

**9.1 Calibration**

Calibration and certification of AUDIT 106 Ultrasonic Thickness gauge instrument can be carried out with full trace ability to national standards if required. Baugh & Weedon NDT is a ISO 9001 registered company.

**SPECIALITY THICKNESS GAUGES****MODEL 2001 General Purpose Gauge**

Range dependent on type of Probe

Plastics 0.12 – 99.99mm or 0.005 – 9.999"

Metal 0.5 – 99.99mm or 0.020 – 9.999"

Metal Range can be extended.

**MODEL 2002 G.R.P. Material Gauge**

Range G.R.P. Dependant on lay up

G.R.P. 4 – 100mm or 0.15 – 6"

Rubber 3 – 60mm or 0.12 – 2.5"

**MODEL 2003 Thin Material Gauge**

Range dependent on type of Probe

0.12 – 9.99mm or 0.005 – 0.9999"

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**ANNUAL CALIBRATION RECORD**

Expiry Date: .....

Annual Certification Date: .....

Annual Certification Date: .....

Annual Certification Date: .....

Annual Certification Date: .....

CERTIFICATION

**9. CERTIFICATION**



The quality standards applied to the inspection, test and calibration of AUDIT Ultrasonic Thickness Gauges are in accordance with ISO 9001:2000 quality control, and all measurements are traceable to national standards.

Baugh & Weedon NDT undertakes to offer repair and maintenance services to the AUDIT 106 thickness gauge for a period of not less than five (5) years from the date of original despatch. The Company cannot make any such undertaking after that period although it will use its best endeavours in every case.

All service test measurement equipment used has full traceability to National Standards.

the Company will quote the Purchaser for the replacement or repair, and will not proceed until written acceptance of such quotation is received.

During the first year of the guarantee the Company will bear the cost of returning guarantee replacement or repaired goods to the purchaser's premises in the country to which the goods were originally delivered. At the purchaser's request and expense.

During the second year of the guarantee the return of guarantee replacement or repaired goods shall be at the Purchaser's expense.

### 8.3 Service Repairs and Maintenance

Repairs not covered by the guarantee or carried out after the guarantee period will be charged at the current hourly service rate, plus the cost of materials.

Goods for repair must be sent at the Purchaser's expense and be accompanied by the Purchaser's written order describing the defect and authorising the company to invoice the purchaser for labour, materials and return delivery costs.

No guarantee or service work will be undertaken until a written order is received.

## 1. INTRODUCTION

The AUDIT 106 is both a Metric and Imperial Ultrasonic Thickness Gauge, it is pre - calibrated with 10 user selectable programs to enable it to measure the thickness of a wide range of metals and plastics.

This handbook describes the instrument and how to use it to its best advantage.

### 1.1 Cautionary information

The AUDIT 106 is intended to satisfy a wide range of applications, including corrosion monitoring. However, the user should be aware that corrosion in a pipeline or vessel is not uniform and thickness readings taken on a sampling basis, example testing to a grid pattern may not indicate the most severely corroded areas.

It is therefore important that inspection schedules should be developed by competent engineers and that measurement of the integrity of a pipeline or vessel should take account of this factor.

## INTRODUCTION

In addition, users should be properly trained in the use of ultrasonic thickness gauges and be made aware of the limitations of the equipment and the proposed testing schedule.

Before using the equipment, operators should make themselves fully conversant with the operating procedures as laid out in this handbook. Particular note should be taken of the following points: Under no circumstances should any part of this equipment be connected to any form of electrical supply other than that specified.

### 1.2 Standard Schedule of Equipment

Dimension 150 x 80 x 35mm

Weight 300g

The standard equipment package consists of the following.

- AUDIT 106 Thickness Gauge. Complete with two AA size alkaline batteries. 0176
- Plastic Transit/Carrying Case. 0173
- Probe type DT25 with Integral lead. 0171
- Operator Handbook. 0174
- Ultrasonic Coupling Agent 125 ml 0185

## SERVICE &amp; GUARANTEE

## 8. SERVICE & GUARANTEE OF EQUIPMENT

### 8.1 Guarantee

The Baugh & Weedon NDT AUDIT 106 is guaranteed for two (2) years, excluding batteries and probes which have been subject to wear.

Baugh & Weedon Ltd ("the company") undertakes to make good by a replacement instrument, or at it's option, by repairing defects arising from faulty design, material or Your existing consumer rights are not effected by these guarantees and conditions.

