



# **AUS-MEAT**

## **ACFM PROGRAM**

**ADVANCED CARCASS FAT  
MEASUREMENT  
(ACFM)**

**- OVINE & CAPRINE GR -  
PARTICIPANTS WORKBOOK**

**JANUARY 2000**

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## 1. Objective of the Course

The objective of this course is to improve your understanding of the importance of carcass fat measurement as well as improving your carcass fat measurement skills.

At the completion of this course you should be able to:

- ✓ Explain the importance of accurate GR measurements.
- ✓ Define and locate the GR site.
- ✓ Take GR measurements that are within the performance standard.
- ✓ Understand the GR measurement monitoring process.
- ✓ Explain possible causes of carcass fat measurement error.



The ACFM-Ovine examination comprises of a multiple choice section, a demonstration of your pre-operational check of measuring instruments, GR site location, and carcass measurement. The answers to the multiple choice section are contained in this workbook.

## **2. The Importance of Carcase Fat Measurement**

### **2.1 Why Measure Carcase Fat Depth?**

The two key factors in determining the value of a carcase are:

- ▶▶ Market destination, and
- \$\$ The yield of saleable meat from the carcase.

The suitability of a carcase for a particular market will be determined by consumer preferences in that market. The GR measurement is one objective measurement that is used to determine the destination of the carcase.

Destination usually refers to the country the carcase will go to and its market segment in that country. It also applies to the domestic market where retail outlets are being encouraged to include carcase fat scores or millimetre ranges in their purchasing specifications.

A carcase which yields a higher percentage of saleable meat is generally more valuable.

An accurate measurement of carcase fat depth will indicate the yield of the carcase and its suitability for a particular market. Research results support this claim and indicate that GR measurements can provide useful data for plant management, the producer and the end-user. This information is used, not only as a means of determining payment to producers, but also as a management tool for the processor and producer.

### **2.2 Why have the GR site?**

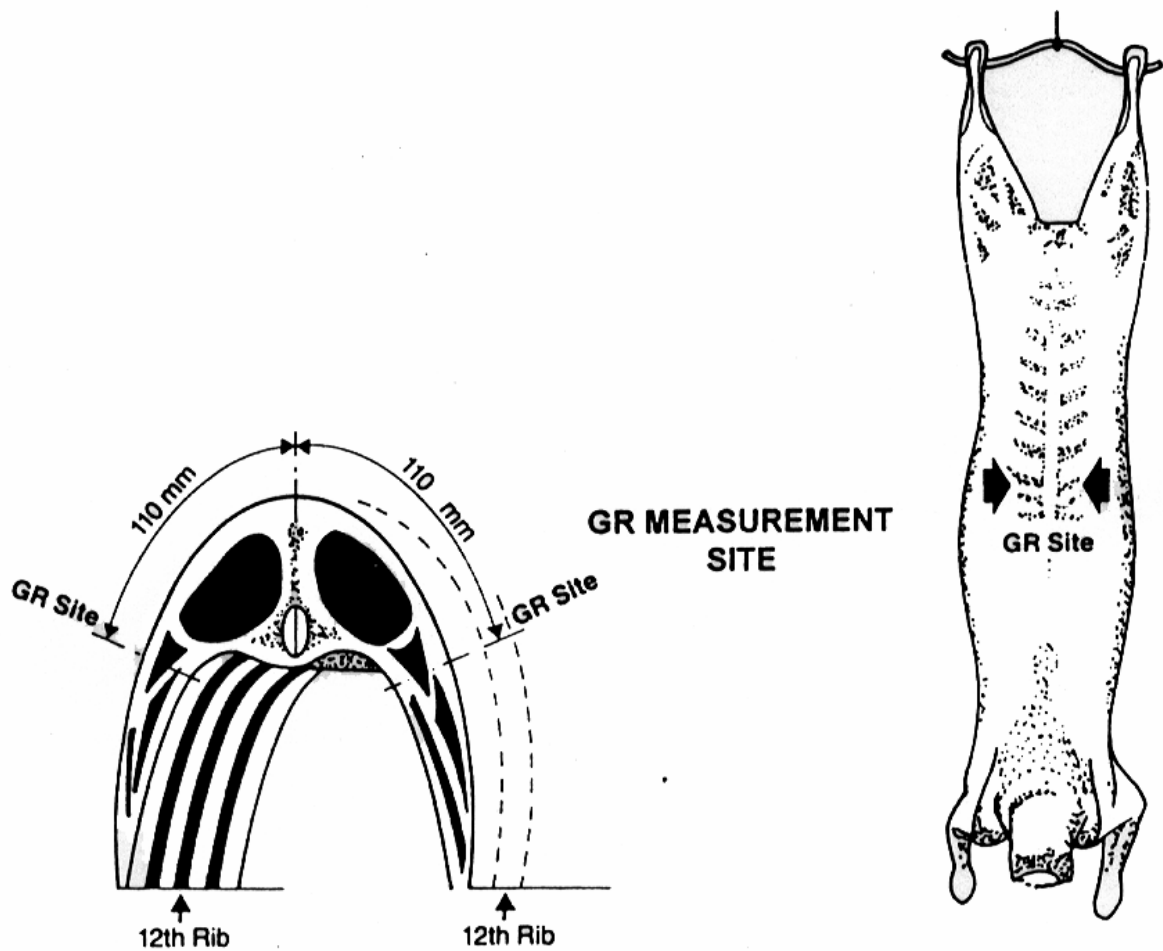
A national carcase fat measurement site makes a lot of sense for the following reasons:

- ◆ It provides objective producer feedback that can be compared between meatworks and mobs of sheep or lambs. Feedback aids livestock production management.
- ◆ It provides a reliable indicator to abattoir management of the market suitability and the saleable meat yield of carcasses.
- ◆ It provides an objective basis for establishing the prices paid for stock purchased 'over the hooks'.
- ◆ It provides livestock buyers with an objective yardstick to compare their live animal assessment.
- ◆ It provides carcase buyers with an objective means of specifying the desired fat depth range.

### 3. The GR Site

#### 3.1 Definition of the GR Site

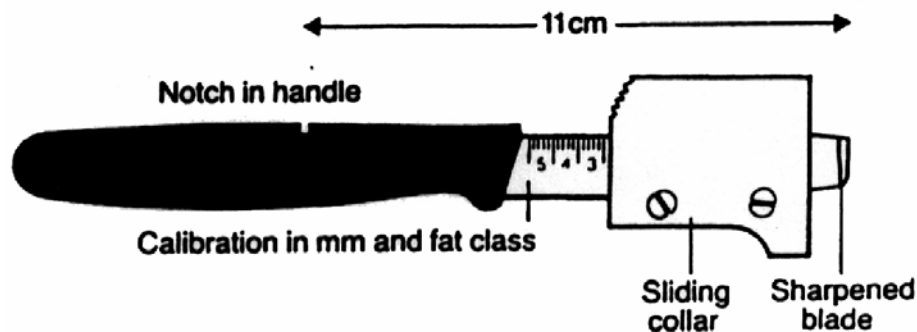
The GR site is located 110 mm from the mid-line of the carcass along the lateral surface of the 12<sup>th</sup> rib on either side of the carcass.



## 4. The GR Knife

### 4.1 Parts of the GR Knife

The GR knife consists of a handle, a blade and a block which moves along the blade to indicate the fat depth measured. One side of the blade is marked in millimetre graduations and the other in five divisions or fat classes. The measurement may be recorded in millimetres or fat class.



### 4.2 Pre-operational check of the GR Knife

**Before using the GR Knife a check should be conducted of the following:**

- ◆ **Accuracy:** Check, by placing rear edge of plastic collar exactly on fat class 4 or 5 grading and using an accurate ruler, measure from the point of the knife to leading edge of the plastic collar. Measurement should read 20mm or 25mm dependent on the fat class chosen. Check that the machine engraved graduations are not damaged or worn.
- ◆ **Cleanliness:** The knife must be free of fat, grease, blood, tissue, etc.
- ◆ **Plastic Collar Assembly:** Check that the plastic collar is not too loose or too tight on the knife. Adjust by tightening/loosening two small screws, using a small screwdriver. Do **not** use the blade.
- ◆ **Knife Point Sharpness:** Check that the knife point is sharp.
- ◆ **Eleven (11) Centimetre Mark:** Check that the notch on the handle measures 11cms from the tip of the blade.

