

Locator 2S

Owners Manual



HOCKING

Locator 2s Owners Manual

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Doc Ref: 39DH04
Handbook version 01
April 2003

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THRESHOLD

A limit which indicates that the signal from a defect is sufficient to cause concern.

TRAIN

To train an instrument is to set the phase angle to optimum for the sample under test (term used on Hocking Locator UH). The equivalent of Auto Lift-Off on Locator 2s .

Hocking NDT Owners Manuals provide functional information about a particular instrument or group of instruments. However, proper set-up and use of this equipment and the performance of electromagnetic tests requires familiarity with factors which are beyond the scope of Owners Manuals. These factors include the following:

- A. Selection of appropriate cables, probes, fixtures, mechanical handling equipment and other accessories.
- B. Selection of proper test frequency, test mode and other test settings.
- C. Preparation of the test surface.
- D. Characteristics of the test material for example: conductivity, hardness, permeability, geometry, magnetic properties, heat treatment etc.
- E. Environmental factors such as temperature humidity, dust and electrical interference.
- F. Any individual factors that will depend on the particular test object or test being performed.

It is therefore imperative that operators are properly trained in both general procedure for electromagnetic testing and in the set up and execution of the particular test to be performed. It is the responsibility of the instrument user to ensure that test operators are trained to a sufficiently high standard, suitable equipment is used in the correct manner and that any test variables which may affect specific tests are taken into account. Similarly, compliance with standards such as ASTM, ASNT, API, ASME, BS,EN etc., as well as the observance of any test procedure specified by any government, manufacturer or other regulating authority is the responsibility of the user.

Periodic calibration, cleaning and maintenance may be necessary to ensure proper operation of the equipment. Environmental conditions and regularity of use should be considered when determining the frequency of such checks, then this should be observed.

Incidents such as physical shock, immersion in liquid and exposure to damaging environments such as excessive heat, moisture, dirt or dust can adversely affect equipment performance. The equipment must be examined for damage and recalibrated after any such incident. Do not use any product which you know or suspect to be faulty.

EC Declaration of Conformity

We Hocking NDT Ltd
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declare under sole responsibility that all production issue versions of the Locator 2s Eddy Current Flaw Detector meet the intent of Directive 89/336/EEC for Electromagnetic Compatibility.

Compliance tested to:

EN 50081 - 1 Emissions
EN 50082 - 1 Immunity

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Abbreviation for Nickel-Cadmium technology batteries. Well known for suffering from the memory effect, where the energy storage capability is reduced if the battery is not discharged fully before recharging. Oldest of battery technology used in portable equipment.

NiMH

Abbreviation for Nickel Metal Hydride battery technology. Successor to NiCd giving no memory effect at the cost of a higher self discharge rate.

NOISE

Unwanted signals which appear on the display. Much of the design work for an eddy current instrument is involved with minimising electronic noise (both external and internal) in order to improve the signal to noise ratio.

- P -

PROBE

This is the name given to hand held eddy current sensors. See also ABSOLUTE, LOCATOR, DIFFERENTIAL, BRIDGE and REFLECTION.

- R -

REFLECTION

A probe connection where there is a primary and secondary windings. The secondary output is connected so as to give a small output. May be differential or absolute.

RS232

A serial communications protocol for transferring data between computers and other devices.

- S -

SKIN EFFECT

The tendency for alternating current to flow near the surface of a conductor.

SKIN DEPTH

The average depth at which an eddy current is considered to flow (37% of the current density at the surface) and decreases exponentially with depth. Higher frequencies, relative permeability (magnetism) and conductivity result in less skin depth.

- T -

Circuits that have resistive and reactive components (capacitance and inductance are reactive components) are said to give an impedance to the flow of current. Impedance is normally dependent on frequency.

INDUCTANCE

Inductance is a measure of the voltage required to cause current to change at a given rate in a coil of wire. Measured in Henrys. Usually in micro-henries (millionths of a Henry) = uH

- *L* -

LED

Abbreviation for light emitting diode.

LCD

Abbreviation for Liquid Crystal Display.

Li-Ion

Abbreviation for Lithium Ion battery technology. Offering high charge density, zero memory effect and greater charge cycle life. Also see NiMH and NiCd. State of the art technology.

LIFT-OFF

The signal caused when a probe is lifted from the test specimen surface. Can refer to movement or the actual spacing.

LIFT-OFF COMPENSATION

Setting the phase of the signal caused by lift-off to the 9 o'clock direction from the balance point in order to ensure that defect signals in the Y axis are relatively free of this effect.

LOCATOR PROBE

As in Locator Probe. This is an absolute probe but to be compatible with the Locator UH the nominal impedance is 100 ohm. This means that the operating frequency for a Locator Probe when set to Absolute Probe Mode is half that when set to Locator Probe Mode e.g. 2Mhz probe may be used at 1Mhz in absolute probe mode. See Absolute Probe.

- *N* -

NDE

Abbreviation for NON DESTRUCTIVE EVALUATION

NDT

Abbreviation for NON DESTRUCTIVE TESTING

NiCd or NICAD

Chapter 1

Unpacking and Preparing for Operation

- 1.1 Checking Supplied Equipment
- 1.2 Basic Knowledge
- 1.3 Key Physical Features of the Locator 2s
- 1.4 Power Sources
- 1.5 Positioning Locator 2s
- 1.6 Switching Locator 2s On and Off

1.1 Checking Supplied Equipment

Locator 2s is available with a wide range of accessories. Check that the contents of your shipment match all the items listed on the packing note. If any items are missing please contact your supplier immediately.

1.2 Basic Knowledge

As a general rule, effective use of eddy current equipment for new applications requires the following:

- An understanding of the principles of eddy current testing, particularly aspects which may limit detectability of flaws such as depth of penetration and the way in which different probe configurations respond to different flaw types.
- An understanding of other NDT and inspection procedures which may be appropriate or which may be required to verify results.
- Knowledge of the application, i.e. the way in which the part being tested is manufactured or stressed in use and the probable flaw mechanisms.
- Existing applications require a good working knowledge of the equipment to be used plus a written technique to be followed in performing the inspection.

1.3 Key Physical Features of the Locator 2s

The Locator 2s has been designed to be extremely rugged and robust, whilst also avoiding risk of damage to the surrounding environment. For this reason plastics and rubbers have been used to avoid scratching or denting of precision surfaces, whilst all connectors are flush with the surface to avoid any scratch hazard. All parts of the unit are secured so as to avoid a Foreign Object Damage (FOD) hazard. For this reason connectors are locked from the inside of the case and there are no parts that can become disconnected.

1.4 Power Sources

Connect Locator 2s to power source. This will depend on the configuration of Locator 2s purchased and can be an advanced lithium-ion battery, AA cells or connection to an AC supply via the charger/eliminator unit. For information on these options see Chapter 5, Power Sources and Battery Management.

1.5 Positioning Locator 2s

Locator 2s is a versatile, lightweight unit that is designed for operation in a wide range of environments. A variety of accessories is available for setting the unit in the optimal position for operator use including tripods and other camera accessories. These can be secured to Locator 2s using the camera thread provided on the lower edge (see Fig 1.1). Ensure any screw is not longer than 8mm (3/16") or it may damage the enclosure. The thread type is 1/4" BSF.

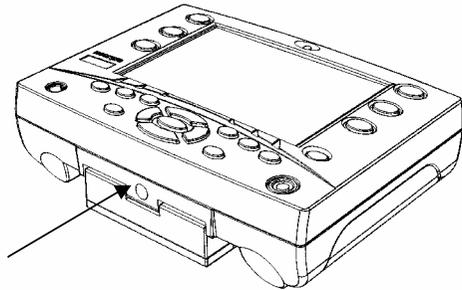


Fig 1.1 - Position of Tripod Mount

Note...

Locator 2s has designed to be rugged, splash resistant and also resistant to dirt and dust ingress. The unit is rated to IP64. However, it should not be considered drop proof or water proof, and care should be taken to position it to prevent damage due to falling or immersion in water.

Locator 2s has high grip rubber handles on the rear of the unit and these are intended to prevent sliding of the unit when placed on inclined smooth surfaces. Care should be taken to keep the rear of the Locator 2s clean to prevent scratching of the surface. Avoid placing the instrument on contaminated surfaces where it might pick up abrasive particles.

ET

Electro-magnetic testing. An alternative term used in the USA for Eddy Current Testing.

- F -

f, Freq.

Abbreviation for Frequency. Unit Hertz (Hz)

FILTER

Is an electronic device for limiting frequency range. Filters are often described as high, low or band pass.

FLAW

An imperfection in material composition e.g. a crack.

FREQUENCY

For an alternating current signal, frequency is a measure of the number of full cycles occurring every second (measured in Hertz).

- G -

GAIN

See AMPLIFICATION

GROUND

An alternative word for EARTH, a local connection between a circuit or device and the earth which is at zero potential.

GROUNDING

The act of connecting to ground.

- H -

HERTZ

Unit of frequency. Abbreviated to Hz

Hz

Abbreviation for Hertz. 1 kHz = one thousand Hz and 1 MHz = one million Hz

- I -

IMPEDANCE

- C -

CURRENT

Is the measure of the amount of electrical charge flowing in a conductor in unit time.
Unit of measurement the Ampere (A)

- D -

dB

An abbreviation for decibels, a logarithmic measure of gain or attenuation. See AMPLIFICATION

DC

An abbreviation for direct current as supplied by a battery.

DEFECT

An imperfection in material composition.

DIFFERENTIAL

A differential probe is one that has two detection coils arranged such that equal signals detected by both coils are cancelled out. This gives much less drift and noise than an absolute probe. May be Bridge or Reflection connected.

DIGITAL

Digital or logic circuitry operates in incremental steps and switches between two voltage levels (commonly 0V and +5V). A microprocessor consists of digital circuitry.

DSP

Digital Signal Processor. A specialised type of microprocessor, it is optimized for high speed processing of digitized signals, used for phase rotation, filtering, mixing etc.

- E -

EARTH

A local connection between a circuit or device and the earth which is at zero potential.

EDDY CURRENT

These are the currents that are created in a conductive material when changing magnetic fields intersect the conductor. e.g. by bringing a coil carrying an alternating current near to the conductive material. Commonly used to describe the Non-Destructive testing method exploiting this phenomena.

EC

An abbreviation for Eddy Current.

1.6 *Switching Locator 2s On and Off*

Once a suitable power source has been connected to Locator 2s the unit can be switched on by a single press of **on/off**

The unit will then display the welcome screen momentarily, followed by the operating screen, (see fig 2.2).

The unit can be switched off by pressing and holding **on/off** for more than 2 seconds. A short press of **on/off** switches the backlight on and off.

Chapter 2

Introduction to Controls and Basic Operation

- 2.1 Introduction to Locator 2s Controls
- 2.2 Overview of Button Functions
- 2.3 Changing Settings Using Menus and Cursors
- 2.4 Setting the Operating Language
- 2.5 Setting the Time and Date
- 2.6 Switching the Backlight On and Off
- 2.7 Setting the Display Contrast Level
- 2.8 Setting the Automatic Power Down Function
- 2.9 Graticules – Spot Mode
- 2.10 Selecting the Graticule Type
- 2.11 Selecting Key Click
- 2.12 Defining User Programmable Softkeys
- 2.13 Using Pre-Programmed Softkeys
- 2.14 Keyboard Lock
- 2.15 Understanding the Different Modes
- 2.16 Normal Mode
- 2.17 Conductivity Mode

2.1 Introduction to Locator 2s controls

All operating controls are available on the front panel of the instrument. The most frequently used controls (balance, clear and freeze) are located vertically beside the screen. These buttons are duplicated on either side to allow both left handed and right handed operation.

These keys have two functions. The short press function is as indicated by the light writing on the dark background (i.e. Balance, Clear, Freeze). The second functions are invoked by a long press and are as indicated by the dark writing on the light ellipse (i.e. Automatic Load selection, Clear Reference Trace and Keyboard Lock). These are positioned to be most accessible during operation (see 2.2 for further information).

Chapter 10

Glossary

- A -

ABSOLUTE PROBE

A probe where only one coil is used to test the material. A balancing coil may be present in the instrument or within the probe body. For Locator 2s the nominal impedance is 50 ohms. Also see Locator.

AC

An abbreviation for alternating current as used in the domestic power supply and eddy current probe excitation.

ALPHANUMERIC

Indicating either alphabetic letters or numerals.

AMPLIFICATION

This is a measure of the increase in level of the probe signal before a representation of it appears on the display. On the menu, it is also described as Gain and is usually measured in dB. E.g. +6dB = 2x gain, -6dB = 1/2x gain, +20dB = 10x gain and -20dB = 1/10x gain

- B -

BALANCE LOAD

An inductance added to the instruments input circuit to allow the use of absolute single coil probes. The value of the inductance should equal that of the absolute probe. Also see HENRY and INDUCTANCE.

BALANCING

This facility allows steady or dc signals from a probe, or probe/material combination, to be cancelled out. The visual effect is that after balancing has occurred the display is set at zero or a preset reference point.

