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***UniWest***®

**US - 454 EddyView™  
Test Instrument**

Operation Manual P/N # 96780

330 West Clark  
Pasco, WA. 99301 (509) 544-0720

**STATEMENT OF LIMITED WARRANTY**

UniWest instruments and other products are warranted against defective materials and workmanship for one year from date of purchase. (Date of purchase is defined as UniWest shipping date). Batteries, probes and accessory products (subject to wear out) are excluded from the warranty.

**LIMITS OF WARRANTY**

Defect status of probes, batteries, accessory products and subsequent repair or replacement will be determined by UniWest on an "as found basis".

Instruments and other products that are damaged or otherwise rendered inoperable due to physical abuse or exceeding design limits are not covered by the warranty.

Instruments and other products must be examined by UniWest or other authorized service centers before warranty status is declared. Warranty claims must be evaluated by UniWest.

Shipping charges are not normally included in the warranty. However, prepaid shipments to UniWest or authorized service centers will generally be prepaid on return.

Instruments and other products are used in various commercial and military applications by personnel of different levels of qualification. Fitness for use or results of use is not covered by the warranty.

Instruments and other products having Certificates of Calibration and Certifications of Compliance to various commercial and mil specs are available at customer request.

Service warranty is defined as warranty after repair by UniWest or authorized service centers and covers only the parts and labor of the existing repair status. Service warranty may extend "the warranty" if repair is required during the warranty period. This will be evaluated after repair service.

Service calibration or certification requirements are not covered by the warranty. Service warranty time is determined by UniWest at the time of service and is otherwise subject to the same conditions of "the warranty" and limits of warranty.

Any conditions or items not covered in the limited warranty statement or the limits of warranty as listed will be warranted only at the discretion and evaluation of UniWest.

Reconditioned Extended Warranty will be for the period stated in the Certificate of Warranty and will otherwise be the same as New Instrument.

Spare parts and subassemblies sold for customer installation are warranted for thirty (30) days against defects.

**SOFTWARE**

The US-454 EddyView™ Test Instrument is shipped with all the required software necessary for operation. Installation of any other software on this system may interact unfavorably with the supplied software and cause system failures. Installing additional software will void the warranty.

**United Western Technologies Corp.**

*UniWest*®

330 W. Clark St.

Pasco, WA. 99301 U.S.A.

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**RETURNING INSTRUMENTS FOR SERVICE**

If your instrument is in need of service either under warranty or after the warranty period has expired, please contact UniWest or an authorized service center prior to returning your instrument. This will ensure that your instrument is repaired and returned in a timely manner. If it is necessary to return your instrument, please return in the original package for the best shipping protection.

**UNITED WESTERN TECHNOLOGIES CORP.**

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## UNPACKING THE EQUIPMENT

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Upon arrival of the equipment, be sure none of the cartons or packaging is damaged. Check all contents for damage. If damage is noticed, contact the carrier and keep the damaged containers and/or contents until a representative of the carrier can make an inspection.

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## CALIBRATION INTERVALS

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US-454 EddyView™ Test Instrument should be calibrated and certified per the owners QC policy for inspection systems. Service should be performed as needed.

Calibration consists of verifying and adjusting, if needed, the system to UniWest manufacturing specifications as described in the UniWest Tech Specs for the US-454 EddyView™ Test Instrument. Mechanical and electrical system components are tested for compliance and performance.

The eddy current signal path is verified for signal to noise and consistency between the probes, and the US-454 EddyView™ Test Instrument.

Calibration stickers are installed at the time of calibration and a certification document is available. Certificates of compliance and training will be included when required.

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## OPERATING ENVIRONMENT

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There are no specific restrictions for this equipment. However, consider the equipment as a sensitive electronic device. The equipment should be protected as much as possible from water and chemical spills, extreme temperature changes, high humidity areas, dusty areas, and abusive handling or dropping the equipment.

If the equipment is to be stored for a short period of time (less than three months) there are no special requirements. However, if the equipment is to be stored for more than three months and the storage area is humid, the equipment should be placed in a sealed container with desiccant. In all storage situations severe temperature changes should be avoided. Batteries should be removed and placed on a maintenance charge.

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## SAFETY SUMMARY


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This section contains general precautions that must be followed to ensure safe operation of the instrument. Note that additional safety requirements may be specified when performing particular inspections.

This is a sensitive electronic instrument. It must be handled with care and not subjected to sharp blows, intense electric fields, or other extreme environmental conditions. The US-454 EddyView™ Test Instrument uses 120/240 VAC — 9-24VDC from attached battery. Do not connect to any non-standard electrical supply.

 **CAUTION** — is used in this manual to identify conditions or practices that could lead to damage to property, or equipment.

 **WARNING** — is used to identify conditions or practices that could lead to personal injury or loss of life.

There are two items that the operator must be aware of to operate this instrument in a safe manner.

1. There are dangerous voltages present inside the instrument. Only qualified personnel, who are thoroughly familiar with working on equipment that operates from the AC power line, should open the enclosure.
2. Only replace fuses with a properly rated replacement. Fuses of lower voltage rating may not interrupt high voltages (such as AC line voltage) safely.

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## 1 Introduction and General Information

### 1-1 Description of US-454 EddyView™ Test Instrument



Figure 1. US-454 EddyView™ Test Instrument

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The US-454 EddyView™ Test instrument is a portable, lightweight, user-friendly eddy current test instrument. A state-of-the-art eddy current test instrument that performs nondestructive detection of cracks and defects in conductive materials. The US-454 EddyView™ Test Instrument is capable of storing up to 100 instrument setups and 10 impedance plane displays for later recall. Stored data and displays may be recalled and printed using the "screen snapshot" feature.

As a portable inspection instrument, the US-454 EddyView™ Test Instrument relies on a Lithium Ion battery pack for its primary source of power. However, the US-454 may be powered with an AC adapter power supply.

The US-454 EddyView™ Test Instrument provides multiple inputs and outputs, such as, a hand-held scanner and probe connection. A PAL/NTSC compatible video input is used for viewing a full motion video from any external source, such as, a UniWest video probe, an alternate manufacturer's video scope or a VCR for viewing a recorded video of a procedure. In addition, an RGB Video output is provided for connecting to an external computer monitor or a video projector.

The US-454 EddyView™ Test instrument is an integrated, miniaturized version of the UniWest E-Lab US-450 eddy current instrument. The US-454 EddyView™ Test Instrument essentially combines the functionality of the US-450 instrument and the Windows-based PC running the E-Lab software application into a single integrated package with multiple enhancements.

A variety of features include:

- Fully portable inspection instrument.
- Microprocessor control and versatility.
- Easy to use menu driven control.
- Digital storage of instrument set-ups, test data, and Impedance plane displays.
- Support circuitry for synchronizing and mixing incoming/instrument video.
- Flat panel display controller with color LCD.
- EPP parallel port for computer interface or parallel printer output.
- PAL or NTSC compatible video input.
- RGB VGA video output.

**1-2 US-454 EddyView™ Basic Package**

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US-454 EddyView™ Test Instrument(1)	
SBS 3002 Smart Battery Charger	(1)
Power Supply w/ power cord	(1)
Lithium Ion Battery Packs	(2)
Operation Manual	(1)

**1-3 US-454 EddyView™ Standard Package**

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US-454 EddyView™ Test Instrument(1)	
SBS 3002 Smart Battery Charger	(1)
Power Supply w/ power cord	(1)
Lithium Ion Battery Packs	(2)
Operation Manual	(1)
Back Pack for Transport	(1)

**1-4 US-454 EddyView™ Plus Package**

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US-454 EddyView™ Test Instrument(1)	
SBS 3002 Smart Battery Charger	(1)
Power Supply w/ power cord	(1)
Lithium Ion Battery Packs	(2)
Operation Manual	(1)
Heavy Duty Shipping Case	(1)

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**1-5 US-454 EddyView™ Recommended Accessories**

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SBS 3002 Smart Battery Charger	(1)
Power Supply w/ power cord	(1)
Additional Power Supply w/ power cord	(1)
Additional Battery Pack	(1)
Operation Manual	(1)
Back Pack for Transport	(1)
Heavy Duty Shipping Case	(1)
JF-15 Hand Scanner (see probes for FR selection)	(1)
JF-15 Scanner Indexer	(1)
Printer w/ cable	(1)
Additional Printer cable	(1)

**1-6 US-454 EddyView™ Vision Probe and Accessories**

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US-1475 Vision Probe
RGB to NTSC Converter for external video display
Video Player

**1-7 US-454 EddyView™ Probe Kits**

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Training and Calibration Kit
2 <sup>nd</sup> Layer Probe Kit
Pencil Probe Kit
Bolt Hole Probe Kit for JF-15 Scanner
RD-2002 adjustable Bolt Hole Probes
US-1269 Floating (3 point) Surface Probe

## 1-8 Power Requirements

The US-454 EddyView™ Test Instrument is a fully portable inspection instrument and is equipped with a rechargeable lithium ion battery pack. The battery compartment for the lithium ion battery pack is located at the back of the instrument with quick release screws to provide easy access.

