

[Newborn Care Manual: Contents](#)**THE TELETHERMOMETER****22-A THE COMPONENTS OF A TELETHERMOMETER.**

The electrical telethermometer (tele-thermometer = to measure temperature at a distance) is attached to a temperature (skin) probe by a cable. The telethermometer should be calibrated every month and contains a battery which should be replaced every year.

22-B USING A TELETHERMOMETER.

1. Check the calibration by unplugging the cable from the skin probe and then switching on the telethermometer. The needle should lie directly over the red line indicating that the calibration is correct. Only if the calibration is incorrect should you use a screw driver to turn the adjusting screw until the needle lies over the red line. An incorrect calibration usually indicates that the battery is almost flat.
2. Plug the cable from the temperature probe into the telethermometer.
3. Attach the temperature probe to the infant's skin.
4. Switch the telethermometer on.
5. Allow the needle to settle and then read the infant's skin temperature.

22-C ATTACHING A TEMPERATURE PROBE TO THE SKIN.

1. The temperature probes of a telethermometer, a servocontrolled closed incubator and a radiant warmer are all attached to the infant's exposed skin using the same method. Rectal probes are not usually used. If the infant lies supine (back down) attach the temperature probe over the left side of the abdomen. Avoid the area over the liver on the right side as this is warmer than other areas of the abdomen. If the infant lies prone (back up) attach the temperature probe over the back to the left of the spine at the level of the lower ribs. The infant should not lie on the temperature probe as this will give too high a reading (similar to a rectal temperature) and may damage the infant's skin.
2. Clean the area of skin where the probe is to be placed. This removes any vernix and allows the probe to be firmly attached. Alcohol can be used to clean the skin. The skin can also be prepared with Skin prep which helps to protect sensitive skin.
3. The probe is best attached with a non-irritant tape such as Dermical. The temperature probe must be firmly taped to the skin so that it does not come loose. Do not cover the temperature probe with clothing or a nappy and do not allow the infant to lie on the temperature probe.
4. When the temperature probe is to be removed, care must be taken in removing the tape. Do not injure the skin as this may cause infection. The preparation Uni-solve can be used to remove the tape without damaging the skin.

22-D PROBLEMS WITH A TELETHERMOMETER.

1. The temperature probe may come loose.
2. The cable may be damaged if it is crushed by the incubator hood.
3. The battery may run flat.
4. The calibration may not be accurate.
5. The skin may be damaged if the infant lies on the temperature probe or when the strapping is removed.
6. The reading may be much higher than the temperature of the rest of the infant's skin if the infant lies on the temperature probe or if the temperature probe is covered by clothing or a nappy.

If you suspect that the telethermometer reading is incorrect, check the skin temperature with another telethermometer or measure the axillary temperature with a digital or low reading mercury thermometer. An axillary reading should be about 0,5°C higher than the telethermometer reading over the left side of the abdomen.

THE CLOSED INCUBATOR

There are many different makes of closed incubator but the basic operating principles are the same. In a closed incubator, air is warmed by an electrical heater and then circulated through the incubator by a fan to heat the infant by convection. The temperature of the circulating air in the incubator can be adjusted manually or automatically (i.e. servocontrolled).

22-E DETERMINING THE CORRECT TEMPERATURE SETTING FOR A CLOSED INCUBATOR.

The correct temperature setting in a closed incubator will give the infant a normal skin temperature and keep the infant's oxygen and energy needs as low as possible. The correct incubator temperature is known as the NEUTRAL THERMAL ENVIRONMENT. Infants gain weight and grow best in a neutral thermal environment. This is, therefore, the ideal incubator temperature for an infant.

The neutral thermal environment decreases as the infant's body weight, gestational age and age since delivery increases. Newborn infants with a very low body weight and gestational age, therefore, need a higher incubator temperature than heavier, more mature infants who are older.

22-F USING AN INCUBATOR TEMPERATURE CHART.

Usually the infant's birth weight and age after delivery is used to determine the recommended incubator temperature. If you look at figure 22-A you will notice that the incubator temperature is lower for heavier infants. The recommended incubator temperature also falls as the infant becomes older. In practice, once the infant is stable, the incubator temperature can be changed manually to keep the infant's temperature within the normal range if a servocontrolled incubator is not used.

Figure 22-A. The recommended environmental temperatures (for warm rooms or closed incubators) for naked infants on the day of birth.

Birth weight	Temperature (°C)
1000 g	35.0
1500 g	34,5
2000 g	34.0

Most dressed infants can be nursed in a warm room (28°C at 2000 g and 26°C at 3000 g).

22-G THE COMPONENTS OF A CLOSED INCUBATOR.

