 15 TOCO - DC Input**

Ri > 10 kΩ  
Input range = -3 V to +2 V  
Sensitivity = -1 V Full scale

**Pin 17.** Signal ground for pins 14 and 15.

**Pin 18 - 24.** Ground for supply and status bits S1 to S10 activation. System outputs will be controlled in the telemetry mode as in the front mode.

**Pin 25. MECG Mode Input > (L).** MECG mode programming. Activated MECG mode will be displayed on the front panel. The input signal from pin 1 (MECG Analog Input) will be processed by the instrument.

**External Parameter**

**Pin 6 (S2) External Parameter ON (L).** The external parameter is printed on the recorder in addition to the front mode information.

- Pin 5 (S1) must be High, if not appears in the display.
- Status bits S3 to S7 have function 2.

**Pin 7 (S3) INOP (L).** Printer disabled for the external parameter.

**Pin 8 (S4) MSB and Pin 9 (S5) LSB.** External parameter code.

<table>
<thead>
<tr>
<th>Ext. Par. Code</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSB</td>
<td>LSB</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Figure 6-3  External Parameter Definition 1

HR Channel: 1 V/100 bpm
TOCO Channel: 1 V/100 Toco units

Positive input voltages only; when the paper scaling limits are exceeded the external parameter will no longer be recorded.

Figure 6-4  External Parameter Definition 2

HR Channel: 1 V/100 bpm
TOCO Channel: 1 V/100 units
When the paper scaling limits are exceeded the external parameter is recorded as a straight line on the limit.

**Pin 10 (S6) Cardio Channel (L).** External parameter will be printed on the Cardio Channel.

**Pin 11 (S7) Toco Channel (L).** External parameter will be printed on the Toco channel. One and only one of either S6 or S7 has to be selected otherwise [image] is displayed on the right hand Cardio 2 display.
**Pin 16 External Parameter Input**

$R_i > 10 \, k\Omega$

$U_{in} \text{ (max } \pm 5 \, V)$

See external parameter code definition (pin 8, pin 9).

The external parameter is recorded but does not appear at the display and system interface output. The digital serial interface can provide the external parameter signal.

---

**RS232 System Interface**

The 9 pin RS232 Telemetry interface system connector provides a digital interface protocol to permit connection to a Philips Series 50 OB TraceVue system or an IBM compatible PC.

![Telemetry Interface RS232 System Connector](rs232sys.hpg)

**Figure 6-7** Telemetry Interface RS232 System Connector

---

**Note**

If an OBMS Board (M 1350-66532) is plugged in at the same time as the Combined Telemetry/Digital System Interface Board (M 1350-66536), the digital interface on the Telemetry Board is switched off as per default. See Chapter 5 for information on how to activate RS232.

If the Software Revision installed is earlier than A.04.01 the RS232 system interface will remain inactive.
System Interface Option J12

The system interface is provided for connection to the Obstetrical Display Information System (ODIS), and the Obstetrical Information Management System (OBMS) Central Stations.

The pin allocations for the various signals are shown below.

![System Interface Connections Diagram]

Figure 6-8 System Interface Connections

The following table lists the pin numbers, the signals at each pin and the signal details. If a Telemetry/System Interface M 1350-6636 is connected at the same time, you should check the correct setting of C13. See Chapter 5 for the correct setting.
Table 6-2  System Interface: Pin Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Signal Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HR2 Output</td>
<td>1 V/100 bpm ±40mV (0V if not valid) R_out = 100Ω</td>
</tr>
<tr>
<td>2</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RS422 Output +</td>
<td>Digital Serial Output</td>
</tr>
<tr>
<td>4</td>
<td>Toco Status Output</td>
<td>Toco external/No Toco (L) IUP (H) (Digital Signal)</td>
</tr>
<tr>
<td>5</td>
<td>HR1_valid Output</td>
<td>When heart rate is valid, output is high.</td>
</tr>
<tr>
<td>6</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Not connected</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>HR1-Mode 10V Output</td>
<td>US=0.6V / AECG=5V / DECG=6.7V / INOP=8.5V</td>
</tr>
<tr>
<td>12</td>
<td>Ground Analog</td>
<td>Signal Ground</td>
</tr>
<tr>
<td>13</td>
<td>Toco 10V</td>
<td>1 V/10 Toco-units ±100mv R_out = 100Ω</td>
</tr>
<tr>
<td>14</td>
<td>HR2-Mode 10V Output</td>
<td>US=0.6V / M ECG=5V / DECG=6.7V / INOP=8.5V</td>
</tr>
<tr>
<td>15</td>
<td>RS422 Output -</td>
<td>Digital Serial Output</td>
</tr>
<tr>
<td>16</td>
<td>Flash 1</td>
<td>Pulse (H) &gt; 100ms (Digital Signal)</td>
</tr>
<tr>
<td>17</td>
<td>RS422 Input +</td>
<td>Digital Serial Input</td>
</tr>
<tr>
<td>18</td>
<td>RS422 Input -</td>
<td>Digital Serial Input</td>
</tr>
<tr>
<td>19</td>
<td>Instrument ON/OFF</td>
<td>Open PNP Collector R_i = 22kΩ (ON =Conducting)</td>
</tr>
<tr>
<td>20</td>
<td>External Marker</td>
<td>0V=On (Output)</td>
</tr>
<tr>
<td>21*</td>
<td>FHR1 Analog Output</td>
<td>1V/100bpm ±30mV R_out=100Ω</td>
</tr>
<tr>
<td>22</td>
<td>External Test Input</td>
<td>When input is low, external test is on. Internal Pullup 5kΩ</td>
</tr>
<tr>
<td>23</td>
<td>Instrument ID</td>
<td>2.5V Regulated R_i = 100Ω</td>
</tr>
<tr>
<td>24</td>
<td>Chassis Ground</td>
<td>Chassis ground</td>
</tr>
</tbody>
</table>

1. In the event of a "paper end" or an "FHR coincidence" condition, an analog signal is applied to Pin 21 FHR1 output. This lasts approximately 600msec and is repeated every minute while the condition remains. The exact output voltage values are shown in the following table.
RS232 Dual Serial Interface Option J13

The Dual Serial Interface board provides data communication between the Philips monitor and external devices. A model **8801** adapter is required from Critikon before the Dinamap 8100 can be connected to the interface socket on the Philips monitor. External parameters are transmitted/printed only if the monitor has no internal parameters installed.

### Supported External Devices

<table>
<thead>
<tr>
<th>Supported External Devices</th>
<th>External Maternal Parameters</th>
<th>Fetal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NIBP</td>
<td>SpO2</td>
</tr>
<tr>
<td>Philips M1165A/1166A/1175A/1176A CMS/V24/V26</td>
<td>Yes²</td>
<td>Yes²</td>
</tr>
<tr>
<td>Philips 78352C/78354C Compact: Configurable Monitor (CCM)</td>
<td>Yes²</td>
<td>Yes²</td>
</tr>
<tr>
<td>COLIN PressMate/Nippon Colin</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Listmini Model BP-8800</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>DatascopAccutorr 3, 4</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Dinamap 1846/8100 NIBP Monitor</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>DatascopAccutorr 3SAT, 4SAT</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Nellcor Oxygen Saturation monitor (N-200)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Nellcor OxiFirst™ Fetal Oxygen Saturation monitor (N-400)</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

1. An MHR measurement is provided in conjunction with maternal NIBP or SpO2 monitoring.

<table>
<thead>
<tr>
<th>Table 6-3 Pin 21: Output Voltage Values</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>FHR Coincidence Bit</th>
<th>Paper End Bit</th>
<th>Reserve Bit</th>
<th>Voltage Range</th>
<th>Pin21 Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3.500 - 3.650</td>
<td>3.575</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3.650 - 3.800</td>
<td>3.725</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3.800 - 3.950</td>
<td>3.875</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3.950 - 4.100</td>
<td>4.025</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4.100 - 4.250</td>
<td>4.175</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4.250 - 4.400</td>
<td>4.325</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4.400 - 4.550</td>
<td>4.475</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4.550 - 4.700</td>
<td>4.625</td>
</tr>
</tbody>
</table>
Measurement Priority

Measurements made by internal maternal parameters (SpO₂, NIBP, and MHR) take precedence above the same measurements made by an externally connected device. The MHR measurement obtained from the SpO₂ measurement has higher priority than the MHR obtained from the NIBP measurement.

Connecting External Devices

The supported external devices are connected to the monitor via the Dual Serial interface at the rear of the monitor. External devices connected to socket 1 that can monitor SpO₂ have priority over the Nellcor OxiFirst™ Oxygen Saturation monitor (N-200).

Warning

Before connecting an external device to the monitor, connect the equipotential grounding point (3) to earth potential. Use the grounding cable supplied with the monitor. The power cord of the external device must be plugged into a wall-mounted power outlet - not into an extension block.

The Dual Serial Interface has two sockets: see 6-1.

1. Use socket 1 (9 pin) for connecting:
   - Philips M 1165A/1166A/1175A/1176A CMS, all models
   - Philips 78352C/78354C Compact Configurable Monitor.
   - Dinamap 1846/8100 NIBP Monitor.
   - COLIN Press-Mate/Nippon Colin Listmini Model BP-8800.
   - Datascop Accutor 3, 4, 3SAT and 4SAT.

2. Use socket 2 (25 pin) for connecting:
   - Nellcor Maternal Oxygen Saturation monitor (N-200) and Nellcor OxiFirst™ Fetal Oxygen Saturation monitor (N-400).
To connect either a Philips CMS, a Philips 78352C or 78354C, a Dinamap 1846/8100, or a Datascopc Accutorr monitor follow the instructions below. The screws for the Philips CMS and Philips 78352C or 78354C are metric and should be tightened by hand only, and not with a screwdriver.

- Use interface cable M 1350-61609.
- Connect the 9-pin end of the cable to the Philips Series 50 XM or XMO monitor.
- Connect the 25-pin end of the cable to the external device.
- Secure the interface cable by the screws at the cable connectors.

![Figure 6-9 Interface Cable M1350-61609](image1)

To connect a COLIN BP-8800 Monitor to a Philips Series 50 XM or XMO monitor:

- Use the interface cable supplied by the COLIN Corporation with the NIBP monitor.
- Connect the 9-pin end of the cable to the Philips Series 50 XM or XMO monitor.
- Connect the 15-pin end of the cable to the COLIN.
- Secure the interface cable by the screws at the cable connectors.

![Figure 6-10 COLIN Interface Cable](image2)
Nellcor N-200 or N-400 Monitor

To connect a Nellcor N-200 or N-400 monitor to the Philips Series 50 XM or XMO monitor:

- Use the interface cable M1350-61609.
- Connect the 25-pin end of the cable to the Philips Series 50 XM or XMO monitor.
- Connect the 9-pin end of the cable to the Nellcor N-200 or N-400.
- Secure the interface cable by the screws at the cable connectors.
- Set the dip switches on the rear panel of the Nellcor N-400 fetal SpO2 monitor to:
  - Up: 4, 8
  - Down: 3, 6, 7

This selects a baud rate of 2400 and an output format of “Conversation”. The positions of the other dip switches do not matter.

Philips V24/V26

To connect a V24/V26 to the Philips Series 50 XM or XMO monitor:

- Use the interface cable M1353-61614.
- Secure the interface cable by the screws at the cable connectors.

### Table 6-4 9-Pin Connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Signal Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-</td>
<td>Connected to pin 4</td>
</tr>
<tr>
<td>2</td>
<td>RxD (RS232)</td>
<td>Received data input</td>
</tr>
<tr>
<td>3</td>
<td>TxD (RS232)</td>
<td>Transmitted data output</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>Connected to pin 1</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
</tbody>
</table>
### Table 6-5  25-Pin Connector

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal</th>
<th>Signal Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TxD (RS232)</td>
<td>Transmitted data output</td>
</tr>
<tr>
<td>3</td>
<td>RxD (RS232)</td>
<td>Received data input</td>
</tr>
<tr>
<td></td>
<td>RxD-1 (RS422)</td>
<td>Received differential data input +</td>
</tr>
<tr>
<td>7</td>
<td>GND</td>
<td>Signal ground</td>
</tr>
<tr>
<td>9</td>
<td>TxD-1 (RS422)</td>
<td>Transmitted differential data output +</td>
</tr>
<tr>
<td>10</td>
<td>TxD-2 (RS422)</td>
<td>Transmitted differential data output -</td>
</tr>
<tr>
<td>18</td>
<td>RxD-2 (RS422)</td>
<td>Received differential data input -</td>
</tr>
</tbody>
</table>

![Diagram of 9-Pin and 25-Pin connector pins]

**Figure 6-11. Dual Serial Interface: 9-Pin and 25-Pin**
External Device Baudrate Settings and Configurations

Philips CMS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baudrate</td>
<td>9600</td>
</tr>
<tr>
<td>Startbit</td>
<td>1</td>
</tr>
<tr>
<td>Databits</td>
<td>8</td>
</tr>
<tr>
<td>Stopbits</td>
<td>1</td>
</tr>
<tr>
<td>Cable</td>
<td>M 1350-61609 only</td>
</tr>
<tr>
<td>Port</td>
<td>Any port may be used, but ensure the above settings are stored to the Philips CMS in configuration mode.</td>
</tr>
</tbody>
</table>

Philips 78352C and Philips 78354C

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baudrate</td>
<td>9600</td>
</tr>
<tr>
<td>Startbit</td>
<td>1</td>
</tr>
<tr>
<td>Databits</td>
<td>8</td>
</tr>
<tr>
<td>Stopbits</td>
<td>1</td>
</tr>
<tr>
<td>Cable</td>
<td>M 1350-61609</td>
</tr>
<tr>
<td>Port</td>
<td>Only port B (sometimes referred to as port 2) can be used if the Philips 78352C or 78354C is configured to 9600 Baud.</td>
</tr>
</tbody>
</table>

COLIN BP-8800

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baudrate</td>
<td>4800</td>
</tr>
<tr>
<td>Startbit</td>
<td>1</td>
</tr>
<tr>
<td>Databits</td>
<td>8</td>
</tr>
<tr>
<td>Stopbits</td>
<td>1</td>
</tr>
<tr>
<td>Cable</td>
<td>Supplied by the COLIN Corporation</td>
</tr>
</tbody>
</table>
**Dinamap 1846/8100**

- **Baudrate:** 600
- **Startbit:** 1
- **Data bits:** 8
- **Parity:** None
- **Stopbits:** 1
- **Cable:** M 1350-61609

**Datascope Accutorr**

- **Baudrate:** 9600
- **Startbit:** 1
- **Data bits:** 8
- **Parity:** None
- **Stopbits:** 1
- **Cable:** M 1350-61609

**Nellcor N-200 and N-400**

- **Baudrate:** 2400
- **Startbit:** 1
- **Data bits:** 8
- **Parity:** None
- **Stopbits:** 1
- **Cable:** M 1350-61609

**Philips 26/24**

- **Baudrate:** 9600
- **Startbit:** 1
- **Data bits:** 8
- **Parity:** None
- **TX/RX:** High/Low
- **Stopbits:** 1
- **Cable:** M 1353-61614
External Maternal Measurement on the FHR Trace

Annotations on the trace of measurements made by external devices are always prefixed with an asterisk, *. Maternal measurements made by the 50 XM/XMO monitor itself have higher priority than maternal measurements made by a device externally connected to it.

Table 6-6  External Maternal Measurement Frequency

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Measurement Printout Interval</th>
<th>Internal</th>
<th>External</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpO₂</td>
<td>5 minutes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIBP</td>
<td>Each measurement¹</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MECG Waveform</td>
<td>On demand</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>Not available</td>
<td>5 minutes</td>
<td></td>
</tr>
</tbody>
</table>

¹. If you are using automatic mode to measure maternal blood pressure, with a short interval between repetitions, not all measurements will be recorded on the paper.

If you monitor maternal NIBP only, an MHR measurement is printed at the same time as the NIBP measurement. If you monitor SpO₂, an MHR measurement is printed at the same time as the maternal SpO₂ measurement, every 5 minutes.

If you set the NIBP monitor to automatic mode, you must leave a minimum time interval between each measurement. This time interval depends upon the paper speed setting.

<table>
<thead>
<tr>
<th>Paper Speed</th>
<th>Minimum Time Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cm/min</td>
<td>3 minutes</td>
</tr>
<tr>
<td>2 cm/min</td>
<td>2 minutes</td>
</tr>
<tr>
<td>3 cm/min</td>
<td>1 minute</td>
</tr>
</tbody>
</table>
## Troubleshooting

You can use the following tables for solving general application problems and product-specific problems that may occur. For solving general technical problems, refer to the troubleshooting flowcharts.

### General

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not all maternal NIBP measurements are printed on the trace and the NIBP Monitor is in automatic mode.</td>
<td>The time interval between each measurement is too short.</td>
<td>Set the minimum time interval according to paper speed. (See previous pages in this Chapter).</td>
</tr>
<tr>
<td>Incorrect SpO2 or Temperature measurements.</td>
<td>The monitor has been switched on before the appropriate sensor was applied.</td>
<td>Apply sensor 5 minutes before the monitor is switched on.</td>
</tr>
</tbody>
</table>

### Nellcor N-200 Maternal SpO2 Monitor

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No maternal SpO2 and no MHR measurements are printed on the trace.</td>
<td>The Nellcor monitor is powered by the internal battery. (Battery power symbol is lit.)</td>
<td>Switch on the AC power at the rear of the monitor. (Battery power symbol is not lit.) See also “FSpO2 Monitor” on page 11-166 for FSpO2 troubleshooting instructions.</td>
</tr>
<tr>
<td>Wrong DIP switch configuration of N-200 monitor.</td>
<td></td>
<td>Check DIP switch configuration of N-200 monitor (see page 64).</td>
</tr>
</tbody>
</table>

### Nellcor N-400 Fetal SpO2 Monitor

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No FSpO2 annotation after Rec On in Toco grid.</td>
<td>Wrong DIP switch configuration of N-400 monitor.</td>
<td>Check DIP switches (see page 64).</td>
</tr>
<tr>
<td>Mat H R and Mat SpO2 appear as printout instead of trace.</td>
<td>Wrong setting of C10.</td>
<td>Change C10 setting.</td>
</tr>
<tr>
<td></td>
<td>No FSpO2 transducer plugged in.</td>
<td>Connect transducer.</td>
</tr>
<tr>
<td></td>
<td>Wrong C10 setting.</td>
<td>Change C10 &gt;10.</td>
</tr>
<tr>
<td>Problem</td>
<td>Possible Causes</td>
<td>Solutions</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>No maternal measurements are printed on the trace.</td>
<td>The parameters are switched off.</td>
<td>Switch on the parameters in the Parameters On/Off menu. (See the Operating Guide supplied with the Component Monitoring System.)</td>
</tr>
<tr>
<td></td>
<td>Incorrect interface cable.</td>
<td>Ensure the interface cable M 1350-61609 is used. (This number is printed on both ends of the cable.)</td>
</tr>
<tr>
<td></td>
<td>Incorrect Philips CMS software revision.</td>
<td>Ensure the Philips CMS has Revision C (or higher) software.</td>
</tr>
<tr>
<td></td>
<td>Other RS232 external devices are blocking the communication to the Fetal Monitor.</td>
<td>Disconnect all other RS232 external devices, except the fetal monitor from the Philips CMS and turn the power supply switch for the Philips CMS off. Wait at least 10 seconds, then turn the Philips CMS power supply switch on again. Check Philips CMS settings and refer to Philips CMS Service Documentation.</td>
</tr>
<tr>
<td></td>
<td>Incorrect configuration of the RS232 port.</td>
<td>Alter the Philips CMS settings and refer to Philips CMS Service Documentation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alter the Philips CMS settings and refer to Philips CMS Service Documentation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Causes</th>
<th>Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>No M H R measurement is printed on the trace.</td>
<td>Incorrect parameter source.</td>
<td>If the SpO₂/PLETH module is plugged in, set the HR/PULSE source to PLET H.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alter the Philips CMS settings and refer to Philips CMS Service Documentation.</td>
</tr>
<tr>
<td>No maternal temperature is printed on the trace.</td>
<td>TEM P1 is not labeled T1.</td>
<td>Change TEM P1 label to T1.</td>
</tr>
<tr>
<td></td>
<td>Temperature sensor is not connected to module TEM P1.</td>
<td>Check the cable connection of the temperature sensor.</td>
</tr>
<tr>
<td>Mat. H R 0 and Mat. SpO₂ 0% values are printed on the trace.</td>
<td>The Nellcor and the Philips CMS are connected in parallel and the Nellcor front power supply switch is in the off position and the rear power supply switch is in the on position.</td>
<td>Ensure the Nellcor power supply switches (front and rear) are both on or both off. Alternatively, disconnect the Nellcor monitor completely (see also page 166).</td>
</tr>
</tbody>
</table>
Carrying Out the Checks

After you have installed the monitor, perform the following checks listed below:

1. Ensure you have loaded some paper and connected the power cord.
2. Turn the monitor on.
3. Check that the paper speed, and time and date are configured.
4. With no transducers connected, press \textit{Test}.
   
   You should see the following:

   \textbf{DISPLAY}: All parts of the display are lit followed by all mode symbols. These will flash alternately for about 10 seconds.

   \textbf{RECORDER}: During the test the recorder speed will automatically set to 3cm/min and a test pattern will be printed on the recorder paper to verify the condition of the thermal print head and if the printer is correctly configured. See Figure 10-1. Recorder Test Pattern, for a sample recorder test pattern.

5. Perform the Parameter Test as described in “Parameter Test” on page 118.
6. Check the Barcode Reader is correctly connected as outlined in Chapter 3.

The previous checks should verify the operation of the monitor. More complete tests, such as transducer tests, are given later in this book.
### Introduction

This chapter tells you how to upgrade the monitors, which options require which steps, and how to restore the monitor’s original configuration. Many of the upgrade options (especially those whose option number begins with “C”) require very similar steps to upgrade them, as you will see from the tables.

### Overview of Upgrade Options

There are many different upgrades possible. The following table shows you the upgrade option numbers (upgrade option and part numbers are prefixed with M 1360) and gives a brief description of their function.

<table>
<thead>
<tr>
<th>add</th>
<th>Existing Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Series 50 IX</td>
</tr>
<tr>
<td></td>
<td>without maternal parameters</td>
</tr>
<tr>
<td>Second US/Cardio channel</td>
<td>C01</td>
</tr>
<tr>
<td>Fetal Movement Profile</td>
<td>C02</td>
</tr>
<tr>
<td>Maternal parameters only</td>
<td>C04</td>
</tr>
<tr>
<td>FSpO₂ only</td>
<td>C31</td>
</tr>
<tr>
<td>FSpO₂ and maternal parameters</td>
<td>C33</td>
</tr>
<tr>
<td>latest software release</td>
<td>S01</td>
</tr>
<tr>
<td>RS232 Interface (for Philips OB TraceVue) or Telemetry Interface</td>
<td>J10</td>
</tr>
<tr>
<td>Combined analog/digital system interface for OBMS and ODIS</td>
<td>J12</td>
</tr>
<tr>
<td>Maternal parameter interface to connect external patient monitor</td>
<td>J13</td>
</tr>
</tbody>
</table>


## Work Instructions at a Glance

Each upgrade is described in a series of work instructions. Not all upgrades require all the work instructions. The following table shows you exactly which instructions you must follow for the upgrade you are performing.

<table>
<thead>
<tr>
<th>Upgrade option</th>
<th>Work Instruction</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>C02</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
</tr>
<tr>
<td>C03</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C04</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C05</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C06</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C07</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C08</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C09</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C10</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C11</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C12</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C13</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C14</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C15</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C16</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C17</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C18</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C19</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C20</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C21</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C22</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C23</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C24</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C25</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C26</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C27</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C28</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C29</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C30</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C31</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C32</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C33</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C34</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>C35</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>S01</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>J10</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>J12</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
<tr>
<td>J13</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
</tr>
</tbody>
</table>
The following table gives you an overview of what is involved in each upgrade option. All “Cxx” upgrades include a mandatory CPU firmware upgrade for the ROM board.