**NOTE:** Upon receiving the US-454 instrument package, the MPE202 Lithium Ion Battery packs should be charged to the full rated capacity. See *Charging the Lithium Ion Battery Pack* in the next section.



Figure 2. US-454 Back Panel Battery Compartment

The SBS 3002 Smart Battery Charger is provided with the US-454 package for recharging the lithium ion battery packs.

The SMBus Smart Batteries contain a microchip that monitors the condition (tracks capacity and usage) of the battery pack.

It is *recommended* that only a SMBus compliant smart charger rated Level II or III be used for charging the SMBus Smart Batteries.

Occasionally, it may be necessary to run the battery pack through a recalibration cycle. This is due to temperature fluctuations, aging, and self-discharge that may cause errors. The internal information should be kept as accurate as possible. The recalibration cycle involves fully charging the battery pack, completely discharging the battery pack and then recharging it again.

The SBS 3002 Smart Battery Charger performs these recalibration steps automatically. To recalibrate, place the battery pack in the left bay and press the red arrow located between the bays. Recalibrating may take as long as 16 hours. Some battery packs may not have the capability of recalibration. If so, the charger automatically senses this and simply drops back into a normal charge mode.

To charge, recalibrate and monitor the status of the battery packs, perform the following steps.

### 1-9 Checking the Fuel Gauge Operation

The MPE202 Lithium Ion Rechargeable Battery Pack can directly display the capacity information. The battery capacity is displayed as the relative state-of-charge. Each LED segment represents a portion of the full charge capacity. The LED pattern definition is provided in the table below. The LEDs illuminate for 5 seconds following switch activation. If the battery voltage is below 7.1V, there will be no LED indication.

CAPACITY	LED INDICATORS				NOTE
	1	2	3	4	
At or below 10%					Blinks
10% - 25%					Lit for 3 seconds
26% - 50%					Lit for 3 seconds
51% - 75%					Lit for 3 seconds
76% - 100%					Lit for 3 seconds

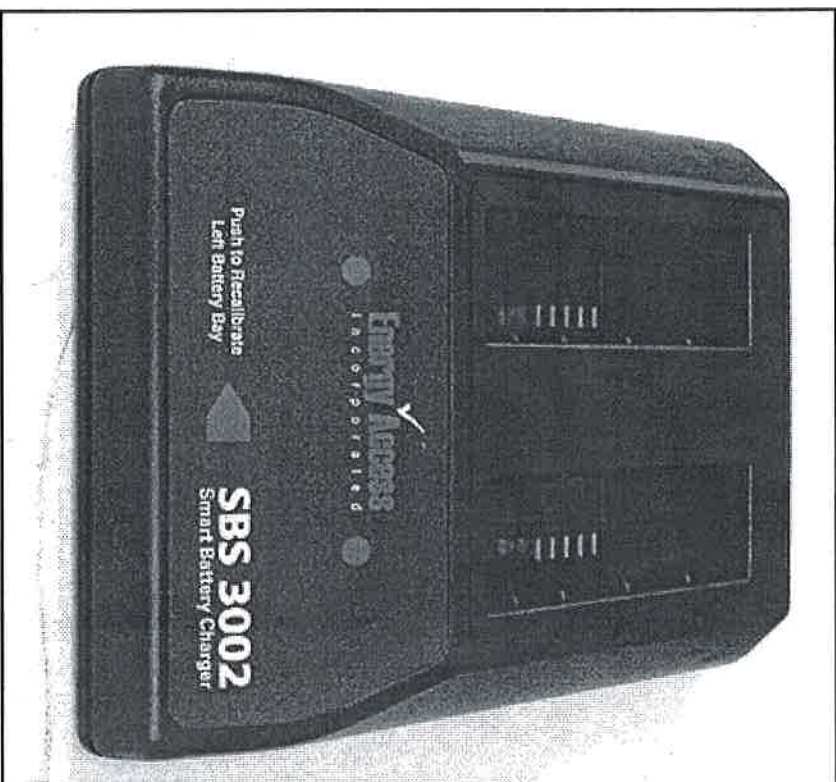


Figure 3. SBS 3002 Smart Battery Charger

## 1-10 Charging the Lithium Ion Battery Pack

1. Plug the AC adapter power supply into an outlet and insert plug end of the power cable into the DC power jack on the charger.
2. Insert battery pack into bay.
3. The LED illuminates to indicate the status of the battery pack as follows:

**NOTE:** Connection other than indicated may result in permanent damage to the unit.

OFF:	No Battery Detected
Green Flash:	Fast Charging
Green Solid:	Fully Charged
Yellow Flash:	Recalibrating
Yellow/Green:	Recalibrated
Yellow Solid:	Standby
Red Flash:	Error

## 1-11 Lithium Ion Rechargeable Battery Pack Characteristics

- Nominal Voltage — 10.8V
- Rated Capacity — 5400 mAh
- Hours of Operation — approx. 3 hrs.
- Operating Temperature Performance —
  - Charge — 0°C to +45°C
  - Discharge — 0°C to +55°C at C-rate
  - Storage Temperature — -10°C to +60°C
  - Relative Humidity Range — up to 90%
- Cycle Life — Min. 300 charge and discharge cycles
- Charge Time — Max. 4 hrs.
- Weight — 1lb.

## 1-12 Lithium Ion Battery Pack Safety Summary



- Avoid shorting the battery
- Use approved charging methods **ONLY**
- Do **NOT** charge in a gas-tight container
- Do **NOT** immerse in water
- Do **NOT** disassemble the battery
- Do **NOT** dispose of the batteries in fire
- Keep out of the reach of children
- If battery appears to have suffered abuse, do **NOT** use.

**NOTE:** Dispose of batteries according to local, state and federal regulations.

## 1-13 US-454 EddyView™ Initial Power-Up Self Test

The US-454 EddyView™ Instrument performs a series of automatic self tests of its internal functions. These tests include: a memory test to check the system memory for errors, a DSP communication test to check the communication line between DSP and the main processor, and a DSP Nulling test to check the instrument null function.

## 2 US-454 EddyView™ Test Instrument Specifications

### HARDWARE

- *US-454 Instrument Weight*  
Less than 5 lbs.
- *US-454 Instrument Overall Dimensions*  
11.5" in. length x 7.5" in. width x 3" in. depth approx.
- *Power Requirements*  
120/240 VAC, 20 watts through external 24V power pack.  
9-24 VDC, 17 watts from attached battery or optional auto cord.  
Battery Life: 3 hours approx.
- *Operating Temperature Range: 32° to 158° F (0C - 70C)*
- *Storage Temperature Range: - 4° to 158° F (-20C - 70C)*
- *Display and Video Input/Output*  
6.5" in. diagonal display, Color LCD, Flat panel display  
RGB display output, NTSC or PAL video capture for video input.

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**Scanner Support**

Power supply output and synchronizing input at the scanner connector for hand-scanner support

**Probe Drive**

Frequency 10 Hz to 10 MHz, 7.0V p-p maximum with an output impedance of 10Ω.

**Gain**

0 dB to 99.9 dB in 0.1 dB steps

**Analog Inputs/Outputs**

16 bit A/D and D/A conversion with  $\pm 10V$  range.

**SOFTWARE****Filtering**

Variable Band Pass. — Low Pass and High Pass filtering in the X and Y axis

Selectable from 0 to 10 KHz in 1 Hz increments

**Rotation**

Continuously variable 0-359° degrees in 1° degree increments

**Strip Chart Recorder**

Display of simulated strip chart recorder showing X and Y data

**Auto Clear**

0-10 seconds in 1 second increments

**Alarm**

Rectangular region, Elliptical region - Region inclusive/exclusive, audio alarm buzz/beep

**Test Setup Storage**

Storage of 100 instrument setups

**Data Storage**

Minimum storage of 1MB Data Buffers.

- **Screen Storage**  
Storage of 10 Impedance Plane displays in memory for later recall
- **Display Scaling**  
0.2, 0.5, 1.0, 2.0, 5.0 Volt/div.
- **Display**  
Selectable XY Impedance Plane display, or Oscilloscope display.
- Selectable video display, combining external video with eddy current display.
- **Parallel Printer Support**  
via EPP parallel port  
One standard printer driver included

### 3 US – 454 EddyView™ Test Instrument Top and Front Panel Descriptions

The following illustration is an example of the US-454 EddyView™ Test Instrument screen display with user control keys. These *User Control keys* consist of: 1) a Cancel Key, 2) an Enter Key, 3) a Control Knob, 4) a Null Key, 5) an Erase Key, 6) and five Soft Keys. The five soft keys are associated with a portion of the *Key Label Area* at the bottom of the Main Display Area and may be assigned to the most frequently used settings. The Key Label Area displays the most current soft key assignment. At the top of the Main Display Area is the *Status Area*; this area is specifically used for displaying the current instrument settings.