### 4.3 Measuring with a GR Knife

- ◆ While facing the back of the hanging carcass locate the intercostal space between the 12th and 13th ribs by moving the thumb down the internal wall of the abdominal cavity.
- ◆ When this space is located press against it with the thumb. This will produce a slight bulging on the outside of the carcass and indicate the intercostal space between the 12th and 13th ribs.
- ◆ Use the free hand to locate the midline of the carcass. Next, locate the point on the midline nearest the bulge.
- ◆ Lay the GR knife flat against the carcass at right angles to the midline and with the notch in the handle on the midline.
- ◆ Roll the knife around the carcass until the tip of the blade comes in contact with the tissue surface.
- ◆ Keep the point of the blade at this site and continue rolling the knife until it is at right angles to the carcass surface.
- ◆ Remove the thumb from the intercostal space while maintaining the carcass in a steady position.
- ◆ Press the blade into the intercostal space between the 12th and 13th ribs.
- ◆ Cut down until the blade touches the 12<sup>th</sup> rib. Keeping the blade in contact with the rib, withdraw the knife slightly and move it around the rib until the blade tip is resting on the point of the rib nearest the outside surface of the carcass. This is the GR site where the measurement is to be taken.
- ◆ Keeping the blade against the highest point of the rib and at right angles to the tissue surface, move the plastic collar along the blade until the front of the collar just touches the tissue surface. Do not indent the surface.
- ◆ Holding the collar firmly against the blade to ensure it does not move, withdraw the knife from the carcass and read the fat class or measurement. Readings are taken at the trailing edge of the plastic collar.

#### **4.4 Care and maintenance of the GR Knife**

**The following points should be observed:**

- ◆ **Cleanliness:** Remove the plastic collar from the knife and clean the knife and collar with hot water. Ensure all fat, grease, blood, tissue, etc, is removed. Dry with paper tissue.
  
- ◆ **Knife Point Sharpness;** Check that the knife point is sharp. To sharpen, use a small hardstone or fixed whetstone. After sharpening, the knife must be checked for accuracy as specified in paragraph 4.2. Adjustment, if required, is affected by reducing either the leading edge, or, rear edge of the plastic collar, using a fine cut file, to compensate for any reduction of the knife point from sharpening.
  
- ◆ **Storage:** The knife should be lightly smeared on all metal surfaces, with an approved oil and stored in a dry, warm place.
  
- ◆ **Replacement:** The knife must be replaced when, for example, :
  - a) the knife blade is broken;
  - b) the machine engraved graduations are damaged, or hard to read; or
  - c) the plastic collar assembly is damaged.

## 5. The Sheep Probe

### 5.1 General information

The Sheep Probe was developed from a need to find a means of collecting fat depth information in millimetres, at chain speed, that can be passed electronically to slaughter floor computer terminals.

The Sheep Probe is aimed at companies that slaughter lambs and have computerised scales and ticketing. However, it can be used as a "stand alone" system, where fat depth is recorded manually.

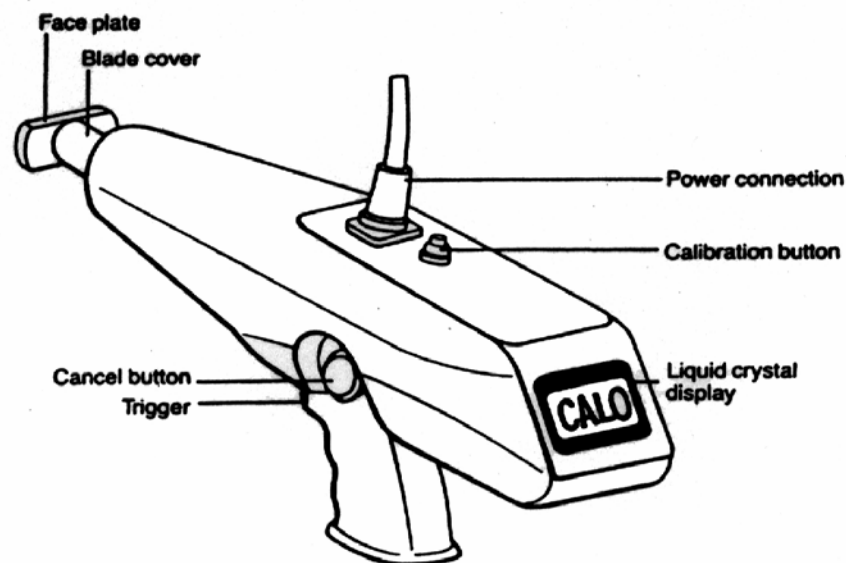
### General Design Features

The Sheep Probe is a gun shaped instrument.