1. The HOOD (or cover) which is made of transparent Perspex. Some incubators have a double hood to reduce radiant heat loss.
2. DOORS in the hood for gaining access to the infant. The doors (port holes) have a perspex cover or are lined with a rubber gasket and can be closed with a plastic cuff. Sometimes the whole side of the incubator can be opened to get better access to the infant for procedures.
3. The MATTRESS and FLOOR which can be tilted into the head-up position.
4. The HEATING COIL and FAN that warm and circulate the air.
4. The THERMOSTAT which controls the temperature of the incubator.
5. The CONTROL PANEL where the required temperature is set. On servocontrolled incubators, the infant's temperature and the incubator temperature are also displayed.
6. The WATER RESERVOIR which can be used to humidify the air in the incubator. Often water is not used in incubators as dangerous bacteria may colonize the water and infect the infant. Not using the water reservoir does not effect the functioning of the incubator.
7. The incubator HOUSING which holds the heating coil, fan and thermostat.
8. The TEMPERATURE PROBE. Servocontrolled incubators have a skin probe that measures the infant's temperature.
9. The THERMOMETER which measures the air temperature in the incubator.
10. The STAND which supports the incubator. The stand may have shelves or drawers.

22-H USING A MANUALLY OPERATED CLOSED INCUBATOR.

With these older incubators the staff have to manually control the temperature of the air in the incubator. If the skin temperature of the infant is too low then the incubator temperature must be manually increased by turning up the temperature setting on the control panel. This will increase the temperature of the heating coil. In contrast, the temperature of the incubator must be turned down if the infant is too hot. The temperature of the incubator and the infant's skin temperature have to be measured regularly and carefully recorded on the observation sheet by the staff. The temperature of the incubator often has to be increased at night when the nursery temperature drops. During the day the incubator temperature usually has to be turned down.

The method of using a manually controlled incubator is as follows:

1. Before placing an infant in a closed incubator, the incubator must be clean and correctly assembled. Place a clean linen sheet over the mattress.
2. Plug the power lead into the wall fitting and switch on the power at the wall.
3. Switch on the incubator and adjust the incubator temperature to 37°C. Always keep a warm incubator available in the nursery for a new admission. Never place an infant in a cold incubator.
4. Open the hood for as short a time as possible when placing the infant in the incubator. If available, open the side panel rather than the whole hood. This will prevent cooling the incubator.
5. From the infant's birth weight and age since delivery determine the recommended incubator temperature (neutral thermal environment).
6. Read the incubator temperature. Increase or decrease the incubator temperature until the recommended temperature is reached.
7. Measure the temperature of the infant and incubator after 30 minutes and adjust the incubator temperature if the infant's temperature is not in the normal range (36-36,5°C for skin and 36,5-37°C for axilla).
8. The infant and incubator temperature should be read and recorded as part of the routine observations. Alter the incubator temperature whenever the infant's temperature is outside the normal range.
9. If the infant remains cold in spite of the recommended incubator setting then the cause is either:
 - (i) The room is too cold or the incubator is too close to a cold window. Warm the room if necessary and move the incubator away from the cold window. Place a perspex heat shield over the infant and put on a woollen cap to prevent radiant heat loss.
 - (ii) The infant is infected. Septicaemic infants often become hypothermic.
 - (iii) The incubator is malfunctioning.

22-I USING A SERVOCONTROLLED CLOSED INCUBATOR.

These modern incubators automatically control (servocontrol) the temperature of the air in the incubator to keep the infant's skin temperature within the normal range. The required skin temperature of the infant must be set on the control panel. A temperature probe, which is attached to the infant's skin, sends information via a cable to the thermostat in the incubator. The thermostat then automatically increases or decreases the temperature of the heating coil to keep the infant at the required temperature.

The method of using a servocontrolled incubator is as follows:

1. Clean and re-assemble the incubator, plug in the power lead at the wall and switch on the wall plug and incubator as mentioned above for manual closed incubators.
2. Switch the controls to manual (AIR) and preheat the incubator to 37°C.
3. Place the infant in the warm incubator and attach the temperature probe to the infant's skin. Make sure that the cable from the skin probe is correctly plugged into the incubator.
4. Switch the incubator controls from manual (AIR) to servocontrolled (SKIN). Set the required skin temperature to 36,5°C on the control panel. The actual skin temperature will be displayed on the panel. If the incubator gets too hot an alarm will sound.
5. After 30 minutes check that the infant's skin temperature is the same as the required temperature. If not, then the skin probe is not correctly applied or the incubator is malfunctioning. If the skin probe comes loose the incubator will continue to warm up and the infant may become too hot (hyperthermic).

If required, a servocontrolled incubator can be used under manual control.

22-J ADVANTAGES AND DISADVANTAGES OF A SERVOCONTROLLED CLOSED INCUBATOR.