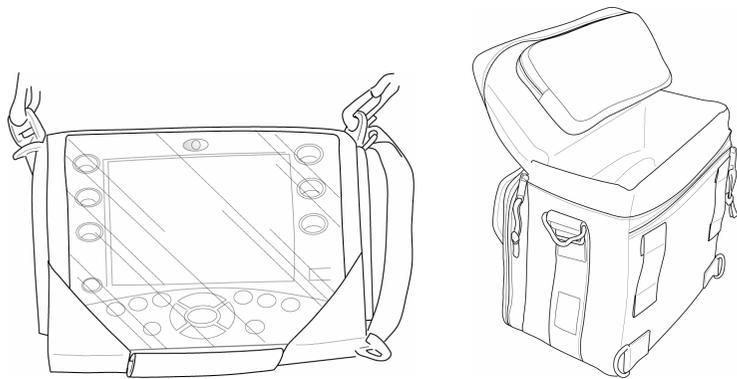
BAUD

Baud Rate is the number of bits of information transmitted in one second.

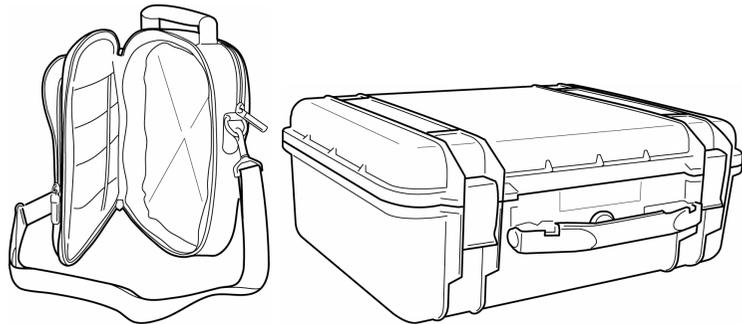
BRIDGE

A probe connection where there are two coils connected so that the signal is compared between them.

- 39A038 Locator 2 Communication Software
- 39A039 Tripod stand for Locator 2s
- 39A040 Lightweight operating handle for Locator 2s
- 39A041 Splashproof case with plastic front for operation of Locator 2s
- 39A042 Locator 2s Soft Pouch for storage, accepts charger
- 39A043 Rugged Polycarbonate Transit case
- 39A044 Compact Locator 2s soft pouch for storage, does not accept charger
- 39A054 Acrylic stand for Locator 2s
- 39A170 Lead, conductivity Locator 2s, Lemo 7 way to Lemo 5 way, 1.5 metre
- 39DH04 Locator 2s Owners Manual



Locator 2s in 39A041 Splashproof case and 39A042 Soft Pouch



39A044 Soft Pouch and 39A043 Rugged Transit Case

All the controls required for adjustment of operating settings are based along the lower edge of the screen. Softkeys are engraved with F1 to F6 for ease of reference (see 2.11).



Figure 2.1 – Locator 2s Front Panel Controls

- 1 Balance Button
- 2 Clear Button
- 3 Freeze Button
- 4 5 Way connector for RS232 connection and Y analogue output
- 5 User Programmable Softkey Button (1 of 6)
- 6 Menu Screen Button
- 7 Cursor and OK Buttons for Menu Selection
- 8 Exec Button
- 9 7 Way Connector for Probe Connection
- 10 ON and Off button (short presses select backlight)
- 11 Alarm LED

Chapter 9

Accessories

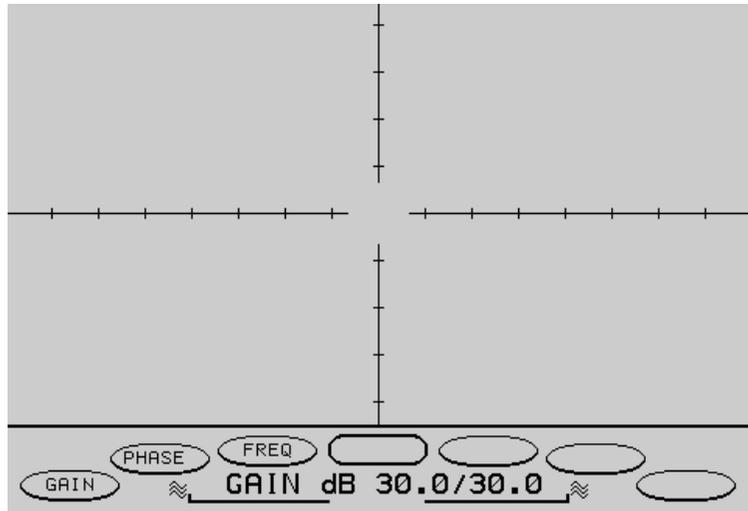


Figure 2.2 - Locator 2s operating screen

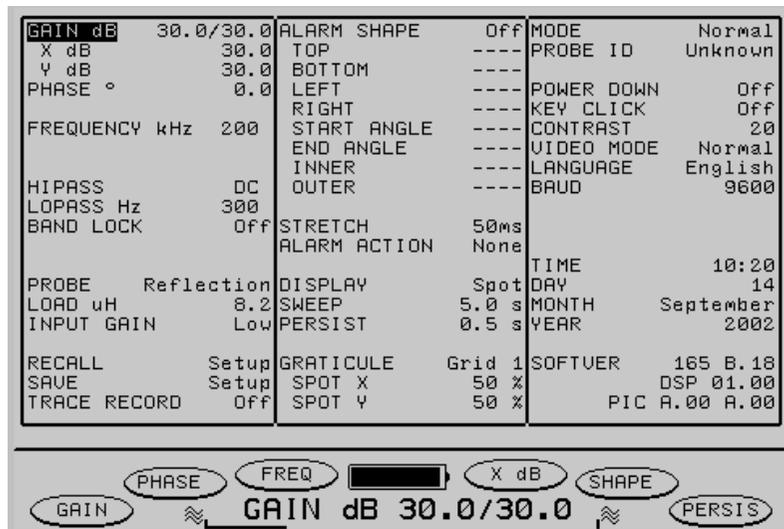


Figure 2.3 - Locator 2s Normal menu screen

PRN	Description
39i004	Locator 2s, Portable Eddy Current Flaw Detector
29A09x	Power cord
39A001	Lead, for Absolute probe, Lemo 7 way to Microtech 1.5 metre
39A002	Lead, for Absolute probe, Lemo 7 way to BNC 1.5 metre
39A003	Adapter, for Absolute BNC lead, Lemo 7 way to BNC
39A004	Lead, Hocking Bridge Lemo 7 way to Lemo 4 way 1.5 metre
39A005	Lead, Hocking Reflection Lemo 7 way to Lemo 4 way 1.5 metre
39A007	Adapter, Lemo 7 way to Din 5 way Defectometer
39A008	Adapter, Lemo 7 way to 2 x BNC
39A009	Lead, Rohmann Bridge Lemo 7 way to Fischer 4 way 1.5 metre
39A010	Lead, Rohmann Reflection Lemo 7 way to Fischer 4 way 1.5 metre
39A011	Lead, Lemo 7 way to Lemo 2 way Super Halec Reflection
39A012	Lead, Lemo 7 way to DIN 7 way, Alcoprobe Reflection
39A013	Adapter, Lemo 7 way to DIN 7 way, Alcoprobe Reflection
39A014	Adapter, Lemo 7 way to Jaeger 6 way
39A015	Adapter, Lemo 7 way to Burndy Nortec
39A016	Adapter, Zetec Bridge, Lemo 7 way to Amphenol 4 way
39A017	Adapter, Zetec Reflection, Lemo 7 way to Amphenol 4 way
39A018	Adapter, Rohmann reflection Lemo 7 way to Fischer 8 way
39A019	Adapter, Lemo 7 way to Veam 15 way, Forster
39A020	Lead, Lemo 7 way to Lemo 5 way, Forster Reflection
39A021	Lead, Lemo 7 way to 2 x Microtech, Differential Beadseat
39A023	Output Power lead for Charger/Eliminator to Locator 2s
39A024	RS232 Lead
39A025	Earpiece and Lemo 5 way connector for Audio output from Locator 2s
39A030	Lithium-ion battery pack
39A031	AA/Battery eliminator pack
39A034	AC power adapter
39A035	Battery Charger/Eliminator Unit

Probe (7 way Lemo) connections.

Pin Number	Function
1	FG0V
2	Diff-
3	Diff+
4	OVD
5	FGO/P

Auxiliary (5 way Lemo) connections.

Pin No.	Locator 2s
1	0v
2	RX
3	TX
4	Alarm
5	Y output

The menu screen shows all the settings available for Locator 2s. For this reason some variables that are not necessarily being used (e.g. alarm settings) will still be visible in the menu view

2.2 Overview of button functions

Button	Function	Description
 	balance	Returns the spot to its set position on the operating screen. A long press automatically selects the balance load for absolute mode.
 	clear	Clears active trace data left on screen as a result of long (or permanent) persistence. A long press will erase traces that have been recalled from memory.
 	freeze	Freezes the active trace in its current position (useful for saving traces). A long press locks the keypad (see 2.14)
	menu	Switches between the operating screen and the menu screen.
	OK	Selects menu items in the menu screen. Switches between softkey items in the operating screen.
	exec	Executes menu actions such as entering Save or Recall, activates alarm parameters, activates the required menu language, and starts the Trace Recorder. A long press performs an auto lift-off setting.
	cursors up down left right	Navigates around the menus and changes values. For some menu items (such as GAIN, ALARM TOP, BOTTOM etc) left and right cursor have large increments, whilst up and down have fine increments.
	on/off	Long presses switch the unit on and off. Short presses switch the back light on and off.

2.3 Changing Settings using Menus and Cursors

To change settings on Locator 2s the following general guidelines apply. There are some special cases explained in the relevant sections.

The **menu** button switches to the menu screen.

Use **cursors** to move to the relevant menu field.

Use **OK** to highlight the setting.

Use **cursors** to change the setting and press **OK** to exit the menu field.

Note...

Function of the cursor buttons may vary depending on the type of variable.

Alternatively the operator can switch back to the operating screen once the menu item has been highlighted by pressing **menu**. The variable will now be displayed on the operating screen. At this point it can be adjusted using the **cursors**.

2.4 Setting the Operating Language

Locator 2s can be set to operate in a range of languages. Available languages are English, French, German, Spanish and Portuguese. Use the **cursor up** button to move through the available languages. When the required language has been selected press **exec** to activate the selection. This instantly updates the menu in the chosen language.

2.5 Setting the Time and Date

Setting the time and date will enable all stored traces and settings to have accurate date and time information stored with them.

To set the time;

- 1 Press **menu** to enter the menu screen.
- 2 Using **cursors** move to the third menu column.
- 3 Move to the TIME item.
- 4 Press **OK** to highlight the menu item.
- 5 Use **cursors** , **left/ right** to select the time component to change.
- 6 Use **cursors** , **up/down** to set the time.
- 7 Once this has been completed press **menu** to return to the operating screen.

Tactile moulded rubber grips for non-slip on smooth angled surfaces

Tripod Mount

The enclosure features a standard camera tripod mounting point

Conformance

CE marked. The instrument and accessories conform to appropriate Standards, including EEC Directive 89/336/EEC and 73/23/EEC.

These standards apply when used with appropriate Hocking leads and accessories.

Connectors

Probe - 7 way fixed socket, Lemo Size 2B

Auxiliary - 5 way fixed socket, Lemo Size 1B

Note: Sockets are different sizes to prohibit incorrect connection of cables.

Sockets are secured from rear to reduce risk of Foreign Object Damage

Recharge time

Batteries receive sufficient charge for 3 hours operation in 30 minutes.

Standard full charge takes 3 hours.

Pre-charge may take up to 90 minutes (see Section 5.2)

Note: No gases are released during charging or discharging.

Software

Supervisor PC Lite, a Windows based program, allows connection to an external PC for control, setting up, data transfer and printing (Requires Cable PRN 39A024).

This software allows either the individual download of settings and traces, or the complete backup of a Locator 2s unit, and then simple upload of all settings and traces. This feature is ideal for applications such as "fleet" programming, where the same instrument settings have to be applied to many different units, or where the operator wishes to save different characters of the unit.

Serial Interface

Standard RS 232, full Duplex.

Analogue Output

Y analogue signal is always "available" via the 5 way output connector. An alarm output is also available as a switch closure.

Baud Rate

Selectable - 2400, 4800, 9600, 19200, 38400 Baud

Size

192 mm x 140 mm x 55 mm, (7.6 x 5.5 x 2.2 inches) including Lithium Ion battery pack.

Weight

0.94 kg (2 lbs) Including Lithium Ion battery

Temperature Range

Operation from -10° C to +55° C

Storage from -33° C to +71° C

Note...

Prolonged exposure to temperatures over 50°C will reduce battery life

Enclosure

Rated to IP 64, Resistant to short term immersion and/or splash or wipe contact with a wide range of substances including:

Avtur/FSII (F34), Avcat (F44), JP8+100

Avgas, 100LL, F18, Diesel, Petrol, Synthetic and mineral based oils, Lotoxane

To set the date:

- 1 Press **menu** to enter the menu screen.
- 2 Using **cursors** move to the third menu column.
- 3 Move to the DAY item.
- 4 Press **OK** to highlight the menu item.
- 5 Use **cursors , left/ right** to move in seven day steps
- 6 Use **cursors, up/down** to move in one day steps.
- 7 Press **OK** to leave the DAY item and step down to MONTH.
- 8 Use **cursors , left/ right** to move in three month steps
- 9 Use **cursors, up/down** to move in one month steps.
- 10 Press **OK** to leave the MONTH item and step down to YEAR.
- 11 Use **cursors** to move in one year steps
- 12 Press **OK** to leave the YEAR item

2.6 Switching the Backlight On and Off

For operation in low light environments Locator 2s has an inbuilt LED backlight.

