

## 4 Testing the Instrument

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### Objectives

In order to meet this chapter's objectives, you should be able to test the Monitor, the Measurement Server and, where present, the Measurement Server Extension through the following types of tests:

- Performance Assurance Checks and Tests.
- Accuracy, Calibration and Performance Procedures.
- Patient Safety Checks.

This chapter provides a checklist of testing procedures for the Measurement Server, the Measurement Server Extensions and the Monitor.

For inspection procedures; preventive maintenance procedures; cleaning procedures; and battery handling, maintenance, and good practices used to maintain the Instrument in good working order, see "Maintaining the Instrument".

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### Concepts

- Functionality Assurance** This refers to the combined Performance Assurance Test and Functionality Testing Procedures to be found in this chapter. These tests verify correct Instrument function in general terms.
- Preventive Maintenance** Preventive Maintenance refers specifically to the service calibration tests required to make sure the Instrument measurement results are accurate. When authorized Philips personnel service the Instrument, they report these results back to Philips. The collected data forms a database to be used in product development. These specific tests are required for the NBP parameter and for the sidestream CO<sub>2</sub> parameter. It is not necessary, however, for hospital personnel to report results.
- Performance & Safety Tests** This concept refers to all the remaining accuracy and performance tests available on the Instrument including safety tests and checks for the Instrument.

## Test Reporting

The following table shows what must be recorded on the Service Record after completing the tests in this chapter.

Test	What to record
Visual	V:P or V:F
Power On	PO:P or PO:F
P NIBP	PN:P/X1/X2/X3/X4 or PN:F/X1/X2/X3/X4
P CO <sub>2</sub>	PCO2:P/X1/X2/X3/X4/X5/X6/X7/X8 or PCO2:F/X1/X2/X3/X4/X5/X6/X7/X8
Safety	S(1):P/x1/x2 or S(1):F/x1/x2 S(2): P/x1 or S(2): F/x1 S(3): P/x1 or S(3): F/x1

Where P = Pass, F = Fail and X/x are the measured values as defined in the tests described in this chapter



## Test Map

The test map shows which tests are required in which situations.

<b>Service Event (When performing...)</b>	<b>Test Blocks Required .....Complete these tests)</b>
Installation of M3/M4 with <b>no</b> display connected to the VGA output	Perform Visual and Power On test blocks
Installation of M3/M4 with a display connected to the VGA output	Perform Visual, Power On and Safety (1) test blocks
Installation of M3/M4 with a recorder connected to the serial interface	Perform Visual, Power On and Safety (1) test blocks. Perform test print on recorder.
Repairs where the power supply in the M3/M4 is replaced	Perform Power On and Safety (2) Test blocks
Repairs where the monitor has been dropped	Perform Power On and Safety (2) and (3) Test blocks
All other M3046A repairs, Hardware or Software Upgrades	Perform Power On test block
Preventative Maintenance	Perform all Preventative Maintenance Tests
Safety and Performance	Perform all Safety and Performance Test blocks.

## Testing Checklist

Check Here	Topics in this Chapter	See Page
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	S(3) Patient Leakage current - Single Fault Condition (S.F.C.) mains on applied part	162

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## Serial Numbers

When recording test results, these are always associated with a particular instrument by means of the serial number. The serial numbers for the Monitor and the Measurement Server can be seen in the “Revisions” window (press Setup key then select “Revisions”). However, if a Measurement Server Extension (M3015A or M3016A) is in use, the number will not appear and must be noted down from the back of the Extension. To do this, remove the Measurement Server and Extension from the Monitor, so that the back of the extension is visible.

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## Passwords

The following table show the passwords you need to enter to access the different modes. Go to Operating Modes and use the TouchStrip to specify the password. Press OK:

Demo	Config	Service
42351	13251	25531

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## Visual Test

Inspect the system for obvious signs of damage. Also check external leads and accessories.

What to record on the service record:

V:P or V: F

where P=pass, i.e. the system has no obvious signs of damage  
and F=fail

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## Power On Test

**Step 1** Switch on the monitor and connect the Measurement Server to the M3046A

**Step 2** Observe whether the monitor boots up successfully without displaying an error code and if an ECG wave appears on the screen.

What to record on the service record:

PO:P or PO:F

where P=pass, i.e. the monitor boots up displaying no error codes and displays an ECG wave and F=fail

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## Functionality Assurance Tests

The following functionality assurance checks are recommended to verify proper operation daily before the Instrument is used to Monitor a patient:

Functionality assurance checks fall into two parts:

- 1 Verification of overall operation by completing the Performance Assurance Test.
- 2 Verification of the Measurement Server and, where present, the Measurement Server Extension operation by completing the System Check and the System Self-Test.

You can perform these checks in any order you choose. They are divided up here for organizational purposes.

### Performance Assurance Test

To verify your Instrument works properly, perform the following test:

- Step 1** Connect the power cord to the Monitor and plug it into an AC power source. Switch the Monitor on by pressing the ON/OFF button.
- Step 2** After approximately one minute, the Monitor should complete its boot-up process. Observe that there is a screen display and that no error codes are displayed.
- Step 3** If any error codes are displayed or the screen remains black, refer to "Troubleshooting the Instrument".

The Instrument has a Self-Test routine which generates and displays test waveforms and corresponding numerics for the Measurement Server and/or Measurement Server Extension that is connected. The test signals are displayed for about 30 seconds and then the display returns to monitoring mode.