### 8.2 How to make a Guarantee Claim

Defective goods must be promptly returned at the purchaser's expense to the Company's factory in Hereford. The goods must be accompanied by the purchaser's written order describing the defect and authorising the Company to invoice the Purchaser for any charges not covered by the guarantee.

On receipt of the goods and order the Company will examine the goods and determine the nature and cause of the defect. If the defect is covered by the guarantee a replacement or repair will be effected at the Company's expense. If the defect is not covered by the guarantee

## HEALTH AND SAFETY

7. HEALTH AND SAFETY

The AUDIT 106 thickness gauge and accessories are **NOT** intrinsically safe or flameproof, and should not be used in hazardous areas without the necessary local precautions being enforced for the use of non-intrinsically safe equipment.

Always adhere to site rules and guidelines concerning Health & Safety when using the AUDIT Instrument.

Always wear safety equipment appropriate to the area where the measurement is to be made.

There are no user serviceable parts within the case of the AUDIT 106. Qualified personnel should only carry out Service work.

Always adhere to safe local regulatory disposal practise for alkaline batteries used within the AUDIT Instrument.

Care should be taken that the couplant used is neither harmful to the operator nor will it attack the probe. For advice please contact Baugh & Weedon Ltd.

Ultrasonic Coupling Agent (Hydrophilic Type) **SURTEST UCA-2**. Safety Data Sheets supplied on request.

## OPTIONAL EQUIPMENT

1.3 Optional Equipment

Product	Item No
Probe type DT15 Requires Twin Lead	0252
Probe type DT21 "	0265
Probe type DT27 "	0258
Probe type TCE20 "	0511
Twin Probe Lead	0253
High temperature Twin Lead	0279
Probe Holder	0254
Carrying Pouch	0186
Ultrasonic Coupling 250ml	0467
Ultrasonic Coupling 1 Litre	0465
Maintenance Manual	0231

## 2. TECHNICAL SPECIFICATION

### 2.1 Thickness Range

Minimum	1.5mm	( 0.060in )
Maximum	99.9mm	( 3.999in )

**NOTE:** It is not always possible to obtain maximum thickness readings through some cast materials as the grain structure may be to coarse. (See section 4.6)

### 2.2 Accuracy & Calibration

Material:	10 user selectable programs.
Resolution:	0.1mm / 0.001in.
Accuracy:	±0.1mm / 0.004in ±1 Digit (or 1%).

### 2.3 Power Supply

Source: 2 x AA Alkaline Batteries.  
 Battery Life: Typically 70 Hours continuous use.

**NOTE:** Low battery condition is indicated by a ▲ located at the top left hand corner of the display.

Auto power off timer 50 Seconds, this can be programmed for other time periods during manufacture.

Low battery Warning: ▲ Approx 10 Hours use available.

## 6. CARE & MAINTENANCE

This instrument is protected against hostile environments as defined in section 2.5 and is designed for prolonged use in the field without any special maintenance other than routine cleaning.

All connectors should be kept free of foreign matter and the probe face regularly cleaned with soft material such as tissue paper. To ensure trouble free operation, when not in use the AUDIT 106 thickness gauge should be returned to the carrying case in a clean condition.

Probes and leads are consumable items and are subject to wear and deterioration during use.

The life of these parts can be much extended by keeping them in a dry, clean condition, and storing them in suitable protective containers.

During use avoid 'scrubbing' the probe face on the work piece. Only take spot measurements at the selected locations.

Some organic materials may attack plastic parts and cause early degradation. Contact with such materials should be avoided

## CARE AND MAINTENANCE

proprietary ultrasonic couplant preparations.

We the manufacturers of AUDIT 106 supply within the standard schedule of equipment. Ultrasonic Coupling Agent (Hydrophilic Type) Trade Name **SURTEST UCA-2**. (See section 7).

### 5.8 Transducer Wear

Care should be exercised when taking readings not to "scrub" the probe face over the surface of the work piece, uneven wear and reduced probe lengths can cause poor coupling, making stable readings harder to obtain.

Spare probes are available from the manufacturers and it is recommended that a seriously worn probe be replaced.

A selection of probes is available to suit most applications. (See section 1.3).

## TECHNICAL SPECIFICATION

In normal use battery life will be much greater than the above specification, this is due to the intermittent use of the instrument rather than the continuous test detailed above.