<table>
<thead>
<tr>
<th>Option</th>
<th>Adds.....</th>
<th>Factory ships.....</th>
<th>You must.....</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>second US/Cardio channel</td>
<td>• upgrade key</td>
<td>• upgrade and test the monitor</td>
</tr>
<tr>
<td>C02</td>
<td>Fetal Movement Profile</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C03</td>
<td>maternal parameters to an XM without maternal capability</td>
<td>• new display</td>
<td>• use original base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NIBP board</td>
<td>• fit new display</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SpO2 board</td>
<td>• connect NIBP and SpO2 and fit both boards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C04</td>
<td>maternal parameters to IX</td>
<td>• installed new base assembly</td>
<td>• transfer original cover, recorder, power supply and ROM board to new base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C30</td>
<td>maternal parameters to an XM O without maternal capability</td>
<td>• new display</td>
<td>• use original base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NIBP board</td>
<td>• fit new display</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SpO2 board</td>
<td>• connect NIBP and SpO2 and fit both boards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C31</td>
<td>FSpO2 only (no maternal parameters) to an IX</td>
<td>• installed new base assembly</td>
<td>• transfer original cover, recorder, power supply and ROM board to new base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C32</td>
<td>FSpO2 to an XM that already has maternal capability</td>
<td>• new display</td>
<td>• use original base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FSpO2 board</td>
<td>• fit display assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• Fit FSpO2 board</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C33</td>
<td>maternal parameters and FSpO2 to an IX</td>
<td>• installed new base assembly</td>
<td>• transfer original cover, recorder, power supply and ROM board to new base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C34</td>
<td>FSpO2 only to an XM without maternal capability</td>
<td>• FSpO2-only display</td>
<td>• use original base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FSpO2 board</td>
<td>• fit FSpO2 board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• fit new display</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>C35</td>
<td>FSpO2 and maternal parameters to an XM without maternal capability</td>
<td>• new display</td>
<td>• use original base assembly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• FSpO2 board</td>
<td>• connect NIBP and SpO2 and fit boards</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• NIBP board</td>
<td>• fit FSpO2 board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SpO2 board</td>
<td>• fit new display</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• configure and test monitor</td>
</tr>
<tr>
<td>S01</td>
<td>latest software</td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td>J10</td>
<td>RS232 interface for OB TraceVue, or Telemetry interface</td>
<td>• RS232/Telemetry board</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• new CPU firmware (4 EPROMs)</td>
<td>• Fit new board. Series 50 IX only.</td>
</tr>
<tr>
<td>J12</td>
<td>combined analog/digital system interface for OBMS and ODIS</td>
<td>• Analog/digital interface board</td>
<td>• Fit new board</td>
</tr>
<tr>
<td>J13</td>
<td>maternal parameter interface</td>
<td>• Interface Board</td>
<td>• Fit new interface board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CPU firmware (4 EPROMs)</td>
<td>• upgrade ROM board with new CPU firmware</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cable to link monitor to external device</td>
<td></td>
</tr>
</tbody>
</table>
Initial Inspection

The upgrades are supplied packed in protective shipping cartons. Before unpacking, visually check the packaging and ensure there are no signs of mishandling or damage. Using the table above, ensure that you have received the correct components for the upgrade option number, check that the contents are complete and that you have the correct upgrade.

Claims for Damage

Follow the instructions in the section “Unpacking and Checking the Shipment” on page 1-4 if the shipping cartons show signs of damage.

What You Need

Upgrading a monitor requires simple tools:

- pozidrive screwdriver size 1
- safety test equipment
- PC for configuration
- Configuration software “pegserv.exe”
- Cable to link PC to fetal monitor

Before You Start

Warning
Disconnect the electrical power to the monitor before you remove any component. Follow the necessary electrostatic discharge (ESD) procedures throughout the upgrade process.
Instruction 1  Verifying Monitor for Upgrade

Before you start the upgrade process, ensure that you are upgrading the correct monitor and that it is working properly.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
</tr>
<tr>
<td>×</td>
</tr>
</tbody>
</table>

1. Check the monitor’s serial number as described in the section on “Instrument Identification” on page 1-6.
   
   When you have upgraded the monitor, remove the old serial number labels from the monitor and replace them with the new labels supplied in the upgrade pack.

2. Ensure that the monitor you are about to upgrade works correctly. Perform a Quick Test and a Parameter Test on the monitor. These are detailed in Chapter 10, “Safety, Maintenance, and Calibration.”
   
   If the monitor does not successfully complete its service tests, do not upgrade it. Make appropriate arrangements for its repair. It is more expensive in time and money to troubleshoot after an upgrade.

Instruction 2  Checking Current Configuration

The first step in the upgrade process for all upgrade options is checking the current configuration. You do this by printing the error log to provide you with a record of the current configuration. After you have finished upgrading the monitor, you will need this record to help you to restore the initial configuration. See page 30 for instructions on printing the error log.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
</tr>
<tr>
<td>×</td>
</tr>
</tbody>
</table>
Instruction 3  Removing the Top Cover

See “Removing the Top Cover” on page 12-169 for instructions.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
</tr>
<tr>
<td>×</td>
</tr>
</tbody>
</table>

Instruction 4  Using the New Base Assembly

When you upgrade a Philips Series 50 IX monitor, you receive a new base unit that is fully fitted with the options that were ordered. All you have to do is transfer some components from the original monitor into the new base unit and perform a firmware upgrade. From the original monitor, you must reuse the cover, the power supply, the recorder and the ROM board.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
</tr>
<tr>
<td>×</td>
</tr>
</tbody>
</table>
Reusing the Power Supply

To remove the power supply from the monitor:

1. Undo the four screws at the rear of the power supply.
2. Pull the power supply out of the rear of the monitor.
3. Put the power supply into the new card cache of the upgrade kit. This is basically a reversal of the above procedure. Hold the ON/OFF switch (on the front of the monitor) as this can be dislodged while inserting the power supply. If you have trouble locating the power supply into the rear of the monitor, remove and check that the pins connecting the supply to the backplane are not bent. Reinsert the supply.

Reusing Boards

Depending on the configuration of the original monitor, you may have to swap up to three other boards from the original monitor into the new one. The technique for removal and replacement is the same for all of the boards. These boards are:

- Telemetry interface
- Dual serial interface
- OBM S interface

1. Undo screws (1) and (2) at the top and bottom of the board.
2. Move lever (2) upwards and pull the board out of the rear of the monitor.

3. Put the new board(s) into the appropriate slot(s):
   - Telemetry interface - remains in Slot 3
   - Dual serial interface - put into Slot 7
   - OBMS interface - put into Slot 8

4. Replace and tighten the screws.
To swap the existing recorder to a new unit, follow the instructions in the section on “Recorder Assembly” on page 12-176.

Then replace the cover on the monitor, using the four screws you reserved earlier.

**Labeling**

1. Stick the option indicator label (which indicates whether the monitor has FM P and/or twin capability) beneath the remote event marker socket.

2. Place the upgrade serial number label on the righthand side of the cover so that it can be easily seen.
Instruction 5  Removing the Display Assembly

To remove the display panel you need first to remove the front end board, and then the digital interface board. This applies to upgrades to XM and XM O monitors.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01  C02  C03  C04  C30  C31  C32  C33  C34  C35  S01  J10  J12  J13</td>
</tr>
<tr>
<td>X     X     ✓     ✓     ✓     ✓     ✓     ✓     ✓     ✓     ✓     ●</td>
</tr>
</tbody>
</table>

A Removing the Front End Board

See “Frontend Board” on page 12-178 for instructions on how to remove the frontend board.

B Removing the Digital Interface Board

1. Disconnect all the cables:
   - loudspeaker cable (1)
   - power LED connector (2)
   - recorder switch board connector (3)
   - recorder sensing board connector (5). Unlock the flex layer connector by pulling it slightly forwards.
• recorder stepper motor (6)
• frontend board connector (7)
• backplane flat cable (13)
2. Disconnect the recorder print head (4) from the recorder assembly.
3. Remove the two screws (8) and (11) that hold the board in place.
4. Slide the digital interface (DIF) board towards the rear of the monitor before lifting the board up, to give the marker connector a "chance".
5. Remove the label from the front end connector area. Score carefully around the connectors in the area with a flat bladed knife. Do not allow any adhesive to remain on the front panel.

**C Removing the Maternal Display Panel**

See “Display Assembly” on page 12-182 for instructions on how to remove the maternal display panel.

**Next Step**

If your upgrade is Option C03, C30 or C35 go to “Adding SpO2 and NIBP Capability” on page 8-84.
If your upgrade is Option C32 or C34, now go to “Adding an FSpO2 Board” on page 8-86.
Instruction 6  Adding SpO₂ and NIBP Capability

This adds maternal pulse oximetry and blood pressure measurement capability.

Options Requiring this Procedure

<table>
<thead>
<tr>
<th></th>
<th>C01</th>
<th>C02</th>
<th>C03</th>
<th>C04</th>
<th>C30</th>
<th>C31</th>
<th>C32</th>
<th>C33</th>
<th>C34</th>
<th>C35</th>
<th>S01</th>
<th>J10</th>
<th>J12</th>
<th>J13</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>✓</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

1. Remove the two plastic parts that pad the two holes already prepared for the NIBP and SpO₂ connectors (screws 1 and 2).
2. Remove the three cover-blanks that cover slots 4 and 5 (NIBP) and 9 (SpO₂), from the rear of the monitor.
3. Fix the NIBP tubing and SpO₂ cabling, with their connectors, to the front panel. Do not force the screws drilled into the plastic on the front panel.
4. Replace the DIF board into the monitor, checking that the marker connector is raised through the front end. Reconnect all the cables.

5. Put the frontend board back into the monitor, sliding it towards the front to click the connectors back into their clips. Ensure that all connectors are fully inserted (check this from the front) before you screw the board back in place.

6. Place the SpO₂ cable and the NIBP tubing in wide soft curves from the front to the rear card cache and feed them through the appropriate slots.

7. Insert the SpO₂ and NIBP boards halfway into the appropriate slots at the rear of the monitor. Connect the tubing and the cable and then fully insert the boards. Screw the boards into position with the provided screws.

8. Attach the self-adhesive holders fixing cable and tubing (1) to the top of the card cache so that it allows any subsequent exchange of the boards without removing the top cover. Make sure that the cable and tubing lie in a soft curve without any crossover on top of the card cache.

9. Secure the earth connection mounting (2) to hold the SpO₂ cable in place and to ensure the correct shielding.

10. Replace the top cover, ensuring that the cable and tubing are not squeezed.

**Next Step**

If your upgrade is Option C32, C34 or C35, go to “Adding an FSpO₂ Board” on page 8-86.

If your upgrade is C03, C30, or C34, go to “Upgrading ROM Board EPROMs” on page 8-87.
Instruction 7  Adding an FSpO₂ Board

This adds fetal pulse oximetry capability.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>✗</td>
</tr>
</tbody>
</table>

1.   Replace the DIF board into the monitor, checking that the marker connector is raised through the front end. Reconnect all the cables.

2.   Put the frontend board back into the monitor, sliding it towards the front to click the connectors back into their clips. Ensure that all connectors are fully inserted (check this from the front) before you screw the board back in place.

3.   Remove the cover blank from slot 9 at the rear of the monitor.

4.   Insert the FSpO₂ board into the monitor. There is no tubing or cabling to connect.

5.   Screw the board into position with the screws provided.

6.   Carefully remove the existing product label from the front of the monitor. The existing label says either “Series 50 IX” or “Series 50 XM”. Replace this with the label that says “Series 50 XMO”(1).

7.   Go to “Upgrading ROM Board EPROMs” on page 8-87.
Instruction 8  Upgrading ROM Board EPROMs

Most upgrades require new EPROMS. You must fit them now and then reconfigure the monitor. For upgrade S01 this is the only procedure you need.

<table>
<thead>
<tr>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board</td>
</tr>
<tr>
<td>ROM Board</td>
</tr>
<tr>
<td>NIBP Board</td>
</tr>
</tbody>
</table>

1. Undo screws (1) at the top and bottom of the ROM Board.
2. Move lever (2) upwards and pull the board out of the rear of the monitor.
3. Using a flat-blade screwdriver, replace the EPROM set, according the diagram below.
4. Push the board back into the slot inside the rear of the monitor.
5. Replace the screws and tighten securely.
6. Stick the label (3) provided with the new EPROMS onto the board as shown.
7. Perform the appropriate safety tests, and initiate the monitor’s self test before allowing the monitor to be used on a patient.
8. Carefully attach the new label with the additional holes for the NIBP and SpO₂ connectors to the front panel.

9. If your S01 upgrade includes a new ROM for the NIBP board, follow these instructions:
   a. Remove the NIBP board from the monitor. There is no need to remove the cover.
   b. Undo the screws at the top and bottom of the NIBP board, which is in Slots 4 and 5 at the rear of the monitor.
   c. Move the lever upwards and pull the board out of the rear of the monitor.
   d. Disconnect the part of the NIBP tubing that leads to the display panel at the front of the monitor (1)
   e. Remove screws (2) and (3) from the NIBP tubing board and gently ease the board forwards so you can access the NIBP board beneath.
   f. Lever the NIBP EPROM gently off the board using a flat bladed screwdriver and replace it with the upgrade EPROM.
   g. Replace the NIBP tubing board and tighten the screws.
   h. Reconnect the NIBP tubing that leads to the display panel.
   i. Slide the NIBP board into the rear of the monitor and refasten the screws.
Instruction 9  Reconfiguring the Monitor

When you exchange EPROMs on the ROM board you must rewrite the new serial number and restore the original options configuration (Twins, FPM, FMP Alerting).

<table>
<thead>
<tr>
<th></th>
<th>Options Requiring this Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>C01</td>
<td>X</td>
</tr>
<tr>
<td>C02</td>
<td>X</td>
</tr>
<tr>
<td>C03</td>
<td>✓</td>
</tr>
<tr>
<td>C04</td>
<td>✓</td>
</tr>
<tr>
<td>C30</td>
<td>✓</td>
</tr>
<tr>
<td>C31</td>
<td>✓</td>
</tr>
<tr>
<td>C32</td>
<td>✓</td>
</tr>
<tr>
<td>C33</td>
<td>✓</td>
</tr>
<tr>
<td>C34</td>
<td>✓</td>
</tr>
<tr>
<td>C35</td>
<td>✓</td>
</tr>
<tr>
<td>S01</td>
<td>X</td>
</tr>
<tr>
<td>J10</td>
<td>X</td>
</tr>
<tr>
<td>J12</td>
<td>X</td>
</tr>
<tr>
<td>J13</td>
<td>X</td>
</tr>
</tbody>
</table>

1. If you have not yet done so, print the error log (see “Printing and Clearing the Error Log” on page 4-30). This will serve as a useful record of the current monitor configuration.

2. Enter the new serial number from the serial number labels (included in this upgrade kit). This must be done using the service software: see “Writing the Serial Number” on page 4-42 for instructions. A serial number can be written only once to the exchanged board. If you accidentally confirm an incorrect serial number you can reset it using an access code obtainable from your Philips Response Center or from the Philips Technical Marketing Intranet page, “Softserver.”

3. You will be prompted for the option configuration. You can set all the option settings using the pushbuttons, as described in “Writing the Serial Number” on page 4-42. Using the error log you printed previously, ensure that you restore only those options that the customer had before you commenced the upgrade.

4. Double check the settings carefully, the configuration is irreversible.

5. Step back to the main menu of the service program and select “Configuration Tasks” to set the paper speed, time format, and so forth, or perform the self tests, or read the error log. You will find detailed instructions for all these tasks in Chapter 4, “Configuring the Monitor.”

Restoring Service Settings Using Pushbuttons

Using the data from the error log you must now restore the customer’s original service settings. Of course, if you have added new functionality, you should ensure that default settings for the new parameter(s) are satisfactory for the customer and if not, change them. See “Configuring the Monitor Using Pushbuttons” on page 4-27 for instructions on changing the settings.
Instruction 10  Upgrade Key

This section tells you how to use an upgrade key to upgrade the software of the Philips Series 50 XM and XMO fetal monitors.

1. Disconnect all transducers (and telemetry) from the monitor.
2. Switch on the monitor.
3. Plug the upgrade key into the service socket (see Figure 1-1 on page 9) on your monitor (if applicable, first remove the little plastic cap on the service socket).
   • The “start upgrade” tone sounds (two short beeps) when the upgrade begins.
   • After about 45 seconds the fetal monitor display should change to “−8−”.
   • Within 7 minutes, the display counts down to “−0−”.
4. At the end of the procedure, you will hear the “upgrade successful” tone (a continuous beep lasting two seconds). The monitor display shows “−0−”. Unplug the upgrade key from the monitor.
   If you don’t hear the “start upgrade” tone or you hear the “upgrade failed” tone (a series of short beeps lasting 2 seconds), there may be several reasons:
   • The battery in the upgrade key may be low. Replace the battery.
   • You may already have carried out the maximum number of upgrades. The upgrade key is programmed to perform the number of upgrades ordered, to a maximum of 8.
   If you hear the upgrade failed tone, (a series of short beeps lasting 2 seconds), disconnect the upgrade key and try again from step 3 above.
   If the upgrade still fails, carry out the quick test described in Chapter 10. If the response is not the same as that described in this manual, contact Philips Support Service.
5. Write the serial number of the upgraded monitor in the space provided on the key. In this way you can keep a record of the monitors that have been upgraded.

6. Stick the feature label to the front of the monitor, as in the example below:
   A: Fetal Movement Profile
   B: Dual Ultrasound

7. Switch the monitor off and then on: it will perform the power-on self-test. If an error message is displayed, contact Philips. If “-8-” is displayed, the upgrade was not successful. Try the upgrade again from the beginning. If “--- --- ---” is displayed, the new software is installed and checked. Please refer to the Instructions for Use for information on necessary performance assurance.

Repeat steps 1 to 7 for each monitor to be upgraded.

When the upgrade key has performed as many upgrades as it was programmed to perform, return it to Philips for recycling. Please contact your nearest Philips Service Center for details.
Instruction 11  Test/Inspection and Safety Procedures

Whenever you upgrade a monitor there are some tests you must run before the upgrade is complete. Exactly which tests you must perform depend on the upgrade you are performing.

<table>
<thead>
<tr>
<th>Test Type</th>
<th>C01</th>
<th>C02</th>
<th>C03</th>
<th>C04</th>
<th>C30</th>
<th>C31</th>
<th>C32</th>
<th>C33</th>
<th>C34</th>
<th>C35</th>
<th>S01</th>
<th>J10</th>
<th>J12</th>
<th>J13</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Instrument Safety Test</td>
<td>❌</td>
<td>❌</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>(see page 138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Parameter Test</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(see page 134)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Quick Test</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(see page 135)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. System Test</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>(see page 141)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Perform parameter test with both Cardio1 and Cardio2 connected.
2. Plug in US transducer to either socket. Press Function key and check if FMP can be enabled.
Introduction

This chapter contains an overview of the system, boot sequence and system self tests as well as brief functional descriptions of individual boards. The following boards are described in this chapter.

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1350-65502</td>
<td>Power Supply Board</td>
<td>PSU</td>
</tr>
<tr>
<td>M 1350-65506</td>
<td>ROM Board</td>
<td>ROM</td>
</tr>
<tr>
<td>M 1350-65513</td>
<td>Central Processor Unit Board</td>
<td>CPU</td>
</tr>
<tr>
<td>M 1350-65515</td>
<td>Digital Interface Board</td>
<td>DIF</td>
</tr>
<tr>
<td>M 1350-65517</td>
<td>Frontend Board</td>
<td>FE</td>
</tr>
<tr>
<td>M 1350-65532</td>
<td>OBMS Interface Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-65533</td>
<td>Dual Serial Interface Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-65534</td>
<td>Maternal Pulse Oximetry Interface Board</td>
<td>SpO2</td>
</tr>
<tr>
<td>M 1350-65535</td>
<td>External Blood Pressure Interface Board</td>
<td>NIBP</td>
</tr>
<tr>
<td>M 1350-65536</td>
<td>Telemetry/System Interface Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-65540</td>
<td>Fetal Pulse Oximetry Interface board</td>
<td>FSpO2</td>
</tr>
</tbody>
</table>

The following boards are not described.

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Name</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1350-60026</td>
<td>LCD Display Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-66501</td>
<td>Backplane</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-66521</td>
<td>Switch Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-66525 (XM)</td>
<td>Display Board</td>
<td>None</td>
</tr>
<tr>
<td>M 1350-66527 (XMO)</td>
<td>Display Board</td>
<td>None</td>
</tr>
</tbody>
</table>
System Overview

Figure 9-1  System Overview
9-1 shows the boards and their interconnections.

The CPU board, which has overall control of the entire system, is connected to the ROM board, which contains all the system software, by the system bus. The software for individual boards is loaded from ROM at startup.

The signals from the transducers receive some analog conditioning and are then digitized and loaded, via the DIF board, into the CPU board RAM. The CPU passes the data to the DSPII board which processes it in the two signal processors. Most data movement is by Direct Memory Access (DMA).

The maternal parameters NIBP and maternal SpO₂ and fetal SpO₂ are processed completely by their respective modules.

The results of the processing are transferred from the signal processors, via the DSPII, to the CPU board RAM and then distributed to the outputs, for example the recorder, “traffic lights” and interface boards.

The backplane is passive, all decoding and similar functions take place on the individual boards. The CPU also handles data exchange between the maternal interface and the soft keys.
The system tests itself when it is turned on. There are two types of check: programs that check the
hardware on each board, and programs that perform checksums on the individual portions of code
that are loaded from the ROM board. Boards with processors check themselves; boards without
processors are checked by the CPU board. All error LEDs are lit at the start of the checks, and the
boards are then checked in sequence. If a hardware error is detected on a board, its error LED stays
lit, and the error code for the board is shown on the display (the error code is the last three digits of
the board’s part number). If any element in the display chain is not working, the errors may not be
displayed. If a board passes its check, the LED is extinguished, and the next board in the sequence
is checked.

The system also tests itself while it is running.

When the system is turned on, the initial reset generated by the power supply is fed to the CPU
board, where it is latched and passed to the other boards. Each board latches the reset, to light its
error LED. The LED can only be turned off by the CPU board de-latching it.

The processor on the CPU board runs a small self-test program from the ROM board. The
program tests certain functions of the CPU and ROM boards. If the tests are successful, the LED s
on the two boards are extinguished. If either board fails its test, the LED is left on, and the
appropriate error code is displayed.

The current limits of the outputs of the PSU board are then checked. If any are out of limits, the
board’s error code is displayed. This error doesn’t necessarily mean that the PSU board is faulty.
For example, a short on the system bus or one of the other cards could be drawing too much
current.

If the PSU board passes its checks, the CPU board takes away the reset to the other boards (which
leaves the LEDs lit).

The boards are tested in the order shown below:

- The DIF Board
- The MUX and AD sections of the Frontend Board
- The Telemetry Interface Board
- The OBMS Interface Board
- NIBP Interface Board
- SpO₂ Interface Board
- FSpO₂ Interface Board
- Any other interface board
- The DSPII Board
- LCD Board
- LED Board
- FE Board

If any board fails its test, its LED stays lit and the error code is displayed.

The CPU board boots a test program from the ROM board to the DSPII program RAM, and the
DSPII board runs it. The program tests the DSP-CPU 68000 and its associated components and writes the results to the DSP-CPU 68000 RAM. The CPU board reads the RAM to find out the exit status of the tests. If it fails the tests, the LED stays lit and the error code is displayed. If it passes the tests, the CPU board boots a start up program from the ROM board into the DSP-CPU 68000 program RAM. The program tests the DSP-CPU board. If it fails, the appropriate error code is displayed.

The signal processing software is stored as programs which perform discrete functions (for example, depth selection or auto-correlation). The DSP-CPU generates a list of programs it wants, and passes the name of the first program to the CPU board which transfers the program to the DSPII program RAM by DMA. The DSP-CPU 68000 transfers the program from its 68000 RAM to the program RAM of the appropriate signal processor. The DSP-CPU deletes the program name from the list when it receives the program. When the list is empty, the CPU board passes control to the DSP-CPU 68000 which starts normal processing.

The ARCHIMDES signal processors receive latched resets from the DSP-CPU 68000 to allow the system to start tidily.

When the system boots, the US processing software is loaded by default. If an ECG transducer is connected, the change in transducer is detected, and DECG software is booted from ROM to replace the US software.

Operational Checks

The following self tests are performed while the system is running.

The DSP-CPU checksums the signal processing software approximately every minute, and the CPU board checksums the ROM board at approximately the same interval. If the checks fail, the system is reset and rebooted.

An ASIC is fed patterns by the CPU board 68000 every 300 ms. If it doesn’t receive a pattern, it resets the system.
This section contains brief functional descriptions of some of the boards in the system. Most of the signal processing is digital and makes use of ASICs. As the boards contain mainly surface-mounted components and are not repairable, details of the hardware are not covered.

**PSU (M1350-66502)**

The Power Supply (PSU) board operates as a linear regulated power supply with rectifier, capacitor and regulator. It generates the following voltages:

- Regulated DC: ±12 V, +5 V and +24 V
- Unregulated DC: 28 to 35 V
- AC: 28 V
The regulated voltages have an electronic short circuit current limit.

The +24 V DC regulator works independently from the others. The internal +2.5 V reference voltage is generated from the +24 V, so if the 24 V section is inoperative, the rest of the power supply won’t work. The +12 V regulator also needs the regulated +5 V to work correctly.

The two resets (open collector outputs) are active low, when either the +5V is lower than +4.6 V or the +24 V is lower than +14.8 V. The CPU reads the PSU board ID and its four status bits. The status bits are:

- Line frequency clock to differentiate 50 and 60 Hz.
- +5 V over voltage protection bit (PSU error).
- +12 V current limit bit (overload of +12 V or PSU error).
- -12 V current limit bit (overload of -12 V or PSU error).

**Figure 9-3  CPU Board**

The Central Processor Unit (CPU) board is the heart of the system and, as master of the system bus, it controls most other boards. The 68000 microprocessor and associated support ICs provide system functions, interface control ICs support the Barcode Reader Interface and the bus control section controls the system bus. The card is directly connected to the ROM board, which contains all the system software.
The board includes the following sections:

- **Microprocessor section**
  - 68000 microprocessor.
  - CMOS RAM memory, partially backed by a battery to store short time device settings etc.
  - A non-volatile EEPROM memory for permanent device and user settings.
  - A real-time clock, battery-backed and power-fail protected. The processor has access to all clock registers.
  - The Watchdog ASIC monitors the operation of the microprocessor and restarts the system if it is not served at a constant rate.