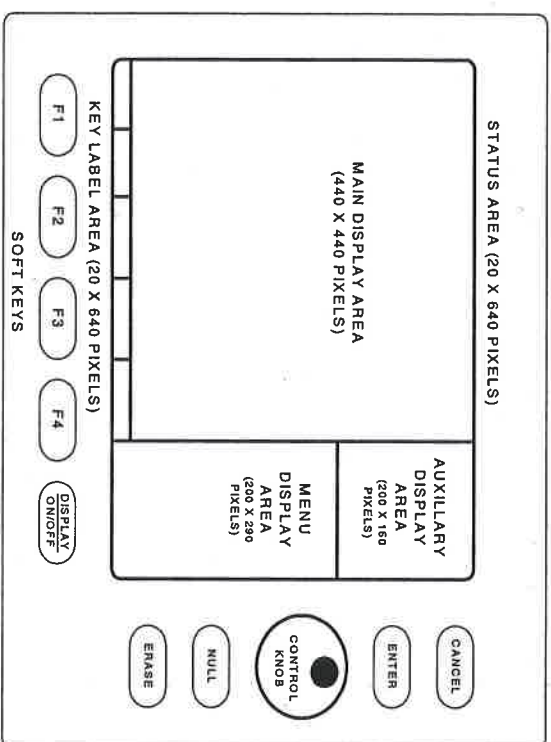


Figure 4. US-454 Test Instrument Front Panel

### 3-1 Display Screen Layout

Upon startup, the following illustration is an example of the US-454 EddyView™ Display Screen layout. The display screen has been designed to provide the operator with multiple displays of eddy current signal information.

#### Main and Auxiliary Display Areas

The *Main and Auxiliary Display Areas* are for displaying active functions, such as, the Impedance Plane/Oscilloscope display, External NTSC or PAL Source Video and/or the Chart Recorder display. In order to display these active functions, they must be enabled by selecting one, two, or all three from the Master Menu.

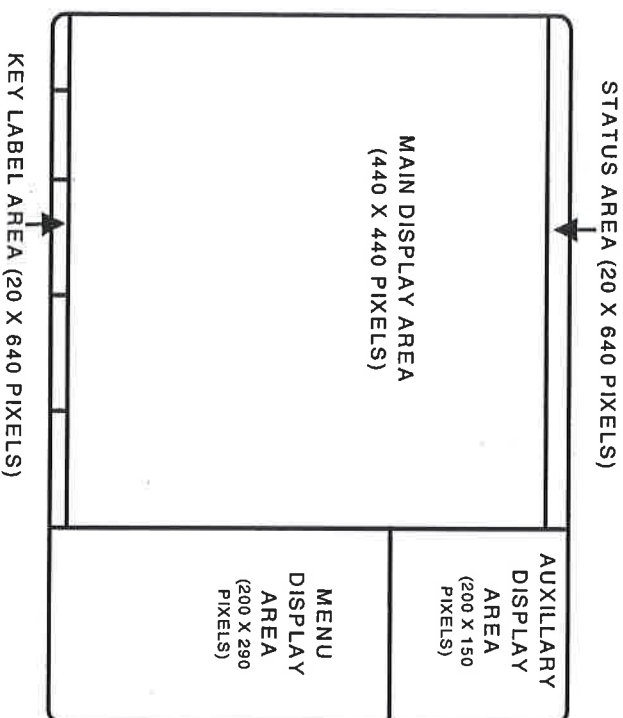


Figure 5. US-454 Display Screen Layout

#### Menu Display Area

The *Menu Display Area* is where the Master Menu is displayed; however, the Master Menu may be turned off when the Chart Recorder display is enabled. By extinguishing the Master Menu, it will allow for a larger display area for the Chart Recorder display.

#### Status Display Area

The *Status Display Area* is for displaying operational status and current instrument settings, such as, Frequency, Gain, Rotation, Filters, and Data Storage Location.

#### Key Label Area

The *Key Label Area* region is used to display menu selections associated with the four Soft Keys and Display Mode Key. These keys are referred to as the instrument "Hot Keys." See the menu descriptions in Section 4-2, *Setup Menu and Extended Menu Selections*.

### 3-2 Screen Appearance Examples

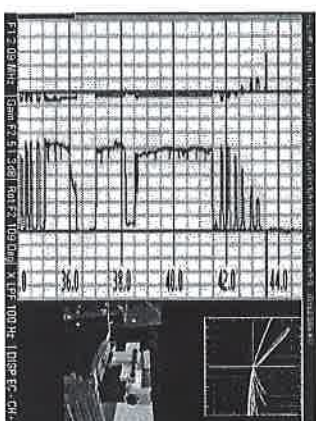
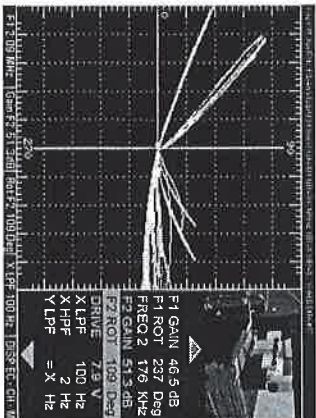
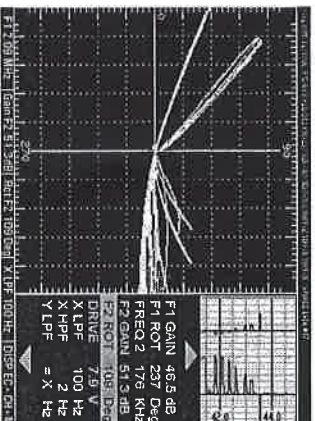
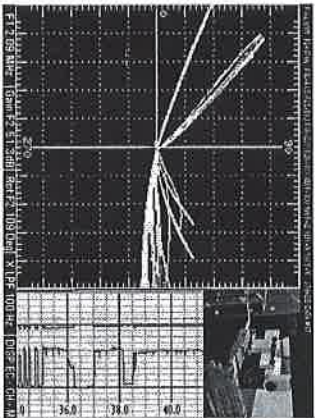
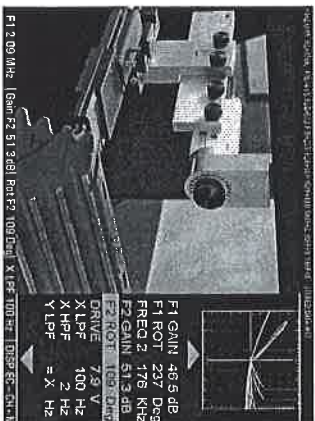
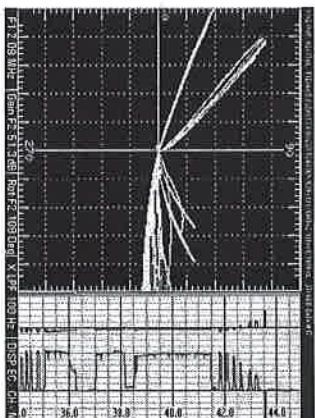


Figure 6. Screen Appearance Examples

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### 3-3 US-454 EddyView™ Test Instrument User Control Key Descriptions

#### Cancel Key

The *Cancel Key* is used at any time to back out of a parameter selection or to extinguish the Master menu from the Menu Display area. Press the *Cancel key* to return to the “parameter select mode” and to keep the previous setting.

#### Enter Key

The *Enter Key* is for confirming the selected menu item and parameter adjustment. Pressing the *Enter Key* again after the parameter is modified keeps the value and returns the operator to the menu selection mode. If the *Master Menu* has been extinguished, press the *Enter Key* to return the *Master Menu* to the *Menu Display Area*.

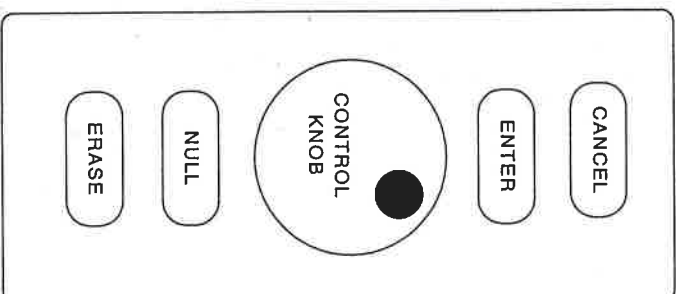


Figure 7. Control Keys

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### Control Knob

The *Control Knob* is used for selecting menu items or for modifying the selected menu item parameter. Rotate the Control Knob to the left or right until the preferred menu item or parameter is displayed. The selection will illuminate in reverse color characters. Confirm the selection by pressing the Enter key. If the selected menu item is to be modified, rotate the Control Knob left or right until the desired parameter value is displayed. Confirm the parameter change by pressing the Enter key.

