Wake Forest University Baptist Medical Center
Department of Anesthesiology

TECHNICIAN
ABBREVIATED CHECKLIST OF RESPONSIBILITIES

For Anesthesia Apparatus Checkout
Specific to the **Draeger APOLLO** anesthesia machine
(This document assumes knowledge and understanding of the
"Apollo Master Checklist Dated 3-28-07-2")

First thing in the morning:

1. Assemble the circuit with accessories (e.g. aerovent chamber, gas sampling line, water trap connections)
2. Power up the machine and bypass the automated checkout.
3. Check power cord, pipelines, and cylinder gas supplies
4. Auxiliary oxygen flow meter
5. Vaporizer seating, interlock, fill port tight
6. Carbon dioxide absorbent: replace if necessary
7. Scavenger vacuum setting
8. Patient suction
9. Backup ventilation and emergency ambu, LMA, Cook stylette and needle
10. Ventilator diaphragm
11. O2 flush for manual to/fro ventilation through circuit, reservoir bag, test lung, and ventilator
12. Virtual flow meter calibration and nitrous oxide maximum flow (79% with O2)
13. Power-down the machine so it is ready for a complete auto-check by provider
14. Perform a "time-out" looking at machine and thinking about what you did
15. Document your performance of the checkout procedure

In preparation for subsequent case:

1. Double check that backup Ambu bag, LMA, Cook stylette and needle are present
2. Machine is in, or place it in stand-by mode. Press "Reset Defaults"
3. Patient suction prepared and ready
4. Assemble the circuit with accessories as before
5. Vaporizer fill port, new sampling line are tight
6. Carbon dioxide absorbent: replace if necessary
7. Perform the manual to/fro ventilation test and ventilator test
8. Place in "Stand-by Mode"
9. Perform the automatic "Leak Test"
10. Reset "defaults"
11. Place into "Stand-by Mode" with ALL fresh gas flows OFF
12. Document your performance of the checkout procedure

Upon room closure for the evening or weekend (non-emergency rooms):

1. In addition to "In preparation for subsequent case":
2. Power-down the machine after performing the automatic "Leak Test"

Working version 3-28-07-2 subject to Departmental approval.
Drafted by Dr. Olympio and reviewed by clinical members of
The Capital Equipment Committee

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PROVIDER
ABBREVIATED CHECKLIST OF RESPONSIBILITIES

For Anesthesia Apparatus Checkout
Specific to the **Draeger APOLLO** anesthesia machine
(This document assumes knowledge and understanding of the
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Always VERIFY that your machine can do the following:

- Oxygen can be delivered to the patient
- Positive pressure ventilation can be performed
- Positive pressure in the breathing circuit can be relieved
- Anesthetic vapor can be delivered if intended as part of the anesthetic plan
- A backup method of positive pressure ventilation is readily available
- Suction is available
- Ventilation, oxygenation, temperature, and hemodynamics can be monitored and enunciated with audible alarms

First thing in the morning:

1. Begin with the Apollo machine powered to OFF, or press button to OFF.
2. Verify presence, operation, and audible alarms of required monitors, particularly later, *as they are attached to patient.*
3. Power-up the machine
4. READ and FOLLOW ALL of the automated checkout guidelines
5. Document completion of your checkout on the anesthetic record

During the case:

1. Verify adequacy of carbon-dioxide absorption as evidenced by zero capnometric baseline during pre-oxygenation with tight mask fit, or initial connection to endotracheal tube.
2. Re-verify the absence of breathing circuit obstruction as patient is pre-oxygenated
3. Verify expected volatile agent measurement when initiated
4. Calibrate "automatic" alarm limits when patient is stable
5. Turn OFF all FGF at end of case and place into STANDBY MODE
6. Power OFF at the end of the day's list

In preparation for subsequent case:

1. Visual inspection after TECH setup
2. Activate mode and FGF as indicated
3. Double check patient suction

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Suggested Apollo Checklist
Final 3-28-07 (Wake Forest University-Olympio)

Master Checklist for Draeger Apollo	Who is responsible?	Frequency to Check	How to Check?	Notes/Rationale
Electrical power source and battery supply.	Provider AND Tech	Daily	Verify electrical cord connection. Power on machine, listening for acoustic tone; look for appropriate LED, confirming wall and battery supply.	Although the machine can operate for at least 30 minutes on battery, it should always be operated on wall supply. With loss of all power, note that none is required to deliver fresh gas, vapor, and manual ventilation.
Verify proper wall gas supply pressure.	Provider AND Tech	Each use.	Scan the LEDs to verify that they are green, if the wall supply is at least 39psi.	When pipeline oxygen is the primary intended source, then there must be adequate pressure before beginning the case.
Verify adequate oxygen cylinder gas supply	Provider AND Tech	Each use.	The oxygen cylinder should be opened while observing the digital display of cylinder pressure. The oxygen pressure LED should be green, indicating a minimum (site-specific) value. Change the cylinder if the LED is not green. Close the valve after checking. Flashing green LED indicates a faulty sensor. Note the backup Bourdon gauges behind the machine. Verify that the LEDs remain green, even after the cylinders are shut.	Backup oxygen must be ensured, both by checking the pressure, and by closing the valve after checking.
Check Oxygen Flush through Scavenger	Tech	Daily	Depress button with circuit Y occluded on the plug, and APL fully open. Listen for usual flow and ascertain circuit pressure is <10 cmH2O.	The function of the oxygen flush valve and scavenger evacuation are critical to safe operation.