- **Outside interface section**
  - The CPU M 1350-66513 interfaces barcode readers which use a RS232 connector.
  - A battery drawer which contains two batteries of type IEC LR1, size N.
  - Battery control and test circuit to provide battery voltage when the power line is switched off and to detect battery low condition.

- **Bus control section**
  - Address and data bus control chips.
  - Board select logic to access all system boards.
  - DMA circuits to allow DMA access via the system bus.
  - Interrupt logic to provide for local and system wide interrupts with different priority levels.
  - A crystal quartz oscillator and related circuitry provide several local and bus clock frequencies.
The Digital Signal Processor (DSPII) board contains the following main functional elements:

- 68000 CPU and RAM
- 2 signal processors and RAM
- DMA control logic and hardware
- Clock circuits

The 68000 CPU has overall control of system signal processing. It controls the on-board signal processors. The majority of the signal processing takes place in the ARCHIMEDES (proprietary Philips signal processors). Two ARCHIMEDES are used. One processes DECG1, MECG1, US1 and fetal movement detection. The second processes DECG2/MECG2 or US2 depending on the software loaded. Maternal SpO2, fetal SpO2 and NIPB measurements are all processed completely on their corresponding PC board.

The signal processing software is booted from the ROM board into the 68000 program RAM by DMA: the process is initiated by the CPU board. The DSP-CPU signal processor software is booted into its program RAM by the DSP-CPU 68000. Communication between the signal processor and the 68000 is by DMA, controlled by handshake flags, data exchange is via the data RAM by DMA. The DMA is controlled by on-board logic and hardware.

The clock circuit generates all clocks of the 40 Mhz backplane master clock.
Figure 9-5  ROM Board

The ROM board contains the sockets for four 1 M bit ROM pairs. The ROM board contains all the system software, except NIBP and SpO₂ software which is loaded into the corresponding boards.
The Digital Interface (DIF) board provides the interfaces to recorder, display, speaker, Frontend board and external service computer.

After system startup, the CPU starts the A/D control chip ADEMUX (a proprietary Philips IC), which divides the signal from the clock circuit and generates an interrupt every 2.5 ms.

The 68000 on the CPU board then programs the ADEMUX to select the analog channels for A/D conversion: the analog/digital conversion of up to eight channels is done by ADEMUX without further intervention by the CPU. A/D conversion is by successive approximation. After the next interrupt, the CPU reads the results stored in registers within ADEMUX. ADEMUX also receives values from the CPU for audio output.

The quiet bus is only enabled during CPU access to the Frontend board to minimize noise on the analog amplifiers on the Frontend.

Address and data bus drivers decrease the load on the system bus.

The recorder interface consists of:

- The parallel/serial converter for the thermal array data.
- A heating timer to control the heating pulse for the thermal array. The voltage from a thermistor on the thermal array is A/D converted and the CPU programs the heating timer with a value which compensates the ambient temperature.
- The recorder sensing hardware consists of two reflective light sensors, one detecting that the recorder is open, the other detecting the black marks on the paper and paper out.

The display interface uses the same parallel/serial converter as the recorder. The complete display is blanked frequently, for a longer or shorter period, depending on the signal from the light sensor on
the display board. The digital functions of this recorder serial interface (RSI) are integrated in the RESI ASIC.

An RS232 serial interface is provided for use during production and service. Connection is via a stereo phone on the front panel.

The board also contains test hardware which is not shown in the diagram.

The serial data communication to and from the LCD display is controlled by the DUPLO ASIC. This ASIC also controls the LCD contrast voltage and the LCD backlight voltage.
The Frontend board contains the analog circuitry for measuring all the possible fetal parameters of the monitor. It includes the control circuit interface to the DIF board (M1350-66515). The FOCUS ASIC on the board provides the US timing and window control, and controls the ECG.

Each type of transducer has a specific mode resistor which is recognized by the monitor when the transducer is connected to an input socket. In this way, different types of transducer can be used without having to recalibrate the system.

**ECG** The FOCUS IC divides the 4 MHz system clock to generate a 181 kHz clock. A power stage generates the power clock for the ECG transducers. The ECG signal modulates the supply current of the transducer. The modulated current is detected, amplified and bandpass filtered (1 - 250 Hz).

**US** The US transducer transmits 998.4 kHz ultrasound bursts which are generated by the FOCUS IC. The burst widths are controlled by software. The transmitter amplifier supplies 5 Vpp at the Cardio sockets. The repetition rate is 3.2 kHz.

The received 998 kHz signal is amplified by a high frequency amplifier with a gain of 120 and then split to provide a reference path a and a compare path b. The two demodulators a and b are independently controlled by software in their receive windows by the FOCUS IC. The demodulated LF signals are bandpass filtered (100 - 500 Hz) and amplified by a software controlled gain of 180 to 1860 in eight steps. The FM-P-LF path is independently demodulated, bandpass filtered and amplified by a factor of 18.
**TOCO** The pins of the TOCO/IUP socket are electrically isolated, connected by three transformers (excitation, sense and mode).

The excitation voltage is a 2.4 kHz square wave with an amplitude of 3.5 V$_{\text{RMS}}$. The frequency is generated in the control chip by dividing the 4 MHz system clock.

The sense input signal is amplified by 93.75 (40µV/V/mmHg) or 750 (5µV/V/mmHg), rectified with a synchronous detector and lowpass filtered with a cutoff frequency of 7.5 Hz.

All LF signals are multiplexed, sampled at either 1600 or 800 Hz, and A/D converted with 12-bit resolution.

The marker cable and the switch board are also connected to the Frontend board.
Maternal Pulse Oximetry (SpO₂) Board (M1350-66534)

Figure 9-8 Maternal SpO₂ Board

The maternal oxygen saturation (SpO₂) parameter is based on the principle of pulse oximetry, in which arterial blood flow through tissue is detected optically. An adaptor holds two LED's against one side of the patient's finger or ear. One LED emits red light, the other infra-red light. Against the other side the adaptor holds a photo diode. The device can register small changes in the conductivity of light in response to patient pulse. By isolating the pulsatile component of the signal, the maternal SpO₂ board eliminates the effects of absorption from tissue, bone and venous blood.

The more heavily blood is oxygenated, the brighter red it becomes. Hence an algorithm comparing the conductivity of red and infra-red light, thereby measuring the color of the blood, can also offer an indication of oxygen saturation.

The maternal SpO₂ board is divided into two distinct areas - floating and grounded. These are connected by two high voltage optocouplers for data transfer, together with the power transformer for power transfer.

**Floating Section**

The sampling of signals from the photo diode is in four discrete phases.

1. Dark Phase. Neither red nor infra-red LEDs are lit. Only ambient light is measured.
2. Red Phase. The red LED is lit, and the light conductivity measured.
3. Infra-Red Phase. The infra-red LED is lit, and conductivity measured.
4. Pleth Phase. Infra-red LED is lit and conductivity measured.
Consecutive frames composed of these four phases are repeated 375 times per second. Both the lighting of the LEDs and the sampling of the signal from the photo diode is sequenced by a time multiplexor governed by the microprocessor.

The function of the floating section of the board is twofold:

1. To enable accurate reading of light conductivity by removing noise and compensating for ambient light in the pulse train.
2. To drive the two LEDs.

The outstream from the photo diode is amplified by variable amplifier. This is software controlled and monitored by comparator, which checks for wave clipping. A series of switched low pass filters is used to separate the four phases within each frame of the pulse train and compensate for the effects of ambient light and for noise rejection.

**The Transducer**

As well as the connections to the transducer relating to the LEDs and photo diode, two more wires are used to check the transducer itself. These are connected to resistor R2 (within the transducer) and enable monitoring to show:

- That the transducer is properly connected.
- Transducer type.

**LEDs**

The LEDs are driven by controlled current source. Two demands must be met:

- LEDs must be lit in their correct sequence, to produce the four phases of the pulse frame.
- LEDs must be lit to an ideal intensity. This is dependent upon the light absorption at the transducer site.

The grounded section of the maternal SpO2 board is completely digital. It is essentially a dedicated microcomputer, and amongst other tasks, performs the following:

- Calculation of the maternal SpO2 saturation percentage.
- Control of the user-determined alarms.
- Control of the “NOP” alarms.

Input is via the optocoupler, shared with the floating section of the board.

The board has its own RAM as working area and its own EPROM holding the software.
External Blood Pressure (NIBP) Board (M1350-66535)

Figure 9-9  External Blood Pressure Board

The measurement of the blood pressure is based on the oscillometric method in which an inflated cuff around the patient’s limb partially occludes the artery. The pulsatile arterial flow causes oscillations superimposed on the cuff pressure, the amplitude of which can be analyzed to obtain the systolic and diastolic pressure values. The procedure is microprocessor controlled.

The board offers three methods of obtaining the external blood pressure measurement:

- **Manual:** This method takes one measurement of systolic and diastolic on each request.
- **Auto:** This method takes repeated blood pressure measurements of systolic and diastolic at specific user-selected time intervals.
- **Stat:** This method immediately takes repeated blood pressure measurements of systolic and diastolic over a period of five minutes. This method uses a faster measurement procedure than the other two.

The cuff around the patient’s limb is connected to the board via a single tube. The cuff is inflated by the pressure pump once or repeatedly (depending on the measurement method used) to a cuff pressure above the patient’s systolic pressure.

For the first measurement, the cuff inflates to approximately 165 mmHg. For further measurements the cuff inflates to approximately 20 mmHg above the previously measured systolic pressure. The pressure transducer detects both the cuff baseline pressure and pressure oscillation. These signals are amplified and filtered to separate the cuff baseline pressure and the pressure oscillations. The microprocessor compares successive pressure oscillation magnitudes until it detects two oscillations of similar amplitude. By checking two subsequent oscillations it is possible to reject artifacts due to patient movement. The baseline cuff pressure and oscillation magnitudes
are stored in the memory and the cuff pressure is further decremented. Subsequent oscillation magnitudes will show decreases until no significant oscillations are seen.

The microprocessor displays the arterial mean pressure together with the systolic and diastolic pressures. The pressure in the cuff is automatically released by the deflation system on the board. The cuff is completely deflated and, depending on the selected cycle time, is inflated when the next measurement is to be made.

The board has the following maximum limits which ensure the safety of the patient:
1. A maximum measurement time of 120 seconds.
2. A maximum time of 120 seconds for a cuff pressure greater than 15 mmHg.
3. An overpressure system with a limit of 330 mmHg maximum, or 300 mmHg for 2 seconds.

The NIBP board contains its own RAM as working area and ROM containing the software and a microprocessor supervised additionally by a watchdog timer.
An Intel 80C186 CPU in the PLCC 68 package performs the fetal SpO₂ processing. It runs with a 20 MHz clock. Beside the ROM and normal RAM, there is a 1 kByte Dual Port RAM for the communication with the M1350C main processor (a Motorola 68HC000).

The communication time frame is 17.5 msec, a multiple of 2.5 msec (the main tick of the M1350C operating system).

The following diagram shows the functional blocks of the fetal SpO₂ processing board:

---

**Figure 9-10 Fetal SpO₂ Board**
The Telemetry Interface board processes analog input signals from Philips telemetry systems, for example, the M1310A. Alternatively, an external analog parameter can be input to be recorded by the fetal/maternal monitor. The board contains an analog signal filter section, an analog to digital conversion section, digital clock and control circuits and a section for calibration and self-test.

The features of the Telemetry Interface board are:

- **Analog Signal Filter Section**
  - An analog input for FHR, US LF or DECG, with low pass filter and variable gain amplifier.
  - An analog input for maternal heart rate, MECG, with low pass filter and variable gain amplifier.
  - An analog input for TOCO/IUP with low pass filter.
  - An analog input for an external parameter with low pass filter and variable gain amplifier.

- **Analog to Digital Conversion Section**
  - A 12-bit digital to analog converter with built-in voltage reference.
  - An ADMUX conversion controller chip.
  - An analog four-channel input multiplexer.
  - A sample and hold circuit.
  - A precision comparator.

- **Digital Clock and Control Sections**
  - Board ID latch.
  - Status input lines.
  - Control latch.
  - Bus control and clock circuits.
- **Calibration and Self Test Section**
  - Calibration and reference circuits.
  - System controlled test signal generation.
  - Analog switches to apply reference voltages and test signals to the telemetry inputs.
- **RS232 Socket**

---

**Note**
If an OBM S board (M 1350-66532) is connected at the same time as the M 1350-66536, the RS232 facility is switched off as default. You can overwrite this setting. See Chapter 5.
OBMS Interface Board (M1350-66532)

Figure 9-12 OBMS Interface Board

The OBMS Interface board sends heart rate, TOCO, mode and status information to systems such as M1370A, 80225A, 80235A and M1340A (FTTS).

The status bit is set if an external test from an OBMS is requested. The clock circuit divides the system clock.

The Board Control section interfaces the fast processor bus with the local board bus. An LED is set if a hardware error is detected.

The analog voltages heart rate 1, heart rate 2 and TOCO are generated by a DAC which feeds three sample and hold buffers via a multiplexer.

The latch stores mode and status information. Status information is passed to the output as a logic signal. Mode information is a sum of logic signals and appears as an analog voltage at the output.

The UART and RS422 receiver/transmitter form a unidirectional RS422 interface for system notes.

Note

If a Telemetry/System board (M1350-66536) is connected at the same time, either the RS422 on the M1350-66532 or the RS232 on the M1350-66536 is active. See Chapter 4 for information about setting configuration options.
The RS232/RS422 dual serial interface board uses both RS232 and RS422 standard voltage levels to interface between the monitor and external devices. Currently, the monitor supports communication with the following external devices:

- Philips M 1165A/1166A/1175A/1176A CMS with appropriate options (abbreviated to Philips CMS).
- Philips 78352C and Philips 78354C Compact Configurable monitors with appropriate options.
- Philips 26/24 monitors.
- Dinamap 1846 and 8100 NIBP monitors.
- Datasep Accutorr 3 and Accutorr 4 NIBP monitors.
- Datasep Accutorr 3SAT, 4SAT NIBP and SpO₂ monitors.
- Press-Mate Listmini Model BP-8800 (abbreviated to BP-8800).
- Nellcor OxiFirst™ Oxygen Saturation monitor (N-200).
- Nellcor OxiFirst™ Fetal Oxygen Saturation monitor (N-400).
The interface board has two independent ports - one 9-pin connector and one 25-pin connector. The 9-pin port can be used for RS232 data transmission and the 25-pin port for both RS232 and RS422 data transmission. The RS232 standard is suitable for distances up to 15m (50 feet) and the RS422 standard for up to 300 m (1000 feet).

The RS232/RS422 interface board consists of the following major components:

- 80C51 Microcontroller (U1)
- ASIC Chip (U2):
  - Multiplexer
  - DMA Controller
  - Signal Input/Output (SIO)
- 32KB SRAM (U3)
- Comparator (U4)
- Switchblock (SW1)

The available baud rates are:

<table>
<thead>
<tr>
<th>Port</th>
<th>Baud Rate</th>
<th>Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-pin</td>
<td>9600 Baud (Philips CMS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9600 Baud (Philips 7835xC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>600 Baud (Dinamap 1846/8100)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9600 Baud (Accutorr)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4800 Baud (BP-8800)</td>
<td></td>
</tr>
<tr>
<td>25-pin</td>
<td>2400 Baud (Nellcor N-200, N-400)</td>
<td></td>
</tr>
</tbody>
</table>
Introduction

This chapter contains maintenance and safety information for the Series 50 XM/XMO monitors and accessories.

All checks that require the instrument to be opened must be made by qualified service personnel. Contact your local Philips representative if you wish safety and maintenance checks to be carried out by Philips personnel.

To ensure proper functioning of your monitor you must adhere to the standards described in this Guide for:

- Cleaning
- Performance assurance checks (self test, parameter test, quick test)
- Safety tests (safety test blocks, instrument safety test, system test)
- Service tests (cyclic test, permanent test)
- Accessory testing (transducer checks, patient module checks)

Caution

Failure on the part of the responsible individual hospital or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.

Cleaning the Monitor

Keep the outside surfaces of the monitor clean and free of dust and dirt. Use soap and water or Ethanol 70%. Do not pour liquid on the monitor or allow any to enter the monitor case.

Although the monitor is chemically-resistant to most common hospital cleaners and non-caustic detergents, alternative cleaners are not recommended and may stain the monitor. Take extra care when cleaning the display surfaces; these are more sensitive to rough handling, scratches and breakage than the other external surfaces of the monitor. Many cleaning agents must be diluted before use. Follow the manufacturer’s directions carefully to avoid damaging the instrument.

Never use an abrasive material such as steel wool or metal polish.
Wipe around the NIBP connector socket, not over it, to ensure that no water or cleaning solution enters the NBP input connector.

The Instructions for Use for this monitor contains more details about how to care for the monitor and the accessories.

---

**Performance Assurance Tests**

**Self Test**

The monitor automatically performs a basic-level self test when you switch it on. There are two possible types of error that you might see. A fatal error prevents the monitor from functioning. A non-fatal error allows you to continue to work but warns you of a problem that must be resolved swiftly.

- If a non-fatal error occurs (for example, if the batteries are low):
  - An error message is displayed for ten seconds.
  - \( \text{Err xxx} \) \( \Delta \), time and date are printed on the paper after ten seconds, and then every ten minutes.
  - (“xxx” is the number of the error message.)
  - Switch the monitor off and then on. If the error occurs again, try to solve the problem or, if you cannot, contact your Philips Service Engineer or Response Center.

  (If the recorder is not on when the monitor is switched on, Err xxx \( \Delta \) time and date are printed when it is switched on subsequently.)

- If a fatal error occurs (for example, if a board is defective):
  - An error message is displayed for ten seconds
  - After ten seconds, the monitor tries to restart.
  - If the error occurs again contact your Philips Service Engineer or Response Center.

**Parameter Test**

The parameter test tests the processing of the signal to and from the transducer, but not the transducers themselves. To perform the parameter test:

- Switch on the monitor and the recorder
- Connect the transducers for the channels to be tested to the correct sockets.
- Press Test.

The monitor produces an artificial signal for each transducer connected and the signals are processed. You will see that the test signal is displayed and the mode symbols light. You will also hear a sound specific for the type of transducer connected.

The following table shows the values recorded when the different transducers are correctly connected. Ensure that the recorder is switched on. If an error occurs, it is displayed for ten seconds and then Err \( \Delta \) is printed by the recorder together with the time/date annotation. After this time, Err \( \Delta \) is printed every ten minutes together with the time/date annotation.
Quick Test

The quick test takes approximately 15 seconds and tests the basic electronics of the monitor display, recorder and hardware. To carry out the test:

1. Remove any monitoring equipment plugged into the input sockets. Switch off or disconnect the telemetry receiver and any external devices connected to the monitor.
2. Switch on the monitor.
3. Press and release the test key. Check that:
   - all parts of the LED display windows light, followed by all the mode symbols. The upper and lower parts of the display flash alternately for about 10 seconds.
   - The left half and the right sides of the LCD display flash light and dark alternately.

<table>
<thead>
<tr>
<th>Signal</th>
<th>Monitor Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>US (Cardio 1/Combi) using M1356A:</td>
<td>190 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>US (Cardio 2) using M1356A:</td>
<td>170 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>TO CO using M1355A:</td>
<td>A signal alternating between 10 and 60 (for periods of 2 secs) for as long as the key is pressed is displayed and printed.</td>
</tr>
<tr>
<td>D ECG using M1357A; using M1365A, M1364A (DECG cable M1362A must be connected):</td>
<td>200 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>M ECG using M1359A; using M1365A or M1364A (MECG cable M1363A must be connected):</td>
<td>120 is printed. MECG indicator is on. 120 ( \equiv ) is displayed on the LCD screen.</td>
</tr>
<tr>
<td>US/M ECG (Cardio 1/Combi) using M1358A:</td>
<td>190 is displayed. 190 and 120 are printed. Signal quality indicator is green. MECG is on. Fetal and maternal heartbeats are heard form the loudspeaker.</td>
</tr>
<tr>
<td>M aternal SpO2 using M1940A:</td>
<td>99% is displayed on LCD and printed. Pulse 120 ( \equiv ) displayed on LCD screen.</td>
</tr>
<tr>
<td>Fetal SpO2 using M1365A:</td>
<td>88% is displayed.</td>
</tr>
</tbody>
</table>

**Table 10-1 Parameter Test**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Monitor Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>US (Cardio 1/Combi) using M1356A:</td>
<td>190 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>US (Cardio 2) using M1356A:</td>
<td>170 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>TO CO using M1355A:</td>
<td>A signal alternating between 10 and 60 (for periods of 2 secs) for as long as the key is pressed is displayed and printed.</td>
</tr>
<tr>
<td>D ECG using M1357A; using M1365A, M1364A (DECG cable M1362A must be connected):</td>
<td>200 is displayed and printed. Signal quality indicator is green. Fetal heartbeat is heard from loudspeaker.</td>
</tr>
<tr>
<td>M ECG using M1359A; using M1365A or M1364A (MECG cable M1363A must be connected):</td>
<td>120 is printed. MECG indicator is on. 120 ( \equiv ) is displayed on the LCD screen.</td>
</tr>
<tr>
<td>US/M ECG (Cardio 1/Combi) using M1358A:</td>
<td>190 is displayed. 190 and 120 are printed. Signal quality indicator is green. MECG is on. Fetal and maternal heartbeats are heard form the loudspeaker.</td>
</tr>
<tr>
<td>M aternal SpO2 using M1940A:</td>
<td>99% is displayed on LCD and printed. Pulse 120 ( \equiv ) displayed on LCD screen.</td>
</tr>
<tr>
<td>Fetal SpO2 using M1365A:</td>
<td>88% is displayed.</td>
</tr>
</tbody>
</table>
A test pattern is printed on the paper. During the test the recorder paper speed is automatically set to 3cm/min and a test pattern is printed onto the recorder paper.

![Figure 10-1 Recorder Test Pattern](image)

Figure 10-1 Recorder Test Pattern

The recorder ON/OFF light blinks in time with the display. Check the test pattern to ensure all the heating elements on the printer head are operational. Ensure that:

- No more than 20 dots are missing over the entire printhead.
- No more than 2 adjacent dots are inoperative.
- No dots in the mode annotation (for example, US1) are inoperative.

If any of these conditions occur, replace the printhead.

If you don't release Test at the end of the test, the monitor repeats the pattern. Dots printed on the colored grid lines might appear light. This is not a fault. After the test the recorder paper speed is automatically reset to the pre-test value.

If an error occurs it is displayed for 10 seconds. (See Chapter 11, “Troubleshooting” for a table of error messages and possible solutions.) After this time Err is printed on the recorder together with the time/date annotation.
Performance Assurance: NIBP

When to perform:
1. Regularly once a year.
2. After any repair related to the NIBP module (this includes NIBP software updates).

Accuracy Test
1. Enter the calibration mode (see page 133).
2. Pressurize the gauge to 220 mmHg.
3. Wait ten seconds for the measurement to stabilize.
4. Compare the manometer’s value with the displayed value.
5. Document the value displayed by the monitor. If the difference is greater than ±3 mmHg, calibrate the module.

Leakage Test
1. Enter the calibration mode (see page 133).
2. Pressurize the gauge to 280 mmHg.
3. Watch the pressure value for 60 seconds. After 60 seconds, the value should have decreased by less than 6 mmHg.
4. Calculate and document: Leakage test = reference value 280 mmHg - displayed value.

Linearity Test
1. Enter the calibration mode (see page 133).
2. Pressurize the gauge to 150 mmHg.
3. Wait ten seconds for the measurement to stabilize.
4. Compare the manometer’s value with the displayed value.
5. Document the value displayed by the monitor. If the difference is greater than ±3 mmHg, calibrate the module.

Service Tests

Cyclic Test
The cyclic test is a permanent self test: see “Running the Cyclic Test” on page 39 for instructions on how to perform it. Any errors located are written to the error log and can be read using Read Error log (see “Reading the Error Log” on page 40).

Permanent Test
You can configure the monitor to perform a permanent/continuous test. This is similar to the cyclic test, which can be performed with the PC-based service software.

To start the permanent test:
1. Disconnect all transducers from the monitor and disconnect, or switch off, Telemetry.
2. Make sure the recorder is on.
3. While pressing F.A. press Test:
• C01 is shown in the US1/US display.
• 0 or 1 is shown in the Toco display.

4. Press \[ F. \] again to select the Function Menu:
   • A01 (Print the Error Log) is shown in the US1/US display.

5. Press \[ + \] repeatedly to select A03.

6. Connect one or more transducers (the test performed depends on the transducers connected).

7. Plug in the marker and hold its button down with tape. You can also use a shorted phone-jack to simulate the action of the marker.

8. Press \[ \] to start the permanent test.
   The permanent test runs until you release the marker button.

---

**Caution**

DO NOT perform this test while a patient is being monitored.

---

### Safety Tests

This section defines the test and inspection procedures applicable to the Series 50 XM and XMO. Use the tables in the following section to determine what test and inspection results must be reported after an installation, upgrade, or repair has been carried out.

- Test Blocks in Table Table 10-2 tells you when to carry out the safety tests
- Test and Inspection Matrix in Table Table 10-3 tells you how to carry out the safety tests.

---

**Warning**

Apply the safety test limits set by the local standards and statutes applicable to the country of installation, such as IEC 60601-1, UL2601-1, CAN/CSA-C22.2 No. 601.1-M90. The safety tests defined in this chapter are derived from local and international standards but may not be equivalent. They are NOT a substitute for local safety testing.