It has two control buttons:

1. The trigger button, which initiates the measurement (located at the front of the handle).
2. The cancel button, which deletes a false measurement if the probe is connected to a computer (located on the left hand side).

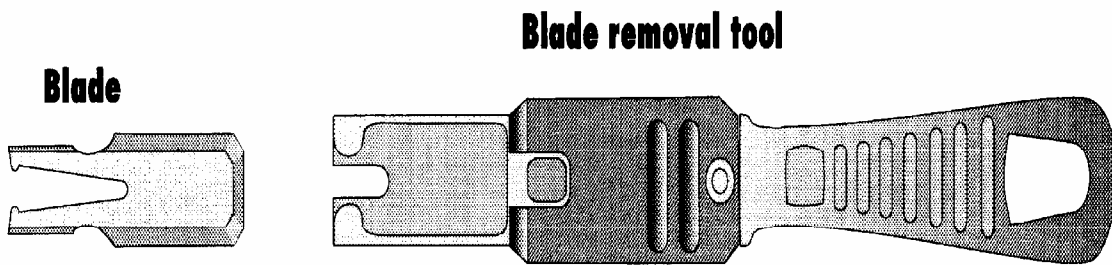
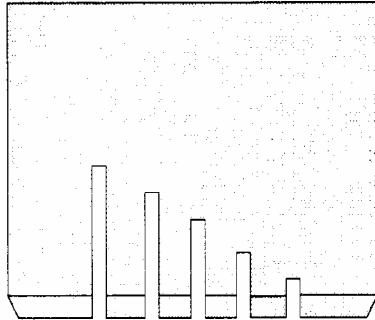
It has a calibration button, which is used to change the mode of operation between "calibrate" and "measure" (located at the back of the casing).



It has a power connection which can be attached to a battery pack for "stand alone" activities, or it can be attached to a slaughter floor cable which not only provides power but also transfers information to the scales computer terminal.

The Sheep Probe is supplied in a case, which should also contain a portable power source, a calibration block and a blade removal tool.

### **Calibration block**

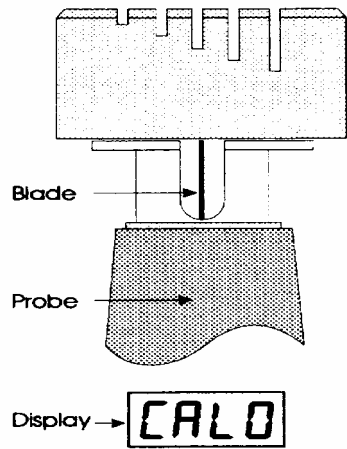


## **5.2 Calibrating the Probe**

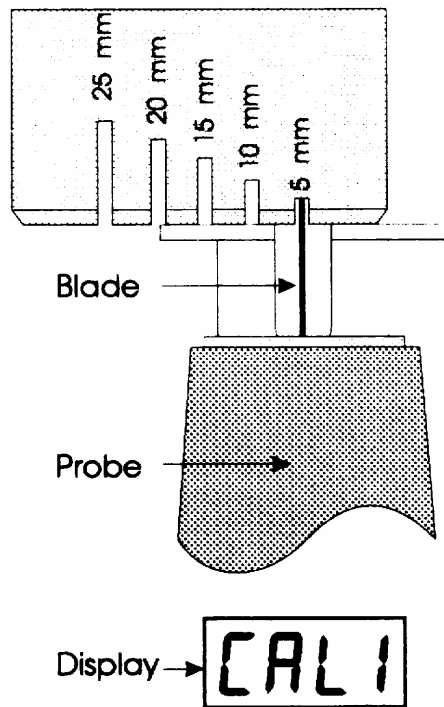
Connect the Probe to a power source, either "stand alone" or with a host computer. Press the measure/calibrate switch to the calibrating position. "CAL-" will appear on the Liquid Crystal Display ('LCD').