### Null Key

The *Null Key* forces the US-454 EddyView™ instrument to Null out the incoming eddy current signal.

### Erase Key

The *Erase Key* clears the Impedance Plane/Oscilloscope Display. Also, used for clearing the label text area during label editing. In Latch Alarm Mode, the alarm output stays activated until pressing the Erase Key, which will reset it.

### Display Mode and On/Off Key

The *Display Mode and On/Off Key* is a dual function key, used for displaying the enabled displays and for turning ON/OFF the US-454 EddyView™ Test instrument. Press the Display Mode key momentarily to turn ON the US-454 EddyView™ Test instrument. Press and hold approximately 5 seconds to turn OFF the US-454 EddyView™ instrument.

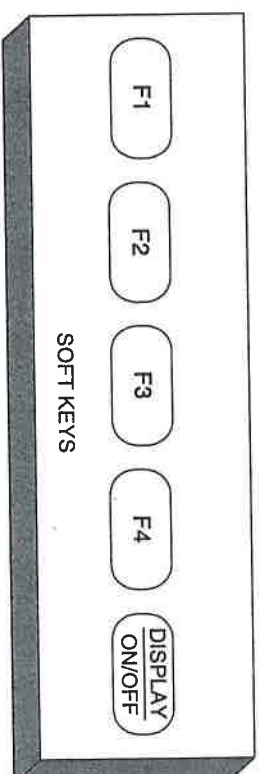


Figure 8. Soft Keys

The displays are selected and enabled from the Setup Menu. The possible display selections are EC Display (impedance plane, oscilloscope, or OFF), Chart Recorder Display, and External Video Display.

If only one display is selected it will always display in the Main Display area.

If two displays are selected, the displays will rotate between the Main and Auxiliary screen areas.

If three displays are enabled at once, the third display will be placed behind the Master Menu in the Menu Display Area and can be viewed by pressing Cancel to turn OFF the Master Menu. See Section 3-2, *Screen Appearance Examples*.

If all displays are turned OFF a message will appear on the screen in the middle of the Main Display area that says "NO DISPLAY MODE SELECTED".

Each time the operator presses the Display Mode Key, the US-454 EddyView™ Test Instrument will rotate each enabled display into the display areas.

### Soft Keys

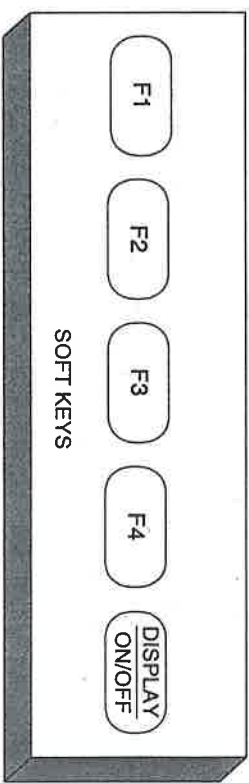
The *Soft Keys*, F1 through F4, are arrayed under each of their corresponding key label areas. Soft Keys are user programmable and may be accessed from the Master Menu, and then by selecting the Setup Menu. The programmable soft keys are

Function Key 1 Set,

Function Key 3 Set, and

Function Key 2 Set,

Function Key 4 Set



**Figure 9. Soft Keys**

These keys provide instant single button (Hot Key) access to the operators most commonly used functions, such as, Frequency, Gain, Rotation, and Filters. A method of returning these keys to their factory default is provided in the Master Menu → Enter Setup → Load Defaults.

If any of the four soft keys are pressed when the operator is in any other menu or parameter, the soft key will take precedence and the instrument will immediately go to the soft key's assigned menu item in the "parameter modify mode." The menu or parameter that was just exited will assume that the Enter key was pressed and that parameter will remain as set.

Pressing any of the soft keys when the Master Menu is extinguished will immediately bring up the Master Menu and display the soft key parameter in the "parameter modify mode."

When a soft key is assigned to a menu item that has multiple subsets of the same parameter, pressing the soft key multiple times will toggle through all of the available parameters. The menu items with multiple parameter selections that may be assigned to a soft key are Frequency, Gain, Rotation, X & Y Sensitivity, LP & HP Filters and Null Position.

If *Frequency* is set to a soft key, the selections are **FREQ1** and **FREQ2**. The copy of the Master Menu in Setup will only contain **FREQ**.

Pressing the soft key once, highlights **FREQ 1** in the Master Menu and places the parameter value in "parameter modify mode."

A second press highlights **FREQ 2** in the Master Menu and places the parameter value in "parameter modify mode."

A third press would return to **FREQ 1** in the Master Menu.

If *Gain* is set to a soft key, the selections are **F1 GAIN** or **F2 GAIN** unless **FREQ2** is set to **OFF**, then the selection will be **F1 GAIN** only. The copy of the Master Menu in Setup will only contain **GAIN** not **F1 GAIN** and **F2 GAIN**.

If *Rotation* is set to a soft key, the selections are **F1 ROT** or **F2 ROT** unless **FREQ2** is set to **OFF**, then the selection is **F1 ROT** only. The copy of the Master Menu in Setup will only contain **ROTATION** not **F1 ROT** and **F2 ROT**.

If *Sensitivity* is set to a soft key, the selections are **X SENS** and **Y SENS**. The copy of the Master Menu in Setup will only contain **SENS** not **X SENS** and **Y SENS**.

If *Filters* is set to a soft key, the selections are **LP FILT** and **HP FILT**. The copy of the Master Menu in Setup will only contain **FILTERS** not **LP FILT** and **HP FILT**.

If *Null Position* is set to a soft key, the selections are **X NULL POS** and **Y NULL POS**. The copy of the Master Menu in Setup will only contain **NULL POS** not **X NULL POS** and **Y NULL POS**.



### Soft Key Assignment

Before proceeding with the example below, it is recommended that the operator understands how to select and modify the instrument parameters. See section, *Selecting and Modifying Instrument Parameters* on the next page.

*For Example:* To set a menu item to a soft key, such as, **FREQ 1**.

- 1) select the **FREQ 1** menu item in the Master menu.
- 2) adjust the parameter value.
- 3) scroll to the 'Enter Setup' in the Master Menu and press the Enter key. Notice that the Setup Menu appears to the left of the Master menu.
- 4) scroll through the Setup Menu to select Function Key 1-4 Set and press Enter.
- 5) the parameters that may be set to a soft key are displayed to the left of the Setup Menu.
- 6) highlight the **FREQ** parameter and press Enter.
- 7) press Cancel to return to the Master menu.

### Selecting and Modifying Instrument Parameters

#### *Selecting a Parameter (Parameter Select Mode)*

To select a parameter, rotate the Control Knob to scroll through all available menu selections and press Enter, or press a soft key to go immediately to the assigned soft key menu item. The selected parameter will illuminate in reverse color characters and the scroll arrows are present. See Figure 10, *Parameter Select Mode* to the right. If the parameter is controlled by one of the soft keys, then the parameter is present on the soft key label area at the bottom of the screen.



**Figure 10.** *Parameter Select Mode*

### Modifying a Parameter (Parameter Modify Mode)

After the parameter is selected, and the Enter Key is pressed, the parameter is ready for modification. Do this by rotating the Control Knob to the left to decrease the value or to the right to increase the value. Notice that only the parameter value is highlighted and no scroll arrows are present.

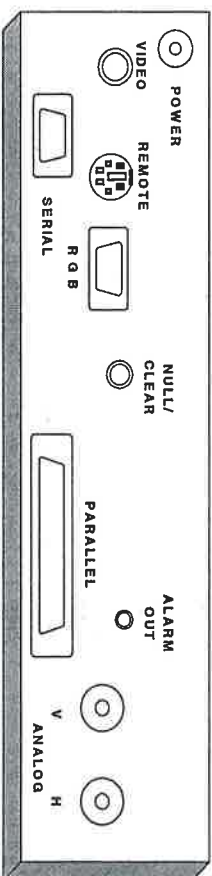
F1 GAIN	46.5 dB
F1 ROT	237 Deg
FREQ 2	176 KHz
F2 GAIN	51.3 dB
F2 ROT	109 Deg
DRIVE	7.9 V
LP FILT	100 Hz
HP FILT	2 Hz
X SENS	1 V/DIV

**Figure 11. Parameter Modify Mode**

After completing the parameter modification, press Enter to keep the change and return to the parameter select mode; or press Cancel to return to parameter select mode and keep the previous setting. The operating parameter will change the instrument electronics in real time.

