COMPACT 7600
Periodic Maintenance Procedure
00-878852-01
© July 1996

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This procedure does not contain any steps which can be performed by the system operator. The steps contained in this procedure should not be attempted by anyone who is not specifically trained or authorized by OEC Medical Systems, Inc. to work on the COMPACT 7600 System.

The contents of this procedure are believed accurate at the time of publication. However, changes in design and additional features may be incorporated in the hardware and software which are not reflected in this version of the procedure. Contact OEC Medical Systems, Inc. for clarification, if discrepancies arise.
## Revision History

<table>
<thead>
<tr>
<th>Rev</th>
<th>Dash</th>
<th>Date</th>
<th>Change Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev 1</td>
<td>-01</td>
<td>July 1996</td>
<td>Initial Engineering Release</td>
</tr>
<tr>
<td>Rev 2</td>
<td>-01</td>
<td>Aug 1996</td>
<td>Added fast stop button operational check</td>
</tr>
<tr>
<td>Rev A</td>
<td>-01</td>
<td>Aug 1996</td>
<td>Manufacturing Release</td>
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1. General Instructions

Use the following procedures to perform periodic maintenance on the COMPACT 7600 System.

1.1 Tools and Test Equipment

The tools and test equipment required to perform Periodic Maintenance are listed below.

1.2 Necessary Test Equipment

- COMPACT 7600 Service Manual (00-878850-01)
- Dual Trace Oscilloscope
- Copper Filters (00-877682-01)
- Converging Lines Resolution Tool (00-900860-01)
- Dosimeter
- DMM (Digital Multi-Meter)
- Beam Alignment Tool (00-877680-01)
- Keithley Triad Non-Invasive

1.3 COMPACT 7600 Periodic Maintenance Form

The COMPACT 7600 Periodic Maintenance Form must be completed as the procedures in this manual are performed. If the system does not pass a portion of the procedure, correct the problem before proceeding with the PM.

2. General Safety

CAUTION: Serious injury and property damage can result from incorrectly performed service procedures. Observe all operating and safety procedures contained within this manual.

CAUTION: The procedures in this section should be performed by service personnel specifically trained by OEC Medical Systems to calibrate the COMPACT 7600 System.

WARNING: This system is capable of generating lethal voltages. Observe safe electrical testing procedures when performing periodic maintenance procedures on the system.

WARNING: Lead aprons, radiation monitors and appropriate radiation shields must be used by personnel while performing tests. Living human anatomy should never be used as a phantom or demonstration aid.

CAUTION: Many of the PCB's in this system contain components which are sensitive to Electro-Static Discharge (ESD). Observe ESD safety procedures.
3. Begin PM Form

1. At the top of the COMPACT 7600 Periodic Maintenance Form check whether you are performing a Semi-Annual or Annual PM.

2. Completely fill in the customer information block, including the System Serial Number and the Field Service Report (FSR) Number.

*NOTE:* Test equipment used must have current calibration dates. Do not use test equipment with expired calibration stickers.

3. While performing the Periodic Maintenance procedures log all test equipment used in the Test Equipment Used block of the Periodic Maintenance Form. Make sure to include the manufacturer, model number, serial number, and calibration due date on all Test Equipment.

4. Complete Sections 1 through 4 and 6 through 8 when performing a Semi-Annual PM. Complete all Sections when performing an Annual PM. Circle Pass or Fail on the PM Form as each test section is completed. Fill in actual measured values where indicated on the PM Form.

4. Functional Checks

4.1 Mechanical Checks

In the steps below, check for ease of movement without excessive play.

1. Check the **Locking Pedals** of the system for proper operation. Lock the system in place by pressing the locking pedals down completely.

2. Check the **Wig Wag** movement of the system from side to side. Verify proper operation of the wig wag lock.

3. Check the **Cross Arm** movement of the system. Verify proper operation of the cross arm lock.

4. Check the **Flip Flop** movement of the system and integrity of the **Pivot Point**. Check proper action of the pivot lock.

5. Check the **Radial Movement** of the system and verify there is adequate resistance to stop the C-arm when the brake is applied.