The advantage of a servocontrolled closed incubator are:

- (i) The incubator temperature does not have to be repeatedly adjusted by the staff. Therefore, the infant can be maintained at a constant temperature which results in the best possible weight gain.
- (ii) The skin temperature can be read off the incubator. Therefore, a telethermometer, digital or low reading mercury thermometer does not have to be used.

The disadvantages of a servocontrolled closed incubator are:

- (i) They are more expensive than a manually controlled incubator.
- (ii) It is more difficult to identify an infant with infection as they can not become hypothermic or pyrexial.

22-K CLEANING A CLOSED INCUBATOR.

The incubator should be wiped down daily, and thoroughly cleaned weekly or after an infant is moved out the incubator. This is important to prevent infection in the infants. A dirty incubator encourages the growth of bacteria.

Each day that the infant is in the incubator, the inside walls should be wiped with a detergent solution to keep it clean. Any urine, stool, blood or vomitus in the incubator must be immediately cleaned away with a detergent solution. Detergent (soapy) solutions commonly used to clean incubators include Savlon (diluted 1 in 200), Teepol (5 ml in 5 litres) or Patagon (5 ml in 5 litres) diluted in warm water.

The following should be done when an incubator is thoroughly cleaned:

1. Move the incubator to a suitable area of the nursery.
2. Dismantle the incubator removing the mattress, floor, the port hole cuffs and gaskets (rubber or plastic linings), and the hood gasket. Note the exact position of the gaskets before removing them.
3. Soak the cuffs and gaskets in a detergent solution for 1 hour.
4. Wipe both the inside and the outside walls of the hood and the base of the incubator with a detergent solution. Make sure that all dirt is removed.
5. Allow the incubator to dry completely before re-assembling it. Allow the gaskets and cuffs to drip dry and replace them.

The principle of cleaning an incubator is to wash it thoroughly with a detergent (soapy) solution to remove any contaminating material. Once dry it should be free of harmful bacteria, fungi and viruses. Bacteria will not grow on a clean, dry incubator surface.

All closed incubators should be serviced every 3 months by a qualified technician.

THE RADIANT WARMER

The overhead, infra-red radiant warmer heats the infant by radiation. A number of different makes (models) of radiant warmer are available.

22-L COMPONENTS OF A RADIANT WARMER.

1. The platform on which the mattress lies.
2. The overhead heating unit.
3. The control panel which contains the on/off switch, the thermostat, a display of the infant's skin temperature and the temperature controls.
4. The temperature (skin) electrode.

22-M USING A RADIANT WARMER.

1. The mattress and platform must be clean. Cover the mattress with a clean linen sheet.
2. Plug the power lead into the wall and switch the wall plug on.
3. Switch on the radiant warmer.
4. Usually the radiant warmer does not need to be preheated as it warms almost instantly. However, should you want to warm the mattress, set the controls to manual mode and set the temperature to 37°C. If a manual mode is not available, simply leave the probe on the mattress and switch the warmer on.
5. Usually the warmer is switched on when the infant is placed on the mattress. The infant must be nursed naked so that the skin can absorb the radiant heat. Very small infants can be covered with a single layer of thin plastic sheeting or Perspex heat shield to prevent draughts cooling the infant. Plastic sheeting will also reduce the amount of water lost through the infant's skin. Always keep the sides of the platform up as they reflect heat and also reduce draughts.
6. Attach the temperature probe to the infant's skin. Make sure that the lead to the temperature probe is correctly plugged into the warmer.
7. Adjust the servocontrol setting on the control panel to 36,5°C. The control panel will display the infant's skin temperature.
8. After 10 minutes check that the infant's skin temperature is the same as that set the control panel. If not, then the temperature probe is loose or the radiant warmer is malfunctioning.
9. Infants under a radiant warmer should receive an extra 25 ml/kg of fluid a day, either as milk or intravenous maintenance fluid to replace the extra fluid lost by evaporation.

22-N ADVANTAGES AND DISADVANTAGES OF A RADIANT WARMER.

Advantages of a radiant warmer when compared to a closed incubator:

1. It is very easy to handle and examine an infant under a radiant warmer. Radiant warmers are particularly useful for resuscitating infants, for sick infants who need a lot of care, and for many procedures in an intensive care unit.
2. Hypothermia can be rapidly corrected.
3. It is easier for the parents to see and touch their infant.
4. They are easy to clean.

Disadvantages of a radiant warmer when compared to a closed incubator:

1. Infants, especially very small infants during the first days of life, lose a lot of water by evaporation when nursed under a radiant warmer. In contrast, the temperature and humidity in a closed incubator are more stable and this improves the growth rate of the infant. Most small infants should, therefore, be nursed in a closed incubator.
2. The infants are exposed to the droplet spread of bacteria and viruses.
3. Infants under radiant warmers are often excessively handled by the staff due to the ease of access.
4. The radiant warmers are large and take up a lot of space in the nursery.