---

**Caution**

Successful completion of the patient safety tests does not ensure the correct and accurate functioning of the equipment.

---

### Safety Test Procedures

The test procedures outlined in this section are to be used only for verifying the safe installation or service of the product. “Safety checks at installation refer to safety aspects directly related to the installation and setup activities and not to intrinsic safety features that have already been checked.
When performing safety tests, you must use a standard safety tester. You can use testers complying with IEC 601-1 internationally. You may also use testers complying with any local standards and statutes applicable to the country of the installation. For safety test procedures see the operation instructions of the safety tester used.

If using the Metron safety tester use your local regulations to perform the test, for example

- in Europe: IEC 60601-1/IEC 60601-1-1
- in the US: UL 2601-1

The Metron Report should print results as detailed in this chapter, along with other data.
**Note**
For information and ordering guides for Metron products contact:
Metron AS, Travbaneveien 1, N-7044 Trondheim, Norway
Tel (+47) 73 82 85 00; Fax (+47) 73 91 70 09;
E-mail: sales@metron.no/support@metron.no
www: http://www.metron-biomed.com

---

**When to Perform Safety Tests**

This table tells you when to perform specific safety tests. See page 125ff. for test details.

**Table 10-2 M1350A/B/C: When to perform safety test blocks**

<table>
<thead>
<tr>
<th>Service Event</th>
<th>Test Block(s) Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation</td>
<td>The product is customer installed. For installation instructions refer to the Installation and Service Guide for your monitor. Perform visual, power on and performance test blocks (see Table 10-3).</td>
</tr>
<tr>
<td>Preventive Maintenance</td>
<td>Preventive maintenance is the responsibility of the customer. For preventive maintenance see page 128. Perform visual test block (see Table 10-3).</td>
</tr>
</tbody>
</table>
| Repair                            | This Installation and Service Guide contains repair instructions for the XM and XMO monitors. Perform visual, power on and performance test blocks (see Table 10-3), and   
                                       • when power supply is replaced perform S-Safety test block,  
                                       • when Frontend-Board is replaced perform Safety (3) test block.  
                                       • **M1350B and M1350C only:** when frontend board is replaced perform S3(T) test block  
                                       when Mat.Sp02-bd. or cable is replaced perform S3(S) safety tests. |
| Upgrade                           | For upgrade information refer to Chapter 8, "Upgrades." Perform visual, power on, performance and safety test blocks (see Table 10-3).                   |
| All other service events          | Perform visual, power on and performance test blocks (see Table 10-3).                                                                                  |
How to Carry Out the Safety Tests

Key to Table Table 10-3: P = Pass, F = Fail, X = test result value to be recorded.

Table 10-3 M1350A/B/C: Test and Inspection Matrix

<table>
<thead>
<tr>
<th>Test Block</th>
<th>Test or “Inspection” to be Performed</th>
<th>Expected Test Results</th>
<th>What to Record on Service Record (Philips Personnel only)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Visual</strong></td>
<td>Inspect the unit, transducers and cables for any damage. Are they free of damage?</td>
<td>If Yes, Visual test is passed.</td>
<td>V:P or V:F</td>
</tr>
<tr>
<td><strong>Power On</strong></td>
<td>Power on the unit. Does the self-test complete successfully?</td>
<td>If Yes, Power On test is passed.</td>
<td>PO:P or PO:F</td>
</tr>
<tr>
<td><strong>Performance</strong></td>
<td>Perform the quick test and parameter test as described on page 119 and page 118 respectively.</td>
<td>If Yes, Performance Test is passed.</td>
<td>P:P or P:F</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Perform Safety Test 2: Protective Earth.</td>
<td>With mains cable: Maximum impedance = X1 (&lt;= 200 mOhms)</td>
<td>S:P/X1 or S:F/X1</td>
</tr>
<tr>
<td></td>
<td>Perform Safety Test 4: Enclosure Leakage Current - Normal Condition.</td>
<td>With mains cable: Maximum leakage current = X2 (&lt;= 100µA)</td>
<td>S:P/X2 or S:F/X2</td>
</tr>
<tr>
<td></td>
<td>Perform Safety Test 6: Enclosure Leakage Current - Single Fault Current Open Earth.</td>
<td>With mains cable: Maximum leakage current = X4 (&lt;= 500µA)</td>
<td>S:P/X4 or S:F/X4</td>
</tr>
<tr>
<td><strong>Safety 3</strong></td>
<td>Safety Test 3: Patient Leakage Current - Single Fault Current Mains on Applied Part.</td>
<td>With mains cable: Maximum Leakage current = X (&lt;=50µA @ 250V or &lt;= 20µA @ 120V)</td>
<td>S3(T):P/X or S3(T):F/X</td>
</tr>
<tr>
<td>(M 1350B and M 1350C only)</td>
<td>ONLY TOCO-input tested: Metron Testconn. (order #19528) or equivalent required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ONLY maternal SpO₂ input tested: Metron Testconn. (Metron order # 19524 and Philips Adapter M 1940A) or equivalent required.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Instrument Safety Test** You must perform the instrument safety test every time you exchange, repair, upgrade or in any other way work on the front end board, the power supply, the power inlet or the maternal SpO₂ board and cable. If you intend to connect the monitor to an OB monitoring system such as Philips OB TraceVue, you must perform the instrument safety test with the monitor as a standalone unit, before reconnecting it to the system.

The instrument safety test is made up of four separate tests (see page 127):

- Protective Earth Test
- Enclosure Leakage Current - Normal Condition
- Enclosure Leakage Current - Single Fault Condition
- Patient Leakage Current - Single Fault Condition

**System Test** Whenever you connect a monitor to an obstetrical system such as Philips OB TraceVue you must perform the System Test. The System Test consists of the Enclosure Leakage Current tests (normal and single fault condition) as described on page 127. You must run this test when connecting either a new or repaired monitor.
S(2): Protective Earth Test

Test to perform:
The protective earth test measures impedance of Protective Earth (PE) terminal to all exposed metal parts of Instrument under Test (IUT), which are connected to the Protective Earth (PE) for safety reasons. Normally it includes the wiring in the mains cable (max. 200 mOhm).
A test current of 25 Amps is applied for 5 to 10 seconds. It is recommended to flex the main cable during the test to identify potential bad contact or damage to the earth wire.
Safety test according to IEC 60601-1 (Clause 18).
Report the highest value.

S(3): Patient Leakage Current Test - AC

Test to perform:
The patient leakage current test measures patient leakage current from the applied part to the earth caused by external main voltage on the applied part. Each polarity combination possible must be tested. This test is applicable for ECG and SpO2.
Safety Test according IEC 60601-1 (Clause 19.4h).
Report the highest value.

S(4): Enclosure Leakage Current Test - Normal Condition (NC)

Test to perform:
The enclosure leakage current: normal condition is applicable to Class 1 and 2 equipment, type B, BF, and CF Applied Parts. The test measures leakage current of exposed metal parts of the Instrument Under Test; it tests normal and reversed polarity.
For Type BF and CF Applied Parts the test measures AP/GND.
Safety Test according to IEC 60601-1 (Clause 19.4g).
Report the highest value.

S(5): Enclosure Leakage Current Test - Single Fault Condition (SFC) Open Supply

Test to perform:
The enclosure leakage current: single fault condition open supply is applicable to Class 1 and 2 equipment, type B, BF, and CF Applied Parts. The test measures leakage current of exposed metal parts of Instrument Under Test with one supply lead interrupted; it tests normal and reversed polarity.
For type BF and CF Applied Parts measures AP/GND.
Safety Test according to IEC 60601-1 (Clause 19.4g).
Report the highest value.

S(6): Enclosure Leakage Current Test - Single Fault Condition Open Earth (Ground)

Test to perform:
The enclosure leakage current: single fault condition open earth (ground) is applicable to Class 1 equipment, type B, BF and CF Applied Parts. The test measures leakage current of exposed metal parts of Instrument Under Test with Protective Earth open-circuit; it tests normal and reversed polarity.
For type BF and CF Applied Parts the test measures AP/GND.
Safety Test according to IEC 60601-1 (Clause 19.4g).
Report the highest value.

Abbreviations
AP: Applied Parts
GND: Ground
IUT: Instrument Under Test
PE: Protective Earth
Regular Maintenance

The care and cleaning requirements that apply to the monitor and the monitoring accessories are described in the Manual Name. This section details the periodic maintenance recommended for the monitor and accessories.

Mechanical Inspection

Inspect all exposed screws for tightness. Check all printed circuit boards are firmly seated in their connectors. All rear panel connections must be tight. Check the condition of all external cables, especially for splits or cracks and signs of twisting. If serious damage is evident, the cable should be replaced immediately.

Recorder Maintenance

The recorder platen, thermal print head and paper sensing mechanism must be cleaned at least once per year, or when needed (when traces become faint).

Clean the assemblies as follows:
- Clean the recorder platen with a lint-free cloth using a soap/water solution.
- Wipe the thermal array using a cotton swab moistened with 70% Isopropyl alcohol based solution.
- Check the paper sensing mechanism is dust free.
- Batteries: Replace the batteries with two alkaline 1.5 Volt size N batteries (recommended type: MN9100). For instructions refer to “Batteries” on page 175.

Ultrasound Transducer

Use of ultrasound gel that is not approved by Philips may reduce signal quality and may damage the transducer. This type of damage is not covered by warranty.

Visual Check

Ensure there are no cracks in the transducer dome, that the cable is not cracked or broken, and that there are no cracks on the connector plug.

Electrical Check

1. Connect the transducer to either the Cardio 1/Combi or Cardio 2 socket. (Both the connector and socket are red, and keyed so that they mate in only one position.)

   Ensure that:
   - The signal quality indicator is red
   - The FHR numerical display is blank
   - When the recorder is switched on, the date, time, mode and paper speed are printed on the recorder trace.

2. Turn the loudspeaker volume up to an audible level.

3. The ultrasound transducer contains seven piezoelectric crystals. Basic functioning of each can be verified by holding a flat bottomed pencil or similar above each crystal and moving it up and down as shown.
Figure 10-2  Testing an Ultrasound Transducer using a Pen

A sound should be heard for each crystal tested. The pen should be held 2 to 3 cm from the transducer surface when the test is carried out.

Figure 10-3  Position of Crystals in an Ultrasound Transducer

4. A sound should also be heard when the transducer is moved back and forth over a solid surface, or the hand as shown below.

Figure 10-4  Checking an Ultrasound Transducer
If the tests are not as outlined above, repeat the tests with another transducer. If this does not solve the problem, refer to Chapter 11, “Troubleshooting.”

The transducers are sealed and are NOT repairable, but the connectors can be exchanged.

**TOCO Transducer**

**Visual Check**  Ensure that the transducer housing is sound, that the cable is not cracked or broken, and that there are no cracks on the connector plug.

**Electrical Check**  1. Connect the Toco transducer to the Toco socket. (Both the connector and socket are brown, and keyed so that they mate in only one position.)

   Ensure that:

   • the Toco display shows 20.
   • when the recorder is switched on, the date, time, mode and paper speed are printed on the recorder trace.

2. Press the transducer button firmly and look for a deflection on the display and recorder. The external Toco display maximum is 100 units.

3. Lay the transducer face up on a flat surface for a few seconds.

4. Press the Toco Baseline Key to re-adjust the Toco display to 20.

5. Turn the transducer over so that the button is face down on the flat surface. Hold the cable at a point 25 cm from the transducer and ensure that the transducer touches the flat surface only with the button and that the transducer is parallel to the flat surface.

   The Toco display should read between 40 to 50 units.

If the test results are not as outlined above, repeat the test with another transducer. If this does not solve the problem, refer to Chapter 11, “Troubleshooting.”

The transducers are sealed and are NOT repairable, but the connectors can be exchanged.

The external Toco recorder display can be between 0 and 127 units. If the test fails, repeat using another transducer. If it still fails, refer to Chapter 11, “Troubleshooting.” After the test, you must zero the system by pressing the Toco Baseline Key.
**IUP Transducer**

**Visual Check**  Ensure there are no cracks in the transducer or its accessories, that the cable is not cracked or broken, and there are no cracks on the connector plug.

**Electrical Check**  1. Connect the transducer to the Toco socket.  
   Ensure that:
   - the display shows 0.  
   - when the recorder is switched on, the date, time, mode and paper speed are printed on the recorder trace.

2. Choose one of the tests below, according to which IUP transducer you are testing:
   - If your IUP transducer has a “zero” button built into the adapter cable itself, press this to intentionally short circuit the cable. The monitor display should read +/- 3mmHg while you press the button. This indicates that the monitor and leads are working properly.
   - If your IUP transducer has no “zero” button, press and hold . Ensure that the display and recorder trace alternate between 10 and 60 units (for periods of 2 seconds) for as long as the key is pressed. The IUP display is limited to +127 / -99. Gently apply pressure to the transducer diaphragm by pressing the syringe plunger, and look for an increase on the display and recorder.

If the test results are not as outlined above, try another transducer. If this does not solve the problem, refer to Chapter 11, “Troubleshooting.”

**Maternal SpO2 Transducer**

**Visual Check**  Ensure there are no cracks in the transducer and that the cable is not cracked or broken, and there are no cracks on the connector plug.

**Electrical Check**  1. Connect the transducer to the maternal SpO2 socket.  
   Ensure that:
   - the LEDs in the transducer head are lit  
   - the LCD display shows ? for pulse and ?% for saturation and \( \text{no pulse} \).  
   - when the recorder is switched on, the date, time, mode and paper speed are printed on the recorder trace.

2. Press and hold the Test key for a short while. Ensure that the display and recorder trace show maternal SpO2 value of 99% and maternal heart rate of 120 bpm.

3. To check out the transducer perform a self measurement using your own finger.

If the test results are not as outlined above, try another transducer. If this does not solve the problem, refer to Chapter 11, “Troubleshooting” for details about how to check the SpO2 board and cable.
Patient Modules (M1365A and M1364A)

**Visual Check** Ensure there are no cracks in the patient module and that the cable is not cracked or broken, and there are no cracks on the connector plug.

**Electrical Check** Connect the patient module to the Cardio 1/Combi socket.

**FSpO₂ channel:**
1. Ensure that the FSpO₂ display shows ![FSpO₂ display](image).
2. Connect the FSpO₂ sensor. Check that the red LEDs on the sensor are working and that the monitor FSpO₂ display shows ![FSpO₂ sensor](image).

**ECG channel:**
1. Ensure that the Cardio 1/Combi channel display shows **NOP** without adapter cable M1362A or M1363A.¹
2. Connect the MECG adapter cable M1363A (alternatively, if no maternal parameters are installed on the monitor, you can use the DECG adapter cable M1362A instead).
3. Make a short between the two wire contacts (you can use a wire or bent paperclip). **NOP** should disappear.

---

¹ M1364A: in the presence of strong electrical fields (50-60Hz), **NOP** may disappear even without additional cabling.
NIBP Calibration

Philips recommends that you calibrate the NIBP module at least once every year, or whenever the validity of the readings is in doubt.

Use a calibrated pressure gauge kit to calibrate the NIBP module. If you use a mercury manometer you must connect an expansion container, volume 250ml ±10% to the pressure circuit to simulate the cuff air volume (connecting material can be ordered under part number 78354-67001). A mercury manometer is not as accurate as the recommended pressure gauge and if the manometer tolerance is >1 mmHg calibration cannot be done within Philips specifications.

To enter NIBP calibration mode

1. Disconnect all transducers from the monitor and disconnect, or switch off, Telemetry. Make sure the recorder is on.

2. While pressing F, press Test:
   - C01 is shown in the US1/US display.
   - 0 or 1 is shown in the Toco display.

3. Press [F] again to select the Function Menu:
   - A01 (Print the Error Log) is shown in the US1/US display.

4. Press + repeatedly to select service setting A04.

To calibrate NIBP

This test mode does not use the monitor's internal pump.

Figure 10-5 Connecting the Pressure Gauge

1. Connect a pressure gauge (0-320 mmHg) to the parameter input socket of the monitor via the cuff tubing.

2. Press Yes to switch the monitor into calibration mode. This allows you to apply pressure through the NIBP connector and view the current measurement.

3. Apply an exact pressure of 220 mmHg. Wait ten seconds for the measurement to stabilize.
4. Press **Store Cal**.

Both the old and the new calibration values are shown in the display. Then the monitor reboots and releases the pressure automatically.

If the NIBP calibration fails (**FAILED !** is shown in the display), repeat the calibration, ensuring that you apply an exact and stable pressure of 220 mmHg. If it fails repeatedly, you must exchange the NIBP module.

---

**NIBP Overpressure Test**

You can test the proper functioning of the NIBP overpressure safety mechanism as follows:

1. Manually pump up a blood pressure cuff and connect it to the NIBP input socket using the cuff tubing.
2. Exercise pressure on the cuff. The ventilation valves should release pressure in the cuff immediately.

The valves operate mechanically and should function whether the monitor is switched on or off. They do not function when the monitor is in calibration mode or in NIBP measurement mode. The NIBP acoustic alarm in contrast functions only when the monitor is switched on. As the actual overpressure safety mechanism consists of the ventilation valves, it is not necessary to test the NIBP alarm function. See "Maternal External Blood Pressure" on page 242 for details of the maternal NIBP alarm limits.
Introduction

The foundation for troubleshooting is the interpretation of error messages written on the display and in the system's error log, which you can print. For details of how to do this, and of how to clear the contents of the error log, see “Printing and Clearing the Error Log” on page 30.

If no error message occurs you may need to look at the troubleshooting flowchart for the system in 11-1. This directs you towards the problem in a schematic approach.

Also explained are the procedures to be followed when the Parameter Test and Quick Test are not as described in Chapter 10, “Safety, Maintenance, and Calibration” on page 117.

Figure 11-1 Troubleshooting Flowchart for the System
When troubleshooting some of the error messages, you will have to check LEDs that are situated on the boards. The following two diagrams show the locations of the LEDs.

**Figure 11-2  LEDs in the Rear Panel**

**Figure 11-3  LEDs on the DIF and Frontend Boards**
## Operator Error Messages

<table>
<thead>
<tr>
<th>Error</th>
<th>LED Display</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err 1</td>
<td>Cardio 1</td>
<td>Wrong transducer in Cardio 1/Combi socket.</td>
<td>Connect correct transducer.</td>
</tr>
<tr>
<td>Err 1</td>
<td>Cardio 2</td>
<td>Wrong transducer in Cardio 2 socket.</td>
<td>Connect correct transducer.</td>
</tr>
<tr>
<td>Err 2</td>
<td>Toco</td>
<td>Wrong transducer in Toco socket.</td>
<td>Connect correct transducer.</td>
</tr>
<tr>
<td>Err 4</td>
<td>Cardio 2</td>
<td>US/M ECG Combi transducer not allowed in this socket.</td>
<td>Only 1 x M ECG and 1 x DECG are permitted in combination. Remove transducer.</td>
</tr>
<tr>
<td>Err 6</td>
<td>Cardio 1</td>
<td>Wrong pairing of US/M ECG Combi transducer, M ECG transducer and DECG transducer.</td>
<td>Remove one of the transducers.</td>
</tr>
<tr>
<td></td>
<td>Cardio 2</td>
<td>M 1365A combined patient module being used to measure FSpO₂ and M ECG.</td>
<td>Measure FSpO₂ and DECG.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M 1364A combined patient module being used to measure DECG.</td>
<td>Measure M ECG.</td>
</tr>
<tr>
<td>Err 8</td>
<td>Cardio 1</td>
<td>Dual Ultrasound Twins option is not fitted.</td>
<td>Remove one of the transducers.</td>
</tr>
<tr>
<td></td>
<td>Cardio 2</td>
<td>Invalid telemetry mode.</td>
<td>Check the cable from the telemetry receiver and if, necessary, replace it.</td>
</tr>
<tr>
<td>Err 14</td>
<td>Cardio 2</td>
<td>2 FHR transducers are being used with single FHR option (Invalid “Ext. parameter” status on Tele IF).</td>
<td>Remove one of the transducers.</td>
</tr>
<tr>
<td>Err 15</td>
<td>Cardio 1</td>
<td>2 FHR transducers are being used with single FHR option (Invalid “Ext. parameter” status on Tele IF).</td>
<td>Remove one of the transducers.</td>
</tr>
<tr>
<td>Err 16</td>
<td>Cardio 1</td>
<td>Wrong pairing of telemetry and transducers.</td>
<td>Either disconnect the transducers or switch off the telemetry receiver.</td>
</tr>
<tr>
<td></td>
<td>Toco</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cardio 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Err 18</td>
<td>none</td>
<td>Use of paper designed for HP 8040 monitor.</td>
<td>Use correct paper for this monitor.</td>
</tr>
<tr>
<td>Err 19</td>
<td></td>
<td>Battery low or empty of charge.</td>
<td>Change the batteries as soon as possible. If you do not change the batteries, your specific settings will return to their default values when the monitor is switched on. (For example, the date is set to 4.4.44.)</td>
</tr>
<tr>
<td>Err 101</td>
<td>Cardio 1</td>
<td>FSpO₂ patient module defective.</td>
<td>Replace patient module.</td>
</tr>
<tr>
<td>Err 102</td>
<td>Cardio 1</td>
<td>Communication error - no connection between FSpO₂ patient module and monitor.</td>
<td>Replace patient module.</td>
</tr>
<tr>
<td>Err 103</td>
<td>Cardio 1</td>
<td>FSpO₂ sensor defective.</td>
<td>Use a new sensor.</td>
</tr>
<tr>
<td>nop</td>
<td>Cardio 1</td>
<td>No contact, or poor contact, between reference electrode and mother.</td>
<td>Use a new spiral electrode.</td>
</tr>
<tr>
<td></td>
<td>Cardio 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## LCD Display Warning Messages

### Error Messages on Trace

<table>
<thead>
<tr>
<th>Error Code</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err bAt1 2</td>
<td>Battery low or empty of charge</td>
<td>Change the batteries as soon as possible. If you do not change the batteries, your specific settings will return to their default values when the monitor is switched on. (For example, the date is set to 4.4.44.)</td>
</tr>
<tr>
<td>Err PAP 30-240 3</td>
<td>Incorrect type of paper loaded.</td>
<td>Load paper with 50-210 scale or change the monitor’s paper format setting (see the section “Setting Paper Speed and Scale” on page 5-46).</td>
</tr>
<tr>
<td>Err PAP 50-210 3</td>
<td>Incorrect type of paper loaded.</td>
<td>Load paper with 30-240 scale or change the monitor’s paper format setting (see) the section “Setting Paper Speed and Scale” on page 5-46).</td>
</tr>
<tr>
<td>Err xxx 3</td>
<td>xxx is between 500 and 600. This indicates a technical failure diagnosed by the monitor’s self test program.</td>
<td>Contact a Philips Service Engineer or Response Center.</td>
</tr>
</tbody>
</table>
| Error 601 3 | Paper speed. | Check that correct paper is used. Check the speed by timing how long it takes for the paper to advance 1cm: 
60 seconds = 1cm/min 
30 seconds = 2cm/min 
20 seconds = 3cm/min 
Contact a Philips Service Engineer or Response Center if the speed is incorrect. |
| Error 602 3 | Incorrect type of paper loaded. | Load with appropriate scale paper or change monitor’s paper format setting. |

1. Displayed for ten seconds when the monitor is first switched on. 
2. Printed every ten minutes.
3. Printed every three pages.

### Noninvasive Blood Pressure Warning Messages

#### Table 11-1 Noninvasive Blood Pressure

<table>
<thead>
<tr>
<th>Warning Message</th>
<th>Situation</th>
<th>Audible Indication</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>overpressure</td>
<td>Cuff pressure increases above 330mmHg or remains above 300mmHg for 2 sec.</td>
<td>Yes (cannot be switched off)</td>
<td>Check to see if cuff is being pressed manually (perhaps by patient movement) and restart the measurement. Cuff deflates automatically.</td>
</tr>
<tr>
<td>artifacts</td>
<td>Patient is moving.</td>
<td>Yes (if alarming is on)</td>
<td>Restrain patient movement and restart the measurement.</td>
</tr>
<tr>
<td>cuff tubing</td>
<td>Inflation/deflation takes too long.</td>
<td>Yes (if alarming is on)</td>
<td>Check that all tubes are connected properly, not blocked, leaking or defective. Ensure that the correct cuff is being used. Restart the measurement.</td>
</tr>
<tr>
<td>NBP error</td>
<td>Tubing obstructed, or hardware problem.</td>
<td>Yes (if alarming is on)</td>
<td>Check tubing. Switch monitor off and try measurement again. If problem persists, call service personnel.</td>
</tr>
</tbody>
</table>
Table 11-2 Pulse Oximetry

<table>
<thead>
<tr>
<th>Warning Message</th>
<th>Parameter Display</th>
<th>Audible Indication</th>
<th>Possible Cause</th>
<th>What to Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>--%</td>
<td>No</td>
<td>Transducer or adapter cable disconnected</td>
<td>Connect transducer or cable.</td>
</tr>
<tr>
<td>![Icon] SpO₂ no pulse</td>
<td>![Icon] N O P</td>
<td>Yes (if alarming is on)</td>
<td>Pulsation too weak or no pulsation detectable. Transducer incorrectly positioned</td>
<td>Check patient’s pulse. Reposition transducer. Ensure transducer is not on same limb as NIBP cuff. Patient wearing colored nail polish. Remove nail polish.</td>
</tr>
<tr>
<td>![Icon] SpO₂ low signal</td>
<td>![Icon] Normal display</td>
<td>No</td>
<td>Weak signal, SpO₂ less accurate. Wrong transducer selected Transducer incorrectly applied. Photodetector not opposite light emitter. Patient wearing colored nail polish.</td>
<td>Reposition transducer or try a different site. Use correct transducer. Reposition transducer. Reposition transducer. Remove nail polish.</td>
</tr>
<tr>
<td>![Icon] SpO₂ light interference</td>
<td>![Icon] -?-</td>
<td>No</td>
<td>A light source is so high that the SpO₂ transducer cannot measure SpO₂ or HR.</td>
<td>Remove strong light source, or cover transducer with opaque material.</td>
</tr>
<tr>
<td>![Icon] SpO₂ artifacts</td>
<td>![Icon] -O-</td>
<td>No</td>
<td>Irregular pulse patterns detected, possibly arising from patient movement.</td>
<td>Restrain patient.</td>
</tr>
</tbody>
</table>
**Service Errors**

If one of these service error message appears on the display, consult the appropriate page in this manual for the procedure you should follow.