A short press on the **on/off** button will switch the backlight on.

Operating the unit with the backlight switched on will increase the battery power consumption.

In conditions of high ambient lighting it may not be evident if the backlight is on or not. For this reason a candle icon is provided in the lower right hand area of the operating screen when the backlight is active.

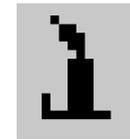


Fig 2.4 Backlight Icon

2.7 *Setting the Display Contrast level*

Locator 2s has a variable display contrast setting to allow the user to set the contrast to the optimum for the ambient lighting and temperature. Range is from 1 to 29.

Step to CONTRAST in the third column. To change the setting in steps of five use the Left and Right cursor buttons.

A further feature is the VIDEO MODE menu item, which allows the user to invert the screen to white display on a black background. For some users this may be a desirable setting.

Note...

Changes in temperature may cause a change in the characteristics of the LCD display. In this case the contrast control should be used to compensate for this effect.

If an operator has problems viewing the menu screen then the unit should be switched off. When switching back on again the operator should press F4 to automatically set to a contrast value of 4, or F6 to set to a contrast setting of 28. This should be pressed when the splash screen is displaying.

2.8 *Setting the Automatic Power Down function*

Locator 2s is provided with a selectable power down function. This switches off the unit after a predetermined period of inactivity. Settings are Off, 5, 10, 15 or 20 minutes. This function will preserve battery life in situations when the equipment is not in constant use.

Note...

When the unit closes down due to the Automatic Power Down function all settings will be preserved and will be restored when the unit is switched back on.

Language

Selectable - English, French, German, Spanish, Portuguese

Key Click

Selectable - On, Off.

Keyboard Lock

Selectable - On/Off.

Deactivates all buttons (except balance, clear, freeze and power buttons) to avoid inadvertent operation

Clock

Time and Date up to Year 2099

Power Sources

Clip-on sealed Lithium Ion battery pack,

securely retained by S/S clip, Gold plated connectors

Clip-on 'AA Cell' battery pack (non IP rated)

Plug in Charger/Battery Eliminator (non IP rated)

Charge Endurance

8 hours with backlight OFF, 6 hours with backlight ON. Battery consumption will increase with the use of low frequency inspection.

Note: Batteries at temperatures below 0°C have reduced capacity

Charge Indicator

Permanently on-screen, shows proportion of battery charge remaining. Does not operate when used with the AA battery cell case as there are significant uncertainties when reading AA battery levels.

Auto Power Down

Selectable - 5, 10, 15, 20 minutes from last 'keystroke', or permanently ON

Safety Power-Down

Instrument switches off automatically when battery charge is very low to avoid degraded operation and protect battery pack

Charger/Battery Eliminator

An 'Intelligent' charger monitors the battery condition and optimises safe recharging. Automatic voltage selection between 90 and 264 VAC, 47-440 Hz. Note: Not IP rated.

Alarm Type

+ and - Y levels Adjustable from 10% to 90% full screen height
Box Adjustable - Left, Right, Top, Bottom
Sector Adjustable - Start, End, Inner, Outer

Alarm Signals

Audio Tone, Visual flashing LED and freeze on alarm

Alarm Tone

Selectable on off using Alarm Action menu item.

Alarm Stretch

Selectable - 50 mS, 100 mS, 500 mS, 1 Sec, 5 Secs, 10 Secs.

Conductivity

The unit is capable of measuring electrical conductivity of materials in the range from 1 to 110% IACS. The unit uses a constant operating frequency of 60 kHz for conductivity measurement.

Coating Thickness

A non-conductive coating on a non-ferrous substrate can be measured up to .250mm (0.0500 inches) thick.

User Restricted Modes

'Supervisor Mode' - all functions and adjustments are available at all times.

'User Mode' - limited functions and stored programmes available as selected in the 'Supervisor' mode

User Controls

Dedicated Tactile buttons for:- Balance, Erase, Freeze large buttons each side for operation by gloved hand

Exec, Menu, Select

On/Backlight Off

Cursor keys for rapid navigation through menu items and settings

'Soft Keys' Six User-Programmable front panel buttons

Note: Keys are arranged for operation by either left or right hand

Menu Screen

Menu allows all settings to be allocated, saved in memory and recalled. 'Frozen' traces may similarly be saved, named and recalled as required

Memory Size

Storage for 50 settings (of all settable parameters) plus up to 50 traces

2.9 Graticules – Spot Mode

A suitable graticule for the inspection can be selected from a choice of four different types. This applies to spot mode only. If Timebase mode is chosen then an automatic graticule (AUTO) is displayed that resizes relative to the sweep setting.

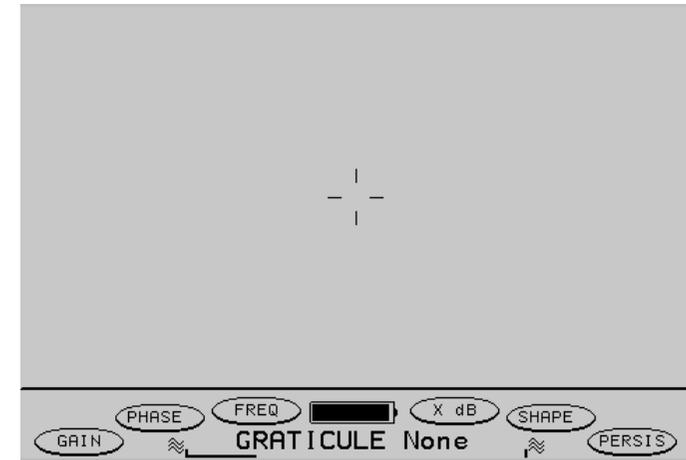


Fig 2.5 NONE - A clear graticule with cross-hairs for identifying the origin

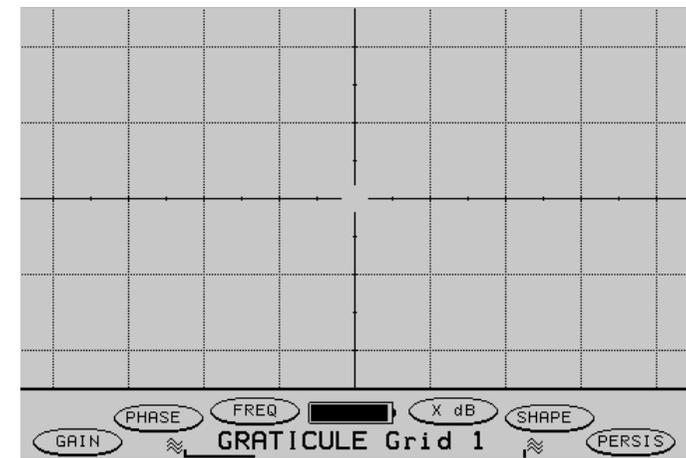


Fig 2.6 GRID 1 - A square graticule marking - X and Y positions marked at 20%

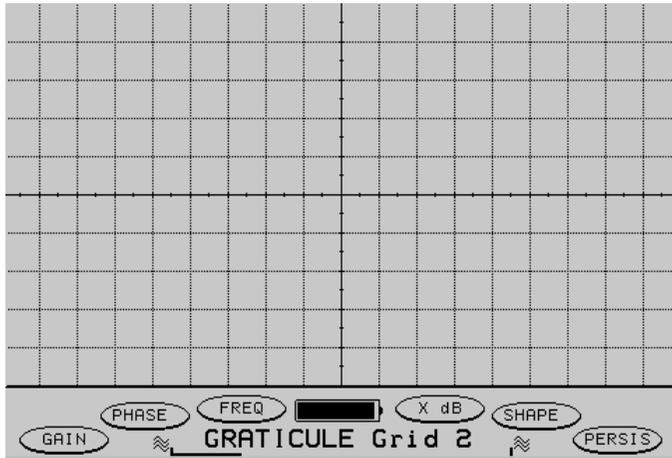


Fig 2.7 GRID 2 - A square graticule with X and Y positions marked at 10%

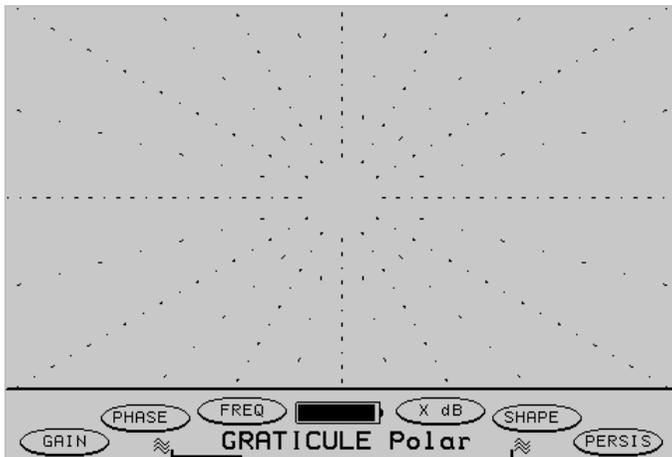


Fig 2.8 POLAR. - a circular style graticule

Display Contrast

Adjustable in 32 steps

Backlight

Selectable by a short press on the On/Off button.

Video Modes

Normal or inverted, (white text on a black background) to allow user choice of background.

Screen Flip

Allows 180 degree rotation of operating screen by a long press on F6. This allows easy presentation of screen traces when many people are gathered around the unit.

Graticules-Definitions

Selectable - Dependant on mode

The grid arrangement allows easy reading of the screen trace height and position, as it presents the screen in regular divisions.

Spot Display

Grid 1 - Divisions at 20% of full screen height

Grid 2 - Divisions at 10% of full screen height

Polar, - Major divisions at 30 degrees, minor divisions at 15 degrees.

None - Crosshairs to indicate the balance point only

Timebase Display

Grid 1, - Y axes at 90 degrees of rotation

Grid 2, - Y axes at 45 degrees of rotation

Grid 3 - Y axes at 20 degrees of rotation

None - no graticules

Display Modes

Selectable - Spot (X, Y), Timebase (Y/T), Waterfall

Timebase Sweep (Normal Mode Only)

Selectable - 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10, 20 and 50 Seconds

Trace Persistence

Selectable - 0.1, 0.2, 0.5, 1, 5, 10 and 15 Seconds and permanent.

Spot Position

Adjustable over trace display area. Displayed in terms of screen percentage.

Minimum Sensitivity

Instrument readily detects a flaw 0.1 x 0.2 x 0.5 (w x d x h) using a 2MHz Shielded probe

Internal Balance Loads

1.3, 8.2, 22, 47, 82, 120 μ H

Balance Load Selection

Automatic or Manual

Balance

Push-button automatic

Lift-off Compensation

Automatic, with Phase rotation to 9 o'clock position, or manual

Filters

High Pass –	DC
	1 Hz to 9.95 Hz in 0.05 Hz steps (180 steps)
	10 to 99.5 Hz in 0.5 Hz steps (180 steps)
	100 to 995 Hz in 5Hz steps (180 steps)
	1kHz to 1.2kHz in 50Hz steps (4 steps, Normal Mode)
	1kHz to 1.95 kHz in 50Hz steps
Low Pass –	3 to 9.95 Hz in 0.05 Hz steps (140 steps)
	10 to 99.5 Hz in 0.5 Hz steps (180 steps)
	100 to 995 Hz in 5 Hz steps (180 steps)
	1kHz to 1.5kHz in 50Hz steps (11 steps, Normal Mode)
	1kHz to 2.0kHz in 50Hz steps

Display size

Total Viewable	115 x 78 mm
Trace Area	115 x 65

Display Type

Impedance-Plane display on LCD with LED Backlight protected by hard-coated Acrylic window, Pixel pitch 0.2 mm, Useable in ambient lighting from 100 Lux to 7000 Lux

Display Resolution

480 x 320 pixels

2.10 Selecting Graticule Type

Select the GRATICULE menu field. Use the **cursors** to step through the options.

2.11 Selecting Key Click

Audio feedback from the unit can be selected so that even when operating the unit in heavy gloves an operator will be able to determine whether a key press has been successful. Set to KEY CLICK to either ON or OFF

2.12 Defining User Programmable Softkeys

Each of the six softkeys on the front panel of Locator 2s can be allocated to any setting as required by the operator (Item 10, Fig 2.1).

Press **menu** to enter the menu screen. Use the cursor buttons to step to the required menu item. When it is highlighted press the OK button to highlight the item value and then hold the required function key.

After 2 seconds the menu field is allocated to the on-screen softkey location.

Note...

The item value must be selected using the OK button in order to be programmed to a softkey.

Press **menu** to return to the operating screen.

Pressing a softkey will bring up the associated item value for adjustment by the cursor buttons.

To clear a softkey press **menu** to enter the menu screen. and hold the softkey for two seconds whilst on the menu screen, when a menu item is NOT selected.