### 2.4 Temperature Range

Operational -5  C to +55

Storage -20  C to +70

### 2.5 Environmental Protection

Sealed and rating to IP65

### 2.6 Electromagnetic Compatibility

Radiated Emission Standard	EN61000-4-22:2011 EN61000-6-4:2007
ESD Immunity	IEC60801-2:1993
Radiated EM field Immunity	IEC61000-4-3:2006+A2:2010

### EC Declaration of Conformity

Model Audit 106 Ultrasonic Thickness Gauge  
WEE compliance Registration No WEE/FK0103WV

## PRINCIPLE OF OPERATION

3. PRINCIPLE OF OPERATION

The AUDIT 106 measures thickness by the injection of a short burst of high frequency sound (ultrasound) into the work piece and measuring the time taken for the burst to travel through the material and be reflected back from the far surface. As the velocity at which the sound travels is constant for a given material the thickness can be computed and displayed.

Thickness readings are updated approximately 5 times per second, the reading being held for approximately 5 seconds when the probe is removed from the work piece.

The velocity factor used for the material thickness calculation is defined by the current program selected. A list of available programs is printed on the rear of the unit.

Material Program Numbers, Pr 0 to Pr 9 = m/sec

0	Mild Steel	5940	1	Stainless Steel	5643
2	Aluminium	6495	3	Copper	4752
4	Brass (70/30)	4395	5	Cast Iron SG	5346
6	Cast Iron Flake	4158	7	Perspex/Nylon	2673
8	P.V.C.	2257	9	Polypropylene	2732

The user will be aware of this situation because it is likely that the effect will change dramatically if the location of the probe on the work piece is changed slightly. If these situations do occur the user should take the following action:

- Apply more couplant to the surface.
- Clean the surface more thoroughly.
- Smooth the surface with a file or grinding wheel.
- Attempt to take readings at other points close to and around the original location.

5.6 Painted Parts

If the paint is thin in relation to the work piece as a whole and is well bonded, very little error will be observed in displayed thickness reading. A poor bond between the paint and metal however, may result in AUDIT 106 trying to read the thickness of the paint layer only.

5.7 Couplant

For all applications the AUDIT 106 Instrument must have its probe coupled to the work piece using a suitable coupling fluid. In practice this can be a variety of fluids such as oil, water, or other types of



If at any point while taking readings a ▲ triangle is displayed at the top left of the display, this is an indication that the batteries need to be changed within the next 10 hours of operation. If the batteries are not changed the unit will stop functioning at a preset voltage and the display will blank. The instrument will remain in calibration until shut-down. It is good practice to carry out confidence check after new batteries are fitted see section 4.3.

#### 5.5 Effect of Surface Condition

A rough front surface may affect the coupling of sound between the probe and the work piece. A rough rear surface will possibly scatter the measuring beam rather than reflect it. In consequence, rough surfaces tend to reduce the reflected signals required for measurement.

The AUDIT 106 can tolerate large changes in signal strength, but ultimately, under very poor conditions, insufficient signal will be received to make a measurement.

There is a point, however, when the signal strength is marginal. Under these conditions the AUDIT 106 may display intermittent thickness readings, the display flickering between a thickness reading and the poor coupling indication.

## 4. DIRECTIONS FOR USE

### 4.1 Unpacking and Preparation

The equipment is supplied in a single commercial carton, containing the items previously detailed, ensure that all the items of equipment are accounted for when unpacking.

Equipment should be examined for signs of transit damage. Damaged equipment **SHOULD NOT BE USED**. Retain the carton in the event the equipment has to be returned to the manufacturer for servicing or period certification.

### 4.2 Preparation for use

Attach the probe to the AUDIT 106 by pushing the moulded connector into the two sockets at the top of the instrument, either way round.

The instrument may now be activated by pressing the **ON** button located in the middle of the front fascia panel. The AUDIT 106 will momentarily display **A106** followed by a single decimal point at the position for Metric or Imperial measurement, from when instrument last used.

The instrument will automatically switch off after 50 seconds of not being used.

### 4.3 Confidence Check

Having prepared the AUDIT 106 for use as detailed above, place the probe firmly onto the surface of the test piece located on the top fascia panel using a suitable couplant. With program **Pr 0** selected (as supplied) the instrument should indicate a stable reading of **6.0**  $\pm$  0.1.

If the reading differs from this value then pressing the **ZERO** button should restore a reading of **6.0**.

**WARNING:** Do not attempt to carry out this Confidence Check on any other test block or material other than the test block mounted on the front fascia panel as this may lead to discrepancies in readings. Imperial mode test piece reading should be **0.236**  $\pm$  0.001in.

### 4.4 Battery Replacement

Place the AUDIT 106 face down. With a small cross-point screwdriver carefully remove the two screws retaining the battery cover plate located near the bottom of the case. The battery compartment cover plate may now be lifted clear of the instrument. Carefully remove both batteries from their retained positions.