### **Calibration Steps**

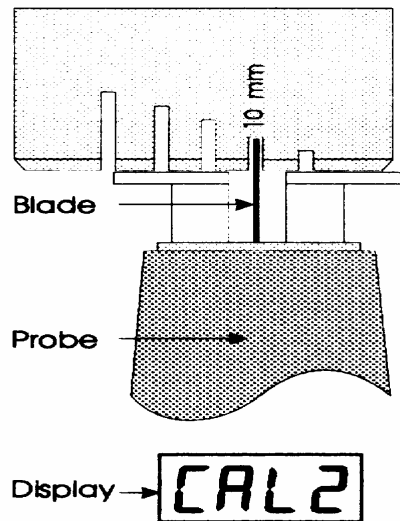
1. Place the face-plate firmly against the flat side of the calibration block. Hold the block steady.
2. Push the blade firmly against the calibration block.
3. Press the trigger button, the display should show  
"CAL 0"



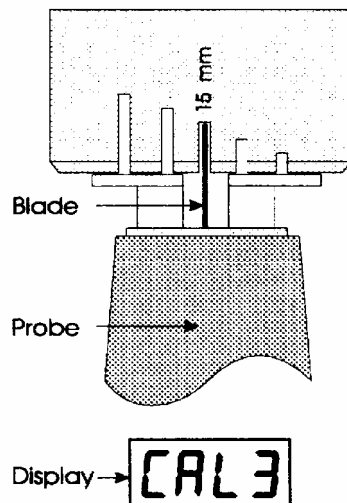
4. Insert the blade in the 5 mm slot of the calibration block. Hold the block steady.
5. Repeat steps 2 and 3. The display should show "CAL 1"



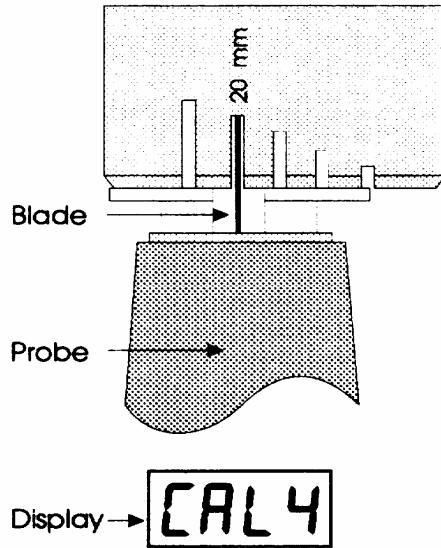
6. Insert the blade in the 10 mm slot of the calibration block. Hold the block steady.
7. Repeat steps 2 and 3. The display should show "CAL 2"



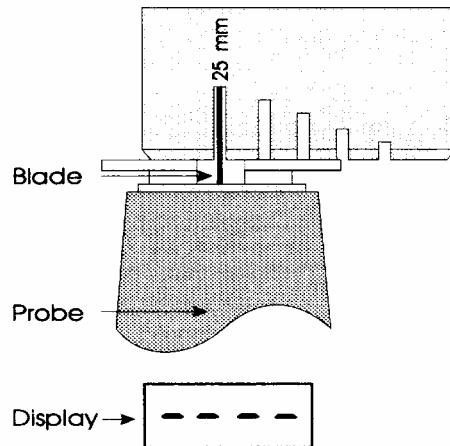
8. Insert the blade in the 15 mm slot of the calibration block. Hold the block steady.
9. Repeat steps 2 and 3. The display should show "CAL 3"



10. Insert the blade in the 20 mm slot of the calibration block.  
Hold the block steady.
11. Repeat steps 2 and 3. The display should show "CAL 4"



12. Insert the blade in the 25 mm slot of the calibration block.  
Hold the block steady.
13. Repeat steps 2 and 3. The display should show " \_ \_ \_ "

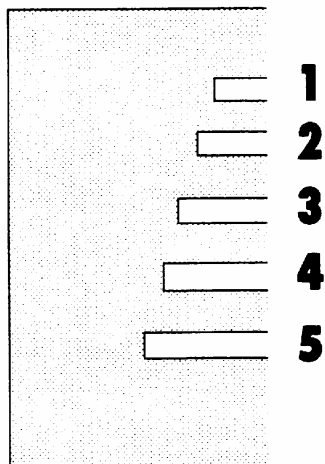


14. Press the calibration button and the display should show "0 00"

## Calibration Check

The Sheep Probe is now calibrated, but it should be re-inserted into the slots of the calibration block as a quick means of double-checking. If the Probe measurement is inaccurate by more than 1mm in a range or inaccurate in more than one range then the calibration procedure should be repeated.