Check auxiliary oxygen flowmeter	Tech	Daily	Turn on while watching indicator, then turn off.	Auxiliary oxygen, when available, is a basic requirement during monitored care, and a critical safety backup.
Verify that vaporizers are adequately filled.	Provider	Each use.	Check the site glass on each vaporizer and fill if necessary.	Volatile anesthetics are a typical component of general anesthetics and an adequate supply must be available.
Check vaporizer connection, safety interlock, and fill port.	Tech	Daily	Check for level seating and proper position of lever. Open one vaporizer dial at a time and attempt to open the others. Repeat for each. Ensure dials are then set to zero. Make sure fill port is closed tightly.	Ensure that obvious leak sources are identified, and that two vaporizers cannot be on simulataneously.
Breathing circuit connection and preparation	Tech	Each use.	Connect breathing hoses, extensions, filters, etc., as needed. Adjust hose length as desired.	The circuit needs to be prepared for the case at hand before leak testing, and before the machine determines the compliance compensation value.

Look for exhaustion of carbon dioxide absorbent	Provider AND Tech	Each use.	Absorbent is exhausted and will turn purple from bottom up. Desiccation may be indicated by purple at the top, or by discovery of fresh gas flow ON at the start of the day.	Routine evidence of exhaustion would be that a majority of the agent is purple. Clinical evidence for exhaustion is the rebreathing of inspired carbon dioxide detected by capnometry. Purple color may revert back to white in some absorbents, or the coloration may be hidden internally.
Replace CO2 absorbent when exhausted.	Tech	When necessary.	When using loose-fill, change when a majority is purple, or if flows were left on overnight. Either Draeger CLIC, or loose-fill absorbent may be exchanged during use, especially if evidence of inspired carbon dioxide is present.	Absorption capacity of the agent should be adequate for the case. New absorbents that are designed to prevent destruction of volatile agent when desiccated, should not be wasted by early disposal.
Check scavenger vacuum level	Tech	Daily	Open the needle valve just enough to bring the top of the float above the bottom line.	Adequate suction is required to prevent contamination of the OR with waste anesthetic gasses. Excessive suction is not necessary and is wasteful.
Gas sampling line and water trap	Tech	Each use.	Ensure firm, straight connections, and tubing routed away from the APL valve. Empty the water trap if liquid is present.	The gas sampling line is an integral part of the breathing system and is included in the leak testing. Sampled gas is returned to the breathing circuit and does not contribute to any "leak".

Verify that patient suction is adequate.	Tech AND Provider	Each use.	Ensure that connections are tight, Yankauer is present, and that suction is adequate.	Adequate suction is essential to remove unwanted secretions from the patient's airway.
Verify backup ventilation equipment is available & functioning	Tech AND Provider	Daily	Test non-rebreathing bag with and without thumb occlusion of the inspiratory port, while squeezing the bag. Ascertain presence of oxygen tubing, Cook transtracheal needle, oxygen jet ventilator and its function.	The clinician must be prepared to ventilate and oxygenate the patient in the event of machine failure or patient difficulty.
Ventilator Diaphragm	Tech		Remove the breathing circuit housing from the ventilator cylinder. Inspect diaphragm for absence of water.	Water accumulation in the ventilator diaphragm can impair ventilator operation.
APL valve pressure regulation	Provider	Daily	Occlude the circuit Y piece on the knob, set APL to 30 cmH2O, depress and hold oxygen flush. Pressure should rise to 30 but not exceed 45 cmH2O. Then release. Verify that pressure does not drop below 15 cmH2O.	If the breathing system, or APL valve, or scavenger system were not functioning appropriately, then a high or low pressure might occur.
Verify there are no leaks in the fresh gas supply to, and in, the manual breathing system.	Provider	Daily	Start the "Self Test". Leaks below 150 ml/min in the Man-Spont circuit are acceptable to the machine (green), and are not reported. If the LED is yellow, attempt to correct the leak and retest. If necessary, use the short blue tubing segment to isolate the test to the machine. The clinician may or may not accept the leak based on his/her clinical judgement. The vaporizer O-ring seal to the backbar is checked in this test. Fill-port leaks must be independently tested for each vaporizer by turning the dial on before each repeated test.	Leaks in the breathing circuit may prevent adequate delivery of oxygen, anesthetic, fresh gas, or gas pressure to the patient. They may be created with each application of a circuit or device. Leaks are wasteful and contaminate the environment.