The test signal will display only if the system Self-Test is successful and the Measurement Server and, where present, the Measurement Server Extension is plugged into the Monitor. Perform the following quick system check to verify that the System Board and the Measurement Server and, where present, the Measurement Server Extension are communicating properly.

### Quick System Check

You can verify that the System Board in the Monitor and Measurement Server and, where present, the Measurement Server Extension are communicating properly by completing the following test.

**The Test**—Press the **Setup** button, move the highlight to **ECG**, and press on the TouchStrip.

**The Result**—The ECG window should appear verifying that the System Board and Measurement Server are communicating with each other.

### System Self-Test

**CAUTION**

**The Self-Test ensures that the Instrument is functioning correctly; it does not test the accuracy of the Server or the Extension**

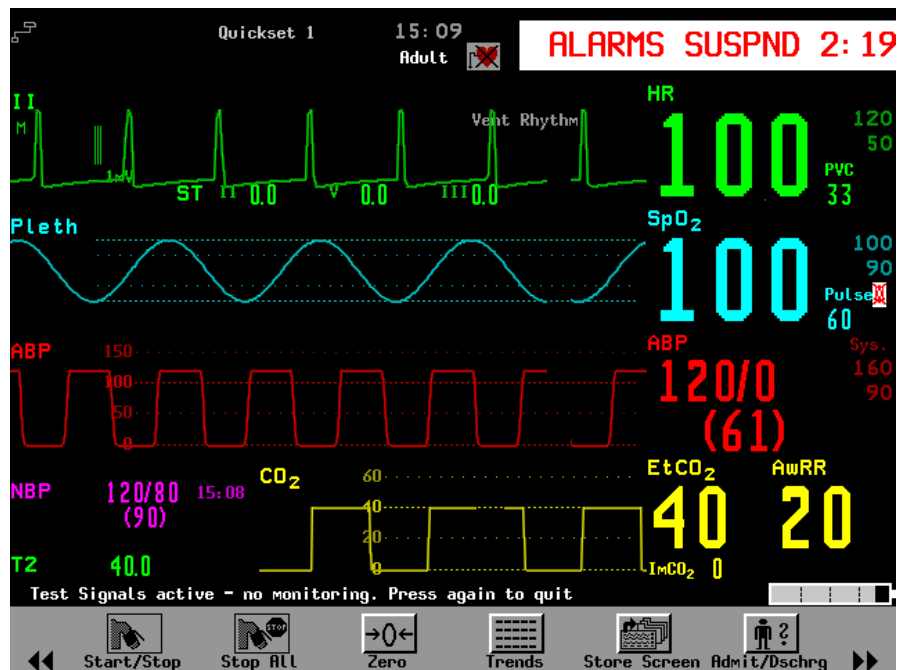
**Step 1** Make sure the Measurement Server is connected to the Monitor, and the Monitor is switched on. (For SpO<sub>2</sub>, mainstream CO<sub>2</sub>, Pressure, or Temperature, an appropriate transducer must be plugged into the Measurement Server – or, for mainstream CO<sub>2</sub>, the Measurement Server Extension – in order to get a test reading. For sidestream CO<sub>2</sub>, appropriate tubing must be plugged into the Measurement Server Extension in order to get a test reading.)

**Step 2** Press the **Setup** button.

**Step 3** Move the highlight to **Test Signals**.

**Step 4** Press on the TouchStrip and observe the display. An example test looks similar to the following illustration (the shape of the test signals depends on the selected filter mode).

As well, the table on the following page lists Self-Test values.





## System Self-Test Values

Module	Test Numeric Limits	Test Waveform
ECG and ECG/ Resp	ECG 100 bpm in ADULT mode 125 bpm in NEO/PEDI mode  Resp 15 rpm in ADULT mode 30 rpm in PEDI mode 55 rpm in NEO mode	Simulated squarewave and numeric  Simulated Resp wave and numeric
Pressure <sup>a</sup>	Systolic 120 mmHg ADULT 60 mmHg PEDI/NEO  Diastolic 0 mmHg ADULT/PEDI/ NEO	Simulated squarewave and numerics
SpO <sub>2</sub> /Pleth <sup>a</sup>	SpO <sub>2</sub> 100% Pleth Wave on display	Numeric only Simulated wave
Temperature <sup>a</sup>	40 °C (104 °F)	Numeric only
Pleth Pulse Rate	60 bpm in ADULT/NEO mode	
NBP	120/80 (90) ADULT 100/60 (80) PEDI 80/50 (60) NEO	Simulated squarewave and numerics
Sidestream CO <sub>2</sub> <sup>b</sup>	EtCO <sub>2</sub> 40 mmHg ImCO <sub>2</sub> 0 mmHg AWRR 20 rpm	Simulated squarewave and numerics
Mainstream CO <sub>2</sub> <sup>a</sup>	EtCO <sub>2</sub> 40 mmHg ImCO <sub>2</sub> 0 mmHg AWRR 20 rpm	Simulated squarewave and numerics

- a. An appropriate transducer must be plugged into the Server or Server Extension in order to get the test reading.
- b. Appropriate tubing must be plugged into the Server Extension in order to get the test reading. When in Neonatal mode the test signals are switched on, a “CO<sub>2</sub> Equip. Malf.” message will appear until the test signals are switched off; no action is required.