**Table 11-3 Service Error Messages**

<table>
<thead>
<tr>
<th>Error Message</th>
<th>Error Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Err 500</td>
<td>Not known (bus error)</td>
</tr>
<tr>
<td>Err 502</td>
<td>Power supply board</td>
</tr>
<tr>
<td>Err 504</td>
<td>DSP-CPU</td>
</tr>
<tr>
<td>Err 505</td>
<td>DSP-CoP</td>
</tr>
<tr>
<td>Err 506</td>
<td>ROM Board</td>
</tr>
<tr>
<td>Err 507</td>
<td>DSPII Board</td>
</tr>
<tr>
<td>Err 513</td>
<td>CPU Board (Smartwand)</td>
</tr>
<tr>
<td>Err 515</td>
<td>Dig If Board</td>
</tr>
<tr>
<td>Err 516 or 517</td>
<td>Frontend Board</td>
</tr>
<tr>
<td>Err 525 and Err 527</td>
<td>LED Board</td>
</tr>
<tr>
<td>Err 526</td>
<td>LCD Board</td>
</tr>
<tr>
<td>Err 531</td>
<td>Telemetry Board</td>
</tr>
<tr>
<td>Err 532</td>
<td>OBMS Interface Board</td>
</tr>
<tr>
<td>Err 533</td>
<td>DSIF Board</td>
</tr>
<tr>
<td>Err 534</td>
<td>Maternal SpO₂ Board</td>
</tr>
<tr>
<td>Err 535</td>
<td>NBP Assembly</td>
</tr>
<tr>
<td>Err 536</td>
<td>Combined Telemetry/System Board</td>
</tr>
<tr>
<td>Err 540</td>
<td>Fetal SpO₂ Board</td>
</tr>
<tr>
<td>Err 601</td>
<td>Recorder Paper Feed</td>
</tr>
<tr>
<td>Err 602</td>
<td>Incorrect Type of Paper</td>
</tr>
</tbody>
</table>
Error 500: General Failure

Warning
The following task requires that the power be on while the cover is removed. Proceed with extreme caution. Failure to do so can result in serious injury.

Figure 11-4 Troubleshooting: Error 500
Warning

The following task requires that the power be on while the cover is removed. Proceed with extreme caution. Failure to do so can result in serious injury.

Figure 11-5 Troubleshooting: Error 502
Warning
Electrical current is dangerous. You must use extreme caution when performing the two following procedures.

Checking Output from the Frontend Board
1. Remove the monitor top cover (see “Removing the Top Cover” on page 169).
2. Connect the monitor to line voltage and switch on.

Checking Output from the Power Supply Board
1. Remove the power supply from the monitor (see “Rear Assembly” on page 170).
2. Connect the monitor to line voltage and switch on.
3. Using a DVM meter, check the voltage output from the pins as shown in 11-5, and in 11-6. It is recommended to use the rear of the board to check the voltages.

Figure 11-6 Power Supply Board
Table 11-4 Power Supply Board: Output from Connector Pins

<table>
<thead>
<tr>
<th>Column</th>
<th>Pin No.</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>32</td>
<td>24V AC (27 to 36V rms)</td>
</tr>
<tr>
<td>A</td>
<td>31</td>
<td>24V AC (27 to 36V rms)</td>
</tr>
<tr>
<td>C</td>
<td>32</td>
<td>+28V (&lt;50V)</td>
</tr>
<tr>
<td>C</td>
<td>31</td>
<td>+24V (22.3 to 25.7V)</td>
</tr>
<tr>
<td>A/B/C</td>
<td>24</td>
<td>+4.9 to 5.1V</td>
</tr>
<tr>
<td>C</td>
<td>03</td>
<td>-11.8 to -12.8V</td>
</tr>
<tr>
<td>C</td>
<td>02</td>
<td>+11.8 to +12.8V</td>
</tr>
</tbody>
</table>

4. If the output is not as shown, replace the board (see "Power Supply Board" on page 170).

Error 506: ROM Board

Figure 11-7 Troubleshooting: Error 506
Error 507: DSPII Board

Figure 11-8 Troubleshooting: Error 507
Error 513: CPU Board

**Figure 11-9  Troubleshooting: Error 513**

**Warning**
The serial number and feature settings can only be written once.
Error 515: DIF Board

Error 515 DISPLAYED

Switch Monitor Off.
Disconnect frontend System Bus Connector.
Connect new:
- Digital Interface PCB
- Frontend PCB
(leave original frontend assy attached to the monitor)
Switch Monitor On.

Are all RED LEDs off?

NO  Exchange relevant PCB.

YES

Switch Monitor Off.
Disassemble frontend assy.
Exchange digital PCB for new one.
Switch Monitor On.

Are all RED LEDs off?

NO  Exchange relevant PCB.

YES  Error corrected.

Figure 11-10 Troubleshooting: Error 515
Troubleshooting: Error 516 or 517

Error 516 or 517 DISPLAYED

Switch Monitor Off.
Disconnect frontend
System Bus Connector.
connect new
- Digital Interface PCB
- Frontend PCB
(Leave original frontend assy
attached to the monitor.)
Switch Monitor On.

Are all RED
LEDs off?

NO Exchange relevant PCB.

YES

Switch Monitor Off.
Disassemble frontend assy.
Exchange frontend PCB for
new one.
Switch Monitor On.

Are all RED
LEDs off?

NO Exchange relevant PCB.

YES

Error corrected.

Figure 11-11 Troubleshooting: Error 516 or 517
Figure 11-12 Troubleshooting: Error 525 or 527
Error 526: LCD Display Board

Error 526 DISPLAYED

Switch Monitor Off.
Unplug LCD display from DIF PCB.
Switch Monitor On.

Is Err 526 displayed?

NO Replace LCD display assy.

YES Switch Monitor Off.
Replace DIF PCB.
Switch Monitor On.

Is Err 526 displayed?

NO Replace DIF PCB.

YES Check as for Err 500.

Figure 11-13 Troubleshooting: Error 526
Troubleshooting Error 532

Error 532: System Interface Board

Error 532 DISPLAYED

Switch Monitor Off, Remove System PCB, Switch Monitor On.

Is Err 532 displayed? NO Replace System interface PCB.

YES

Switch Monitor Off, Remove all B-type interfaces from the Monitor, Switch Monitor On.

Is Err 532 displayed? NO Replace remaining B-type interface PCB.

YES

Check as for Err 500.

Figure 11-14 Troubleshooting: Error 532

Note If Philips M 1350-66536 is connected at the same time, check the correct setting of C 13 (see Chapter 5).
Error 533: Dual Serial Interface Board

Figure 11-15 Troubleshooting: Error 533
Error 534: Maternal SpO\textsubscript{2} Board

Figure 11-16 Troubleshooting: Error 534
**Error 535: NIPB Board**

**Error 535 DISPLAYED**

Switch Monitor Off, Remove NIBP PCB, Switch Monitor On.

Is Err 535 displayed?

- NO: Replace NIBP PCB.
- YES: Switch Monitor Off, Remove all A-type interfaces from the Monitor, Switch Monitor On.

Is Err 535 displayed?

- NO: Replace remaining A-type interface PCB.
- YES: Check as for Err 500.

*Figure 11-17 Troubleshooting: Error 535*
Error 536: Telemetry Interface Board

Figure 11-18 Troubleshooting: Error 536

Note

If the OBM S (M 1350-66532) board is connected to the Fetal Monitor at the same time, check the C13 setting (see Chapter 5).
Error 540: Fetal SpO₂ Board

**Error 540 DISPLAYED**

- Switch Monitor Off, Remove FSpO₂ board, Switch Monitor On.

Is Err 540 displayed?

- NO: Replace FSpO₂ PCB.
- YES: Switch Monitor Off, Remove all B-type interfaces from the Monitor, Switch Monitor On.

Is Err 540 displayed?

- NO: Replace remaining B-type interface PCB.
- YES: Check as for Err 500.

**Figure 11-19 Troubleshooting: Error 540**
**Caution**

The use of recorder paper that is not approved by Philips can damage the monitor. This type of damage will not be covered by warranty.
Error 602: Incorrect Type of Paper

Figure 11-21 Troubleshooting: Error 602

Caution
The use of recorder paper that is not approved by Philips can damage the monitor. This type of damage will not be covered by warranty.

Ultrasound Parameter Test

Figure 11-22 Troubleshooting: Ultrasound Parameter Test
Figure 11-25 Troubleshooting: Toco Parameter Test
Maternal SpO₂ Parameter Test

Figure 11-26 Troubleshooting: Maternal SpO₂ Parameter Test

Internal maternal parameters contained within the monitor override external maternal parameters.
Figure 11-27 Troubleshooting: Fetal SpO₂ Parameter Test
Internal maternal parameters contained within the monitor override external maternal parameters.
No manual measurements are printed on the trace.

Is Err 533 displayed on Fetal Monitor?

Yes

Proceed as for Error 533.

No

Is the interface cable connected to the correct socket on the IF board?

No

Port 2: Nellcor.
Port 1: All other external devices.

Yes

Is the interface cable in the correct port on external device?

No

Refer to chapter 7 for details.

Yes

Is the correct IF cable used?

No

CMS: MI 350-61609 required.

Yes

Is the DIP switch setting on the dual IF board correct?

No

Refer to chapter 7 for details.

Yes

Is a correct SW Revision installed in the Fetal Monitor?

No

1) Check SW Rev via Error Log,
2) Refer to chapter 5 for correct software version.

Yes

Valid values shown on external device?

No

Refer to the Service Documentation provided with the external device.

Yes

Check the external device settings and function. Refer to chapter 7 and the Service documentation provided with the external device.

Figure 11-29 Troubleshooting: External Maternal Parameters
Caution
The use of recorder paper that is not approved by Philips can damage the Monitor. This type of damage will not be covered by warranty.
If the Nellcor FSpO₂ monitor has two power switches (a mains switch at the rear of the unit and a standby switch at the front of the unit), take care to switch them off and on in the correct order. Failure to follow this prescribed sequence can cause the unit to appear to malfunction by displaying data erratically or not at all.

Switching Off
1. Turn front switch (on/standby mode) to standby.
2. Turn rear switch (mains power switch) to off.

Switching On
1. Turn rear switch (mains power) to on.
2. Turn front switch (on/standby mode) to on.

If the unit behaves erratically, switch it off, exactly as detailed above, wait for five seconds, then switch it on again.

When using the FSpO₂ monitor regularly, it is recommended to keep the rear switch in the “on” position and use the front switch to change from on to standby mode.
Removal and Replacement Procedures

Introduction

This section provides detailed information on the removal and replacement of components, but it is not necessary to do this for most service tasks. You should only disassemble the monitor as far as you need to replace an item.

In order to help with the descriptions, the monitor is divided into three sections. These are:

1. The Rear Assembly:
   - Power Supply
   - Boards
   - Backplane
   - Batteries

2. The Recorder Assembly

3. The Front Assembly:
   - Front Cover
   - Frontend Board
   - Loudspeaker
   - Digital Interface Board
   - Display Board
   - Function Switches
   - Recorder Keys
   - LCD Display Board
   - Tilt Mechanism
   - Display Assembly

As no components on the boards are replaceable, the removal procedures will only go down as far as removal and replacement of the boards themselves.
Test/Inspection and Safety Procedures

It is very important to perform the test, inspection and safety tests detailed in Chapter 10, “Safety, Maintenance, and Calibration,” whenever you connect a monitor to an OB system, or have worked on individual monitor components.

Tools

The following tools are needed to dismantle the monitor:

- pozidrive screwdriver size 1
- safety test equipment
- PC for configuration
- Configuration software “pegserv.exe”
- Cable to link PC to fetal monitor
Removing the Top Cover

Warning
Electrical power is dangerous. Prior to attempting to remove any component from the system the power to the system must be disconnected.

Access to most of the items within the monitor is only possible with the top cover of the monitor removed.

To remove the top cover:
1. Turn the system off and disconnect the power cable.
2. Undo the four screws situated on the sides of the monitor.
3. Slide the cover towards the rear of the monitor and lift it off.

Note
The boards and power supply can be removed from the rear of the monitor without removing the top cover. If you do remove the top cover, take care when you slide it back that the RFI spring does not fall into the Fetal Monitor. This could damage the components.
Rear Assembly

Power Supply Board

1. Turn the system off and disconnect the power cable.
2. Unplug the power cable from the rear of the system.
3. Undo the four screws from the rear of the power supply.
4. Pull the power supply out of the rear of the monitor.

Figure 12-2 Removing the Power Supply
5. Turn the power supply over and remove the two screws holding the board in place.

![Figure 12-3 Removing the Power Supply board](psm15sca.tif)

**Figure 12-3 Removing the Power Supply board**

Replacement of the Power Supply board is a reversal of the above procedure. When replacing the Power Supply assembly, hold the ON/OFF switch situated on the front of the monitor as this can be dislodged whilst inserting the Power Supply.

**DO NOT** force the Power Supply into the rear of the monitor. If it will not locate, remove and check that the pins connecting the supply to the Backplane are not bent. Reinsert the supply.

Perform the Instrument Safety Test (see page 126) after you have worked on the power supply.
**Fuses**

1. Remove the Power Supply board as previously described.
2. The location of the fuses is shown below.
3. To remove the fuses, pull them out.

---

**Table 12-1 Fuses**

<table>
<thead>
<tr>
<th>Philips part number</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>2110-0830</td>
<td>bipin fuse 1.25A</td>
<td>4</td>
</tr>
<tr>
<td>2110-0833</td>
<td>bipin fuse 0.16A</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 12-4 Output Voltage from Power Supply board**

3. To remove the fuses, pull them out.
Boards

To remove a board from the monitor:
1. Turn the system off and disconnect the power cable.
2. Undo screws 1 at the top and bottom of the board you want to remove.

**NIPB and SPO₂ Boards Only**

Slide the board out for a few centimeters, until you can easily disconnect the NIPB tubing, or SpO₂ cable.

Detach the connection.
4. Remove the board from the monitor.

![Diagram of boards]

Figure 12-5 Replacing a Board

To replace a board:
1. Push the board into the appropriate slot inside the rear of the monitor. You cannot insert the board in the wrong compartment.
2. Replace the screws and tighten securely.

If the CPU board has been replaced, you must write the serial number (3) and feature settings of the monitor to the EPROMS on this board and reload the functionality with the PC software. (See Chapter 4, “Configuring the Monitor” for details.) The serial number and feature setting can only be written once.

When you replace either the SpO₂ or the NIBP boards, you must disconnect the SpO₂ cable, or NIBP tubing as appropriate before completely removing the boards.

Perform the Instrument Safety Test as described in page 126 after you have worked on the maternal SpO₂ board.
To remove the Backplane proceed as follows:

1. Turn the system off and disconnect the power cable.
2. Remove the Monitor Top Cover.
3. Remove all boards from the rear of the monitor.
4. Remove the system power supply.
5. Disconnect the system bus connector 1 from the Digital Interface board.
6. Remove the three screws 2 connecting the Backplane to the monitor chassis.
7. Gently pull the Backplane out of the side of the monitor.

Replacement is a reversal of the above procedure.

**Figure 12-6 Removing the Backplane**

1. Turn the system off and disconnect the power cable.
2. Remove the Monitor Top Cover.
3. Remove all boards from the rear of the monitor.
4. Remove the system power supply.
5. Disconnect the system bus connector 1 from the Digital Interface board.
6. Remove the three screws 2 connecting the Backplane to the monitor chassis.
7. Gently pull the Backplane out of the side of the monitor.

Replacement is a reversal of the above procedure.
Batteries

The monitor's clock is powered by two batteries located in the rear panel of the monitor. The average life span of these batteries is one year. When the battery charge is low, the message ![Battery Low](image) is displayed, and ![X] is printed on the recorder trace. When this happens, the batteries should be changed as soon as possible.

If the batteries are not changed, the specific settings will return to their default values and will have to be reset each time the monitor is switched on. (For example, the date is set to 4.4.44)

Replace the batteries with two alkaline 1.5 Volt size N batteries (recommended type: MN9100).

To replace the batteries:

1. Switch off the monitor. If you don't, ![X] will continue to be printed on the recorder trace.

![Figure 12-7 Replacing the Batteries](image)

- **Contact Spring:** 5021-3671
- **V-Spring:** 1400-0967
  (not shown)

2. Replace the batteries (see 12-7).
3. Switch on the monitor.
4. Reset the time and date (see "Chapter 5. Getting Started (Basic Considerations and Operation)" on page 45). If you don't, the wrong time and date will be printed on the recorder trace.
To remove the Recorder Assembly proceed as follows:

1. Turn the system off and disconnect the power cable.
2. Remove the recorder paper.
3. Remove the monitor top cover.
4. Disconnect the two earth straps 1 from the front assembly.
5. Loosen screws 2 and 3. Screws 2 are accessible via holes in the paper tray.

Figure 12-8 Removing the Recorder Assembly
7. Unlock the flex layer by pulling it slightly forward.

8. Lift the recorder assembly out of the monitor casing.
9. Place it in the new base assembly, reversing the above procedure. Take care that the paper eject lever fits back into the paper eject knob.

---

**Note**
Take care not to lose the small O-rings when you have removed screws 2 and 3.

Replacing the Recorder Assembly is a reversal of the above procedure.

**Caution**
The use of recorder paper that is not approved by Philips can damage the monitor. This type of damage will not be covered by warranty.
To remove the Frontend board proceed as follows:

1. Turn the system off, disconnect the power cable and all transducers.
2. Remove the monitor top cover.

Figure 12-9 Removing the Frontend Board

- Figure 12-9: Removing the Frontend Board

1. Turn the system off, disconnect the power cable and all transducers.
2. Remove the monitor top cover.
3. Disconnect the switch board cable (1).
4. Disconnect the cable (2) from the connector on the DIF board.
5. Remove screws (3) and (5) and release the clips on either side of the transducer connectors.
6. Remove the Frontend board, with its metal holder, from the monitor.
7. Slide the Frontend board carefully to the rear of the monitor and lift it up out of the unit.
8. Remove screws (4) and (6) to remove the Frontend board from the metal part.

To replace the Frontend board, reverse the above procedure. Ensure that you position the board under the two metal holders (7) and (8) and the ground clips (9) are still in place. Now fix the board to the metal holder with screws (4) and (6). Put the assembly back into the unit and slide the complete assembly towards the front to click the connectors back into their clips. Ensure that all connectors are fully inserted (check this from the front) before you fix the board back in place using the two screws (3) and (5).

Perform the Instrument Safety Check (see page 126) after working on the Frontend board.
1. If this is not already done, turn the system off. Disconnect the power cable and all transducers and remove the monitor top cover.

2. Disconnect all the cables:
   - loudspeaker cable (1)
   - power LED connector (2)
   - recorder switch board connector (3)
   - recorder sensing board connector (5). Unlock the flex layer connector by pulling it slightly forwards
   - recorder stepper motor (6)
   - frontend board connector (7)
   - backplane flat cable (13).
3. Disconnect the recorder print head (4) from the recorder assembly.
4. Remove the two screws (8) and (11) that hold the board in place.
5. Slide the digital interface (DIF) board towards the rear of the monitor before lifting the board up, to give the marker connector a “chance”.
6. Remove the label from the front end connector area. Score carefully around the connectors in the area with a flat bladed knife. Do not allow any adhesive to remain on the front panel.

Item 12 shows the error LED, which is red until the monitor successfully passes its self test.

Replacement is a reversal of the above procedure.
Display Assembly

To remove the display assembly you must first remove the frontend board, and then the digital interface board.

Removing the Maternal Display Panel

Monitors with serial numbers greater than 3545G 01115 have a factory fitted-clip that secures the tiltable maternal display panel. Monitors with numbers below have no factory-fitted securing device. However, it is possible that a “spring and spacer” arrangement may have been fitted by a Customer Engineer.

Before removing the display assembly, you must first remove the clip or spring and spacer.

Removing the Clip

1. Gently slide the top of the clip from the slot located at the top and middle of the display panel (1). Take care not to bend the clip so far that it does not spring back to its original shape.
2. Remove the smaller end of the clip from the slot in the protruding tab on the edge of the display assembly.

Reverse this procedure to replace the clip.
Removing the Spring and Spacer

1. Make sure that the display panel is shut.
2. Unscrew the spacer (1) from the frontend board as shown in the diagram.
3. Remove the end of the spring from the small hole on the protruding tab of the edge of the display assembly.
4. Move the other end of the spring from the groove in the spacer.

Reverse this procedure to replace the spring and spacer.
Figure 12-10 Removing the Display Assembly

To remove the complete display assembly with the tilt mechanism:

1. If you have not done this already, turn the system off, disconnect the power cable and all transducers.
2. Remove the monitor top cover.
3. Remove screws (1), (2), (3) and (4).
4. Disconnect the cables from their connections on the D I F board.
5. Slide the entire display assembly a small way through the front panel.
6. Remove the ground cable and then remove the assembly completely.

Replacement is a reversal of the above procedure. Insert all four screws to center the (closed) display assembly before you tighten the screws. It is important to use the correct screws and exert a minimum of pressure when doing up the screws. Excess force can damage the display assembly.

Caution
Ensure that you use the correct screws. Exert a minimum of pressure when doing up the screws. Excess force can damage the display assembly.
**SpO\textsubscript{2} Cable and NIBP Connector Tubing**

![Diagram](image)

**Figure 12-11 Removing the SpO\textsubscript{2} Cable and NIBP Connector Tubing**

1. Turn the system off, disconnect the power cable and all transducers.
2. Remove the monitor top cover.
3. Remove screws (1) and (2) from the SpO\textsubscript{2} and/or NIBP connector.
4. Slide the NIBP board and/or SpO\textsubscript{2} board slightly out of the unit. Do not remove them completely.
5. Disconnect the NIBP tubing and/or SpO\textsubscript{2} cable from the boards.
6. Release the cable and tubing from where it is fixed to the metal chassis.

Replacement is a reversal of the above procedure.

Perform the Instrument Safety Test (see page 126) after working on the maternal SpO\textsubscript{2} board.
Front Panel Assembly

Figure 12-12 Removing the Front Panel Assembly

1. Turn the system off, disconnect the power cable and all transducers.
2. Remove the Monitor top cover.
3. Remove the Recorder Assembly as described in “Recorder Assembly” on page 176.
4. Remove the FE board as described in “Frontend Board” on page 178.
5. Remove the DIF board as described in “Digital Interface Board” on page 180.
6. Remove the power switch extension jig.
7. Remove the screws (1), (2) and (3) to release the holder from the bottom plate.
8. Slide the front panel backwards and remove it.
9. Release the three metal front panel holders from the front panel.

Replacement is a reversal of the above procedure.
Switch Boards

Figure 12-13 Removing the Switch Board

You can remove the recorder keys board without removing the monitor’s front cover.

**Recorder Keys Board**
- Uncap the Recorder Keys board (1) and lift it clear of the front cover.
- Replacement is a reversal of the above procedure.

**Function Switches Board**
- Remove the Front Assembly and Front Cover from the monitor.
- Unclip the Function Keys board (2) and put the board clear of the Front Cover.
- Replacement is a reversal of the above procedure.

**Loudspeaker**
- Remove the loudspeaker cable going to the DIF board.
- Remove the four screws holding the loudspeaker in place.

**Caution**
The strong magnet will pull your screwdriver towards the membrane. Be careful not to damage the membrane.

- Replacement is a reversal of the above procedure.
Introduction

This section contains information for identifying, locating and ordering replacement parts.

Ordering Information

Occasionally, electronic items in the replacement parts list will be found to carry standard commercial identification numbers, and also to be indicated as being manufactured by Philips. These components have been selected to meet specific operational criteria. The use of these components purchased through normal commercial channels may result in degradation of the operation performance or reliability of the unit.

To order a replacement part, address your order or inquiry to the local Philips Sales/Service Office, giving the Philips part number of the item from the list.

To order a part not listed in a table, provide the following information:

1. Model number of the instrument.
2. Complete serial number of the instrument.
3. Description of the part including function and location.