Cancel is used at any time to back out of a parameter selection or to extinguish the menu from the display.

### 3-4 US-454 EddyView™ Top Panel Connector Descriptions



**Figure 12. US-454 Top Panel Connectors**

#### Power

The *Power* connector is used for connecting 120/240 VAC through an external 24VDC power pack and to the US-454 EddyView™ Instrument.

#### Video

The *Video* connector is for interfacing to a video camera/probe accessory.

#### Serial

The *Serial* port is a standard RS-232 connector and may be used for interfacing to an external control computer.

#### Remote

The *Remote* connector provides the user with the capability to remotely control the functions of the US-454 EddyView™ Test Instrument.

**RGB**

The *RGB* is a 15 pin connector used for connecting to an external RGB (computer) monitor or video projector.

**Null/Clear**

The *Null/Clear* used for remote control of the Null/Clear function.

**Parallel**

The *Parallel* port uses a standard D-Sub 25 pin connector for interfacing with a printer or computer.

**Alarm Out**

The *Alarm Out* connector may be used for connecting to an external alarm.

**Analog V & H**

The standard BNC connectors carry the analog **HORIZ. 1 (X)** and **VERT. 1 (Y)** signals of the impedance plane data. These signals are suitable for connection to an analog strip chart recorder.  $\pm 10$  Volt peak maximum output voltage and 100 ohm output impedance.

## 4 US-454 EddyView™ Test Instrument Menu Selections

### 4-1 US-454 Master Menu and Extended Menu Selections

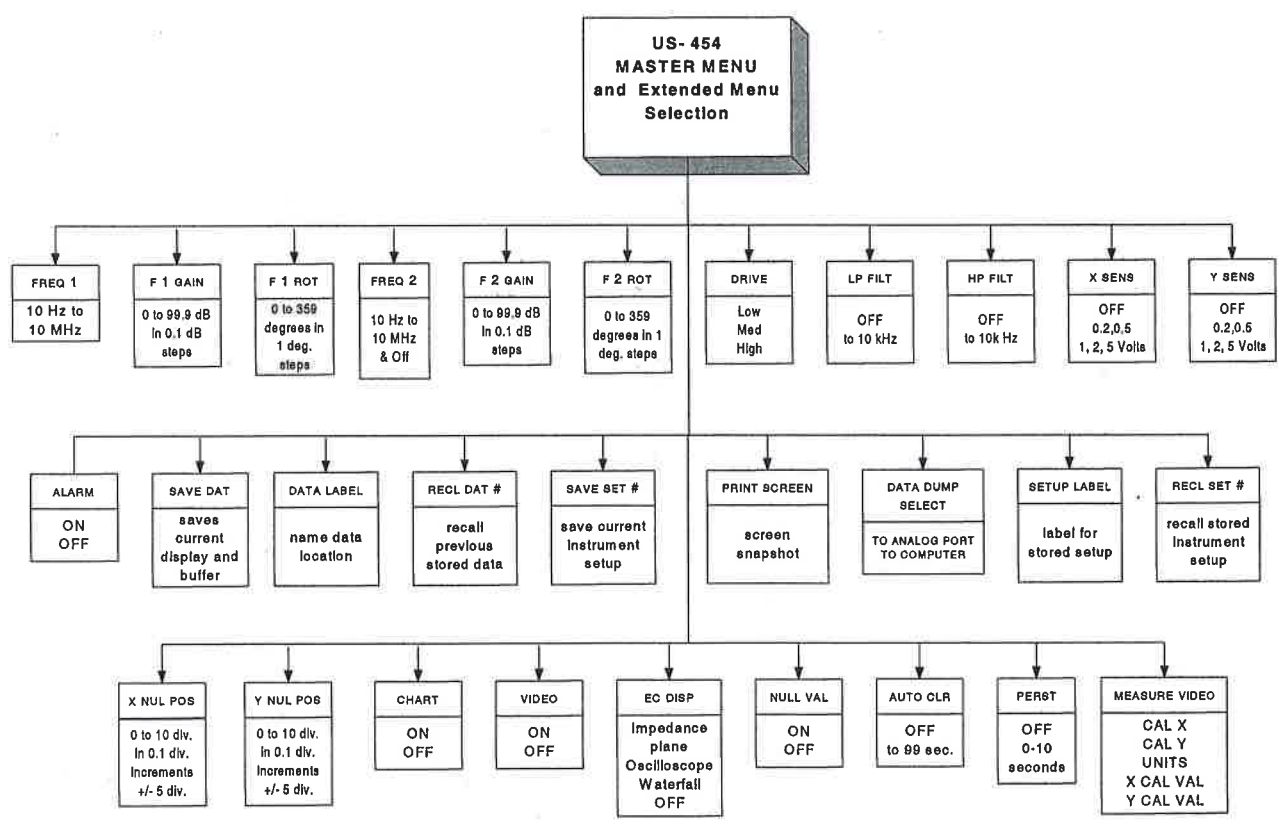
The US-454 *Master Menu* is used for setting and/or displaying the configuration parameters. If the Master Menu is not being displayed at the time, pressing any Soft key or the Enter key will bring up the Master Menu in the Menu Display Area.

To extinguish the Master Menu, press Cancel. Pressing the Cancel key several times will back out of the previous selection until the desired menu or menu item is displayed. All of the possible menu selections in the Master Menu are shown below in Figure 13.

F1 GAIN	48.5 dB	LP FILT	100 Hz	STAGE 3 #243	CHART	ON
F1 ROT	237 Deg	HP FILT	2 Hz	RECL DAT #	VIDE	ON
FREQ 2	176 kHz	X SENS	1 V/DIV	PRINT SCREEN	EC DISP	L PLANE
F2 GAIN	51.3 dB	Y SENS = X SENS		SAVE SET #	NULL VAL	OFF
F2 ROT	109 Deg	ALARM	OFF	J18 TEST #47	AUTO CLR	10 SEC
DRIVE	HIGH	SAVE DAT #	27	RECL SET #	PERST	150 SAMP
LP FILT	100 Hz	STAGE 3 #243		X NULL POS	OPER	MANUAL
HP FILT	2 Hz	RECL DAT #	27	Y NULL POS	ENTER SETUP	
X SENS	1 V/DIV	SAVE SET #	13	CHART	FREQ 1	2.09 MHz

**Figure 13.** US-454 Test Instrument Master Menu and Extended Menu Selections

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**Frequency 1 (FREQ 1)**

The *Frequency 1* setting determines the frequency of the eddy current probe drive signal. This is adjustable from 10 Hz to 10 MHz with 3-digit accuracy.

**Frequency 1 Gain (F1 GAIN)**

*Frequency 1 Gain* is adjustable from 0 to 99.9 dB in 0.1 dB steps.

**Frequency 1 Rotation (F1 ROT)**

*Frequency 1 Rotation* is adjustable from 0 to 359 degrees in 1-degree steps. This parameter will roll over from 359 to 0 on increase and from 0 to 359 on decrease.

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**Frequency 2 (FREQ 2)**

The *Frequency 2* is adjustable from 10 Hz to 10 MHz and OFF with 3-digit accuracy. Turning off this frequency automatically removes *Frequency 2 Gain* and *Rotation* menu entries.

**Frequency 2 Gain (F2 GAIN)**

*Frequency 2 Gain* is adjustable from 0 to 99.9 dB in 0.1 dB steps. This menu item disappears when *Frequency 2* is turned off.

**Frequency 2 Rotation (F2 ROT)**

*Frequency 2 Rotation* is adjustable from 0 to 359 degrees in 1-degree steps. This menu item disappears when Frequency 2 is turned off. The parameter will roll over from 359 to 0 on increase and from 0 to 359 on decrease.

**Probe Drive (DRIVE)**

*Probe Drive* is usually set to the highest level possible in a particular probe without causing saturation, resulting in the best signal to noise ratio for the eddy current indication. Probe Drive is adjustable in three levels LOW, MED, HIGH, at the probe drive output. (2 V p-p, 4 V p-p, and 7 V p-p respectively)

**Low Pass Filter (LP FILT)**

The *Low Pass Filter* is used for reducing the lift-off noise and is adjustable from OFF to 10 KHz, with 1 Hz resolution and from 0 to 999 Hz with 10 Hz resolution and from 1 KHz to 10 KHz. A software limit will keep the Low Pass filter from being set lower than the High Pass filter.