Machine solenoids, valves, and internal components	Provider	Daily	Automatic during "Self Test". Note information boxes. Follow Draeger recommendations for any "orange" or "red" results. Note all component checks and LEDs under "Gas Delivery", "Ventilator", and "Monitoring". Note values for compliance and system leak.	The automated self test checks multiple components within the machine and ventilator circuit. Draeger recommends that it be performed at least once per day to ensure proper function of the machine.
Oxygen monitor and alarm.	Provider	Daily	The oxygen sensor is automatically tested and calibrated to room air during the "Self test". There is no mechanism for the user to directly calibrate the monitor. Test the low FiO2 alarm by temporarily raising it above current concentration, then reset.	An accurate oxygen monitor is essential to determine the inspired oxygen concentration. An audible alarm will alert the clinician.
Breathing system pressure/leak test	Provider	Each morning	The "Self Test" includes a negative aspiration of the Man-Spont circuit, while the "Leak (system)" test performs a positive pressure leak and compliance test of the mechanical inspiratory limb of the circuit.	Effective and reliable closure and opening of the breathing circuit valves is essential to allow safe positive pressure ventilation of the lung.
Additional Manual Tests				
Verify gas flow through breathing circuit during both inspiration and exhalation	Tech	Each use.	Attach the dedicated test lung to the Y-piece; set APL to 20, activate the Man/Spont mode, flush fill the circuit, and then ventilate back and forth between the two bags. Check for any obstruction or abnormal resistance. Return the system to standby.	The Manual APL valve check and the Self Test may detect obstructions to flow, but not all. Human hands can sense restrictions or obstruction within the breathing circuit.

Check virtual flowmeter calibration and proportionator.	Tech	Daily	Turn O2 to 5 L/min and N2O to 5 L/min and compare to the "total flow tube" bobbin, which should read approximately 10 L/min. Attempt to create a mixture of <21% oxygen. Turn flows off.	The initiation and electronic measurement of oxygen and/or nitrous flow is essential to deliver desired concentrations to the patient, and a redundant system for measurement is therefore provided.
Verify proper vaporizer output	Provider	Each use.	The clinician should ascertain that expected levels of volatile agents are shown on the anesthetic gas analyzer.	Accurate output of the vaporizer is expected, although it is not appropriately or accurately measured at the endotracheal tube. Vaporizer calibrations are checked by biomedical PM.
Verify availability and proper function of required monitors and alarms.	Provider	Each use.	The function of numerous monitors is verified as they are connected to the patient. Default alarm limits must be checked for appropriateness while "auto-set" limits are convenient once the patient is connected and has stable, desired vital signs.	Audible and visual alarms help to alert the clinician to potentially dangerous situations.

Document completion of checkout procedure per department policy	Tech AND Provider	Each case.	The Apollo machine automatically documents when it was checked, and documents the outcome of that check. Also document the checkout on the anesthetic record.	The clinician is ultimately responsible for basic operation of the machine, and responsible for proper response to an intraoperative machine failure. To promote backup safety measures, the anesthesia technician will perform the indicated tests.
TIME OUT!	Provider	Each case.	Confirm ventilator settings and evaluate readiness to deliver anesthesia care.	The clinician should follow customary JCAHO recommendations for "TIME OUT" to overcome potential errors or omissions from distractions.

Checking and testing between cases				
Performing the "Leak Test".	Tech	Each use.	While in "Standby Mode" depress the "Leak Test" and follow instructions, noting results.	Any changes to the circuit may induce a leak or new compliance value. The negative and positive pressure circuit tests are performed during the "Leak Test".
All gas flows OFF between cases.	Provider AND Tech	Each use.	Turn fresh gas flow knobs to the off position whenever the machine is not in use.	Leaving flows on is wasteful and may desiccate the absorbent.
Machine to "Standby" between cases.	Provider	Each use.	Place the machine in Standby mode after turning off all fresh gas flow. Press the "Default Parameters" key.	This will prompt the Tech or next user to perform the "Leak Test" and will reset the patient parameters to the default values.
Power shut-off.	Provider AND Tech	Daily	At the conclusion of the day's list, power down the machine. On-call machines should be left in standby, and re-booted in the morning for checkout procedures.	Shutting down the power will mandate performance of the daily checkout as recommended by Draeger. On-call machines should be left in standby so that they are immediately ready to use.