## Calibration Block



Slot	Fat Class	Fat Depth
1 -	1	5
2 -	2	10
3 -	3	15
4 -	4	20
5 -	5	25

**Calibration block note:** The depth of the slots in the calibration block have been adjusted to compensate for the force required to push the probe down the guide rods. For example, the 5mm slot does not actually measure 5mm. The block therefore is only to be used when calibrating the Probe and must not be used to check the GR Knife.

### When Should the Sheep Probe be Calibrated?

The Sheep Probe should be re-calibrated, using the calibration block, each time the blade is replaced, when the power supply is interrupted, after cleaning and at regular intervals through out the day.

### **5.3 Locating the GR Site**

Each Probe operator should identify for him or herself a simple method of locating that point 110mm from the mid-line of the carcass. This will ensure that the blade of the Probe is correctly positioned on the carcass.

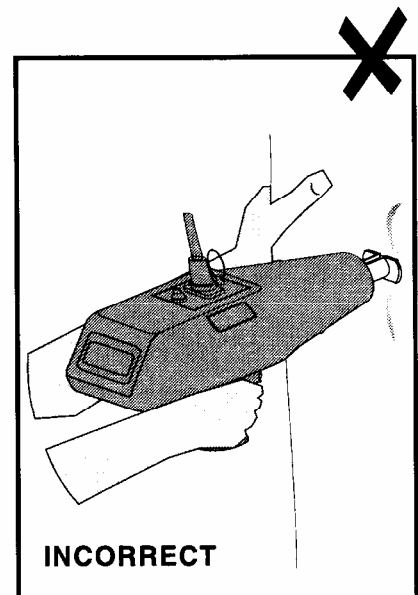
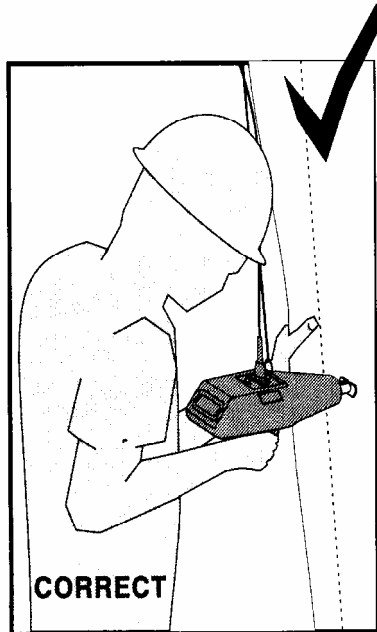
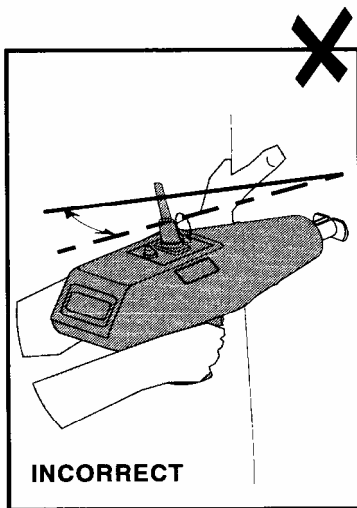
One suggested method is as follows:

1. Carefully locate and mark the GR site on a carcass hanging on a stationary rail using a GR Knife.
2. Place the tip of the thumb of the hand that will be free when the Probe is being used ('free hand') on the site and, resting the hand in a relaxed manner on the carcass, note the position of the mid-line relative to the hand.
3. Identify that part of your free hand that touches the mid-line of the carcass with a pen or marker. Providing that you hold your free hand in a similar manner when using the Probe, you now have a reference point for determining 110mm from the mid-line.

### **5.4 Operating the Probe**

1. Grip the carcass's lumbar vertebrae with the free hand. This will steady the carcass and present the measuring site to the operator.
2. Slide the free hand down to the 13<sup>th</sup> thoracic rib. With the hand against the mid-line of the carcass, the operator should be able to estimate 110mm from the mid-line, providing he or she has taken the steps referred to in 5.3.
3. The Probe should be placed against the carcass and the handle lowered so that the blade is about 30 degrees from the horizontal, and an incision should be made with a gentle slicing motion. Ensure the blade has cut through the skin and tissue and is resting on the rib bone, not just pushing down on the surface.
4. The tip of the blade should be positioned on the 12<sup>th</sup> rib. A "grating feeling" is a good indicator that the blade is actually touching the rib.
5. The Probe should now be arranged so that the blade is 90 degrees to the carcass surface and the face plate is resting squarely on the carcass. The operator must not attempt to read the LCD while the Probe is in the carcass. The eyes should be kept on the face plate to ensure that it is correctly positioned on the carcass.