**High Pass Filter (HP FILT)**

The *High Pass Filter* is used for reducing the low frequency noise and is adjustable from OFF to 10 KHz, with 1 Hz resolution and from 0 to 999 Hz with 10 Hz resolution and from 1 KHz to 10 KHz. A software limit will keep the High Pass filter from being set higher than the Low Pass filter.

**X Sensitivity (X SENS)**

The *X Screen Sensitivity* is used for signal display scaling and is adjustable from OFF, 0.2, 0.5, 1, 2, and 5 volts per division. A software limit will keep both X and Y from being turned off at the same time.

**Y Sensitivity (Y SENS)**

The *Y Screen Sensitivity* is used for signal display scaling and is adjustable from OFF, 0.2, 0.5, 1, 2, and 5 volts per division. A software limit will keep both X and Y from being turned off at the same time.

**Alarm Enable (ALARM)**

*Alarm Enable* allows enabling of alarm output and audible signal. This function alerts the operator to signals that move outside or inside defined ranges on the Impedance plane. Selections are OFF or ON.

**Save Data and Current Display (SAVE DAT)**

The *Save Data and Current Display* function allows the operator to save the current screen display and the contents of the data buffer to non-volatile memory.

To save the current display and buffer, rotate the Control Knob in the Master Menu to the "SAVE DAT" function and select it by pressing the Enter key. This will immediately freeze and hold the current-on-screen data and buffer memory contents.

Rotate the Control Knob again, to select the desired memory location and press the Enter key to store the held data into the selected memory location. Pressing Cancel at this point will return the instrument to normal operating mode.

As the Control Knob is rotated through the various memory locations, the Data Label will scroll through the labels that correspond with the memory locations and the Recall Data "RECL DAT" selection will update it's memory location number.

Clearing a memory location is handled by overwriting a stored memory with a new one and then re-labeling.

**Data Label**

A *Data Label* is provided for each data location and is accessed through the Master Menu. To edit the label, rotate the Control Knob to *Data Label* and press the Enter key. The first character in the label will flash. Rotate the Control Knob until the desired character appears then press Enter. The second character will flash. Continue entering characters into the label until the end of the label.

Press the Cancel key to move back one character or press the Enter key to move forward one character. To Exit, continue pressing Enter or Cancel until either end of the label is reached.

Press the Erase key to delete the entire label and move the entry back to the left most character.

**Recall Data and Display (RECL DAT)**

The *Recall Data and Display* function allows review of any stored data. To Recall Data that was previously stored, rotate the Control Knob in the Master Menu to the "RECL DAT" function and select it by pressing the Enter key. Rotate the Control Knob again to select the desired memory location and press the Enter key.

As the Control Knob is rotated through the various memory locations, the Data label will scroll through the labels that correspond with the memory locations. The Save Data "SAVE DAT" Menu selection will update its memory location number.

The screen will immediately display the data from the selected memory location. Once the memory location is selected, the operator may adjust several parameters. These adjustable parameters are: X SENS, Y SENS, PERST, AUTO CLEAR, CHART SPEED, AND PRINT SCREEN. Pressing Cancel twice will return the instrument to normal operating mode.

If the Chart Recorder Display is enabled, it will contain a cursor that can be scrolled along the display by rotating the Control Knob. As the cursor is scrolled along the Chart Recorder Display, the impedance plane display will show the phase and gain for the selected data area. When the cursor is scrolled to the end or the beginning of the Chart Recorder Display the chart will scroll to the beginning or end of the data buffer. An adjustable (in samples "SAMPLE RATE") data window that is set in the Setup Menu controls the amount of data that is placed on the Impedance Plane Display. Multiple samples will be overlaid on top of each other.

**Save Instrument Setup (SAVE SET)**

The *Save Instrument Setup* function allows the operator to save the current instrument setup to non-volatile memory. To save the current instrument setup, rotate the Control Knob in the Master Menu to the "SAVE SET" function and press the Enter key. Rotate the Control Knob again to select the desired memory location and press the Enter key to store the current instrument settings in the selected memory location.

As the Control Knob is rotated through the various memory locations, the Setup Label will scroll through the labels that correspond with the memory locations and the Recall Setup "RECL SET" Menu selection will update its memory location number.

**Print Screen (PRINT SCREEN)**

Pressing the Enter key on the *Print Screen* selection immediately sends a 'screen snapshot' to the selected output device that is defined in the Setup Menu → Printer Setup. The printout consists of the selected displays and instrument settings. If the printout is from stored data, the memory label is included. Error handling is performed so that the instrument will not stop operating if an error occurs. The instrument will simply display an error message (such as "PRINTER NOT CONNECTED") for 5 seconds and continue on.



**Instrument Setup Label**

An *Instrument Setup Label* is provided for each stored Setup and is accessed through the Master Menu. To edit the label, rotate the Control Knob to the SAV SET #, press Enter and select the number location for the instrument setup to be stored. Next, rotate the Control Knob (CW) to the line below the SAV SET # and press Enter. The first character in the label illuminates in reverse color character. Rotate the Control Knob until the desired character appears, then press Enter. The second character illuminates in reverse color character. Continue entering characters into the label until the end of the label. Press the Cancel key to move back one character or press the Enter key to move forward one character. To Exit, continue pressing Enter or Cancel until either end of the label is reached. Pressing the Erase key will delete the entire label and move the entry to the left most character.

**Recall Instrument Setup (RECL SET #)**

To *Recall an Instrument Setup* that was previously stored, rotate the Control Knob in the Master Menu to the "RECL SET #" function and press the Enter key to select it. Rotate the Control Knob again to select the desired memory location and press the Enter key. The instrument will immediately be programmed to the stored setup parameters.

As the Control Knob is rotated through the various memory locations, the Instrument Setup Label will scroll through the labels that correspond with the memory locations and the Save Setup "SAVE SET #" selection will update its memory location number.

**X Null Position (X NULL POS)**

The *X-Null Position* function adjusts the position on the screen that the X probe signal will Null to. Range is -5.0 - +5.0 Div. 10 divisions in 0.1 division increments.

**Y Null Position (Y NULL POS)**

The *Y-Null Position* function adjusts the position on the screen that the Y probe signal will Null to. Range is -5.0 - +5.0 Div. 10 divisions in 0.1 division increments.

**Chart Recorder Display (CHART)**

The *Chart Recorder Display* is a turn ON or OFF function and is used for plotting the X and Y data versus time.

**External Video (VIDEO)**

The *External Video Display* function is a turn ON or OFF function and is used for viewing and recording the part under inspection with a camera.

**Eddy Current Display Mode (EC DISP)**

The *Eddy Current Display* mode is for selecting the type of display for viewing, like the "Impedance Plane", "Oscilloscope", or "OFF" mode.

**Null Value Readout (NULL VAL)**

The *Null Value Readout* selection turns ON a display of two numbers (four numbers for dual frequency) in the status area that continuously reads out the difference between center scale (zero) and the actual value of null correction. Readout is in millivolts.

**Auto Screen Clear (AUTO CLR)**

The *Auto Screen Clear* erases the impedance plane at periodic intervals that may be set from 1 to 99 seconds or may be set to OFF.

**Screen Persistence (PERST)**

The *Screen Persistence* feature allows the operator to set a time period that the stored eddy current information on the screen will be erased. The Screen Persistence erases the information at a particular point after the time has expired even if more information was displayed there at a later time. May be set from OFF to 9.9 seconds.

**Enter Setup Menu (ENTER SETUP)**

The *Enter Setup* is used for setting the US-454 EddyView™ Test instrument parameters.

**4-2 US-454 Setup Menu and Extended Menu Selections**

The Setup Menu is used for setting the US-454 EddyView™ Test instrument parameters.

Scroll through the Master Menu using the Control Knob until the *Enter Setup* selection is highlighted and press the Enter key, as shown in Figure 14, *Master Menu*.

On the following pages, is a brief description of all the possible menu selections in the Setup Menu.

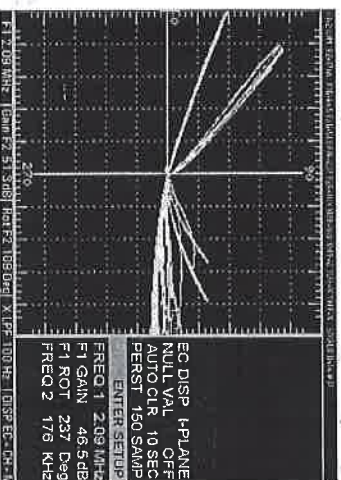


Figure 14. Master Menu

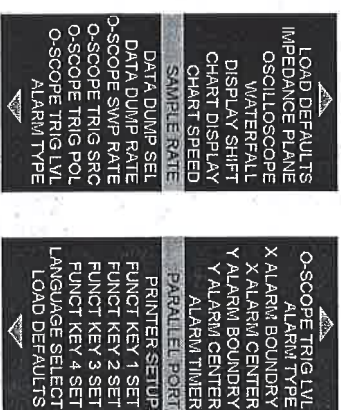


Figure 15. Setup Menu Selections

**Enter Setup Screen (ENTER SETUP)**

In the Master Menu, rotate the Control knob until *Enter Setup* is highlighted and press the Enter key.