6. Check the **Steering Handle** of the C-arm for proper operation.

4.2 Inspect Drag Cable

1. Verify that the drag cable is touching the floor.

2. Verify that the cable is securely attached, ensuring the mechanical/electrical connection and ground continuity.

4.3 Inspect Signal Cables

1. Inspect the signal cable assemblies for damage and signs of abrasion.
4.4 Inspect/Adjust System Power Supply Voltages

**WARNING**  Electrical circuits inside the equipment use voltages that are capable of causing serious injury or death from electrical shock. Use appropriate precautions.

1. The power supplies for the system are located in a perforated metal enclosure on the left side of the generator cabinet. There are two separate power supplies in the enclosure.

2. Locate the output voltage wire bundle coming from the top power supply (NG1). This wire bundle exits the enclosure on the left side and has a 15-pin connector on the end of the bundle. The 15-pin connector is designated as P1. Measure the voltages listed below and record them on the PM Form.

<table>
<thead>
<tr>
<th>GND</th>
<th>To</th>
<th>Adjust</th>
<th>Voltage</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1-2</td>
<td>P1-5</td>
<td>Not Adjustable</td>
<td>+5V</td>
<td>±0.5V</td>
</tr>
<tr>
<td>P1-2</td>
<td>P1-4</td>
<td>Not Adjustable</td>
<td>+24V</td>
<td>±1V</td>
</tr>
<tr>
<td>P1-2</td>
<td>P1-1</td>
<td>R39</td>
<td>+16V</td>
<td>±1V</td>
</tr>
<tr>
<td>P1-11</td>
<td>P1-10</td>
<td>Not Adjustable</td>
<td>+16V</td>
<td>±1V</td>
</tr>
<tr>
<td>P1-11</td>
<td>P1-13</td>
<td>Not Adjustable</td>
<td>+5V</td>
<td>±0.5V</td>
</tr>
</tbody>
</table>

3. Locate the output voltage wire bundle coming from the bottom power supply (NG2). This wire bundle exits the enclosure on the left side and has a 9-pin connector on the end of the bundle. The 9-pin connector is designated as P2. Measure the voltages listed below and record them on the PM Form.

<table>
<thead>
<tr>
<th>GND</th>
<th>To</th>
<th>Adjust</th>
<th>Voltage</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>P2-2</td>
<td>P2-1</td>
<td>R39</td>
<td>+5V</td>
<td>±0.5V</td>
</tr>
<tr>
<td>P2-2</td>
<td>P2-4</td>
<td>Not Adjustable</td>
<td>+12V</td>
<td>±1V</td>
</tr>
<tr>
<td>P2-2</td>
<td>P2-5</td>
<td>Not Adjustable</td>
<td>-12V</td>
<td>±1V</td>
</tr>
</tbody>
</table>

4.5 Measure Line Voltage Regulation

1. Measure the AC line voltage at the wall receptacle.

*NOTE:* In the next step the voltage measured at the wall receptacle will drop immediately after the exposure is terminated. Read the meter at this time.

2. Measure the line voltage at the wall receptacle again while making a radiographic exposure (80 mAs @ 110 kVp).

3. Calculate the percentage line voltage regulation using the following formula and record the results on the Installation Report/Checklist.

\[
100 \times \frac{V_n - V_1}{V_1}
\]

where: 
- \( V_n \) = No load voltage
- \( V_1 \) = Max load voltage

4. If the results above do not fall within the range of 0 to 8 percent, the hospital should be informed that an in-house wiring problem exists. (This problem results in a violation of a provision of the Federal Performance Standards 21 CFR 1020.30)
4.6 Perform System Functional Test

**WARNING:** Steps within this procedure produces X-rays. Use appropriate precautions.

**NOTE:** Use the illustration below as a reference when performing the Operational Verification.

1. Press the C-up and C-down buttons and verify that the c-arm lifts smoothly from top to bottom limits.

2. Press the Auto Fluoro button repeatedly and verify that the LED turns on and off. With Auto Fluoro active (LED on) press the x-ray button and verify that the kV and mA automatically servo by monitoring the kV and mA display. Verify that an image appears on the monitor. Verify that the mA display shows the mA value while x-rays are being taken.