The zero however, will still be correct on all other programs, pressing the **ZERO** button for other programs will display readings as:

Pr-1 = 5.7 (0.226)	Pr-2 = 6.6 (0.260)
Pr-3 = 4.8 (0.190)	Pr-4 = 4.4 (0.176)
Pr-5 = 5.4 (0.213)	Pr-6 = 4.2 (0.166)
Pr-7 = 2.7 (0.1070)	Pr-8 = 2.3 (0.090)
Pr-9 = 2.8 (0.109)	$\pm$ 0.1 $\pm$ 0.004.

Each time a different probe is fitted to the AUDIT 106 the zero should be checked.

### 5.4 Basic Technique

The surface of the work piece to be measured should be cleaned to remove all fouling and other contamination. Surfaces do not have to be entirely flat or smooth, but in general, the poorer the surface, the less satisfactory it will be for accurate measurements.

Prepare AUDIT 106 for use (as previously described). Apply a liberal coating of couplant to the work piece at the point to be measured, Lightly press the probe squarely against the surface and read the thickness value from the digital display. The reading will remain on the display for approximately 5 seconds after the probe is removed from the work piece.

after which the display will return to normal operation indicating only a decimal point and the unit is ready for use with the new program selected.

### 5.3 Setting Zero Correction

From time to time the **ZERO** should be checked and reset if required.

Couple the probe to the test piece mounted on the front panel of the unit and obtain a steady reading.

Press and hold the **ZERO** button. The display will indicate "ZE**r**O" and then show "----".

Release the button, the unit will return to normal operation and indicate the thickness of the test piece.

With program **Pr 0** selected and unit in Metric mode this should be  $6.0 \pm 0.1$ , when in Imperial mode thickness reading  $0.236 \pm 0.004$ .

**NOTE:** The zero can be set with any material program but the thickness of the test piece will only read  $6.0 \pm 0.1$ , for program **Pr 0** (Mild Steel).

Follow the polarity marking on the inside of the battery compartment to make sure that new replacement batteries are inserted correctly (AA Alkaline cells are recommended).

**Note** Incorrect insertion and polarity reversal will not cause breakdown of the instrument, as the supply circuit is protected. Replace the battery compartment lid, re-fit & tighten the screws. Take care not to over tighten these screws.

### 4.5 Other Indications During Operation.

#### **Decimal point only when taking measurements**

Poor or no coupling between the probe and work piece.

Attempting to measure a thickness that is greater than 99.9mm.

#### **▲ Triangle at Top Left of Display**

Low battery warning. When this warning first appears it indicates that there are approx 10 Hours of continuous battery life left.

**ZErO Display**

During use it is possible to obtain the display "ZErO", this occurs when the probe has been placed onto the material under test with the unit in the off mode and you have then inadvertently pressed the **ON** button, this operates the Confidence Check sequence. see section 4.3 but on the material under inspection rather than that of the test piece fitted to the front panel, and may lead to a discrepancy of the thickness readings.

**4.6 Limitations**

Thickness Gauges, the ability to obtain thickness readings is dependant on the capability of the transmitted signal to penetrate completely through and return from the rear surface of the material under test, it is possible due to the composition and or grain structure, of some materials plastics, cast iron etc that limitations to the thickness range is possible, as the material is too attenuative for the ultrasound to penetrate.

AUDIT 106 Instruments can tolerate large changes in signal strength, but ultimately, under very poor conditions, insufficient signal will be received to make a measurement.

**5. OPERATION & APPLICATION INFORMATION****5.1 Selecting Measurement Mode**

With the instrument in the off mode press and hold the **MAT** button without the probe being coupled to work piece, press the **ON** button the AUDIT 106 will display **A106**, release the **MAT** button, the display will indicate **Inch** for Imperial mode or **SI** for Metric mode, pressing the **MAT** button again will change this mode

**5.2 Selecting Material program**

In order to read the thickness of materials other than Mild Steel the correct program will need to be selected:

Refer to the table printed on the rear of the instrument to determine the program number required to suit the material under test. ("Pr-0" to "Pr-9")

Press and release the **MAT** button. The display will indicate the currently active program (e.g. "Pr-0" is the default) further presses of the **MAT** button will step the program display through the available settings. When the desired program is indicated stop, do not touch the buttons for a few seconds,



We've been supplying portable test and measurement equipment to companies of all sizes and industries around the world since 1991.

Our aim is to distribute easy-to-use, reliable and effective instruments to engineering, maintenance and facilities departments; and to complement these products with comprehensive advice, training and support.

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