Table 13-1 Parts List Index

<table>
<thead>
<tr>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parts List</td>
<td>Table 13-2 for Parts and Exchange Parts Numbers</td>
</tr>
<tr>
<td>Exploded System View Recorder</td>
<td>13-1</td>
</tr>
<tr>
<td>Transducers</td>
<td>See Chapter 14</td>
</tr>
<tr>
<td>Board Positions and type</td>
<td>See Chapter 15</td>
</tr>
<tr>
<td></td>
<td>See “Rear Panel” on page 1-15</td>
</tr>
</tbody>
</table>
## Replacement Parts

### Table 13-2 Replacement Parts List

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Exchange Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Philips Series 50 XM/XMO Monitor</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drive Belt (recorder)</td>
<td>1500-0822</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Thermal Print Head (recorder)</td>
<td>1810-1421</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Stepper Motor (recorder)</td>
<td>3140-0847</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Spring Thermal Print Head (recorder)</td>
<td>M 1350-29151</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Spring (recorder)</td>
<td>M 1350-29152</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Flex Layer Assembly</td>
<td>M 1350-46551</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Backplane Board</td>
<td>M 1350-66501</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>PSU Board</td>
<td>M 1350-66502</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>CPU Board</td>
<td>M 1350-66513</td>
<td>M 1350-69513</td>
<td>1</td>
</tr>
<tr>
<td>DSPII Board</td>
<td>M 1350-66507</td>
<td>M 1350-69507</td>
<td>1</td>
</tr>
<tr>
<td>DIF Board</td>
<td>M 1350-66515</td>
<td>M 1350-69515</td>
<td>1</td>
</tr>
<tr>
<td>Frontend Board</td>
<td>M 1350-66517</td>
<td>M 1350-69517</td>
<td>1</td>
</tr>
<tr>
<td>Cardio Transducer Input Connector</td>
<td>1252-3461</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Toco Transducer Input Connector</td>
<td>1252-3462</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Conn Pneumatic</td>
<td>M 1350-60007</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Cable Assembly SpO₂</td>
<td>M 1350-61610</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Display Assembly</strong> - Table 13-3, “Display Assembly,” on page 192</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switch Board</td>
<td>M 1350-66521</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Telemetry/System Interface Board</td>
<td>M 1350-66536</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>NIBP Assembly</td>
<td>M 1350-66535</td>
<td>M 1350-69535</td>
<td>1</td>
</tr>
<tr>
<td>Maternal SpO₂ Assembly</td>
<td>M 1350-66534</td>
<td>M 1350-69534</td>
<td>1</td>
</tr>
<tr>
<td>Fetal SpO₂ Board</td>
<td>M 1350-66540</td>
<td>M 1350-69540</td>
<td>1</td>
</tr>
<tr>
<td>System Interface Board</td>
<td>M 1350-66532</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 13-2 Replacement Parts List

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Number</th>
<th>Exchange Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Serial Interface Board</td>
<td>M 1350-66533</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Recorder Assembly (complete)</td>
<td></td>
<td>M 1350-69602</td>
<td>1</td>
</tr>
<tr>
<td>Overlay Kit (multi language) XM</td>
<td>M 1350-60606</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Overlay Kit (multi language) XM O</td>
<td>M 1350-60607</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Primary Line Assembly</td>
<td>M 1350-61605</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Blank ROM Board</td>
<td>M 1350-66506</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Firmware</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EPROM Kit - Rom Board</td>
<td>M 1350-6802x^1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>EPROM Kit - NIBP Board</td>
<td>M 1350-6835x^1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>EPROM Kit - FSpO_2 Board</td>
<td>M 1350-6840x^1</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Transducers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toco Transducer (complete, 2.5m/8ft 2in cable)</td>
<td>M 1355-60011</td>
<td>M 1355-69011</td>
<td>1</td>
</tr>
<tr>
<td>Toco Transducer (complete, 70 cm/28in cable)</td>
<td>M 1355-60013</td>
<td>M 1355-69013</td>
<td>1</td>
</tr>
<tr>
<td>US Transducer (complete, 2.5m/8ft 2in cable)</td>
<td>M 1356-60011</td>
<td>M 1356-69011</td>
<td>1</td>
</tr>
<tr>
<td>US Transducer (complete, 70 cm/28in cable)</td>
<td>M 1356-60013</td>
<td>M 1356-69013</td>
<td>1</td>
</tr>
<tr>
<td>DECG Transducer</td>
<td>M 1357-60001</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>MECG Transducer</td>
<td>M 1359-60001</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>US/MECG Combi Transducer (US)</td>
<td>M 1358-60011</td>
<td>M 1358-69011</td>
<td>1</td>
</tr>
<tr>
<td>US/MECG Combi Transducer (MECG)</td>
<td>M 1358-60002</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Patient Modules and cables</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSpO_2/ECG Combined Patient Module</td>
<td>M 1365-60001</td>
<td>M 1365-69001</td>
<td>1</td>
</tr>
<tr>
<td>DECG Patient Module (2.5m/8ft 2in cable)</td>
<td>M 1364-60001</td>
<td>M 1364-69001</td>
<td>1</td>
</tr>
<tr>
<td>DECG Patient Module (70 cm/28in cable)</td>
<td>M 1364-60003</td>
<td>M 1364-69003</td>
<td>1</td>
</tr>
<tr>
<td>MECG cable</td>
<td>M 1363A</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DECG Legplate adapter cable</td>
<td>M 13628</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>DECG adapter</td>
<td>M 1347A</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

1. Where “x” changes with the latest software revision. See the CPL for the latest revision. For upgrading order M 1360B/C option #501 to receive the latest software together with the appropriate documentation.
### Table 13-3 Display Assembly

<table>
<thead>
<tr>
<th>Model</th>
<th>Parameters</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1350B</td>
<td>Fetal with maternal</td>
<td>M 1350-69201</td>
<td>1</td>
</tr>
<tr>
<td>M 1350B</td>
<td>Fetal only</td>
<td>M 1350-69203</td>
<td>1</td>
</tr>
<tr>
<td>M 1350C</td>
<td>Fetal with FSpO₂</td>
<td>M 1350-69206</td>
<td>1</td>
</tr>
<tr>
<td>M 1350C</td>
<td>Fetal and maternal and FSpO₂</td>
<td>M 1350-69205</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 13-4 Replacement Parts: Transducer Connectors

<table>
<thead>
<tr>
<th>Description</th>
<th>Connector</th>
<th>Cable Boot</th>
<th>Resistor</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1355A</td>
<td>1251-6887</td>
<td>08030-41701</td>
<td>0698-4443</td>
<td>1 of each</td>
</tr>
<tr>
<td>M 1356A</td>
<td>1252-4830</td>
<td>08030-41701</td>
<td>0698-3511</td>
<td>1 of each</td>
</tr>
<tr>
<td>M 1357A</td>
<td>1252-4830</td>
<td>08030-41701</td>
<td>0698-4443</td>
<td>1 of each</td>
</tr>
<tr>
<td>M 1358A</td>
<td>1252-4830</td>
<td>08030-41701</td>
<td>0698-3511</td>
<td>1 of each</td>
</tr>
<tr>
<td>M 1359A</td>
<td>1252-4830</td>
<td>08030-41701</td>
<td>0698-3519</td>
<td>1 of each</td>
</tr>
</tbody>
</table>
Figure 13-1 Parts Diagram
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monitor Top Cover</td>
<td>M 1350-05202</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Screws - Top Cover M 3 x 6</td>
<td>0515-0890</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Mounting Cam</td>
<td>5041-4284</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Mounting Screw - Cam M 3 x 8</td>
<td>0515-0897</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Foot</td>
<td>5041-4264</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>Mounting Screw - Foot M 3 x 8</td>
<td>0515-0897</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Front Panel (without label)</td>
<td>M 1350-40202</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Mounting Screws - Front Panel M 3 x 4</td>
<td>0515-1508</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Holder Front Panel - Left</td>
<td>M 1350-02311</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Holder Front panel - Front End Board (middle)</td>
<td>M 1350-02315</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Holder Front Panel - Right</td>
<td>M 1350-02312</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Mounting Screws - Holder Front Panel M 3 x 16</td>
<td>0515-1111</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>Mounting Screws - DIF Board Support M 3 x 4</td>
<td>0515-1508</td>
<td>2</td>
</tr>
<tr>
<td>14</td>
<td>Front Panel Label Kit XM</td>
<td>M 1350-60606</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>Paper Eject Key</td>
<td>M 1350-47402</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Spring - Paper Eject Key</td>
<td>1460-2250</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>Power ON/OFF Key</td>
<td>5041-1203</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>Power ON/OFF Shaft</td>
<td>5040-9317</td>
<td>1</td>
</tr>
<tr>
<td>20</td>
<td>Loudspeaker Assembly</td>
<td>9164-0710</td>
<td>1</td>
</tr>
<tr>
<td>23</td>
<td>LED Assembly - Power</td>
<td>M 1350-61607</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>Function Key Switch Assembly</td>
<td>M 1350-66521</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Recorder Key Switch Assembly</td>
<td>M 1350-66521</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Display Assembly Fetal/Maternal</td>
<td>M 1350-69201</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Display Assembly Fetal only</td>
<td>M 1350-69203</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Display Assembly Fetal with FSpO₂</td>
<td>M 1350-69206</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>Display Assembly Fetal and maternal with FSpO₂</td>
<td>M 1350-69205</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 13-5 Part Numbers

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>Display Assembly Mounting Screws</td>
<td>0515-2795</td>
<td>1</td>
</tr>
<tr>
<td>27</td>
<td>Mounting Screws - DIF Board M 3 x 6</td>
<td>0515-0886</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>- Mounting Screws - Frontend Board M 3 x 6</td>
<td>0515-0886</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>Complete Chassis Assembly</td>
<td>M 1350-60102</td>
<td>1</td>
</tr>
<tr>
<td>31</td>
<td>Backplane Mounting Screws M 3 x 4</td>
<td>0515-1508</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Boards

- Fetal SpO₂ Board
- Backplane Board
- CPU Board
- DSPII Board
- Blank ROM Board
- DIF Board
- Frontend Board
- NIBP Assembly
- Maternal SpO₂ Assembly
- Telemetry Interface Board
- System Interface Board
- Dual Serial Interface Board
- Rear Blank Cover

#### Power Supply

- Mounting Screws - Power Supply M 3 x 12
- PSU Assembly
- Mounting Screws - PSU Board M 3 x 8
- Shield - Transformer
- Mounting Screws - Shield M 3 x 8
- Transformer
- Mounting Screws - Transformer M 3.5 x 55
- Washers - Transformer
<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>52</td>
<td>Insulator - Transformer</td>
<td>0340-0458</td>
<td>4</td>
</tr>
<tr>
<td>53</td>
<td>Primary Line Assembly</td>
<td>M 1350-61605</td>
<td>1</td>
</tr>
<tr>
<td>54</td>
<td>Inlet Cover</td>
<td>M 1350-44101</td>
<td>1</td>
</tr>
<tr>
<td>55</td>
<td>Heat Sink - Power Supply</td>
<td>M 1350-21104</td>
<td>1</td>
</tr>
<tr>
<td>56</td>
<td>Power ON/OFF Switch Assembly</td>
<td>3101-2954</td>
<td>1</td>
</tr>
<tr>
<td>57</td>
<td>Mounting Screw - Transformer Earth Lead M 3 x 4</td>
<td>0515-1508</td>
<td>1</td>
</tr>
<tr>
<td>58</td>
<td>Washer - Transformer Earth Lead</td>
<td>2190-0921</td>
<td>1</td>
</tr>
<tr>
<td>59</td>
<td>Recorder Assembly (see Chapter 14)</td>
<td>M 1350-69602</td>
<td>1</td>
</tr>
</tbody>
</table>

**Front Input Connectors**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>Cardio (red) Input Connector</td>
<td>1252-3461</td>
<td>1</td>
</tr>
<tr>
<td>61</td>
<td>Toco (brown) Input Connector</td>
<td>1252-3462</td>
<td>1</td>
</tr>
<tr>
<td>62</td>
<td>Cardio (red) Input Connector</td>
<td>1252-3461</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>SpO₂ Cable Assembly</td>
<td>M 1350-61610</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>NIBP Connector with tubing</td>
<td>M 1350-60007</td>
<td>1</td>
</tr>
<tr>
<td>19</td>
<td>Plastic screw</td>
<td>0515-2795</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Marker Input Connector</td>
<td>1252-2702</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Paper Take-up Tray</td>
<td>M 1350-00452</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Spring Holder Battery</td>
<td>1400-0957</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>1.5V Battery</td>
<td>1420-0255</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Battery Holder</td>
<td>45611-40019</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Spring Battery Contact</td>
<td>5021-3671</td>
<td>1</td>
</tr>
</tbody>
</table>

**Fuses (Two types dependent upon the voltage selected)**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>.5A 250V Fuse</td>
<td>2110-0458</td>
<td>2</td>
</tr>
<tr>
<td>-</td>
<td>1A 250V Fuse</td>
<td>2110-0007</td>
<td>2</td>
</tr>
</tbody>
</table>

**NIBP Assembly**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Pump Assembly</td>
<td>M 1008-60002</td>
<td>1</td>
</tr>
</tbody>
</table>

**Recorder**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Recorder</td>
<td>M 1350-60601</td>
<td>1</td>
</tr>
<tr>
<td>Item</td>
<td>Description</td>
<td>Part Number</td>
<td>Qty</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-------------</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td>Recorder exchange</td>
<td>M 1350-69602</td>
<td>1</td>
</tr>
</tbody>
</table>
Introduction

This chapter is split into three sections:
- Replacing specific items
- Disassembling and reassembling the entire recorder
- Parts list.

This chapter provides detailed information on the complete disassembly of the recorder, but it is not necessary to do this for most service tasks. You should only disassemble the recorder as far as you need to replace an item.

Caution
The use of recorder paper that is not approved by Philips can damage the monitor. This type of damage will not be covered by warranty.

Warning
Do not grease or oil any axle or bearing in the recorder system.

Most of the time, it is easier to work from the rear of the recorder, and even easier with the rear of the base plate held in a vice. However, these instructions always describe the recorder as viewed from the front. For example, “right” refers to the right side when the recorder is viewed from the
front. The following figure illustrates this, and also shows the three major assemblies referred to. Some items, such as the paper box, have not been shown.

The instructions refer to Figures 9-2, 9-3, 9-4 and 9-5. 14-1 is an exploded drawing of the recorder with some parts named. The callouts in the figures are referred to by bold numbers in the instructions. For example, "... spring 3...".

**Tools**

The following tools are needed to service the recorder:

- Small crosshead screwdriver
- Large crosshead screwdriver
- Medium slothead screwdriver
- Spring tool

The following tools are useful but not essential:

- Universal vice to hold the base plate
- Small pincers or tweezers
Figure 14-1 Component Names
Replacing Specific Items

Thermal Line Printer Head

**Figure 14-2  Replacing the Thermal Line Printer Head**

It is not necessary to disassemble the recorder to replace the Thermal Line Printer (TLP) head.

1. Pull the front assembly forward, as though you were changing the paper.
2. Remove the two screws and ESD earth straps 6.
3. Remove the two screws 7 and the ESD shield 8.
4. Slide the TLP head forward.
5. Slide the new TLP head into position.
6. Place the ESD shield 8 in position and loosely attach screws 7.
7. Loosely attach the ESD earth straps with screws 6.
8. Push the TLP head as far back as it will go, then as far to the right as it will go (right is the side with the paper eject levers). See the following figure.

8. Hold it in position and tighten the screws.
Figure 14-3  Paper Table and Thermal Line Printer Assembly
**Paper Table**

See 14-3.

1. Remove screw and washer 1 to disconnect the bottom end of the paper table spring 2.
2. The paper table, 4, is located on pins on the end of the bearing casing on the side plate. Pull the table away from the pins to release it.

**Thermal Line Printer Assembly (TLP)**

See 14-3. But if you are changing only the TLP Head, see “Replacing Specific Items” on page 202.

1. Remove the two TLP retaining springs 3 to free the front of the assembly. Use a spring hook to avoid damaging the springs.
2. Pivot the TLP assembly backwards.

The TLP assembly can be left like this if it is not to be worked on. Proceed as follows to disassemble it, taking care not to damage the flex layer if you remove the thermal line assembly without disconnecting the sensors.

1. Free the base plate end of the flex layer by removing screw and washer 5. Take care not to lose the washer. It is easier to use a magnetic screwdriver.
2. Remove the TLP assembly. The assembly must be rotated slightly to get it off the pins on the base plate.
3. Remove the two ESD shield screws and earthing straps 6.
4. Remove the two ESD shield screws 7.
5. Remove the electrostatic discharge (ESD) shield 8.
6. Remove the thermal line unit 13.
7. Remove the screw and washer 9 to free the flex layer and optical sensor assembly 10a. It is easier to use a magnetic screwdriver.
8. Remove the two TLP bracket screws and washers (only one shown, 11). The brackets can be removed (only one shown, 12).

**Paper Tray**

See 14-3.

1. Pivot the front assembly forward.
2. Remove the paper box links (only one shown, 14).
3. Slide the paper box 15 forward off the slides.
4. Turn the paper box upside down.
5. Lift the free end of the paper eject lever 44 slightly to get it over the lip on the paper box, and rotate it 90 degrees anti-clockwise to remove it.

It is best to remove the motor next, though it can be left on the side plate if it isn’t to be worked on.
Figure 14-4 Motor and Side Plates

Motor

See 14-4.

1. Remove screw and washer 17 and cable clip 18 from the base plate.
2. Remove screw 33 and screw and washer 34 from the left side plate.
3. Lift the motor 37 away from the side plate. The idler cog shown in the figure is fixed to the left side plate and is not removable.
**Right Side Plate**

See 14-4.

1. Remove screws 20 and 21 from the right side plate.
2. Remove the screw and spring adapter 22a from the right side plate.
3. Pull the right side plate 19 away from the assembly. Be careful of the platen washer 23 and washer 24.
4. Slide the front assembly off the rod.

**Left Side Plate**

See 14-4.

1. Remove the screw and rubber stop 36 from the left side plate for ease of working.
2. Remove the screw and spring adapter 22b from the left side plate, the shaft 42 can now be removed. Be careful of washer 24a.
3. Remove screws 26 and 27 from the left side plate.
4. Put the left side plate face down on the bench and slide the black extrusion 28 away from it.
5. Remove the platen 29 and the left platen spacer 30. Be careful of platen washer 31.
Figure 14-5  Eject Mechanism and Base Assembly

See 14-5.

1. Disconnect spring 16 from the eject lever.
2. Remove the screw and washer 38 from the end of the paper eject rod.
3. Remove the left eject lever 39.
4. Slide out rod 40.
5. Only perform this step if the right eject lever is damaged and has to be replaced.
   Remove the right paper eject lever 41 by carefully levering the built-in clip. Be careful, the clip is fragile and may break.
6. Only perform this step if it is necessary. Remove the three base plate screws 43.
   The screws have rubber retaining O-rings (not shown), take care when removing the screws.
**Full Re-assembly**

**Paper Eject Mechanism and Base Assembly**

See 14-5.

1. The right eject lever fits on the end of the eject rod with the longer machining. Make sure the lever is the right way round before fitting.

2. Fit the right eject lever 41 on to the rod 40, being careful not to break or weaken the built-in retaining clip.

3. Slide the eject rod 40 into the base plate.

4. Fit the left eject lever 39 onto the free end of the eject rod.

5. Replace the screw and washer 38 on the end of the eject rod.

6. Replace the spring 16 using a spring hook.

7. Fit the three base plate screws 43 and the rubber O-rings (not shown).

8. It is easier to attach the flex layer 10b to the base plate before the paper box is fitted. However, this can make it more difficult to assemble the TLP assembly later.

   Attach the flex layer 10b to the base plate with screw and washer 5, if you want to do so at this stage. Be careful of the flex layer, as it is easily torn at the junction of the Y. It is easier to use a magnetic screwdriver.

**Left Side Plate and Platen**

See 14-4.

1. Put the left side plate face down on the bench.

2. Fit shaft 42 and attach screw and spring adapter 22b.

3. Locate the left platen spacer onto the left side plate.

4. Position the washer 31 over the hole in the platen bearing. It is essential that the correct washer is used (0.15 mm thick, 8 mm external diameter, hardened).

5. Fit the drive belt 45 on the cog on the right end of the platen and locate the pin of the platen in the hole in the pressed bearing. Make sure the drive belt goes through the two slots in the right hand platen spacer.

6. Hold the platen in position, and slide the black extrusion 28 into place.

7. Turn the assembly over, holding the components together, and fit screws 26 and 27 to secure the side plate to the extrusion.

8. Slide the shaft 42 into the base plate.

9. Fit the right platen spacer 30, making sure washer 31 is in place between the end of the platen and the side plate. It is essential that the correct washer is used (0.15 mm thick, 8 mm external diameter, hardened).

10. Slide washer 24 onto the end of the shaft 42. It is essential that the correct washer is used (0.2 mm thick, 12 mm external diameter, hardened).

11. Put washer 23 on the free end of the platen drive shaft.
12. Fit the right side plate making sure the washer 24 is correctly seated.

13. Fit screw and spring adapter 22a and screws 20 and 21 to secure the right side plate.

14. Check the assemblies pivot freely. If they don’t, washer 24 is probably not seated correctly.

15. Attach rubber stop and screw 36.
Motor

It is important that the motor is correctly positioned. The drive cog should be fully visible through the cut-out in the plate as shown in the following figure, with the cables out towards the bottom (narrowest end) of the panel.

See 14-3.

1. Locate the motor 37 on the left side plate, making sure the idler cog is visible through the cut-out.
2. Attach screw 33, and screw and washer 34.
3. Adjust the belt tension and tighten the motor retaining screws.

Thermal Line Assembly

See 14-2.

1. Attach the flex layer and optical sensor assembly 10a to the TLP assembly using screw and washer 9. It is easier to use a magnetic screwdriver. If you are using a new flex layer, it should be folded at its junction with the PCB holding the optical device to make it easier to insert, as shown below:

The following figure shows the location of the sensor in the TLP assembly:
2. Fix the TLP brackets 12 using the screws and washers 11.

3. Fit the TLP Head 13 and the ESD shield 8, and attach with the screws 7 (front of assembly). The thermal line unit must be pushed to the right and to the rear before the screws are tightened.

4. Attach the two screws and earthing straps 6 (rear of assembly).

5. Slide the assembly onto the pins at the rear of the base plate. The assembly must be rotated slightly to get the right bracket over its pin.
**Paper Box**

1. Position the paper eject lever so that the hole locates over the mounting pin (the lever will protrude from the paper box at 90 degrees to it.
2. Rotate the lever clockwise through 90 degrees, lifting the free end slightly to get it over the lip on the paper box. Make sure the end of the lever, A in the figure, is correctly positioned.

![peglever.tif](peglever.tif)

**Final Stages**

1. Attach the flex layer 10b to the base plate with screw and washer 5, if you have not already done so. Be careful of the flex layer, as it is easily torn at the junction of the Y.
2. Slide the paper box onto the slides on the base plate. Be careful of the eject lever when fitting the tray.
3. Pivot the paper drive and feed assembly upwards.
4. Attach the paper box links 14.
5. Pivot the thermal line assembly upwards.
6. Attach the TLP retaining springs 3 and 4 (springs TLPK). Make sure the body of the spring fits inside the cut out. If the springs are not mounted correctly, the paper table will rub against them.

![pegsprng.tif](pegsprng.tif)

7. Fit the paper table pins into the holes in the bearing casings on the side plates.
8. Fit washer 1 over the pillar on the side panel, and fit the end of the paper table spring 2 over the pillar. Attach screw 1.
Recorder Settings

When you have re-assembled the recorder and installed it into the monitor, it may be necessary to adjust the recorder print offset and/or the recorder thermal head for trace density.

Before doing this, it is recommended that you first connect one of the transducers and perform a Parameter Test (see “Parameter Test” on page 118). This will enable you to check the offset of the printed test trace and the density of the print as described in “Quick Test” on page 119.
The figure id numbers refer to the callouts in 14-2, 14-4 and 14-5. Screws and washers which go together are listed together.