6. The operator pulls the trigger and withdraws the Probe. While still firmly holding the trigger, the operator should now view the fat depth reading on the LCD to check that it is accurate. If it is accurate the operator may release the trigger to send the result to the host computer. Note that while the trigger is pulled the reading is locked into the probe which enables the operator to take the Probe out of the carcass to view the reading.
7. The cancel button must be pressed within 1-2 seconds of releasing the trigger if the operator inadvertently sends an incorrect reading to the computer. The carcass must be re-measured. The cancellation option is not available on all systems so please check before measuring commences.

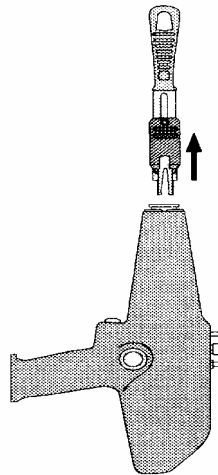


## 5.5 Care and maintenance of the Probe

### Dismantling/cleaning the face plate assembly and chamber

◆ **Remove the blade** (Handle the blade with care at all times!)

Place the probe so that the blade is vertical and hold back the face plate with one hand, then grasp the blade with the blade removal tool, and pull steadily (straight up) until the blade clips disengage.



◆ **Remove the face plate assembly**

The face plate assembly may be lifted out when the blade is removed.

◆ **Clean the assembly**

Remove any deposits of fat or other foreign matter on the assembly and clean as required. Clean the face plate chamber with a lint free cloth.

The body of the Probe can be washed with hot water, but it should not be immersed in it. Most approved detergents are suitable.

**Note:** *The application of a steam hose will buckle the instrument and cause premature failure of the electronics, seals and buttons. Do not stretch the spring in the chamber.*

◆ **Re-assembly of the Face Plate**

The face plate has two notches in one of the squared sides - these go to the top of the Probe.

### ◆ **Inserting the blade**

Hold the face plate in, grasp the new blade with the blade removal tool and slide the blade clips down the grooves in the blade mounting rod (with steady pressure) until they engage into the locking recesses.

If the blade is correctly inserted it will be covered completely by the fully extended face plate.

### **Inspection**

At regular intervals the Probe should be inspected to check for wear that may cause reduction of performance.

Possible impediments to performance are:

- ◆ Worn/loose cable connections
- ◆ Worn/split trigger rubbers
- ◆ Worn/blunt blade
- ◆ Moisture visible in the LCD
- ◆ Incorrect calibration
- ◆ Splayed/loose blade clips

The life span of the Probe will primarily be affected by the treatment it receives in everyday use, so Probe operators should be aware of the factors that affect its performance.

### **Cleaning**

- ◆ The Sheep Probe and cutting blade should be cleaned with cloth or paper towel 4-5 times an hour.
- ◆ Never immerse the probe in a liquid sterilisation unit. Moisture inside the body will damage the electronics.
- ◆ Clean the face plate chamber with a mild detergent using a cotton cloth or sponge. Wipe the face plate and chamber dry using a lint free cloth.

## 5.6 Check List

### - Pre-operational

- The probe performs several self-checks when turned on and should display “000” after 2 seconds. If the display shows “88.88” contact the supplier for repair.
- The blade must be sharp. Install a new blade as necessary.
- Ensure that the electrical connections are secure.
- Calibrate the Probe following the instructions provided.

### - During Use

- Calibrate the probe after each run.
- At each break, clean the probe using a soft cloth and an approved mild detergent.
- Keep the probe dry. **Do not hose the probe.**

### - After Use

- Carefully clean and dry the probe, and place in the carry case provided.
- Store the case in a secure location.
- Check for signs of wear, e.g. split trigger rubbers or worn electrical connections. Order spares parts in advance.
- Recharge the battery so that a fully charged one is available for the next day's use.

## 6. Recording Measurements




Measurements may be recorded in millimetres or fat class. The system used must be in accordance with any specified requirements. For example, a producer may request that feedback on “over the hooks” lambs is recorded in millimetres.