To use the second set of programmable soft keys (the Utility Set) press F1 when on the menu screen in order to page between the two softkey sets.

2.13 Using Pre-Programmed Softkeys

For three frequently used operations, Spot position, Box Gate Alarm, and Sector Alarm there is easy access to these settings via the pre-programmed softkeys.

There is also a Utility set of softkeys which displays frequently used softkeys.

	Utility Set. Can be programmed by the user as a second set by pressing F1 when in the menu mode.
	Box Alarm GAIN, PHASE, TOP, BOTTOM, LEFT, RIGHT
	Sector Alarm GAIN, PHASE, START, END, INNER, OUTER
	XY Position GAIN, PHASE, GRAT, DISP, X, Y

To cycle through the above softkey sets repeatedly press **OK** whilst on the operating screen. An icon on the right hand side of the display indicates which softkey mode the instrument is in.

Another press on **OK** will revert to user programmed softkeys and the icon will disappear. A long press on **OK** at any time will revert to the first set of user programmed keys.

2.14 Keyboard Lock

To prevent accidental key presses changing the settings, the keyboard can be locked. This prevents the operation of all menu keys.

balance, **clear** and **freeze** will continue to remain active when the keyboard is locked.

The keyboard lock is invoked by a long press on **freeze**.

A key icon appears on the display to indicate that the keyboard lock is active.

The keyboard lock is removed by a long press on **freeze**.

2.15 Understanding the Different Modes

Locator 2s is a multi-capability unit that effectively contains two separate instrument modes. In the menu screen the operator can switch the mode by selecting **MODE** and changing to the required mode using the **CURSORS**.

Chapter 8 Specifications

Mode Selection

Conductivity Mode with Cable (PRN 39A170 for Hocking 60kHz probe)

Normal mode is the default mode

Frequencies (Normal Mode)

Between 60Hz and 99.5Hz in 0.5Hz steps

Between 100Hz and 995Hz in 5Hz steps

Between 1kHz and 9.95 kHz in 50Hz steps

Between 10kHz and 99.5kHz in 500Hz steps

Between 100kHz and 995kHz in 5kHz steps

Between 1MHz and 6MHz in 50kHz steps

Frequency (Conductivity and Lift-off Mode)

60kHz

Overall Gain

0 dB - 88 dB

Input Gain

Selectable 0 or +14 dB

X and Y Gain

Adjustable together or as independent axes 10 dB - 80 dB in 0.1, 1 or 10 dB steps

Phase

0 - 359.5 Degrees in 0.5, 1, 10 or 100 Degree steps.

Probe Compatibility

Selectable -

- Locator - Absolute 100 ohm input
- Absolute - Absolute 50 ohm input
- Bridge (50 ohm Impedance)
- Reflection (Driver 2V peak to Peak, 20 ohm Minimum input impedance)

- It is recommended that all settings and traces are saved and archived on computer using the Supervisor PC Lite program as described in Chapter 6.
- Ensure that the Locator 2s is switched off.
- Visually inspect all items for signs of physical damage.
- Pack Locator 2s and accessories in a protective case and place the Locator 2s kit in a location where it will not be subjected to physical shock or exposed to potentially damaging substances.
- Every 3 months the Locator 2s should be removed from storage. The lithium-ion battery pack should be removed and charged.
- When the battery is fully charged place the lithium-ion back on the Locator 2s.

2.16 Normal Mode

The unit automatically defaults to the Normal mode, this mode is covered in Chapter 3. Normal mode is effectively the general purpose mode, and covers a wide variety of applications, from low frequency corrosion inspection to high frequency surface crack detection, with a wide variety of probes such as Absolute, Bridge, Weld Inspection, Spot Face, Reflection etc. Users familiar with the Hocking Locator 2 will be instantly comfortable with this mode. However, in this mode there are some significant differences between the Locator 2s and the Locator 2. Examples are the range of filters available, the fine frequency adjustment, separate X and Y gain, and measurement graticules.

2.17 Conductivity Mode

The conductivity mode is used for the conductivity measurement of non-ferrous metals. This measurement can be very useful for detecting heat damage or other material change. Measurement of conductivity is used for the accurate calculation of effective depth of penetration. This functionality is outlined in Chapter 4.

Chapter 3

Operation of Locator 2s in Normal Mode

- 3.1 Connecting a Probe
- 3.2 Selecting Probe Type
- 3.3 Frequency
- 3.4 Selecting a balance load - Absolute and Locator probes
- 3.5 Balancing the Probe - All Probe Types
- 3.6 Automatic Lift-Off Compensation
- 3.7 Gain
- 3.8 Signal Phase
- 3.9 Overview of Filters
- 3.10 High Pass Filters
- 3.11 Ultra Filters
- 3.12 Low Pass Filters
- 3.13 Filter Indication Bar
- 3.14 Band Lock Setting
- 3.15 Probe Type
- 3.16 Load
- 3.17 Input Gain
- 3.18 Recall Function
- 3.19 Save Function
- 3.20 Allocating Trace and Setup Permissions
- 3.21 Trace Recorder
- 3.22 An Overview of Alarms
- 3.23 Box Gate Alarms
- 3.24 Sector Alarms
- 3.25 Stretch
- 3.26 Alarm Action
- 3.27 Display
- 3.28 Sweep
- 3.29 Persist
- 3.30 Spot X and Spot Y
- 3.31 Output Functions

Chapter 7

Care and Maintenance

- 7.1 Care and Maintenance
- 7.2 Long Term Storage

7.1 Care and maintenance

Locator 2s is a product of superior design requiring minimum user maintenance.

The suggestions below will help you fulfil any warranty obligations and will keep the Locator 2s fully functional for many years.

- Keep it dry. Precipitation, humidity and most liquids contain minerals that will damage electronic circuits.
- Do not store in hot or extremely cold areas. Extreme temperatures can shorten the life of electronic devices, damage batteries and warp or melt plastics.
- Do not attempt to open it. Non-expert handling of the device may damage it.
- Do not drop, knock or shake it. Rough handling could break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents or strong detergents to clean it. Wipe it with a soft cloth slightly dampened in a mild soap-and -water solution.
- Do not paint it. Paint can clog the keypad, connectors and battery latching. This will prevent proper operation

7.2 Long term storage

As with all battery technologies the lithium-ion battery pack has a shelf life. This means that if the battery pack is left for a long period (greater than 12 months) there is a risk that the voltages inside the unit may drop to a level at which permanent damage to the pack may occur, thus rendering it inoperable.

If the unit is to be left in long term storage the following precautions should be followed:

- Ensure that the storage area is clean and dry. For optimum protection it is recommended that Locator 2s is stored at Room Temperature (i.e. 20° C).
- Make sure that the battery is fully charged and place the battery on the rear of Locator 2s.

6.14 Using Locator 2s Help

Supervisor PC Lite has an HTML based help file that can be accessed by selecting the Help item. This also include links to external resources that requires a connection to the internet.

Note...

For the following instructions it is assumed that the operator is familiar with the method of changing variables described in 2.3 - Changing Settings using Menus and Cursors

3.1 Connecting a Probe

A very wide range of eddy current probes may be used with Locator 2s. They may be connected directly by an appropriate cable or via adapters in the case of probes made for other instruments. The primary probe connector on Locator 2s is the 7 way Lemo connector on the right hand side of the front panel (item 9, Fig 2.1).

For Absolute probes terminated in a Microtech connector a Lemo 7 way to Microtech lead is available (Hocking PRN 39A001).

For existing absolute probe cables terminated in a BNC cable a Lemo 7 way to BNC adapter is available (PRN 39A003). For other probes, please see Chapter 9, Accessories.

3.2 Selecting Probe Type

Probe type will depend on the inspection, taking into consideration the flaws that are being inspected for. Flaw geometry, as well as material type and depth of penetration required will determine what kind of probe is required. Once this probe has been selected Locator 2s can be set to match the connected probe type.

It is important to understand that probes are configured as a choice of EACH of the following elements:

- Absolute or Differential
- Bridge or Reflection
- Shielded or Unshielded

With some eddy current instruments the probe must be hardwired into the configuration required. However Locator 2s can drive probes in a variety of ways. For this reason it is often possible to use a differential probe as an absolute probe.

This flexibility allows for different configurations with a single probe, however care must be taken to ensure that the effects of each configuration are understood by the operator.

Probe type can be set to Locator, Absolute, Bridge or Reflection.

Locator mode is a dedicated mode that is designed to match the impedance of all absolute Locator probes at 100 Ohms.

The Absolute mode is for Absolute probes with an impedance of 50 Ohms.

For Absolute or Differential probes intended for bridge operation the setting should be Bridge.

For driver/pick-up probes the Reflection setting probe should be used.

3.3 Frequency

Locator 2s has a wide range of selectable frequencies between 60Hz to 6MHz. Select FREQUENCY from the menu. The frequencies available are in the following ranges

- Between 60Hz and 99.5Hz in 0.5Hz steps
- Between 100Hz and 995Hz in 5Hz steps
- Between 1kHz and 9.95 kHz in 50Hz steps
- Between 10kHz and 99.5kHz in 500Hz steps
- Between 100kHz and 995kHz in 5kHz steps
- Between 1MHz and 6MHz in 50kHz steps

Correct frequency selection is critical for a good inspection and is dependent on the flaw type, the probe used and the depth of penetration required.

To rapidly step through the frequency ranges the left and right cursors can be used, by stepping to the end of the frequency and repeating the key press, the frequency will step in orders of magnitude.

3.4 Selecting a Balance Load - Absolute and Locator Probes

Locator 2s has a series of internal balance loads to balance Absolute and Locator probes. Attach a suitable probe and go to the operating screen (Fig 2.2).

Press and hold **balance** for approximately 2 seconds, until the auto load detect process starts.

Locator 2s will select a suitable load in order to balance the absolute probe. If the operator wishes to override the selection then this can be performed by going to the Load item on the menu screen.

3.5 Balancing the Probe - All Probe Types

For all types of probes the probe should be placed on a known good section of material and **balance** pressed. If the probe cannot be balanced the message BALANCE FAILED will be displayed. A failed balance may be for a variety of reasons:

- Incorrect probe selection (see 3.2)
- Incorrect frequency selection (see 3.3)
- Input Amplifier saturated, i.e. Input Gain too high (see 3.7)
- Incorrect Load selection for absolute probe (see 3.4)
- Probe worn or damaged, or lead damaged (check equipment)

Note...

The unit can only be switched back to Supervisor mode by connection to the SupervisorPC Lite software.

6.13 Remote Control of Locator 2s

Supervisor PC Lite provides a tool for the remote control of Locator 2s. Select Tools, Remote and the Remote window will open.

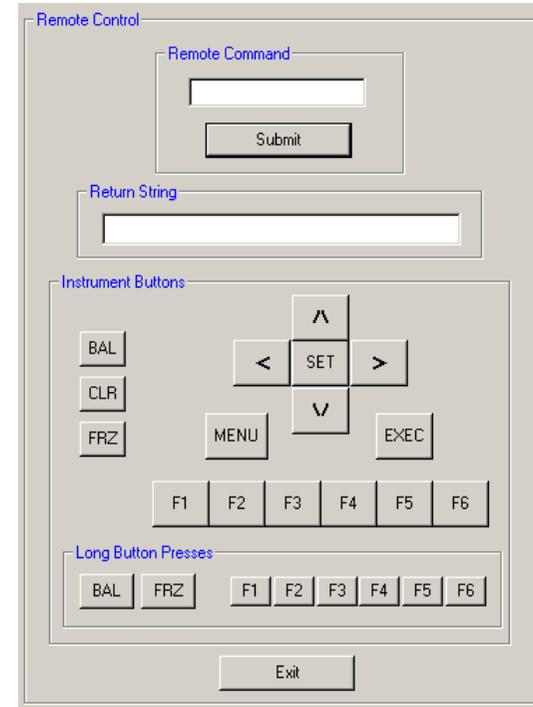


Fig 6.11 Remote Control Panel

The remote control function operates by the simulated keys on the right hand side of the screen. These can be used in place of the keypad to control the instrument.

Alternatively the remote command line can be used to interrogate the unit and control it. A full set of command strings can be found in the online help.

6.11 Changing the Default Editor and Template

If a different editor is required open up the file SuperPC.ini in an appropriate editor. Replace the Wordpad.exe item with the required editor. This .ini file can be found in the root directory that SupervisorPC Lite was installed to.

For a different Template replace the work.tpl item with the file name for the required template.

6.12 Restricting Locator 2s Operation

Supervisor PC Lite provides a method for restricting the availability of certain controls. This facility is especially useful when tests are to be carried out by less experienced operators and a supervisor wishes to restrict access to the basic controls.

In user Mode the operator will only be able to look at the Menu and will only be able to change settings that are allocated to the softkeys.

If the Supervisor wishes the operator to recall Traces or Setups then the corresponding files should be set to User Type (see 3.25).