### Table 14-1 Replaceable Parts

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Size</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thermal Line Printer Assembly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ESD shield / TLP cover</td>
<td>M 3 x 8</td>
<td>M 1350-04151</td>
<td>1</td>
</tr>
<tr>
<td>6, 7</td>
<td>ESD cover screws</td>
<td>M 3 x 8</td>
<td>0515-0897</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>TLP head</td>
<td></td>
<td>1810-1421</td>
<td>1</td>
</tr>
<tr>
<td>13a</td>
<td>TLP body</td>
<td></td>
<td>M 1350-67751</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>TLP arm</td>
<td></td>
<td>M 1350-45051</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Arm screw</td>
<td>M 3 x 12</td>
<td>0515-1110</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>Arm washer</td>
<td></td>
<td>3050-0891</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Springs TLPH</td>
<td></td>
<td>M 1350-29151</td>
<td>2</td>
</tr>
<tr>
<td><strong>Front Assembly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Left side plate</td>
<td></td>
<td>M 1350-64151</td>
<td>1</td>
</tr>
<tr>
<td>25</td>
<td>Right side plate</td>
<td></td>
<td>M 1350-64152</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>Paper de-fold center</td>
<td></td>
<td>M 1350-23252</td>
<td>1</td>
</tr>
<tr>
<td>20, 21, 26, 27</td>
<td>Side plate screws</td>
<td>M 3 x 12</td>
<td>0515-1110</td>
<td>4</td>
</tr>
<tr>
<td>22a, 22b</td>
<td>Spring adapter screw</td>
<td>M 3 x 10 c/sunk</td>
<td>0515-1005</td>
<td>2</td>
</tr>
<tr>
<td>22a, 22b</td>
<td>Spring adapter</td>
<td></td>
<td>M 1350-23253</td>
<td>2</td>
</tr>
<tr>
<td>23, 31</td>
<td>Platen bearing washer</td>
<td></td>
<td>M 1350-28851</td>
<td>2</td>
</tr>
<tr>
<td>24, 24a</td>
<td>Shaft bearing washer</td>
<td></td>
<td>M 1350-28852</td>
<td>2</td>
</tr>
<tr>
<td>30</td>
<td>Right platen spacer</td>
<td></td>
<td>M 1350-44752</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Left platen spacer</td>
<td></td>
<td>M 1350-44751</td>
<td>1</td>
</tr>
<tr>
<td>29</td>
<td>Platen</td>
<td></td>
<td>1530-2223</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Drive belt</td>
<td></td>
<td>1500-0822</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 14-1 Replaceable Parts

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Size</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>Motor</td>
<td></td>
<td>3140-0847</td>
<td>1</td>
</tr>
<tr>
<td>34, 33</td>
<td>Motor screw</td>
<td>M 3 x 6</td>
<td>0515-0886</td>
<td>2</td>
</tr>
<tr>
<td>34</td>
<td>Motor washer</td>
<td></td>
<td>3050-0891</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Base Plate Assembly

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Size</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>43</td>
<td>Base plate assembly</td>
<td></td>
<td>M 1350-67752</td>
<td>1</td>
</tr>
<tr>
<td>43</td>
<td>Base plate screws</td>
<td>M 3 x 16</td>
<td>0515-1111</td>
<td>3</td>
</tr>
<tr>
<td>43</td>
<td>O-ring</td>
<td></td>
<td>0900-0010</td>
<td>3</td>
</tr>
<tr>
<td>39</td>
<td>Left eject lever</td>
<td></td>
<td>M 1350-45052</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>Left eject lever screw</td>
<td>M 3 x 4</td>
<td>0515-1508</td>
<td>1</td>
</tr>
<tr>
<td>38</td>
<td>Left eject lever washer</td>
<td></td>
<td>3050-0891</td>
<td>1</td>
</tr>
<tr>
<td>41</td>
<td>Right eject lever</td>
<td></td>
<td>M 1350-45053</td>
<td>1</td>
</tr>
<tr>
<td>16</td>
<td>Eject lever spring</td>
<td></td>
<td>1460-2260</td>
<td>1</td>
</tr>
<tr>
<td>40</td>
<td>Eject distance rod</td>
<td></td>
<td>M 1350-23752</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>Eject key adapter</td>
<td></td>
<td>M 1350-43251</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>P-clip</td>
<td></td>
<td>1400-0624</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>P-clip screw</td>
<td>M 3 x 6</td>
<td>0515-0886</td>
<td>1</td>
</tr>
<tr>
<td>17</td>
<td>P-clip washer</td>
<td></td>
<td>3050-0891</td>
<td>1</td>
</tr>
</tbody>
</table>

#### Paper Tray

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Paper tray</td>
<td>M 1350-65551</td>
<td>1</td>
</tr>
<tr>
<td>44</td>
<td>Paper eject lever</td>
<td>M 1350-45055</td>
<td>1</td>
</tr>
<tr>
<td>14</td>
<td>Paper box lever</td>
<td>M 1350-45054</td>
<td>2</td>
</tr>
</tbody>
</table>

#### Paper Table

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Paper table</td>
<td>M 1350-07752</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Right paper table guide</td>
<td>M 1350-43157</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Left paper table guide</td>
<td>M 1350-43156</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Paper table spring</td>
<td>M 1350-29152</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Spring screw - table end</td>
<td>M 3 x 4</td>
<td>0515-1508</td>
</tr>
<tr>
<td></td>
<td>Washer</td>
<td>3050-0681</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 14-1 Replaceable Parts

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Size</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>Tube-Flex</td>
<td></td>
<td>0890-1767</td>
<td>2</td>
</tr>
<tr>
<td>36</td>
<td>Screw-Shldr</td>
<td></td>
<td>0515-2524</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Spring screw - side plate</td>
<td>M 3 x 4</td>
<td>0515-1508</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Washer</td>
<td></td>
<td>3050-0681</td>
<td>1</td>
</tr>
</tbody>
</table>

**Flex Layer**

<table>
<thead>
<tr>
<th>Figure ID</th>
<th>Description</th>
<th>Size</th>
<th>Philips part number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10a, 10b</td>
<td>Flex layer</td>
<td></td>
<td>M 1350-46551</td>
<td>1</td>
</tr>
<tr>
<td>5, 9</td>
<td>Screw</td>
<td>M 2 x 4</td>
<td>0515-0977</td>
<td>2</td>
</tr>
<tr>
<td>5, 9</td>
<td>Washer</td>
<td></td>
<td>3050-1283</td>
<td>2</td>
</tr>
</tbody>
</table>

Paper take-up tray (not shown)  
M 1350-00452
Introduction

This section deals with troubleshooting, specifications, dismantling and assembly and parts listing of the transducers used on the monitor.

- The Blue transducers can only be immersed in water while monitoring when they are used with the HP Series 50 T Telemetry System. The telemetry transmitter must NEVER be immersed in water.
- The blue ultrasound and Toco transducers are protected against the effects of continuous immersion in water according to IEC 529 IP 68.

Warning

NEVER immerse any transducer in water when it is connected to the Fetal Monitor.

Ultrasound Transducer (M1356A)

Description

The M1356A Ultrasound Transducer detects fetal heart movements by directing a low-energy pulsed Doppler ultrasound beam towards the fetal heart. The transducer contains seven crystals which transmit the ultrasound signal and receive the reflected signal from the fetal heart. The
frequency shift caused by fetal heart movement is converted into an electrical signal from which the fetal heart rate is derived. **Blue** Ultrasound transducers are sealed units and are **NOT** repairable.

**Specifications**

**System:** Pulsed Doppler

**Oscillator Frequency:** 998.4 kHz

**Ultrasound Intensity:** < 1.5mW/cm²

**Dimensions:** 75mm diameter, 21.5mm depth

**Transducer weight with Cable:** 185 grams

**Cable Length:** 2.5m/8ft 2in

**Watertight:** to a depth of 0.5m

**Temperature Storage Range:** -40°C to +60°C

---

**Caution**

Using ultrasound gel that is not approved by Philips may reduce signal quality and may damage the transducer. This type of damage will not be covered by warranty.

---

**Troubleshooting**

Ultrasound transducer tests and troubleshooting are described in "Ultrasound Transducer" on page 128.
**Toco Transducer (M1355A)**

![Toco Transducer Image](psm10sca.tif)

**Figure 15-2  Toco Transducer**

**Description**
The M 1355A Toco Transducer detects relative measurement of uterine activity. **Blue** Toco transducers are sealed units and are **NOT** repairable.

**Specifications**

- **System:** Passive Strain Gauge
- **Sensitivity:** 0 to 12N / overload protected
- **Dimensions:** 75mm diameter, 25mm depth
- **Transducer Weight with Cable:** 180 gram
- **Cable Length:** 2.5m / 8ft 2in
- **Watertight:** to a depth of 0.5m
- **Temperature Storage Range:** -40°C to +60°C

**Troubleshooting**

See "T O C O Transducer" on page 130 for a description of the functional tests which can be carried out with a Toco transducer.
DECG Transducer (M1357A)

Figure 15-3 DECG Transducer

**Description**

The M1357A Direct ECG Transducer has two spring loaded clamp type connectors for connection to the 15133D (EU) or 15133E (USA) spiral scalp electrodes.

**Specifications**

- **Input Impedance:** >10M Ω
- **CMRR:** with patient cable, 51.5kΩ/0.047μF imbalance at line frequency >110dB
- **Noise:** (referred to input with 25kΩ) <4μVp
- **Contact Potential Difference:** ±500mV
- **Input Voltage Range:** 20μVp to 3mVp
- **Patient Leakage Current:** 120V at 60Hz, 10μA rms
- **Patient Auxiliary Current:** <0.1μA (dc)
- **Dielectric Strength:** 1500V rms spark gap protected
- **Transducer Weight with Cable:** 185 grams
- **Cable Length:** 2.5m/8ft 2in
Parts List

Table 15-1 Cable Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>Brown</td>
</tr>
<tr>
<td>1+6</td>
<td>Bridged by Code Resistor 4.53 kΩ 0698-4443</td>
</tr>
<tr>
<td>1</td>
<td>Shield</td>
</tr>
</tbody>
</table>

Table 15-2 DECG Transducer Parts List

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete Transducer</td>
<td>M 1357-60001</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Connector (Rose)</td>
<td>1252-4830</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Cable Boot</td>
<td>08030-41701</td>
<td>1</td>
</tr>
</tbody>
</table>

Troubleshooting

The functional checks that can be carried out on the M 1357A DECG Transducer are those outlined in Chapter 10, "Safety, Maintenance, and Calibration."
MECG Transducer (M1359A)

Description

The M1359A MECG Transducer has two press fit type connectors that allow connection of two electrode cables from the maternal ECG electrodes.

Specifications

- **Input Impedance:** > 10M Ω
- **CMRR:** with patient cable, 51.5kΩ/0.047μF imbalance at line frequency > 90dB
- **Noise:** (referred to input with 25kΩ) < 4μVp
- **Contact Potential Difference:** ±500mV
- **Input Voltage Range:** 80μVp to 4mVp
- **Patient Leakage Current:** 120V at 60Hz, 10μA rms
- **Patient Auxiliary Current:** < 0.1μA (dc)
- **Dielectric strength:** 1500Vrms spark gap protected
- **Transducer Weight with Cable:** 175 grams
- **Cable Length:** 2.5m/8ft 2in

Figure 15-4  MECG Transducer
Transducers and Patient Modules

Troubleshooting

The only functional checks that can be carried out on the M 1359A M ECG Transducer are those outlined in Chapter 10, “Safety, Maintenance, and Calibration.”

Table 15-3 Cable Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>Brown</td>
</tr>
<tr>
<td>1+6</td>
<td>Bridged by Code Resistor 12.4 kΩ 0698-3519</td>
</tr>
<tr>
<td>1</td>
<td>Shield</td>
</tr>
</tbody>
</table>

Table 15-4 MECG Transducer Parts List

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Complete Transducer</td>
<td>M 1359-60001</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Electrode Cable (not shown)</td>
<td>M 1531B</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>Patient Electrode (not shown)</td>
<td>40493D</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>Connector (Rose)</td>
<td>1252-4830</td>
<td>1</td>
</tr>
<tr>
<td>-</td>
<td>Cable Boot</td>
<td>08030-41701</td>
<td>1</td>
</tr>
</tbody>
</table>
US/MECG Combi Transducer (M1358A)

Description
The M1358A US/MECG Combi Transducer gives the end user the possibility to monitor both the FHR and MHR using one transducer. The Ultrasound transducer operates in exactly the same way as the standard Ultrasound transducer. The MECG transducer has two press fit type connectors that allow connection of two electrode cables (M1531B) from the maternal ECG electrodes (40493D).

Caution
Using ultrasound gel that is not approved by Philips may reduce signal quality and may damage the transducer. This type of damage will not be covered by warranty.
### Specifications

**Ultrasound Transducer**
- **System:** Pulsed Doppler
- **Oscillator Frequency:** 998.4 kHz
- **Ultrasound Intensity:** < 1.5mW/cm²
- **Dimensions:** 75mm diameter, 21.5mm depth
- **Transducer weight with Cable:** 185 grams
- **Cable Length:** 2.5m/8.2ft
- **Temperature Storage Range:** -40°C to +60°C
- **Watertight:** to a depth of 0.5m

**MECG Transducer**
- **Input Impedance:** > 10M Ω
- **CMRR:** with patient cable, 51.5kΩ/0.047μF imbalance at line frequency > 90dB
- **Noise:** (referred to input with 25kΩ) < 4µVp
- **Contact Potential Difference:** ±500mV
- **Input Voltage Range:** 80µVp to 4mVp
- **Patient Leakage Current:** 120V at 60Hz, 10µA rms
- **Patient Auxiliary Current:** < 0.1µA (dc)
- **Dielectric strength:** 1500Vrms spark gap protected
- **Dimensions**
- **Transducer Weight with Cable:** 175 grams
- **Cable Length:** 2.5m/8ft 2in
Parts List

Table 15-5 US/MECG Transducer: Cable Connections

<table>
<thead>
<tr>
<th>Pin</th>
<th>Cable Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Brown</td>
</tr>
<tr>
<td>8</td>
<td>Red</td>
</tr>
<tr>
<td>5</td>
<td>Green</td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
</tr>
<tr>
<td>6</td>
<td>Red</td>
</tr>
<tr>
<td>1+6</td>
<td>Bridged by Code Resistor 665Ω 0698-3511</td>
</tr>
<tr>
<td>1</td>
<td>Shield</td>
</tr>
</tbody>
</table>

Table 15-6 US/MECG Combi Transducer Parts List

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Combi Transducer (US)</td>
<td>M 1358-60001</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Combi Transducer (MECG)</td>
<td>M 1358-60002</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Combi Cable Assy (US)</td>
<td>M 1358-61681</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Connector</td>
<td>1252-4830</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Cable Boot</td>
<td>08030-41701</td>
<td>1</td>
</tr>
</tbody>
</table>

Troubleshooting

Troubleshooting for the US/MECG Combi Transducer is the same as described for the Ultrasound Transducer and the MECG Transducer.
IUP Pressure Transducer (CPJ840J5)

**Description**  IUP pressure transducer, supplied with transducer holder CPJ84046. Use with sterile disposable domes CPJ84022.

- **Pressure range:** -20 to +300 mm Hg
- **Max. overpressure:** 10,000 mm Hg
- **Sensitivity:** 5 µV/V/mm Hg
- **Resonance frequency:** 300 Hz typical (transducer and dome)
- **Max. electrical excitation:** 15 V DC or AC
- **Bridge resistance:** 1000 Ohms (input and output)
- **Non-linearity and hysteresis:** max. 0.5% of full scale
- **Zero balance:** max. 0.15 mm Hg/°C
- **Operating temperature range:** +10 to +50°C
- **Storage temperature range:** -20 to +70°C
- **Isolation resistance:** min. 1000 M Ohms
- **Leakage current:** max. 1.5 µA at 250V, 50 Hz
- **Weight:** 24 grams (without cable)
- **Connector:** Equipment specified
- **Immersion:** See the User Documentation that is supplied with the transducer.
- **Cleaning:** See the User Documentation that is supplied with the transducer.
- **Sterilization:** See the User Documentation that is supplied with the transducer.
- **Mounting:** Wrist strap provided for mounting on patient arm; transducer holder available as accessory for IV pole mounting.
Patient Modules (M1364A and M1365A)

Description
Both patient modules have a 7-pin ECG connector into which you can plug either D E C G cable (M 1362A) or M E C G cable (M 1363A). The F S p O₂ combined patient module also has a 9-pin connector for the fetal oxygen sensor.

Specifications

<table>
<thead>
<tr>
<th>M1364A Patient Module</th>
<th>Overall length: 2706mm (+30, -100mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of free cable: 2618mm (+30, -100mm)</td>
</tr>
<tr>
<td></td>
<td>Weight: 120 grams</td>
</tr>
<tr>
<td></td>
<td>Size: 88x42x30mm</td>
</tr>
<tr>
<td>Red Socket: D E C G or M E C G connection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M1365A Patient Module</th>
<th>Overall length: 2706mm (+30, -100mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length of free cable: 2618mm (+30, -100mm)</td>
</tr>
<tr>
<td></td>
<td>Weight: 145 grams</td>
</tr>
<tr>
<td></td>
<td>Size: 88x42x30mm</td>
</tr>
<tr>
<td>Blue Socket: F S p O₂ connection</td>
<td></td>
</tr>
<tr>
<td>Red Socket: D E C G or M E C G connection</td>
<td></td>
</tr>
</tbody>
</table>
DECG Cable (M1362A)  For red connector on M1365A and M1364A patient modules

Cable weight: 22 grams
Cable Length: 666 +/- 30mm

MECG Cable (M1363A)  For red connector on M1365A and M1364A patient modules

Cable weight: 16 grams
Cable Length: 606mm +/- 30mm

M1364A/M1365A With DECG Cable M1362A

Patient Leakage Current: 120V at 60Hz, 10μA rms
Patient Auxiliary Current: < 0.1μA (dc)
Dielectric strength: 1500V rms spark gap protected
Input Impedance: > 10M Ω
CMRR: with patient cable, 51.5kΩ/0.047μF imbalance at line frequency > 110dB
Noise: (referred to input with 25kΩ) < 4μVp
Contact Potential Difference: ±500mV
Input Voltage Range: 20μVp to 3mVp
M1364A/M1365A With MECG Cable M1363A

**Patient Leakage Current:** 120V at 60Hz, 10µA rms

**Patient Auxiliary Current:** <0.1µA (dc)

**Dielectric strength:** 1500V rms spark gap protected

**Input Impedance:** >10MΩ

**CMRR:** with patient cable, 51.5kΩ/0.047µF imbalance at line frequency >80dB

**Noise:** (referred to input with 25kΩ) <4µVp

**Contact Potential Difference:** ±500mV

**Input Voltage Range:** 80µVp to 4mVp

### Parts List

**Table 15-7 Parts List**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Exchange Part Number</th>
<th>Part Number</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Combined Patient Module</td>
<td>M 1365-69001</td>
<td>M 1365-60001</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>ECG-only Patient Module</td>
<td>M 1364-69001</td>
<td>M 1364-60001</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>DECG Cable</td>
<td>M 1362A</td>
<td>M 1362A</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>MECG Cable</td>
<td>M 1363A</td>
<td>M 1363A</td>
<td>1</td>
</tr>
</tbody>
</table>

### Troubleshooting

The only functional checks that can be carried out on the patient modules and cables are those outlined in Chapter 10, “Safety, Maintenance, and Calibration.”
D

Safety

Introduction

This appendix gives you safety information for patient, user and monitor.

General Safety Information

**Equipotential Terminal**

This symbol is used to identify terminals that are connected together, bringing various equipment or parts of a system to the same potential. This is not necessarily earth potential. (The value of potentials of earth may be indicated adjacent to the symbol.)

**Protective Earth Terminal**

This symbol identifies the terminal for connection to an external protective earth.

Battery Symbol

2 x 1.5 V

This symbol identifies the battery holder containing two 1.5 V batteries. For further information see Appendix B.

Electrical Safety

The monitor should only be used by, or under the direct supervision of, a licensed physician or other health care practitioner who is trained in the use of fetal and maternal heart rate monitors and in the interpretation of fetal and maternal heart rate traces. U S law restricts this device to sale by, or on the order of, a physician. The monitor is designed to fulfil safety requirements according to IEC 601-1/EN 60601-1 (Class I), UL 2601-1, CSA-C22.2 No 601.1-M 90.
It complies with the essential requirements of the Medical Device Directive 93/42/EEC. The monitor is classed:

**ORDINARY EQUIPMENT** - Enclosed equipment protected against ingress of water.

**CONTINUOUS OPERATION** - Can be operated continuously.

The Philips Series 50 XMO and the Philips Series 50 XM are not “ECG-Monitors”, are not defibrillator-protected, and are not designed for direct cardiac application.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Equipment Type</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Toco transducer (M 1355A)</td>
<td>CF</td>
<td>Patient Connector is electrically isolated. Connecting the transducer to the Toco channel results in CF condition.</td>
</tr>
<tr>
<td>IUP quartz transducer (1290C)</td>
<td>B</td>
<td>Patient Connector is electrically isolated. Connecting the transducer to the Toco channel results in CF condition.</td>
</tr>
<tr>
<td>IUP pressure transducer (CPJ040J5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ultrasound transducer (M 1356A)</td>
<td>B</td>
<td>Connecting the transducer to a Cardio channel results in a B condition.</td>
</tr>
<tr>
<td>DECG transducer (M 1357A) and M ECG transducer (M 1359A)</td>
<td>CF</td>
<td>Connecting the transducers to a Cardio channel results in a CF condition.</td>
</tr>
<tr>
<td>US/M ECG combi transducer (M 1358A)</td>
<td>B</td>
<td>Connecting the transducer to a Cardio channel results in a B condition.</td>
</tr>
<tr>
<td>SpO2 transducer (M 1191A) adapter cable (M 1940A)</td>
<td>CF</td>
<td>Connecting the transducers to a Cardio channel results in a CF condition.</td>
</tr>
<tr>
<td>NIPB cuffs (M 1574A and M 1575A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interconnect tubing (M 1599A)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FSpO\textsubscript{2}/ECG patient module (M 1365A)</td>
<td>CF</td>
<td>Connecting the transducers to a Cardio channel results in a CF condition.</td>
</tr>
<tr>
<td>ECG only patient module (M 1364A)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ESU, MRI and Defibrillation**

Remove all transducers, patient modules, sensors and accessories before performing electrical surgery, defibrillation, MRI and so forth. High frequency current can flow through the equipment and burn the skin.
Leakage Current

Leakage current can be hazardous to the patient. Leakage current can increase if:

- the monitor is connected directly to other equipment, such as an additional patient monitor.
- a second monitor is applied directly to the mother.

Maximum Input/Output Voltages

The following diagram shows the sockets for peripheral devices.

1. Mains Socket.
2. Equipotential Grounding Point.
   To use the monitor with other equipment in an operating room environment, connect the equipotential grounding point (2) to earth potential. Use the grounding cable supplied with the monitor.
3. +5V input socket for the HBSW 8200 Barcode Reader.
4. Socket for the HP M 1310A Series 50 T Fetal Telemetry System. +5V input except for:
   - Pins 1, 14, 15 and 16: ±12V input
   - Pin 2: -12V output
   - Pin 3: +5V output
   - Pin 4: ±12V output
5. RS232 Digital System Interface:
   - Pin 2: ±12V input
   - Pin 3: ±12V output
6. Socket for one of the following:
   - Philips 80225A or 80235A/B Obstetrical Information Management System (OBMS).
   - Philips M 1370A Obstetrical Display Information System (ODIS).
   - ±12V except for Pins 17, 18 and 22 which are +5V input.

7. Socket (9-pin) for an external device:
   Pin 3 ±12V

8. Socket (25-pin) for an external device:
   Pin 2 ±12V
   Pins 9 and 10 +5 Volt

---

**Service Socket**

The Service Engineer can connect a compatible laptop, Palmtop or PC to this socket (1) to carry out extended configuration and service functions.

---

Maximum voltage of ±12V.

---

**Protective Earth**

To protect hospital personnel and the patient, the monitor's casing must be grounded. Accordingly, the monitor has a 3-wire power cable that grounds it to the power line ground when plugged into an appropriate 3-wire receptacle. Do not use a 3-wire to 2-wire adapter with the monitor. Any interruption of the protective earth grounding will cause a potential shock hazard that could result in serious personal injury.
Whenever it is likely that the protection has been impaired, the monitor must be made inoperative and be secured against any unintended operation.

**Caution**

Check each time before use that the monitor is in perfect working order and properly grounded.

Position the patient cable so that it does not come into contact with any other electrical equipment. The cable connecting the patient to the monitor must be free of electrolyte.

Make sure that during operation, the monitor is free from condensation. This can form when equipment is moved from one building to another, and is exposed to moisture and differences in temperature.

**Warning**

Possible explosion hazard if used in the presence of flammable anaesthetics.

---

**Environment**

Use the monitor in an environment that is reasonably free from vibration, dust, corrosive or explosive gases, flammable agents, extremes of temperature, humidity and so forth. It operates within specifications at ambient temperatures between 0 and 55°C. Ambient temperatures that exceed these limits can affect the accuracy of the monitor and cause damage to the components and circuits. Only products that fulfill the necessary safety and electrical standards should be used in conjunction with the monitor (contact your local response center for details).

Allow at least 5cm (2in) clearance around the monitor for proper air circulation. If the monitor is mounted in a cabinet, allow sufficient space at the front for operation and at the rear for servicing with the cabinet door open.

---

**Spillage**

When the maternal display is in a tilted position, take additional care to prevent spillage of liquid. If liquid enters the monitor through the maternal display recess, you must cease using the monitor immediately. Contact an authorized engineer for a safety inspection.
Electromagnetic Compatibility

The electromagnetic compatibility (EMC) validation includes testing performed according to the international standard for EMC with medical devices. See the manufacturer's Declaration for details.

EMC Testing

During the test program the monitor was subjected to international standard and Philips proprietary EMC tests. During most of the testing no anomalies were observed. Some reduced performance was observed with the IEC 801-3 Radiated Immunity and IEC 801-4 Fast Transient/Bursts Immunity tests.