The Setup Menu appears just to the left of the Master Menu, as shown in Figure 16, *Entering the Setup Menu*, below.

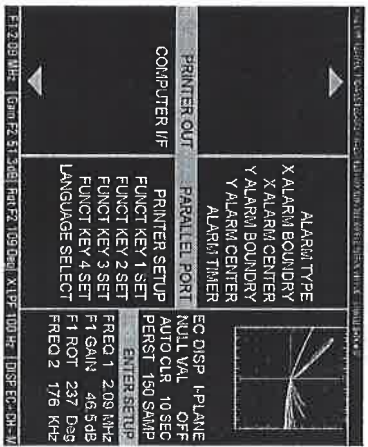
Scroll through the parameter selections in the Setup Menu using the Control knob and highlight the desired system parameter by pressing the Enter key.

The parameter selected will appear in the upper left-hand corner of the display. Rotate the Control Knob to adjust the parameter and then press the Enter key.

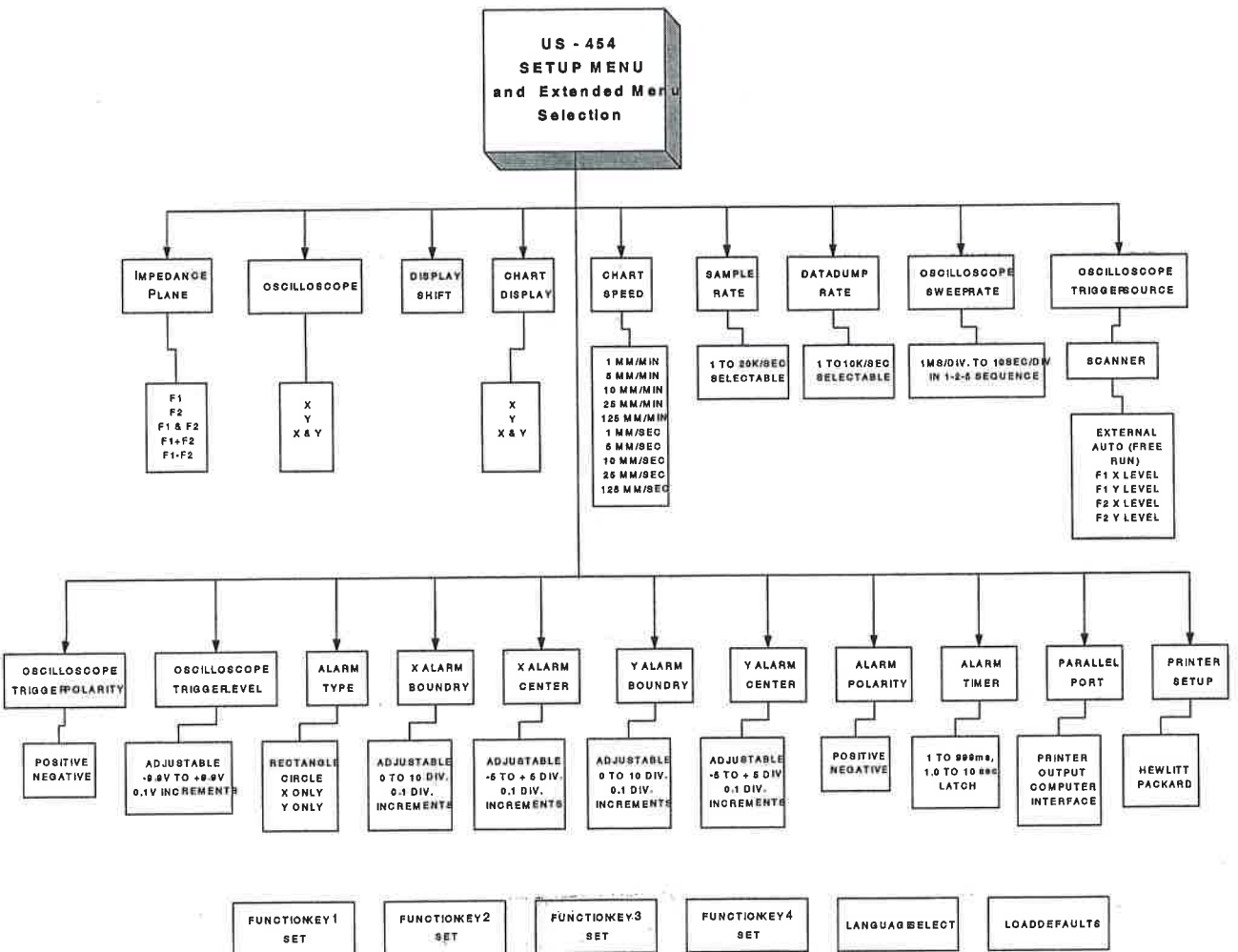
To return to the Master Menu, press the Cancel key several times until the US-454 instrument returns to the selected display and Master menu.



**Figure 16. Entering the Setup Menu**



**Figure 17. Selecting a Setup Menu Parameter**



**Impedance Plane (IMPEDANCE PLANE)**

The *Impedance Plane* provides the primary display of impedance data. It plots the X-Y data from the US-454 EddyView™ Test Instrument hardware in real time. Rotate the Control Knob until "IMPEDANCE PLANE" appears in the Setup menu and press Enter. A circular menu will appear in the left Main Display area with the following selections.

F1
F2
F1 and F2
F1 + F2
F1 – F2

This page intentionally left blank.

The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or press Cancel (to retain the old value).

**Oscilloscope (OSCILLOSCOPE)**

The *Oscilloscope Display* provides an alternative to the standard impedance plane display. The O-Scope Display functions as a standard oscilloscope. Rotate the Control Knob until "OSCILLOSCOPE" appears in the Setup menu and press Enter. A circular menu will appear in the left Main Display area with the following selections.

X	(1 trace)
Y	(1 trace)
X & Y	(2 traces)

The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or press Cancel (to retain the old value).

**Display Shift (DISPLAY SHIFT)**

The *Display Shift* parameter allows the zero point on the display to be placed in any horizontal position from zero to 359 degrees on the Oscilloscope Display mode.

Rotate the Control Knob until "DISPLAY SHIFT" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or press Cancel (to retain the old value). Display Shift is adjustable from 0 to 360 degrees in 1-degree increments.

**Chart Display (CHART DISPLAY)**

The *Chart Display* simulates a paper strip chart that plots the X and Y data versus time. Rotate the Control Knob until “CHART DISPLAY” appears in the Setup menu and press Enter. A circular menu will appear in the left Main Display area with the following possible selections:

X	(1 trace)
Y	(1 trace)
X and Y	(2 traces)

The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or press Cancel (to retain the old value).

**Chart Speed (CHART SPEED)**

The *Chart Speed* provides the following speed selections for the Chart Display. Rotate the Control Knob until “CHART SPEED” appears in the Setup menu and press Enter. A circular menu will appear in the left Main display area with the following possible selections:

1 mm/min	1 mm/sec
5 mm/min	5 mm/sec
10 mm/min	10 mm/sec
25 mm/min	25 mm/sec
125 mm/min	125 mm/sec

The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or press Cancel (to retain the old value).

**Sample Rate (SAMPLE RATE)**

*Sample Rate* selection is used for adjusting the sample rate that the data is recorded into the instrument's circular data buffer. Sample Rate is adjustable from 1 to 20k samples per second with 2-digit accuracy.

Rotate the Control Knob until "SAMPLE RATE" appears in the Setup Menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or press Cancel (to keep the old value).

**Data Dump Rate (DATA DUMP RATE)**

*Data Dump Rate* sets the rate (in samples per second) that the instrument will output the data from the currently selected buffer to the analog outputs when the "DUMP DATA" command is used. Sample rate is adjustable from 1 to 20k samples per second with 2-digit accuracy.

Rotate the Control Knob until "DATA DUMP RATE" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

**Data Dump Select (DATA DUMP SEL)**

The *Data Dump Select* function is used in selecting the type of output for the data, either to a chart recorder or computer. Rotate the Control Knob until *Data Dump Sel* appears in the Master Menu and press the Enter key. A circular menu will appear in the left Main Display area with the following possible selections:

TO COMPUTER  
(This function is NOT implemented at this time.)

The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or Cancel (to retain the old value).