To change the unit to User mode go to the Tools menu and click on User (See Fig 6.3). The software will alert you to the fact that this will lock the unit, as illustrated below;

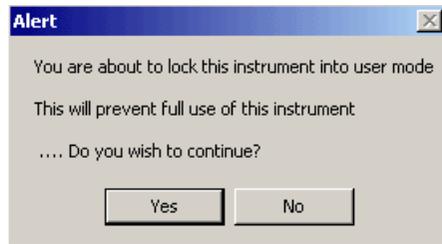


Fig 6.9 User Lock Alert

When the User mode is selected the user Icon will appear on the operating screen, next to the backlight item (if this is switched on)

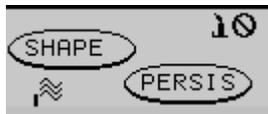


Fig 6.10 User Lock Icon

The instrument should now be switched off and disconnected from the RS232 communications cable.

When the unit is switched back on the operator will only have access to the functions provided by the **clear**, **balance** and **freeze** buttons, as well as any functions that have been programmed to the Softkeys.

3.6 Automatic Lift-Off Compensation

An automatic facility is provided to rotate the lift-off signal so that it moves from the balance point horizontally to the left of the screen (for most applications this is the accepted position).

To perform this procedure place the probe on known good metal of the type to be inspected.

Press and hold **exec** for 2 seconds.

The unit will balance. When the unit displays LIFT PROBE the probe should be removed from the surface of the metal. The unit will automatically rotate the phase of the signal so it is in the correct orientation.

If the LIFT PROBE message shows for more than 2 seconds after you have lifted the probe then automatic lift-off compensation has failed. If this occurs, please see reasons for balance failure in section 3.5. Also, the gain may need to be increased so that the lift-off signal is greater than one half screen height.

3.7 Gain

Locator 2s has independent X and Y gain to allow fine setting of the impedance plane display. The unit allows simultaneous increase or decrease of the gain setting, by using the GAIN dB function and pressing **left/right cursors** for 10dB adjustment and **up/down** for 1 dB adjustment

X dB and Y dB Menu fields allow for individual adjustment of either the X or Y channel. This independent gain allows extremely fine attenuation of the signals properties to give the best separation of lift-off signal from the flaw signal.

3.8 Signal Phase

Select PHASE from the menu. Highlight the PHASE setting using **OK**, and select the required digit using the **left/right cursors**, and increase or decrease using **up/down cursors**.

This feature allows rotation of the signal so that flaw indications can be presented in the clearest possible fashion, and is useful for ensuring that non flaw signals do not trigger alarms.

Convention is that the lift-off signal (i.e. the signal that displays when the probe is lifted off the surface of the material) is set in the "9 o'clock" position.

Phase is adjustable from 0 to 359.9 degrees in steps of 0.1, 1, 10 or 100 degrees as required.

3.9 Overview of Filters

Filters are used to reduce or eliminate unwanted signals. High pass filters reduce low frequency components of signals and Low pass filters reduce high frequency components. The frequency of the two sets of filters should not be set so that there is no gap between them or the inspection bandwidth will be reduced to zero (i.e. no signal).

The gap between the filters can be set as a band pass filter. The Locator 2s allows the user to relocate this band in the frequency cutoff spectrum by employing the Band Lock setting feature (see 3.13).

3.10 High Pass Filters

The High Pass filter reduces low frequency components such as product vibration, geometry and temperature drift changes. If the probe does not traverse a crack quickly the unit may treat it as a slowly varying signal and the indication will be reduced.

High pass filters can be used effectively during hand scanning where there are slowly changing effects but care should be exercised to move the probe at a constant speed. Settings greater than 10Hz may be unsuitable for hand scanning.

Select HIPASS from the Menu.

Use **CURSORS** to change the value.

The DC setting indicates that no low frequency signals are being filtered.

Standard High Pass filter settings available are (in Hz):

- High Pass - DC
- 1 Hz to 9.95 Hz in 0.05 Hz steps (180 steps)
- 10 to 99.5 Hz in 0.5 Hz steps (180 steps)
- 100 to 995 Hz in 5Hz steps (180 steps)
- 1kHz to 1.2kHz in 50Hz steps (4 steps, Normal Mode)

3.11 Ultra Filters

The Ultra filter is a special form of the High Pass filter. ULTRA is a filter setting that removes the effect of very long timebase signals, and will reduce or remove the effect of long term drift of the balance point. This has a range of timebases that it averages over so that different scanning speeds etc. can be compensated.

However, it has been designed so that rapid and/or large movements of the spot from the balance point will not be compensated. This stops the spot from rebalancing to the centre when the probe has been taken off the surface of the metal, for example. Ultra filters are indicated by a U prefix before the value.

6.7 Downloading All the Unit Settings and Traces

To back up the unit first select a directory that contains uploaded data (see section 6.5). Select the Tools Menu (see Fig 6.3). Click on Download Memory. A dialog box will confirm the directory selection



Fig 6.7 Source Directory Location Dialogue

Click on Yes. The software will confirm how many files have been found. If none are found then the dialogue will confirm 0 settings found and no action will be taken.

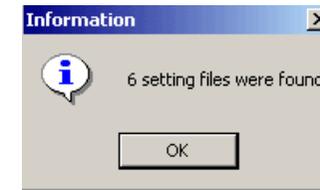


Fig 6.8 Example of Settings Found Confirmation Dialogue

6.8 Quick Printing

To quickly print the downloaded trace or setting go to the file menu and select print screen or settings. This will print to the Windows default printer.

6.9 Creating a Report

In the File menu select new report. By default this will launch WordPad with a simple template called work.tpl. Move to the Edit menu and choose Copy Trace. This will move the trace to the Windows clipboard. In the WordPad application move the cursor to the appropriate point and choose Paste from the edit menu to insert. Repeat the process for the settings.

6.10 Saving and printing a report

Use the Save As function in the editor to save the file under a different name.

Note...

If Save is selected this will write over the report template provided with the SupervisorPC Lite software.

The report can be printed using the print command of the editor.

6.6 Downloading Individual Traces and Settings

Select a directory in the Files area of the SupervisorPC lite programme, as illustrated below;



Fig 6.5 Upload Directory Selection Dialogue

Click and drag the required setting to the Locator 2s area of the SupervisorPC Lite interface.

The Unit will now prompt to check that this is the correct file to transfer



Fig 6.6 Download Confirmation Dialogue

Click on OK, and then click on an empty file location in the Locator 2s settings or Trace directory.

3.12 Low Pass Filters

The Low Pass filter reduces and eliminates rapid signal changes such as electrical noise. If a discontinuity or flaw is traversed quickly with a probe, a low pass filter unit will treat it as a rapidly changing signal and the indication will be reduced. The filter setting is sometimes a compromise between acceptable noise and ability to respond to fast flaw signals.

Select LOPASS from the Menu.

Use the cursor pad to change the value.

Low Pass	3 to 9.95 Hz in 0.05 Hz steps (140 steps)
	10 to 99.5 Hz in 0.5 Hz steps (180 steps)
	100 to 995 Hz in 5 Hz steps (180 steps)
	1kHz to 1.5kHz in 50Hz steps (11 steps, Normal Mode)

3.13 Filter Indication Bar

The user can use the Filter Indication bar on the Operating screen to clearly see how the High Pass and Low Pass filters are interacting in order to provide a band pass. This facility can alert the operator to the fact that filters may have been set in too restrictive a way. This can help troubleshoot situations where the operator is not seeing signals that might be expected.

Fig 3.1 Indicates filter settings that will allow all signals through, indicated by the continuous solid bar. Fig 3.2 Indicates filter settings that restrict a lot of signals getting through.



Fig 3.1 Filter Bar – Wide



Fig 3.2 Filter Bar – Narrow

3.14 Band Lock setting

Variations in test frequency will result in the operator wanting to move the high and low pass filter settings simultaneously. This can be achieved through the use of the Band Lock setting. This item has three possible settings, Off, Ratio and Fixed.

Off – This allows the Hi Pass and Low Pass filter settings to be adjusted independently.

Fixed - This maintains the gap between hi and low pass filters as a fixed amount. For example if the low pass is set at 700Hz and Hi Pass at 400Hz then incrementing either will always result in a 300Hz band being maintained between the two

Ratio - This maintains a band between Hi Pass and Low Pass filters that is proportional to the original setting position, so as the operator reduces either the Hi or Low Pass setting, the Band Pass will reduce, likewise as the Hi or Low Pass are increased so the size of the band will increase.

3.15 PROBE Type

This function allows the selection of the probe configuration. See 3.2 for a full explanation.

3.16 LOAD μH

This allows the manual selection of Load for balancing absolute probe operation. A long press on the **balance** will automatically select the most appropriate balance load. The following table gives approximate inductances for a range of probes.

6.4 Uploading Individual Traces and Settings

Once the unit has been successfully connected, a directory tree named Locator 2s will appear in the left hand window.

Double click the category you require, Settings or Traces. The tree will expand to show all the stored files on the unit. Double click the required file. The file will be downloaded and shown in the relevant window.

This file can then be copied out of the text window or inserted into a report as below. To copy the contents of a unit it is recommended that the technique described in 6.5 Uploading Memory is used.

6.5 Uploading All the Unit Settings and Traces

To back up the unit select the Tools Menu. Click on Upload Memory.

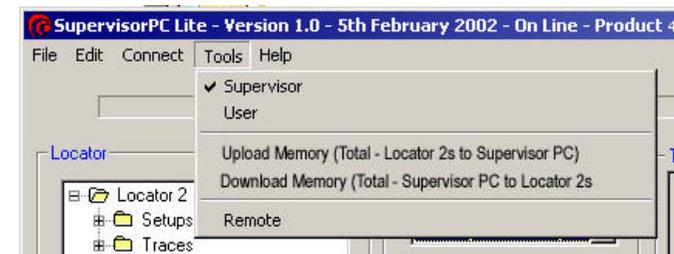


Fig 6.3 Tools Menu

The unit will now present the dialog below. Type in a directory name and press OK. The unit will now complete a full backup of the unit to the PC.



Fig 6.4 Upload Directory Selection Dialogue

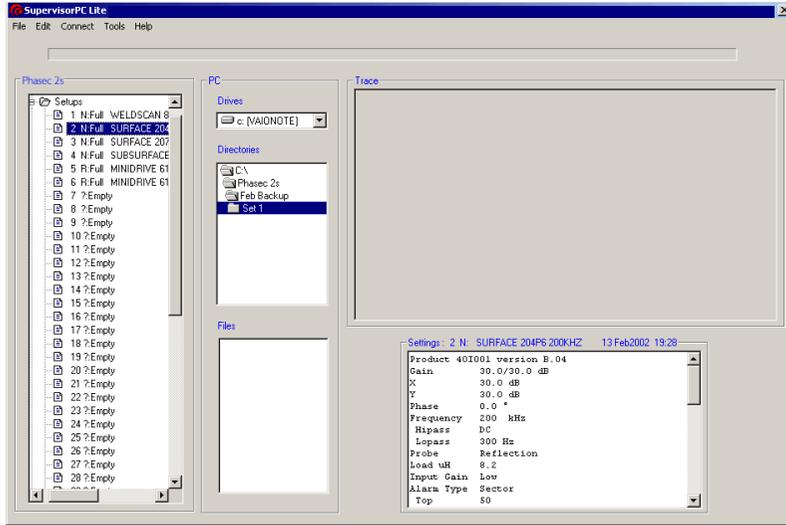


Fig 6.1 Supervisor PC Lite Main Screen

6.3 Connecting Locator 2s

Connect the RS232 communications cable (part no. 39A024) to the COM1 port of the PC. Insert the Lemo 5 way connector of the RS232 lead into the auxiliary socket of Locator 2s. Switch on the Locator 2s. Go to the Connect menu item and select log on as shown in fig. 6.2.

Once the communication has completed the Trace and settings headers will be shown on the Locator window.

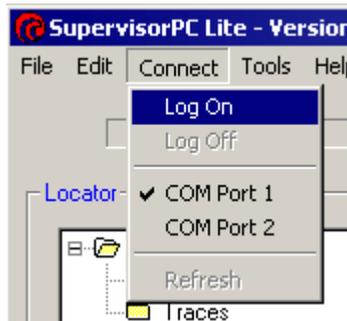


Fig 6.2 Log On dialogue

Load	Description	Example Hocking Product Reference Numbers
8.2 μ H	Locator 2MHz probes, Defectometer probes with adapter 29A010	122P1A, 352P1A, 106P4, 206P4, 304P24
22 μ H	Broad band and some Phasec probes	130P2, 5P21
47 μ H	Locator 500kHz probes.	121P1A, 351P1A, 105P4
82 μ H	Broad Band and some Phasec probes	5P22, 5P262, 130P3
120 μ H	Locator 200kHz probes, probes for ED520 and compatibles	120P1A, 350P1A, 104P4, 204P4, 308P24

3.17 INPUT GAIN

The sensitivity of the probe can be increased by switching the INPUT GAIN from Low (+0dB) to High (+14dB). This increases the voltage at the probe, but for some probe types and materials this may cause problems with balancing (see 3.5).

3.18 RECALL function

To recall a trace move to RECALL menu field, press **OK** and select TRACE.

Press **exec** to enter the Recall screen (see Fig. 3.3).

To move to the location use DN/F6 to move down and UP/F5 to move up.

To leave the dialogue without recalling press **exec**.

To clear the location without leaving the dialogue press DEL/F2.

To recall the trace press RECALL/F1. To exit, press **exec**

To recall a SETUP repeat the steps above but ensure RECALL is set to SETUP.