3. Press the Pulse Fluoro button repeatedly and verify that the LED turns on and off. With Pulse Fluoro active (LED on) press the x-ray button and verify that the system produces pulsed x-rays and that an image appears on the monitor.

4. Press the Snapshot button repeatedly and verify that the LED turns on and off. With Snapshot active (LED on) press the x-ray button and verify that an exposure is taken and then automatically terminates. The image should remain on the monitor until the next exposure is taken.

5. Press the Auto Fluoro button and then the kV button and verify that both LED’s illuminate. Press the kV-up/down button and verify that the kV can be changed from 36 to 110kV.

6. Press the Film button repeatedly and verify that LED turns on and off. With Film active (LED on) press the Film Timer-up/down button and verify that you can select a time from 0.1 sec. to 4 sec. as shown on the seconds display. Take a number of film shots at various kV and mAs settings to verify film mode operation.
7. While taking x-rays in the Auto Fluoro mode press the slot collimator open and close buttons and verify that the collimator opens and closes.

8. While taking x-rays in the Auto Fluoro mode press the slot collimator rotate buttons and verify that the collimator rotates in both directions.

9. While taking x-rays in the Auto Fluoro mode press the iris collimator open and close buttons and verify that the iris opens and closes.

10. Press the Magnification button repeatedly and verify that the LED turns on and off. With Magnification active (LED on) verify that the iris collimator sizes down and the image on the monitor changes to the small field mode when x-rays are taken.

11. Press the Image Reversal button repeatedly and verify that the LED turns on and off. With Image Reversal active (LED on) verify the image reverses horizontally when x-rays are taken.

12. Press the Image Rotation buttons and verify that the image on the monitor rotates in both directions. Press both keys simultaneously and verify that the image rotates to the normal orientation and automatically stops.

13. Press the Thorax Surgery button repeatedly and verify that the LED turns on and off. With Thorax Surgery active (LED on) take an x-ray and verify that a live image appears on the monitor.

14. Press the Hand Surgery button repeatedly and verify that the LED turns on and off. With Hand Surgery active (LED on) take an x-ray and verify that the field size automatically decreases because the iris collimator closes partially.

15. Place lead aprons on the image intensifier to attenuate the beam. Press the Hip Surgery button repeatedly and verify that the LED turns on and off. With Hip Surgery active (LED on) take an x-ray and verify that the mA increases to a maximum of 6mA.

16. Obtain an image on the monitor and press the Save button. Verify that the image is saved by noting the image storage number which will appear on the monitor.

17. Save 4 distinct images in memory using the Save button. Press the Image Recall button repeatedly and verify that the saved images are displayed in sequence on the monitor.
18. Press the Auto-Histo button repeatedly and verify that the LED turns on and off. Verify that when the Auto-Histo is active (LED on) the x-ray images are optimized for contrast and brightness automatically.

19. Press the Low Dose button repeatedly and verify that the LED turns on and off. Verify that when Low Dose is active (LED on) the technique is reduced in comparison to a normal Auto Fluoro exposure.

20. Press and hold the Alarm Reset button for at least 2 seconds and verify that the accumulated fluoro time shown on the display is cleared to zero.

21. Verify that fluoro x-rays can be taken using the footswitch. Verify that film exposures cannot be taken using the footswitch.

22. Press the Fast Stop button and verify that power is immediately interrupted.

5. Generator Accuracy Verification/Calibration

5.1 Verify X-Ray Calibration

Refer to the KV CALIBRATION and MA CALIBRATION section of the COMPACT 7600 Service Manual (00-878850-01) for instructions on checking the kv and mA. The table below lists the techniques to check and the tolerances allowed. If any portion of the Generator Accuracy Verification fails to meet specifications proceed to section 5.2 (Perform X-Ray Calibration) of the PM procedure.