IEC 801-3 specifies that the product must be subjected to a field of 3V/m over a frequency range of 26 to 1000 MHz with no degradation of performance. At many of the test frequencies over the specified range no anomalies were observed. However, increased jitter of SpO$_2$ values and DECG derived fetal heart rate values was observed at a number of test points. For these test points the radiated field was reduced to the level at which the trace returned to normal. These reduced levels are shown in the table below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sensor</th>
<th>Frequency Range</th>
<th>Immunity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECG</td>
<td>M 1357A</td>
<td>60 MHz to 68 MHz</td>
<td>2.5 V/m</td>
</tr>
<tr>
<td>IUP</td>
<td>1290C</td>
<td>26 MHz to 1000 MHz</td>
<td>≤0.7 V/m</td>
</tr>
<tr>
<td>SpO$_2$</td>
<td>M 1191A</td>
<td>52 MHz to 70 MHz</td>
<td>2.3 V/m</td>
</tr>
<tr>
<td></td>
<td>M 1192A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 1194A</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IEC 801-4 specified that the product is subjected to high speed pulses up to 1000 V applied to the power cord and all I/O cables. During and after most of the test pulses, no anomalies were observed. However, in rare cases the ultrasound channel had been triggered.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sensor</th>
<th>Burst Immunity Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrasound</td>
<td>M 1356A</td>
<td>600 V</td>
</tr>
<tr>
<td></td>
<td>M 1358A</td>
<td></td>
</tr>
<tr>
<td>SpO$_2$ with adapter cable M 1940A</td>
<td>M 1191A</td>
<td>≤ 200 V</td>
</tr>
<tr>
<td></td>
<td>M 1192A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M 1194A</td>
<td></td>
</tr>
</tbody>
</table>
System Characteristics

The phenomena discussed above are not unique to the monitor but are characteristic of patient monitors in use today. This performance is due to very sensitive high gain front end amplifiers used to process the physiological signals from the patient. Among the many similarly performing monitors already in use by customers, interference from electromagnetic sources is rarely a problem.

Avoiding Interference

When electromagnetic interference (EMI) is encountered there are a number of things that can be done to mitigate the problem.

1. Eliminate the source. Possible sources of EMI can be turned off or moved away to reduce their strength.

2. Attenuate the coupling. If the coupling path is through the patient cables the interference may be reduced by moving and/or rearranging the cables to a different location of the monitor. If the coupling path is through the power cord, plugging the monitor into a different mains circuit may help.

3. Connect the equipotential terminal of the monitor to the corresponding terminal of your mains installation.

4. Add external attenuators. If EMI becomes an unusually difficult problem, external devices such as an isolation transformer or a transient suppressor may help. A Philips customer engineer can assist you in determining the need for external devices.
Manufacturer’s Responsibility

Philips only considers itself responsible for any effects on safety, reliability and performance of the equipment if:

- assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by Philips, and
- the electrical installation of the relevant room complies with national standards
- and the instrument is used in accordance with the instructions for use.

Manufacturers of Interfacing Monitors

This book refers to monitors made by manufacturers other than Philips. These are:

- Dinamap monitors are products of Critikon Incorporated.
- Press-Mate monitors are products of COLIN Corporation.
- Datascope monitors are products of Datascope Corporation.
- NELCOR monitors are products of Tyco Healthcare.

Warranty

Philips hardware products are warranted against defects in materials and workmanship. If Philips receives notice of such defects during the warranty period, Philips shall, at its option, either repair or replace hardware products which prove to be defective. Some newly manufactured products may contain selected remanufactured parts equivalent to new in performance.

Philips software and firmware products which are designated by Philips for use with a hardware product, when properly installed on that hardware product, are warranted not to fail to execute their programming instructions due to defects in materials and workmanship. If Philips receives notice of such defects during the warranty period, Philips shall repair or replace software media and firmware which do not execute their programming instructions due to such defects. Philips does not warrant that the operation of the software, firmware or hardware shall be uninterrupted or error free.

If Philips is unable, within a reasonable time, to repair or replace any product to a condition as warranted, Customer shall be entitled to a refund of the purchase price upon return of the product to Philips.

1. Duration and Commencement of Warranty Period
The warranty period for each product is one year, depending upon the warranty classification code of the product at time of order. The applicable warranty code shall be specified on the Philips Price List. The warranty period begins either on the date of delivery or, where the purchase price includes installation by Philips, on the date of installation. If Customer schedules or delays installation more than thirty (30) days after delivery, the warranty period begins on the thirty-first (31st) day from the date of delivery.

2. Place of Performance

Within Philips service travel areas, warranty and installation services, for products installed by Philips and certain other products designated by Philips will be performed at Customer's facility at no charge. Outside Philips service travel areas, warranty and installation services will be performed at Customer's facility only upon Philips' prior agreement and Customer shall pay Philips's round trip travel expenses and applicable additional expenses for such services.

On-site warranty services are provided only at the initial installation point. If products eligible for on-site warranty and installation services are moved from the initial installation point, the warranty will remain in effect only if Customer purchases additional inspection or installation services at the new site.

For product warranties requiring return to Philips, products must be returned to a service facility designated by Philips. Portable products (battery powered) and products purchased under Philips's international prices can be returned to the closest authorized Philips repair depot worldwide. All other products with return to Philips warranty must be returned to one of the authorized repair depots within the country of original purchase. Customer shall prepay shipping charges (and shall prepay all duty and taxes) for products returned to Philips for warranty service. Except for products returned to Customer from another country, Philips shall pay for return of products to Customer.

Installation and on-site warranty services outside the country of initial purchase are included in Philips's product price only if Customer pays Philips international prices (defined as destination local currency price or Export price). Service outside the country of initial purchase is subject to the conditions regarding Philips service travel areas and initial installation point described above.

3. Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from:

- Improper or inadequate maintenance by Customer;
- Customer-supplied software or interfacing;
- Unauthorized modification or misuse;
- Operation outside of the environmental specifications for the product; or
- Improper site preparation and maintenance.

TO THE EXTENT ALLOWED BY LOCAL LAW, THE WARRANTY SET FORTH ABOVE IS EXCLUSIVE AND NO OTHER WARRANTY, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND PHILIPS SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE

4. Australia and New Zealand Only

For consumer transactions the warranty terms contained in this statement, except to the extent lawfully permitted, do not exclude, restrict or modify and are in addition to the mandatory statutory rights applicable to the sale of this product to you.

**USA Law**

United States federal law restricts this device to sale by or on the order of a physician.
Specifications

The following section gives the manufacturer's specification for the monitor.

Patient Safety

The monitor is designed to comply with:

- IEC 601-1/EN 60601-1
- UL 2601-1
- CSA-C22.2 No 601.1-M 90

None of the ECG modes are electrosurgery proof.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Monitor Input Connector</th>
<th>Resulting Isolation with transducer/patient module</th>
</tr>
</thead>
<tbody>
<tr>
<td>IUP, TO CO, N IBP, SpO2</td>
<td>CF</td>
<td>CF</td>
</tr>
<tr>
<td>US (M 1356A)</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td>DECG (M 1364A)</td>
<td>B</td>
<td>CF</td>
</tr>
<tr>
<td>MECG (M 1365A)</td>
<td>B</td>
<td>CF</td>
</tr>
<tr>
<td>DECG or MECG via M 1364A</td>
<td>B</td>
<td>CF</td>
</tr>
<tr>
<td>FSpO2 and either MECG or DECG via M 1365A</td>
<td>B</td>
<td>CF</td>
</tr>
</tbody>
</table>

Operating and Environmental

<table>
<thead>
<tr>
<th>Power Requirements</th>
<th>Operating Voltage</th>
<th>100 - 120 V (±10%)&lt;br&gt;220 - 240 V (±10%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Frequency</td>
<td>50 to 60 Hz</td>
<td></td>
</tr>
<tr>
<td>Power Consumption</td>
<td>60 VA max</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
<th>Operating Temperature</th>
<th>0°C to +55°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-40°C to +75°C</td>
<td></td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5% to 95%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions and Weight without transducers</th>
<th>Height</th>
<th>147 mm (5.8in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>422mm (16.6in)</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>392mm (15.4in)</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>14.6kg (31.96lb)</td>
<td></td>
</tr>
</tbody>
</table>

1. Transducers can be stored at temperatures of -40°C to +60°C
## Fetal Display

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate Range</td>
<td>US: 50 to 240 bpm</td>
</tr>
<tr>
<td></td>
<td>D E C G: 30 to 240 bpm</td>
</tr>
<tr>
<td></td>
<td>M H R: 30 to 240 bpm (not displayed)</td>
</tr>
<tr>
<td>External Toco Range</td>
<td>0 to +127 relative units</td>
</tr>
<tr>
<td>IUP Range</td>
<td>-99 to +127 mmHg</td>
</tr>
<tr>
<td>Fetal SpO2 Range</td>
<td>0 - 99%</td>
</tr>
</tbody>
</table>

## Maternal External Blood Pressure

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure Transducer Accuracy</td>
<td>15°C to 25°C ±3 mmHg</td>
</tr>
<tr>
<td></td>
<td>10°C to 35°C ±3 mmHg (±0.6% of reading)</td>
</tr>
<tr>
<td></td>
<td>0°C to 55°C ±3 mmHg (±1.7% of reading)</td>
</tr>
<tr>
<td>Measurement Ranges</td>
<td>Systolic: 30 to 270 mmHg</td>
</tr>
<tr>
<td></td>
<td>Diastolic: 10 to 245 mmHg</td>
</tr>
<tr>
<td>Cuff Inflation Time</td>
<td>Typically less than 10 seconds</td>
</tr>
<tr>
<td>Auto Mode Repetition Time</td>
<td>2, 5, 10, 15, 30, 60 minutes</td>
</tr>
<tr>
<td>Stat Mode Duration</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Cycle Time (Typical at HR over 60 bpm)</td>
<td>Auto/manual: 35 seconds</td>
</tr>
<tr>
<td></td>
<td>Stat: 17 seconds</td>
</tr>
<tr>
<td></td>
<td>Maximum: 120 seconds</td>
</tr>
<tr>
<td>Limit Alarms</td>
<td>Adjustment: 5mmHg g steps</td>
</tr>
<tr>
<td></td>
<td>Diastolic: 10 to 245mmHg</td>
</tr>
<tr>
<td></td>
<td>Systolic: 30 to 270 mmHg</td>
</tr>
<tr>
<td></td>
<td>Overpressure Safety Limit: 300 mmHg for more than 2 seconds or 330mmHg immediately</td>
</tr>
<tr>
<td>Pulse Rate Range</td>
<td>Measurable within heart rate range of 30 to 240 bpm, averaged during NIBP measurement.</td>
</tr>
</tbody>
</table>
### Maternal Pulse Oximetry

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage Range</td>
<td>0 to 100%</td>
</tr>
<tr>
<td>BPM Range</td>
<td>30 to 300 bpm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1%</td>
</tr>
<tr>
<td>Resolution</td>
<td>1 bpm</td>
</tr>
</tbody>
</table>

#### Pulse Rate Limit Alarms

<table>
<thead>
<tr>
<th>Range</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>70% - 90%</td>
<td>1% steps</td>
</tr>
</tbody>
</table>

#### Accuracy at 1 standard deviation

<table>
<thead>
<tr>
<th>Model</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>M 1191A</td>
<td>70 to 99%</td>
<td>±2.5%</td>
</tr>
<tr>
<td>M 1192A</td>
<td>70 to 99%</td>
<td>±2.5%</td>
</tr>
<tr>
<td>M 1194A</td>
<td>70 to 99%</td>
<td>±4%</td>
</tr>
<tr>
<td>Nellcor sensors</td>
<td>80 to 99%</td>
<td>±3%</td>
</tr>
</tbody>
</table>

### Maternal ECG and Heart Rate

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart rate Measurement</td>
<td>Range 30 to 240 bpm</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±1 bpm</td>
</tr>
<tr>
<td>Resolution</td>
<td>Recorder: 0.25 bpm Display: 1 bpm</td>
</tr>
</tbody>
</table>

#### Heart rate Alarm Limits (excluding NIBP)

<table>
<thead>
<tr>
<th>Range</th>
<th>Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 to 250 bpm</td>
<td>5 bpm steps</td>
</tr>
</tbody>
</table>
Maternal Display Section

Numerical Display
Two heart rate displays (orange) and one uterine activity display (green).
Type: (10mm) 7 segment LEDs.

Maternal Display
The maternal display shows:
- systolic measurement
- diastolic measurement
- SpO₂ level
- maternal heart rate (if derived from M ECG), pulse rate (if derived from pulse oximetry) or average pulse rate (if derived from NIBP)
- Alarm status for each parameter (except NIBP pulse rate)
- Warning message (if any)

Instrument Displays

Mode Display
Mode display for M ECG and Telemetry (Telemetry mode will be displayed when an 80240A or M 1310 Ultrasound Telemetry System is connected and powered up.)
Two signal quality indicators (cardio channels only): green, yellow and red show signal quality. Acceptance lamps flash with valid heart rate measurement (M 1350B only).

Ultrasound, External and Internal Toco

<table>
<thead>
<tr>
<th>Ultrasound Mode</th>
<th>System</th>
<th>Pulsed Doppler oscillator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>998.4kHz</td>
<td></td>
</tr>
<tr>
<td>Repetition Rate</td>
<td>3.2kHz</td>
<td></td>
</tr>
<tr>
<td>Ultrasound Intensity</td>
<td>1.5mW/cm² average for each of the seven active surfaces (using M 1356A transducer)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External Labor</th>
<th>Signal Range</th>
<th>0 to 100 units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Compensation</td>
<td>±200 units</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intrauterine Pressure</th>
<th>Signal Range</th>
<th>-99 to +127mmHg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Leakage Current</td>
<td>10µA. Displayed pressure unit mmHg</td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Automatically selectable between 40µV/V/mmHg (1290A) and 5µV/V/mmHg (1290C)</td>
<td></td>
</tr>
</tbody>
</table>
Recorder

Recorder mechanism: 5 channel, high resolution (8 dots per mm, 200 dots per inch) thermal array recorder, paper end detection. Paper speeds 1, 2 and 3 cm/min.

Annotation: time of day and date (automatic annotation every 10 minutes), paper sensing mode (annotated with each alteration of parameter).

Paper advance speed: 24 cm/min. Automatic stop at perforation line.

FHR (Cardio)
Scales

<table>
<thead>
<tr>
<th>Vertical Scale Size</th>
<th>Scale A</th>
<th>Scale B</th>
<th>Uterine activity (Toco) scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 cm</td>
<td>8 cm</td>
<td>4 cm</td>
</tr>
<tr>
<td>Vertical Scale Sensitivity</td>
<td>30 bpm/cm</td>
<td>20 bpm/cm</td>
<td>25 units/cm</td>
</tr>
<tr>
<td>Range</td>
<td>30 to 240 bpm</td>
<td>50 to 210 bpm</td>
<td>0 to 100 units</td>
</tr>
</tbody>
</table>

Z-fold paper with numbered pages

Recording times per pack:

- 8h 20min at 3 cm/min
- 12h 30min at 2 cm/min
- 25h at 1 cm/min

Fetal Movement Profile (FMP) recording:

- 2 mm high bars on upper Toco scale

Testing Facilities

Test button: With no front end connections to the instrument a thorough instrument test is performed including a display and recorder test. With the appropriate transducer connected the respective mode can be tested. See Chapter 11, “Troubleshooting.”
Index

A
ACOG technical bulletin, 46
alarm
testing NIBP alarm, 134
Alerting, FHR
enabling and disabling, 44

B
backplane
removing, 174
Barcode Reader (HBCR8200)
connecting, 22
test barcodes, 22
testing, 22
batteries, removing, 175
baudrate settings, 66
board positions, 15
board removing, 173
booting and self test, 96

C
calibrating the NBP function, 133
calibration
NIBP, 133
care and cleaning, 117
cart
internal mounting of the Monitor, 19
mounting options, 19
carts
replacement parts, 21
specifications, 21
cleaning
monitor, 117
CMS connecting to the monitor, 61
configuring the Monitor
using a PC, 33
using pushbuttons, 27
using the service program, 37
connecting
PC to Monitor, 35
conventions, 2
CPU board
functional description, 99
cyclic test
using the service program, 39

D
damage claims, 76
date
changing the format, 46
setting, 45
date and time, setting, 45
DECG
input specifications, 244
parameter test, 159
DECG transducer (M1364A)
cable connections, 220
specification, 220
troubleshooting, 220
defibrillation, 232
DIF board
functional description, 103
removing, 180
digital interface board
removing, 82
Digital System Interface, 58
DIF switches for N-400, N-200, 64
display assembly
removing, 182
replacing, 182
display panel
removing, 83
replacing, 78
display specification, 244
display, quick visual check, 71
dSP II board, a functional
description, 101
dual serial interface
connecting external devices, 61
functional description, 115
setting baudrates, 66

F
Factory information code (FIC), 32
fetal oxygen saturation board, 111
fetal SpO2 parameter test, 162
FHR alerting
enabling and disabling, 44
flowcharts
DECG parameter test, 159
error 500, 141
error 502, 142
error 506, 144
error 507, 145
error 513, 146
error 515, 147
error 516 and 517, 148
error 517, 149
error 526, 150
error 532, 151
error 533, 152
error 534, 153
error 535, 154
error 536, 155
error 601, 157
error 602, 158
error log
clearing, 30
clearing using the service program, 41
printing, 30
reading in the service program, 40
writing in the service program, 41
error messages
operator, 137
service, 140
ESU, 232
external devices
connecting, 62
connecting to Series 50 XM
Monitor, 15
connecting to the Series 50 XM, 61
external maternal parameters, 61
external parameter input functions
telemetry, 54

Index

247
instrument identification, 6
Instrument safety test, 126
IUP
formatting, 33
setting scale, 27
IUP transducer
specifications, 227
testing, 131
L
labelling, 81
LCD display board, error 526
flowchart, 150
leakage current, 233
LED Display board, error 525 and 527
flowchart, 149
loading the service program, 35
M
maintenance, regular, 128
manufacturer’s responsibility, 239
maternal display clip
removing, 182
maternal parameters, external
devices, 61
maternal SpO2 board, 107
maternal SpO2 board, error 534
flowchart, 153
maternal SpO2 parameter test, 161
maximum input/output voltages, 233
measurement priority, 62
MECG parameter test, 159
MECG transducer (M1365A)
cable connections, 223
specifications, 222
mechanical inspection, 128
Metron
contact address, 124
monitor
cart mounting, 19
cleaning, 117
configuring using a PC, 33
configuring using pushbuttons, 27
description, 8
installing, 19
overview, 9
settings, 45
top mounting, 19
mounting, 19
on carts, 21
MRI, 232
N
N-400, N-200 DIP switches, 64
NIBP calibration, 133
NIBP capability
adding, 84
NIBP connector tubing
removing, 185
NIBP monitors, 61
NIBP overpressure test, 134
NIBP parameter test, 163
noninvasive blood pressure
warning messages, 138
Noninvasive Blood Pressure Board
functional description, 109
notes, 2
O
OBMS interface board, a functional
description, 114
operator error messages, 137
ordering parts, 189
overview
of monitor, 9
of service tests, 7
P
paper
feed error 601, 157
incorrect type, error 602, 158
sensing, 165
setting speed and scale, 46
varieties available, 47
parameter test, 7
recorder settings, 213
parts list
Barcode Reader (complete), 22
DECG transducer (M1364A), 220
MECG (M1365A), 223
recorder, replacement parts, 214
replacement parts, 190
US/MECG transducer, 226
Patient leakage test, 127
patient modules
specifications, 228
testing, 132
patient safety, 231
PC-based configuring, 33
performance assurance checks
display, 119
quick test, 119
recorder, 119
performance assurance tests, 118
performance plus package, 8
permanent test, 121
pin connections
Combined Telemetry/Digital System
Interface, 58
Dual serial interface, 64
systems interface, 60
Telemetry interface, 58
power source, 17
power supply
board
error 502 flowchart, 142
board fuses, 172
board output voltage, 143
board removing, 170
functional description, 98
removing, 170
reusing, 79
pre-installation checks, 17
print density, 213
protective earth, 234
protective earth test, 127
Q
quick installation checks
display, 71
recorder, 71
quick test, 7
R
reading the error log, 40
recorder
adjusting, 38
paper sensing troubleshooting
flowchart, 165
paperfeed error 601, 157
preparation, 30
quick installation check, 71
reusing, 81
scale, 54
settings, 213
specifications, 245
recorder assembly and disassembly, 199
component names diagram, 201
eject mechanism and base
assembly, 207
motor, 205, 210
motor and side plates diagram, 205
correct installation flowchart, 157
paper box, 212
paper eject mechanism and base
assembly, 208
paper table, 204
paper tray, 204
printer table and thermal line printer as-
sembly diagram, 203
recorder assembly removal, 176
recorder settings, 213
replaceable parts, 214
side plates, 205
side plates and platen, 208
thermal line assembly, 210
thermal line printer, 204
thermal line printer head, 202
tools, 200
recorder maintenance, 128
recorder print offset, 213
recorder settings, 213
regular maintenance, 128
replacement and removal
backplane, 174
batteries, 175
boards, 173
digital interface board, 180
display assembly, 182
front panel assembly, 186
frontend board, 178
NIBP connector tubing, 185
power supply, 170
power supply board, 170
power supply board fuses, 172
recorder assembly, 176
SpO2 cable, 185
switch boards, 187
top cover, 169
response mode, 28
ROM board, a functional
description, 102
S
safety test connector
Metron, 123
Safety test S2
protective earth test, 127
Safety test S3
patient leakage test, 127
Safety test S6
enclosure leakage current test 2, 127
Safety tests
instrument safety test, 126
overview, 7
Index
performance tests, 125
power on test, 125
visual inspection, 125
when to perform, 124
securing device, 182
self test, 118, 245
self tests
overview, 7
serial number, 77
serial prefix number, 6
serial suffix number, 6
service
error message, 140
philosophy, 7
tests, 7
tests, an overview, 7
service program
adjusting the recorder, 38
clearing the error log, 41
configuring the Monitor, 37
cyclic test, 39
installing, 34
loading, 35
main menu, 36
option number, 33
reading options, 40
reading the error log, 40
service menu, 39
using, 36
writing the error log, 41
service tests
overview, 7
permanent test, 121
setting
FHR paper scale, 47
FHR Traces with a Barcode Reader, 48
FMP option using keys, 48
FMP option with a Barcode Reader, 48
paper speed and scale, 46
time and date, 45
specifications
DECG with M1362A cable, 229
display, 244
inputs, 244
IUP transducer, 227
M1364A, 228
M1365A, 228
MECG with M1363A cable, 229
recorder, 245
Spillage, 235
SpO2
board, error 535 flowchart, 154
monitors, 61
removing the cable, 185
warning messages, 139
SpO2 capability
adding, 84
SpO2 transducer
testing, 131
spring and spacer, 182
supported external devices, 61
switch boards
removing, 187
system
fuse values, 17
interfaces, 51
overview, 94
voltage, 17
T
Telemetry
external parameter input functions, 54
input signal connections, 15
interface board, error 536
flowchart, 155
interface functional description, 112
interface pin connections, 58
Telemetry/Digital System Interface, 58
testing
Barcode Reader (HBCR8200), 22
DECG parameter test, 159
display, 119
external maternal parameters, 164
fetal SpO2 parameter test, 162
internal fetal parameters, 162
internal maternal parameters, 161
maternal SpO2 parameter test, 161
MECG parameter test, 159
NIBP overpressure, 134
NIBP parameter test, 163
patient modules, 132
quick test, 119
recorder, 119
safety, 122
self test, 245
Toco parameter test, 160
toco transducer, 130
transducers, 128
ultrasound parameter test, 158
ultrasound transducer, 128, 218
thermal line printer head
replacement, 202
time
changing the format, 46
setting, 45
time and date, setting, 45
time format
setting, 33
time format, setting, 45
time format, setting, 45
toco parameter test, 160
Toco parameter test, 160
Toco transducer
electrical check, 130
recorder scale, 54
specification, 219
visual check, 130
top cover
removing, 78
top cover removing, 169
trace density, 213
transducers, 217
DECG (M1364A), 220
IUP, 131, 227
MECG (M1365A), 222
SpO2, 131
Toco, 219
ultrasound, 217
US/MECG combi, 224
troubleshooting
DECG parameter test flowchart, 159
DECG transducer (M1364A), 220
external maternal parameters, 164
frontend board output, 143
internal maternal parameters, 161
maternal SpO2 parameter test
flowchart, 161, 162
MECG parameter test flowchart, 159
MECG transducer (M1365A), 223
NIBP parameter test flowchart, 163
noninvasive blood pressure warning
messages, 138
operator error messages, 137
paper sensing flowchart, 165
power supply board, 143
recorder paper sensing flowchart, 165
service error messages, 140
SpO2 warning messages, 139
system flowchart, 135
Toco parameter test flowchart, 160
ultrasound, 218
ultrasound parameter test
flowchart, 158
US/MECG combi test, 225
troubleshooting flowcharts
error 500, 141
error 502, 142
error 506, 144
error 507, 145
error 513, 146
error 515, 147
error 516 or 517, 148
error 525 and 527, 149
error 526, 150
error 532, 151
error 533, 152
error 534, 153
error 535, 154
error 536, 155
error 601, 157
error 602, 158
U
ultrasound parameter test, 158
ultrasound transducer
electrical check, 128
specification, 217
testing, 218
troubleshooting, 218
visual check, 128
Upgrade option S01, 87
upgrade options, 75
US/MECG combi
cable connections, 226
dismantling, 225
specifications, 225
V
voltage
fuse values, 45
output from frontend board, 143
output from system interface
connection, 61
power supply board output, 143
setting, 17, 18
system, 17
system voltage checking, 45
W
warnings, 2
writing the error log, 41