To clear the reference trace from the screen press and hold **clear**

Note...

When a trace is recalled, the graticule that was used when the trace was stored will be recalled and displayed for as long as the reference trace is displayed. A flashing icon (see fig 3.4) is used to indicate to the user that other selected graticules cannot be selected whilst this is the case.

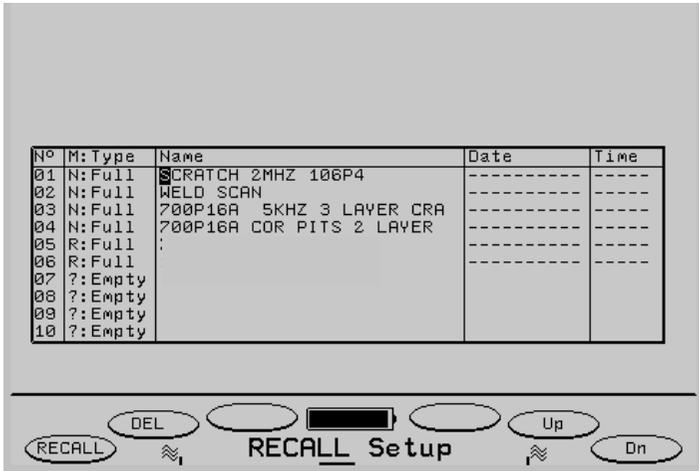


Fig 3.3 RECALL menu

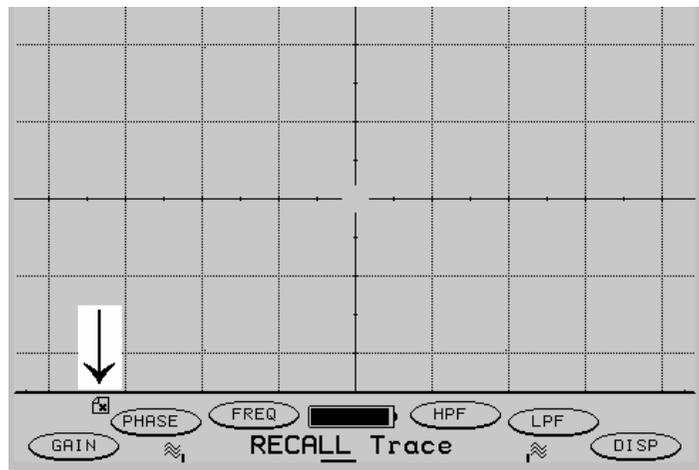


Fig 3.4 Recalled Trace with flashing reference trace icon indicated

3.19 SAVE function

To save a trace first create the trace on screen.

Press **freeze** to freeze the display.

Go to SAVE and select TRACE. Press **EXEC** to enter the Save screen (see Fig 3.5)

Chapter 6

Supervisor PC Lite

- 6.1 Installing Supervisor PC Lite
- 6.2 Starting Supervisor PC Lite
- 6.3 Connecting Locator 2s
- 6.4 Uploading Individual Traces and Settings
- 6.5 Uploading All the Unit Settings and Traces
- 6.6 Downloading Individual Traces and Settings
- 6.7 Downloading All the Unit Settings and Traces
- 6.8 Quick Printing
- 6.9 Creating a Report
- 6.10 Saving and Printing a Report
- 6.11 Changing the Default Editor and Template
- 6.12 Restricting Locator 2s Operation
- 6.13 Remote Control of Locator 2s
- 6.14 Using Locator 2s Help

6.1 Installing Supervisor PC Lite

Place the provided Supervisor PC Lite in the CD-ROM drive.

The Installation process should automatically start, using the Windows AutoRun routine. If your computer has AutoRun disabled, you can locate the supervisor.exe file on the CD-ROM using Windows explorer.

Follow the on screen directions to install the software.

If any problems should occur during installation or operation, please read the "readme.txt" file in the root directory of the CD.

6.2 Starting Supervisor PC Lite

Go to the Supervisor PC program group and select the Supervisor PC program. The main screen will appear.

Inspecting the File, Edit, Connect, Tools and Help menu will reveal that certain options are greyed out. These options are dependant on whether the software is connected to an operational Locator 2s . When connected to Locator 2s (see 6.3) these options will become available. However the simulation in the Tools menu is only available when the software is not connected.

Place 8 AA cells in the polarity indicated by the pack.

Replace cover by snap-fitting over the base.

CAUTION

DO NOT USE A MIXTURE OF RECHARGEABLE AND ALKALINE CELLS. DO NOT USE CELLS THAT HAVE DIFFERENT AMP HOUR RATINGS. DO NOT MIX CELLS OF DIFFERENT CHARGE LEVELS.

5.8 Restarting after unexpected power down

The Locator 2s has a recovery mode that attempts to protect settings if power has been unexpectedly removed. This may occur if the power out put lead has been pulled out without switching off the unit, or if the battery has been removed from the back without switching off the unit.

Caution...

These actions may result in damage to the software of the unit.

Following this unexpected power down, the operator should ensure that a safe power supply can be attached, and then power up the unit.

A dialogue box will appear as illustrated below;

- Total Reset** **F1**
- Default** **F2**
- Continue** **F3**

TOTAL RESET reboots the unit and takes unit back to factory settings, losing all traces, settings and other setup data.

DEFAULT will reset standard factory settings but will attempt to maintain traces and settings if possible.

CONTINUE maintains stored locations and unit settings.

It is advised at this point that the operator continues by pressing CONTINUE/ **F3** to continue. This will start the unit in a normal manner without resetting any of the variables in the unit. However the user must check both the settings menu, and the stored traces and settings to check for evidence of corruption which would invalidate further operations. This will be evident by file locations reported as full that have no apparent data, and corrupted data labels etc.

If data corruption is evident then the unit should be switched off.

When the unit is switched back on the operator should press and hold the **F5** button.

This will bring up the reset menu, and depending on the perceived level of corruption either TOTAL RESET or DEFAULT should be implemented.

The instrument will move to the next empty storage space.

Note...

If a trace or setting has been saved then Locator 2s will automatically duplicate the previous saved item and add an incremental character to help the operator name subsequent traces rapidly. If the automatic name is not required it can be immediately cleared with a single press of the F2/Clear softkey.

To move to a new storage space press UP/F5 and DN/F6 to move up and down the list.

The operator can name the file using the alphanumeric box. Use the **cursor**s to navigate to the correct letter and press **OK** to accept each letter.

Any mistakes in the file name can be corrected by moving the cursor to the correct point by using </F3 and >/F4. Once the file has been named press SAVE/F1 to exit the field. To leave the menu without saving back changes, simply press **EXEC**

To save setups repeat the steps above but ensure SAVE is set to SETUP.

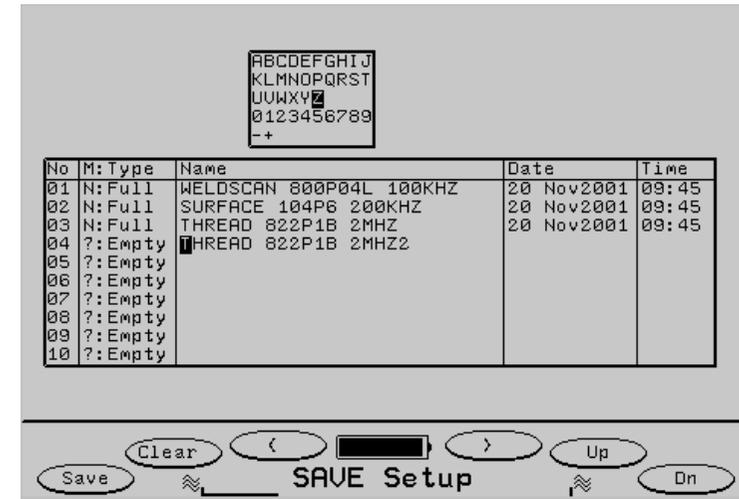


Fig 3.5 Save Menu

3.20 Allocating Trace and Setup Permissions

The Trace and Setup Files have four different Type statuses; Empty, Full, Lock and User. To access these settings, select RECALL, Setup/Trace and press **EXEC**

The status can be read from the Type column on the Recall screen (the second column).

'Empty' indicates that no data has been stored in the location.

'Full' indicates that data has been stored in the location. This is the default data Type.

'Lock' prevents the user from accidentally deleting the file when recalling the data.
 'User' enables an operator to recall the Trace or Setup when in User mode. (See 6.12).
 When the instrument is in User mode no other Traces or Setups can be recalled.
 To change the data type go to the required data location via the recall screen (see 3.16). Press the OK button. The data type will change to User. A further press will change to Lock.

To return the Type to Full, go to the setting on the RECALL menu (see Fig 3.3), and make sure the data is showing LOCK.. Press the FREEZE button and it will return to FULL..

Press **menu** to return to the menu.

Note...

When saving large traces the unit may automatically allocate a subsequent Save slot to cope with all the data. In this case the user will see that the type is indicated as Extra. This can only be cleared by deleting the saved trace above..

3.21 Trace Recorder

The Locator 2s has the facility to record up to 32 seconds of trace and to play it back, allowing the optimal set-up of gain levels and alarm gates, amongst other items.

This feature allows the operator to concentrate on good scanning of the test piece in the first instance, and then can fully focus on the instrument in order to optimise settings.

To operate the Trace Recorder mode move to the Trace Record item in the menu and select on. Press **exec** to activate the Recorder. A new set of function keys will appear (see Fig 3.5). Pressing **OK** the operator can move through the softkeys as before.

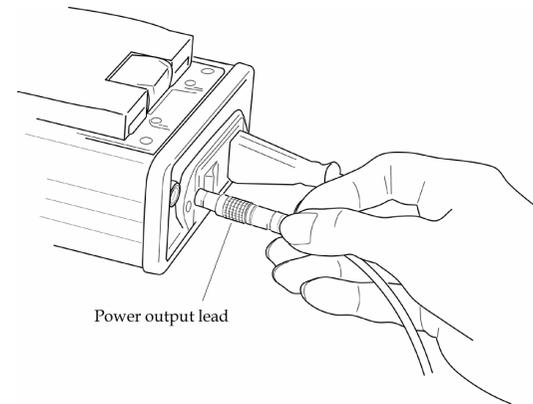
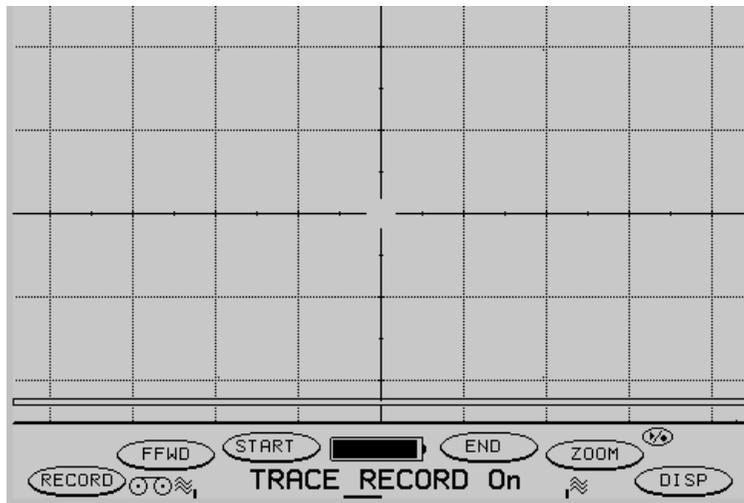


Fig 5.5 Connecting the Power Output Lead to the Charger

5.7 Placing cells in the AA battery/eliminator pack

Remove the AA battery eliminator pack from Locator 2s .

Remove the pack cover by gently pulling the tabs located at the middle of the pack on either side.

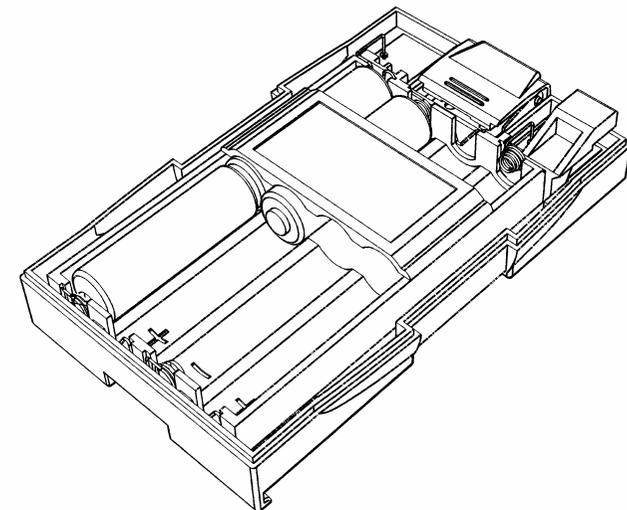


Fig 5.6 Interior of AA Pack

low charge level even after two hours on the recharger then the Lithium-ion unit should be returned for service at the next convenient time..

5.5 Battery charge indicator (Lithium-ion only)

Locator 2s indicates the battery charge of Lithium-ion packs when they are operated on the unit. The indication of charge remaining can alter with change in ambient temperature, use of backlight and inspection frequency, amongst others. This indication will not work with the AA pack. The unit will give a fill on the battery graphic on screen to indicate approximate remaining charge. When the battery charge icon approaches the empty state the operator is advised to save the settings and replace/recharge the battery.