The table below indicates the relationship between fat classes and millimetres.

<b>Fat Class</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Fat Depth (mm)</b>	Over		<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>
	& up to	<b>5</b>	<b>10</b>	<b>15</b>	<b>20</b>	

Millimetre measurements are recorded in whole numbers only. Fractions of a millimetre are rounded either up or down. For example, a measurement of 10.4 mm is rounded down to 10 mm whereas a measurement of 10.5 mm is recorded up to 11 mm.

The fat measurement must be accurately recorded so that carcass data may be used in the preparation of feedback sheets and/or carcass tickets. There are a number of ways that abattoirs can record measurements, including:

-  The measurer records the reading on a sheet, where chain speed permits.
-  The measurer informs the scales operator who in turn records the measurement.
-  The measurement is written on a ticket which is then applied to the carcass.

## 7. Monitoring GR Fat Depth Measurements

### 7.1 Monitoring

GR carcass measurements must be regularly monitored by qualified persons, e.g. a Standards Officer, to ensure that the measurements are within the allowable tolerances.

Monitoring is conducted in accordance with the abattoir's quality assurance procedures and monitoring records are maintained. Generally monitoring is conducted every two hours or three times per day.

A recommended monitoring sample size is as follows:

Kill Size	Up to 100	101 – 200	201 – 400	401 – 1,000	1,000 +
Sample Size	10	20	30	40	40

### 7.2 The Measurement Tolerance

The tolerance for ovine carcass fat measurements is + or – 2 mm.

For ACFM examination purposes, a bias (+/- 8 mm) and consistency (not more than 14) tolerance for each sample of 20 carcasses has been established. Consistency is the total number of millimetres difference between the measurer and monitor, disregarding whether a figure is positive or negative. Bias is the sum of the differences between the measurer and the monitor, taking into account whether the differences are positive or negative. The table below provides an example of the calculations on a sample of 10 carcasses.

	Measurer	Monitor	Difference
1	14	14	0
2	12	12	0
3	14	16	-2
4	18	17	+1
5	11	10	+1
6	12	12	0
7	15	15	0
8	7	9	-2
9	8	8	0
10	13	12	+1
			+3
			-4

Consistency = 7

Bias = -1

### 7.3 The Monitoring Sheet

A sheet can be used to record the monitoring results. Measurements outside the tolerance must be handled in accordance with the abattoir's quality assurance program. Note that the person monitoring assumes the position of the standard and any differences are noted taking the monitor's measurement as the reference point.

	<b>Measurer (mm)</b>	<b>Monitor (mm)</b>	<b>Difference</b>	<b>Site Location</b>
1	7	7	0	OK
2	6	8	-2	OK
3	12	9	+3	Not 110mm
↓				
19				
20				

### 7.4 Auditing Abattoir Procedures

AUS-MEAT will audit abattoir procedures from time to time to ensure that checks are being performed on carcass fat measurement. Quality system problems will be brought to management's attention for rectification.

## **8. Trouble Shooting**

### **8.1 Damaged Sites**

Possible GR site damage must be considered when measuring carcass fat depth. A measurer should be aware of two possible causes of measurement site damage, pelt removal and trimming. If a suitable site can not be found within 10 mm of the GR site, then an estimate of the fat depth is to be made.

### **8.2 Possible GR Knife Problems**

Measurement errors can occur if the GR Knife is damaged or not correctly used. The following situations should be avoided:

- ✘ Faulty knife – damaged ruler or not 110mms from the notch on the handle to the tip of the blade.
- ✘ The collar is not flush with the carcass.
- ✘ Parallax error when reading ruler.
- ✘ Knife not resting against the crest of the rib.
- ✘ Moving the plastic collar when reading the ruler.
- ✘ Incorrect reading of the ruler.
- ✘ Excessive pressure on the plastic collar.
- ✘ Incorrect site location.

### 8.3 Possible Sheep Probe Problems

The Probe, like most devices, will only provide accurate readings if it is correctly calibrated and well maintained. The following situations should be avoided:

- ✘ Faulty probe, incorrectly calibrated
- ✘ Indentation
- ✘ Incorrect measuring action
- ✘ Holding the contact plate with the free hand
- ✘ Blunt blade
- ✘ Parallax error
- ✘ Contact plate not flat against the carcass
- ✘ Not calibrating the probe on a regular basis