<table>
<thead>
<tr>
<th>TEST TECHNIQUE</th>
<th>KV TOLERANCE</th>
<th>MA TOLERANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Fluoro @ 60kV</td>
<td>54-66kV</td>
<td>±10% of displayed mA</td>
</tr>
<tr>
<td>Manual Fluoro @ 70kV</td>
<td>63-77kV</td>
<td>±10% of displayed mA</td>
</tr>
<tr>
<td>Manual Fluoro @ 80kV</td>
<td>72-88kV</td>
<td>±10% of displayed mA</td>
</tr>
<tr>
<td>Manual Fluoro @ 90kV</td>
<td>81-99kV</td>
<td>±10% of displayed mA</td>
</tr>
<tr>
<td>Manual Fluoro @ 100kV</td>
<td>90-110kV</td>
<td>±10% of displayed mA</td>
</tr>
<tr>
<td>Manual Fluoro @ 110kV</td>
<td>99-121kV</td>
<td>±10% of displayed mA</td>
</tr>
</tbody>
</table>

If the Calibration Accuracy Verification passes proceed to section 6. (Radiographic and Fluoro Verification/Alignment) of the PM procedure.

5.2 Perform X-Ray Calibration

Refer to the KV CALIBRATION and MA CALIBRATION section of the COMPACT 7600 Service Manual (00-878850-01) for instructions on performing the generator calibration.

After performing the generator calibration repeat section 5.1 of the PM procedure. If any portion of the Generator Accuracy Verification fails to meet specifications contact Technical Support before continuing with the PM. If the Generator Accuracy Verification passes proceed to section 6. (Radiographic and Fluoro Verification/Alignment) of the PM procedure.
6. Radiographic / Fluoro Verification/Alignment

6.1 Verify/Adjust Beam Alignment

WARNING  Steps within this procedure produce X-rays. Use appropriate precautions.

Refer to the BEAM ALIGNMENT PROCEDURE section of the COMPACT 7600 Service Manual (00-878850-01) for instructions on verifying and adjusting the beam alignment.

6.2 Verify/Adjust Fluoroscopic Camera Alignment

WARNING  This procedure produces X-rays. Take appropriate precautions.

Refer to the CAMERA ALIGNMENT section of the COMPACT 7600 Service Manual (00-878850-01) for instructions on verifying and adjusting the fluoro beam alignment.

The camera resolution and kV/mA tracking specifications are listed below.

### KV/MA TRACKING

<table>
<thead>
<tr>
<th>Immm Copper Filters</th>
<th>kV Range</th>
<th>mA Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 filter</td>
<td>59-65kV</td>
<td>1.62-1.98mA</td>
</tr>
<tr>
<td>2 filters</td>
<td>70-76kV</td>
<td>2.25-2.75mA</td>
</tr>
<tr>
<td>3 filters</td>
<td>79-85kV</td>
<td>2.7-3.3mA</td>
</tr>
</tbody>
</table>

### CAMERA RESOLUTION

<table>
<thead>
<tr>
<th>Field Size</th>
<th>Minimum Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>1.4 lp/mm</td>
</tr>
<tr>
<td>MAG</td>
<td>1.8 lp/mm</td>
</tr>
</tbody>
</table>

6.3 Perform Entrance Exposure Calibration Test

The tests in this section are designed to ensure compliance with the 10.0 R/minute entrance exposure limitation set by the Bureau of Radiological Health (BRH).

Refer to the MA CALIBRATION section of the COMPACT 7600 Service Manual (00-878850-01) for instructions on verifying and adjusting the entrance exposure.

7. Cleanup

1. Replace all covers on the system and wipe down the system.
2. Reboot and verify system operation.

8. Complete PM Form

1. Verify that all information blocks have been completed.
2. Verify that each procedural step has been circled or a value recorded.
3. Attach all films to the Periodic Maintenance Form cover.
4. Sign and date the PM Form.
5. Obtain the customer signature and date. Leave the customer's copy.
6. Mail the PM form to: OEC Medical Systems, Inc. Attention Technical Support, 384 Wright Brothers Drive, Salt Lake City, Utah 84116

NOTE: OEC Regional Service offices may require the completed PM form and films to be routed through their offices prior to being forwarded to OEC Medical Systems, Inc. in Salt Lake City.