5.6 AA battery/eliminator pack

The AA battery/eliminator pack has two functions.

It is able to take standard dry cell AA batteries when required. The operator can use rechargeable technology AA cells such as NiCad or NiMH and recharge on a proprietary frame.

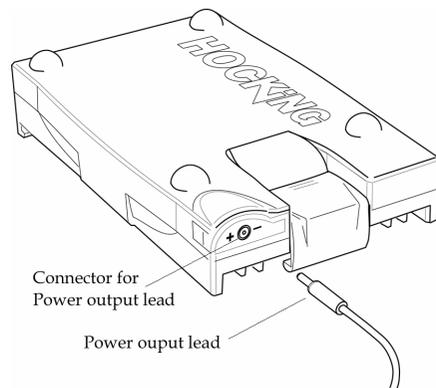


Fig 5.4 Connecting the Power Output Lead to the Battery Eliminator Pack

It connects the charger/eliminator unit to the Locator 2s by the Power Output lead (PRN 39A023) as illustrated (see Fig 5.5)

Fig 3.6 Trace Recorder screen

The operator has to ensure that the correct frequency, probe type, Load (if applicable) and Input gain are selected before starting the recording. These items cannot be changed when playing back as they are fundamental to the data captured. The system indicates that these are "locked" (i.e. they cannot be changed) by displaying a key item alongside them in the menu (see Fig 3.7).



Fig 3.7 Trace Record Menu screen showing Locked items

Once the operator is ready to scan then the RECORD softkey can be pressed, and the trace recorder will start. The operator can choose to record for the maximum amount of time or simply press Play/F1 to start replaying the recorded signal.

During recording the bar at the bottom is displayed and the solid area indicates how much of the available storage area has been used. A flashing bar indicates that all the storage area is full and only the last 32 seconds of data is stored.

When the signal is replayed a bar at the bottom will be displayed, the black area indicating which element of the recorded trace is being displayed. The operator can focus on a specific area of the replayed trace by pressing Start/F3 and moving the point using the cursors to locate the start point for the clip, pressing End/F4 and moving the point using the cursors to locate the end point for the clip, and then pressing Zoom/F5 to move in. Excessive Zoom can be corrected by re-pressing Zoom/F5 to step back through previous Zoom levels.

DISP/F6 allows the user to toggle between XY display and YT mode. In Normal mode only FFWD/F2 allows the user to play the clip at double speed, pressing F2 again returns the replay speed to normal.

Whilst in the trace recorder the operator can press OK as normal to scroll through the Programmable key sets, and can use menu to access the menu as usual.

To end a Trace Recorder session, select the Trace Record item, select off and press **exec**.

3.22 An Overview of Alarms

The Alarm menu field shows only the parameters of alarm shapes that are currently selected in the Alarm Shape dialog (see fig 3.8)

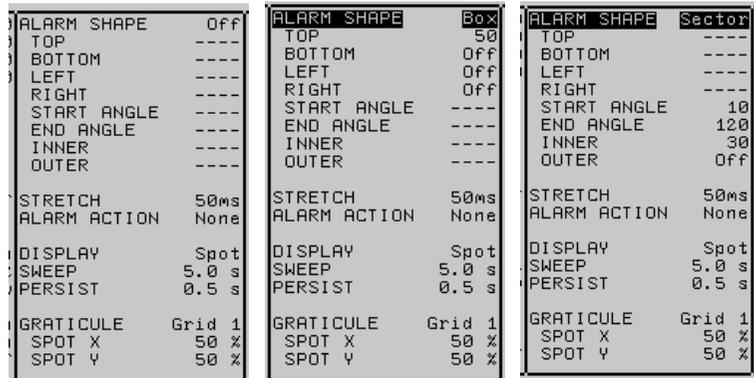


Fig 3.8 Alarm Menu showing different Alarm types

There are two types of alarm; BOX and SECTOR. An alarm condition can be indicated in a number of ways, including visual alarm via the LED (Item 11, Fig 2.1) and an alarm tone. To improve audibility, the Alarm may be stretched to lengthen the audible alert. An alarm can be switched off by setting ALARM SHAPE to OFF.

Note...

Only one type of alarm can be active at a time, and if ALARM SHAPE is set to off no alarms will appear, even if settings appear on the menu screen.

3.23 Box Gate Alarms

BOX alarm can be selected as a threshold (X or Y) or as a complete box.

To set a BOX go to ALARM SHAPE and select BOX.

1. Press **menu** to return to the operating screen
2. Press **OK** until the BOX Pre-Programmed Softkeys appear (see 2.12)
3. Press TOP/F3 to call up the TOP dialogue.
4. Press **exec** to activate the box alarm TOP function and a threshold alarm will appear:

(2) ENSURE THAT THE UNIT IS NOT EXPOSED TO DIRT OR FLUID AS THIS MAY DAMAGE THE UNIT.

(3) HIGH VOLTAGES ARE PRESENT INSIDE THE UNIT. AS WITH ALL POWER SUPPLIES CARE MUST BE TAKEN IN HANDLING AND THE UNITS MUST NEVER BE OPENED BY NON-AUTHORISED PERSONNEL.

5.3 Lithium-ion battery pack

A Lithium-ion battery pack is available for Locator 2s. This slimline package provides sufficient running power for over 8 hours of operation from a single charge (without backlight). The fully enclosed design means that there are no user serviceable parts.

Lithium-ion batteries offer the highest possible energy density for the minimum size and weight. The fully charged cells provide sufficient energy for 8 hours continuous use without the backlight or 6 hours with backlight on.

A significant advantage of this technology over other secondary battery technologies is that unlike NiCad or NiMH cells there is no requirement for cycling or deep discharging the batteries. Lithium-ion does not suffer from memory effects, therefore it is possible to top up batteries as required without losing battery capacity.

This battery technology has several levels of protection to ensure safety for the operator and equipment. However as with all forms of battery power care must be taken in handling these units.

Note...

The contacts are contained in a moulded feature on the pack providing barriers between the contacts and reducing the likelihood of inadvertent short circuit. Nevertheless the batteries should be handled with care, shorting the contacts may cause the cell protection to operate and render the pack useless. If it is suspected that the battery contacts have been shorted then the pack must be returned to a battery charger/eliminator unit. Placing the pack on the unit will allow the intelligent management system to establish whether the pack is useable or not.

The battery charge indicator on the screen will only work with the Lithium ion pack. If the AA/eliminator pack is attached then the battery charge indicator will not display a remaining charge indicator.

Charging of the Lithium-ion battery pack should only be performed using the Locator 2s battery charger eliminator.

5.4 "Battery Not Full" Indication

A solid red LED B indicates that the battery has not fully charged in three hours. This may have happened for a number of valid reasons, such as requiring a lengthy pre-charging routine due to deep discharge or high ambient temperatures. In nearly all cases the battery will be OK to operate. To validate this, place the battery on the Locator 2s and switch on. If the battery charge indicator shows full, or nearly full, then the battery is fine. However if the Locator 2s battery charge indicator shows a

Different conditions of the battery charger and Lithium-ion battery pack are indicated in the table below.

Condition	LED A	LED B
Temperature OK	Solid Green	
Temperature too high to charge	Solid Red	
Temperature too low to charge	Solid Orange	
Incorrect Battery Type		Flashing Red
Battery charging		Flashing Green
Battery charged		Solid Green
Battery not full after 3 hours		Solid Red
Pre-Charge failed		Solid Orange
Battery not detected		No light
Unknown battery, pre-charging for 1 minute		Flashing Red/Orange
Problem with power supply	Flashing Orange	Flashing Orange

The charger/eliminator pack has two modes of operation, Pre-charge and fast charge which are determined automatically depending on battery condition and are not user selectable..

The unit interrogates Lithium-ion packs when they are placed on the unit. If the unit has discharged to a very low level then the unit initiates a pre-charge routine that trickle charges the pack until it is ready to accept the fast charge. In the case of extremely discharged packs this process can take up to 90 minutes.

If LED A is not green then the battery will not be charging. LED B may still flash green to indicate it is in the battery charge cycle, but the unit will wait for the pack and charger to stabilise before starting to charge.

For packs in normal use the pre-charge is not necessary and the unit can start on a fast charge routine immediately.

Using the fast charge the pack can be supplied with enough charge in 30 minutes to provide over 3 hours of operation. If the battery illuminates LED B as a solid red, see section 6.4 "Battery Not Full" Indication

CAUTIONS...

(1) AS THE UNIT USES HIGH CURRENTS WHEN IN FAST CHARGE MODE THE UNIT WILL GET WARM. IT IS IMPORTANT THAT THE COOLING SLOTS IN THE SIDE OF THE BATTERY CHARGER/ELIMINATOR UNIT ARE KEPT CLEAR FROM OBSTRUCTION.

- To get a full box the BOTTOM, LEFT and RIGHT functions must be switched on. Select the BOTTOM/F4, and press **exec**.
- Repeat for LEFT/F5 and RIGHT/F6.

If the balance point is inside the box then an alarm condition will be created when the working point goes outside the BOX. If the balance point is outside of the BOX alarm then the alarm will indicate when the working point goes inside the BOX.

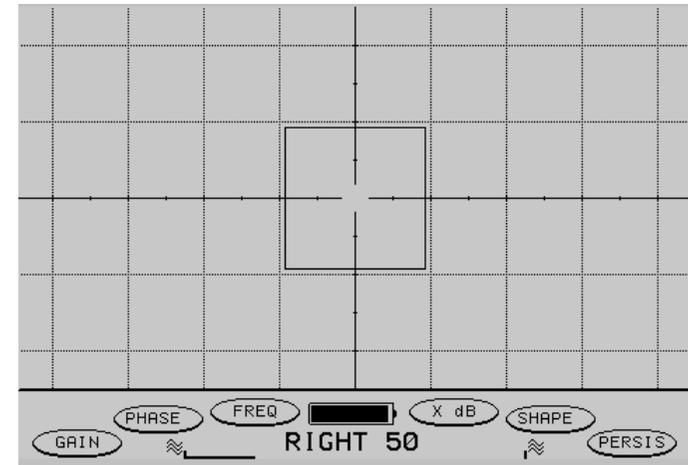


Fig 3.9 Box Gate Alarm

3.24 Sector Alarms

The sector alarm has the same versatility as the BOX alarm, and works on a similar principle.

- To set a Sector Alarm go to Alarm Shape on the Menu and select SECTOR.
- Press **menu** to return to the operating screen.
- Press **OK** until the Sector Pre-Programmed Softkeys appear (see 2.12).
- Press START/F3 to select the START setting.
- Adjust the start point of the sector by using the **cursors.. left/right** move the threshold in steps of 10. **up/down** cursor buttons move the threshold in steps of 1.
- Press END/F4 to select the END setting. Adjust the end point of the sector by using the **cursors.. left/right** move the threshold in steps of 10. **up/down** move the threshold in steps of 1.

Note...

The sector alarm will wrap to a full circle if the start point is set higher than the end point or if the end point is set lower than the start point. The controls will continue to work as described above.

7. Press INNER/F5 to select the INNER setting. Adjust the position of the inner of the sector by the **cursors**. **left/right** move the threshold in steps of 10. **up/down** move the threshold in steps of 1.
8. Press OUTER/F6 to select the OUTER setting and press **exec** to switch it on
9. Adjust the position of the outer of the sector by using the **cursors**. The **left/right** will move the threshold in steps of 10 **up/down** move the threshold in steps of one.

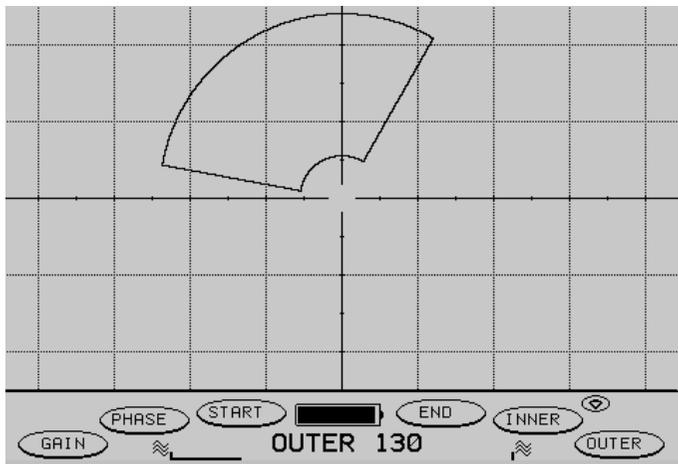


Fig 3.10 Sector Alarm

3.25 STRETCH

This setting allows the alarm to be stretched for 50msecs, 100msecs, 500msecs, 1 second, 5 seconds and 10 seconds. This function is relevant where a short alarm might be missed but it is important to note that several flaws close together will not be resolved if the alarm stretch is too long

3.26 ALARM ACTION

This setting controls action of the unit upon detecting an alarm condition. The permissible selections are NONE, TONE, FREEZE, and BOTH. Tone emits a beep

5.2 Battery charger/eliminator

The battery charger/eliminator should be connected an AC supply using an appropriately terminated plug. The adapter is able to switch to power supplies that are in the range of 90 to 264VAC, and 47 to 440Hz. Once the unit has been connected the mains switch on the side of the unit should be switched on.

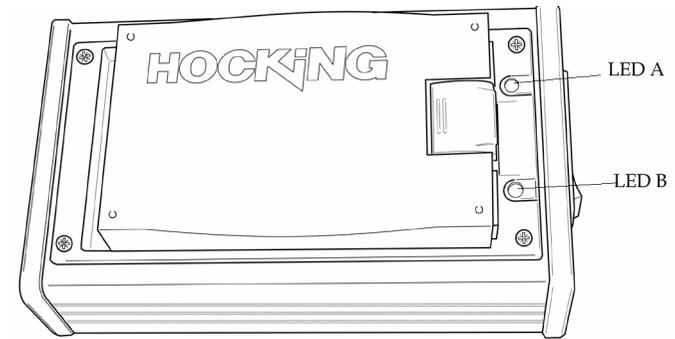


Fig 5.2 Location of the Battery Charger Indication LEDs

The charger has automatic safety protection to ensure that it will only charge the Lithium-ion battery pack supplied for Locator 2s , and will not charge the AA/eliminator pack if it is placed on the unit.

Note...

The charger/eliminator unit will continue to supply to Locator 2s even when recharging a lithium-ion battery.

To charge the Lithium-ion battery pack place the battery on top of the unit in exactly the same way as described in 6.1.

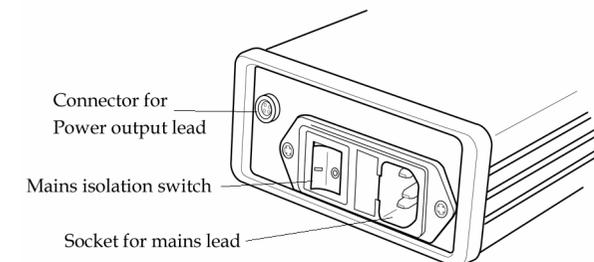


Fig 5.3 Location of the Battery Charger Connections

Chapter 5

Power Sources and Battery Management

- 5.1 Removing and Installing the Battery Pack
- 5.2 Battery Charger/Eliminator
- 5.3 Lithium-ion Battery Pack
- 5.4 "Battery Not Full" Indication
- 5.5 Battery Charge Indicator (Lithium-ion only)
- 5.6 AA Battery/Eliminator Pack
- 5.7 Placing Cells in the AA Battery/Eliminator pack
- 5.8 Restarting after Unexpected Power Down

5.1 Removing and installing the battery pack

Locator 2s has a variety of power options. The various choices all use the same method of connecting to the unit as outlined below:

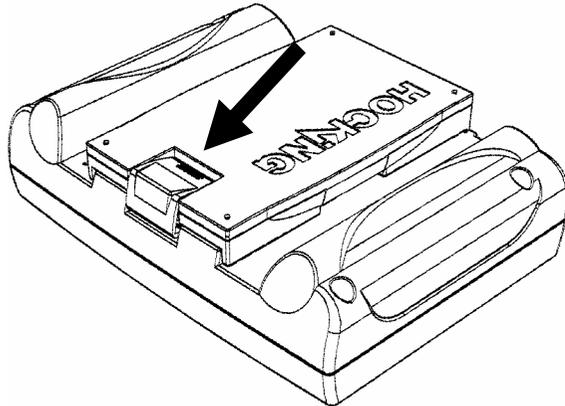


Fig 5.1 Location of the Battery Release Catch

Place the Locator 2s face down on a soft, clean surface.
Press down on the battery release clip as indicated above.
Roll the battery pack away from the unit.
Installation is the reverse process.

when the gate is triggered, and Freeze stops the trace at that point. BOTH allows Freeze and Tone to be used at the same time.

3.27 DISPLAY

Display type can be selected between SPOT, TIMEBASE & WATERFALL.

SPOT mode (or XY display) is the display mode used for the majority applications. This displays both the X and Y components of the impedance plane.

TIMEBASE mode (or YT display) is the mode in which the Y component is represented against time. In this mode some of the menu items are not valid, such as X:Y ratio, Graticule, and Sector Alarm. However these items are still displayed and can be modified. The T component (time) can be changed by changing the SWEEP variable below.

3.28 SWEEP.

Sweep applies only when TIMEBASE has been selected. This varies the time that it takes the spot to move across the major division on screen.

Settings available are (in seconds):

0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50.

3.29 PERSIST

This function sets the time for which data is retained on the display before it is refreshed. When set to permanent the data on the screen remains until the Clear button is pressed. The persistence values are set to match the Sweep values above so that the trace can persist for one full traverse of the screen.

Settings available are (in seconds):

0.1, 0.2, 0.5, 1, 5, 10, 15, permanent...

3.30 SPOT X and SPOT Y

The position of the spot can be adjusted to define the origin. This only applies when DISPLAY is set to SPOT. When the spot position is altered the graticules move automatically to indicate the origin point on screen. If the graticule is set to NONE there are cross hairs to indicate the origin (see Fig 2.5)

The cross-hairs allow the operator to observe if the balance point has drifted or moved due to an artefact or material condition.

The spot positions are indicated in terms of percentage position, relative to X and Y axes.

For this reason 0% X and 0% Y are indicated as the bottom left hand corner of the screen. This allows the user to easily set up the unit in terms of percentage screen deflection relative to the display.

To move spot position whilst on the operating screen use the Spot Position Pre-Programmed Softkeys (see 2.12).

3.31 *Output Functions*

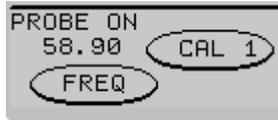
The Locator 2s has a provision for outputting Analogue Y signals, which could be used on an external plotter or data logger. To enable this function the unit should be connected to the external device using the 5 way lemo connector (Fig 2.1, Item 4).

The Y output is always available, so there is no need to configure the device to output it (see chapter 8 for details of pin outs).

VALUE OUT OF RANGE - The Locator 2s is unable to perform a reading within range. This error is usually followed by THE SEQUENCE WILL RESTART. This error may occur for a number of reasons.

- If the set values do not correspond with the standards
- If a probe is not attached
- If the cable is damaged

Move the probe to a position that is well away from any material (at least 10cm) and press the Exec softkey again. The following message will appear;



Note...

58.90 represents the value for CAL 1.

Place the probe on the Calibration sample that has been set up as sample 1 and press Exec again. The following message should appear;



Note...

8.66 represents the value for CAL 2.

Place probe on the calibration sample that has been set up as sample 2 and press **EXEC** again. When 8.66 (or the sample 2 conductivity) is indicated in the main conductivity screen, the Locator 2s is ready to perform conductivity measurements.

4.7 *Measuring Conductivity and Coating Thickness with the Locator 2s*

Guidelines for successful operation:

For accurate measurement of conductivity the surface coating thickness should not exceed 0.25mm (0.010 inches)

The surface to be measured should be flat, or of the same curvature as the calibration standards. Where curved surfaces must be measured, additional error may be introduced.

Measurement close to edges and on thin materials may give erroneous results. Check on a known consistent material to establish the influence of these effects.

The coating thickness function does not require further calibration, it should be accurate to better than 10% of the displayed value on base materials having a conductivity between approximately 15% and 100% IACS.

4.8 *Error messages*

If the lift-off is greater than 1.250mm (0.0500 inches) Coating Thickness will be displayed as "+++" and the conductivity will be shown as zero

On Ferrous (Magnetic) materials the Conductivity will be displayed as 'Fe', on ambiguous materials such as copper coated steel coins, it will be displayed as '??'

Chapter 4

Operation of Locator 2s in Conductivity Mode

- 4.1 Basics of Conductivity
- 4.2 The Effect of Temperature on Conductivity
- 4.3 Lift-off Compensation
- 4.4 Measurement on Curved Surfaces
- 4.5 Setting up for Conductivity and Coating Thickness Inspection
- 4.6 Calibration of the Locator 2s for Conductivity Measurement
- 4.7 Measuring Conductivity and Coating thickness with the Locator 2s
- 4.8 Error Messages

4.1 *Basics of Conductivity*

Conductivity of metals is commonly measured in two sets of units. In the SI system the unit of conductivity is MegaSiemens/meter (reciprocal ohm-meter). Conductivities of metals at ambient temperature are typically in the range of 1 to 60 MegaSiemens per meter.

For convenience metal conductivities are often expressed as a percentage of the conductivity of a standard sample of copper- the International Annealed Copper Standard (IACS). 100% IACS corresponds to 58 MS/m. Note that since this 'pure' copper standard was established in 1913 pure copper now often has a conductivity greater than 100% IACS

The Locator 2s measures the conductivity of non-magnetic metals and alloys in the range 0.8 to 110.0 %IACS. It uses the Eddy Current technique for measuring the conductivity of materials in %IACS, or MSiemens/meter, (set this in UNITS on the menu).

It is important to understand that eddy current measurement is essentially a 'skin' effect. The eddy current field intensity is greatest at the surface and decreases exponentially with depth. The depth at which the field strength reduces to 1/e (37%) of its surface value is referred to as the 'standard depth of penetration'. This depends primarily on the operating frequency and the conductivity of the metal.

It is generally considered that materials of thickness greater than 3 standard depths of penetration can be measured without any correction factors being required

For example at 60kHz this figure (the "effective depth of penetration") is around 0.05" (1.25mm) in Aluminium Alloys (conductivity approximately 35% IACS) and

0.32" (8mm) in Titanium alloy, (conductivity approximately 1% IACS). At 500kHz the corresponding values are 0.02"(0.5mm) and 0.11"(2.8mm)

Care must also be taken when measuring non-homogeneous materials, for example materials which have been surface heat-treated, clad or plated, or where the surface is rough or corroded. Measurements at different frequencies will give different results due to the different distribution of energy within layers of different conductivity. Care must be taken to always measure such materials at the same frequency (usually 60kHz).

4.2 The Effect of Temperature on Conductivity

The conductivity of a material can change with temperature, but is normally specified at 20 degrees Celsius. For the best accuracy, the instrument, material to be tested, probe, and calibration standards should always be at the same temperature, close to 20°C.

4.3 Lift-off Compensation

Other key factors are coating thickness/lift-off and material curvature.

Measurements can be made through layers of paint or other non-conductive coatings up to a thickness of 0.020" (0.5mm) with the 12.7mm probe.

4.4 Measurement on Curved Surfaces

Use on curved surfaces requires some caution, with concave surfaces the effect is primarily lift-off and the instrument will compensate up to the point where the spacing of the centre of the probe from the material becomes excessive. With convex surfaces the indicated conductivity will decrease as the radius decreases. Correction tables are required for radii below approximately 3" (75mm).

4.5 Setting up for Conductivity and Coating Thickness Inspection

To use the Locator 2s for Conductivity measurement requires the following:

- Locator 2s Instrument
- Standard 60kHz Probe (Hocking PRN 47P001) and Cable (PRN 33A170)
- Conductivity standards of known value (PRN33A136 or equivalent)

Before switching on, plug the lead into the 7 way Lemo socket on the front of the unit and manually select conductivity in the menu screen.

Fig 4.1 Conductivity Operating Screen

The screen above shows the two elements of the Conductivity operating mode.

On the left the screen displays the conductivity reading, in the units as set on the Menu page. An arrow adjacent to the bar indicates the limits set. On the right is the

display for Lift-off. Again this bar graph is calibrated in the units set by the operator on the menu screen, in this case under DIMS (an abbreviation for Dimensions). Press **menu** to show the Conductivity Menu Screen (see Fig 4.2).

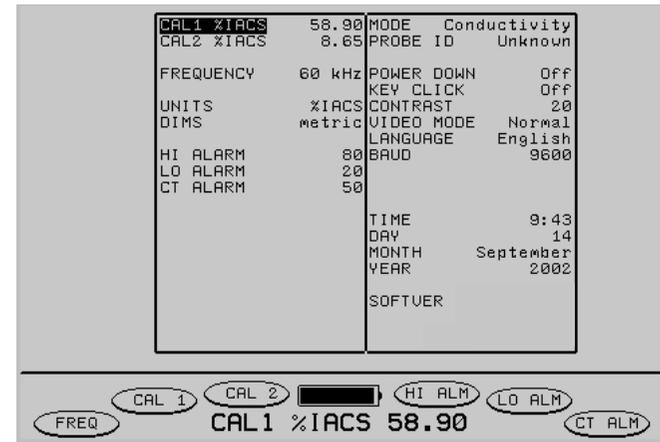


Fig 4.2 Conductivity Menu Screen

Go to the UNITS item in the menu. Using the **CURSORS**, change the conductivity units to match those in which the blocks are calibrated. As a general rule the CAL1 setting should be the higher value of the two.

Use the **CURSORS** to select the CAL1 menu item. Adjust the figures to match the value of standard 1 on the Calibration Block set.

Repeat the process to set CAL2 to the value of standard 2 on the Calibration Block set.

Adjust other parameters as desired.

Press **menu** again to return to the Conductivity Operating Screen.

4.6 Calibration of the Locator 2s for Conductivity Measurement

Make sure the frequency is set to 60kHz.

Press **EXEC** to start the setting process.

The following dialogue will appear in the bottom left hand side of the screen;