**Oscilloscope Sweep Rate (O-SCOPE SWP RATE)**

*Oscilloscope Sweep Rate* sets the horizontal sweep rate (in seconds or milliseconds per division) for the Oscilloscope mode. Sweep rate is adjustable from 1 millisecond per division to 10 seconds per division in a 1-2-5 sequence.

Rotate the Control Knob until "O-SCOPE SWEEP RATE" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to keep the old value).

**NOTE:** This control only has affect when in 'Oscilloscope Mode'.

### Oscilloscope Trigger Source (O-SCOPE TRIG SRC)

Rotate the Control Knob until "O-SCOPE TRIG SOURCE" appears in the Setup menu and press Enter. A circular menu will appear in the left Main display area with the following possible selection.

**NOTE:** This control only has affect when in 'Oscilloscope Mode'.

#### SCANNER

Selecting Scanner Trigger will enable a built in 24VDC power source and place a revolutions-per-minute (RPM) display in the status area. The RPM is calculated by measuring the period between the sync pulses and performing a simple calculation.

EXTERNAL
AUTO (FREE RUN)
F1 X LEVEL
F1 Y LEVEL
F2 X LEVEL
F2 Y LEVEL

The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or Cancel (to retain the old value).

### Oscilloscope Trigger Polarity (O-SCOPE TRIGGER POL)

Rotate the Control Knob until "O-SCOPE TRIGGER POL" appears in the Setup menu and press Enter. A circular menu will appear in the left Main display area with the following possible selections:

POSITIVE  
NEGATIVE

The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or Cancel (to retain the old value).

**NOTE:** This control only has affect when in 'Oscilloscope Mode'.

### Oscilloscope Trigger Level (O-SCOPE TRIG LVL)

Rotate the Control Knob until "O-SCOPE TRIG LVL" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

**NOTE:** This control only has affect when in "Oscilloscope Mode".

Trigger Level is adjustable from -9.9 to +9.9 volts in 0.1 volt increments.



**Alarm Type (ALARM TYPE)**

The *Alarm Type* is used to define areas of the impedance plane, which causes an audible alarm to sound, when the impedance point goes outside the alarm boundary. In addition, these boundaries may be altered to change the shape and position of the alarm boundaries. Rotate the Control Knob until “ALARM TYPE” appears in the Setup menu and press the Enter key. A circular menu will appear in the left Main display area with the following possible selections:

CIRCLE
RECT / X AND Y
X ONLY
Y ONLY

The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or Cancel (to retain the old value).

**X Alarm Boundary (X ALARM BOUNDARY)**

The *X Alarm Boundary* is used for changing the shape and position of the alarm boundary. The alarm position is relative to the null point. X Alarm Boundary is adjustable in volts from +0.00 to +10.00 Volts.

Rotate the Control Knob until “X ALARM BOUNDARY” appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

**X Alarm Center (X ALARM CENTER)**

The *X Alarm Center* is used for changing the shape and position of the alarm boundary. The alarm position is relative to the null point. X Alarm Center is adjustable in volts from – 0.00 to -10.00 Volts.

Rotate the Control Knob until “X ALARM CENTER” appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

### **Y Alarm Boundary (Y ALARM BOUNDARY)**

The *Y Alarm Boundary* is used for changing the shape and position of the alarm boundary. The alarm position is relative to the null point. Y Alarm Boundary is adjustable in volts from +0.00 to +10.00 Volts.

Rotate the Control Knob until "Y ALARM BOUNDARY" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

### **Y Alarm Center (Y ALARM CENTER)**

The *Y Alarm Center* is used for changing the shape and position of the alarm boundary. The alarm position is relative to the null point. Y Alarm Center is adjustable in volts from - 0.00 to -10.00 Volts. Rotate the Control Knob until "Y ALARM CENTER" appears in the Setup menu and press Enter. The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired value and press Enter (to keep) or Cancel (to retain the old value).

### **Alarm Polarity (ALARM POLARITY)**

The *Alarm Polarity*, either positive or negative, may be set to all alarm types. Positive polarity forces the alarm to be ON when the eddy current signal is inside the alarm threshold. The Negative polarity initiates the alarm when the eddy current signal is outside the alarm threshold. Rotate the Control Knob until "ALARM POLARITY" appears in the Setup menu and press Enter. A circular menu will appear in the left Main display area with the following possible selections:

- POSITIVE
- NEGATIVE

The parameter to be changed will illuminate in reverse color characters in the left Main display area and the scroll arrows will disappear. Rotate the Control Knob to the desired selection and press Enter (to keep) or Cancel (to retain the old value).

**Alarm Timer (ALARM TIMER)**

The *Alarm Timer* feature is used for setting the length of the alarm pulse and sound. Adjustable from 1 to 999 milliseconds, 1.0 to 10 seconds and LATCH.

In *Timed Mode*, the signal must drop below the alarm threshold and increase above the threshold after the time expires to generate a new alarm signal. In *Latch Mode*, the alarm output stays activated until pressing the *Erase* key resets it.

Rotate the *Control Knob* until "ALARM TIMER" appears in the *Setup* menu and press the *Enter* key. The parameter to be changed will illuminate in reverse color characters in the left *Main* display area and the scroll arrows will disappear. Rotate the *Control Knob* to the desired value and press *Enter* (to keep) or *Cancel* (to retain the old value).

**Parallel Port (PARALLEL PORT)**

The *Parallel Port* is used for data output to a printer or computer. Rotate the *Control Knob* until "PARALLEL PORT" appears in the *Setup* menu and press the *Enter* key. A circular menu will appear in the left *Main* display area with the following possible selections:

PRINTER OUTPUT

COMPUTER INTERFACE

The parameter to be changed will illuminate in reverse color characters in the left display area and the scroll arrows will disappear. Rotate the *Control Knob* to the desired selection and press *Enter* (to keep) or *Cancel* (to retain the old value).

**Printer Setup (PRINTER SETUP)**

Rotate the *Control Knob* until "PRINTER SETUP" appears in the *Setup* menu and press the *Enter* key. A circular menu will appear in the left *Main* display area with the following possible selections:

HEWLETT PACKARD

The parameter to be changed will illuminate in reverse color characters in the left *Main* display area and the scroll arrows will disappear. Rotate the *Control Knob* to the desired selection and press *Enter* (to keep) or *Cancel* (to retain the old value).

**Function Key 1 Set (FUNCTION KEY 1 SET)**

The following keys, *Function Key 1 – 4 Set*, provide instant single button (Hot Key) access to the operators most commonly used functions, such as, Frequency, Gain, Rotation, and Filters. Rotate the Control Knob until “FUNCTION KEY 1 SET” appears in the Setup menu and press the Enter key. A circular menu will appear in the left Main display area that is a duplicate of the Master Menu. Rotate the Control Knob to select the desired function for this key and press Enter. The Function Key Label at the bottom of the screen changes and provides single key access to the selected function.

**Function Key 2 Set (FUNCTION KEY 2 SET)**

Rotate the Control Knob until “FUNCTION KEY 2 SET” appears in the Setup menu and press the Enter key. A circular menu will appear in the left Main display area that is a duplicate of the Master Menu. Rotate the Control Knob to select the desired function for this key and press Enter. The Function Key Label at the bottom of the screen changes and provides single key access to the selected function.

**Function Key 3 Set (FUNCTION KEY 3 SET)**

Rotate the Control Knob until “FUNCTION KEY 3 SET” appears in the Setup menu and press the Enter key. A circular menu will appear in the left Main display area that is a duplicate of the Master Menu. Rotate the Control Knob to select the desired function for this key and press Enter. The Function Key Label at the bottom of the screen changes and provides single key access to the selected function.

**Function Key 4 Set (FUNCTION KEY 4 SET)**

Rotate the Control Knob until “FUNCTION KEY 4 SET” appears in the Setup menu and press the Enter key. A circular menu will appear in the left Main display area that is a duplicate of the Master Menu. Rotate the Control Knob to select the desired function for this key and press Enter. The Function Key Label at the bottom of the screen changes and provides single key access to the selected function.

**Language Select (LANGUAGE SELECT)**

English

**Load Defaults (LOAD DEFAULTS)**

The *Load Default* selection resets the US-454 EddyView™ Test instrument to its original (factory default) configuration. Rotate the Control Knob until “ENTER SETUP” is highlighted in the Master Menu and press Enter, the Setup Menu will appear just to the left of the Master Menu. Again, rotate the Control Knob until “LOAD DEFAULTS” appears in the Setup menu and press Enter. The system will reset to the following:

DEFAULT PARAMETERS	
F1=FREQ	X Sensitivity (X SENS)=1 V/div
F2=GAIN	Y Sensitivity (Y SENS)=1V/div
F3=ROTATION	Alarm Enable (ALARM)=OFF
F4=FILTERS	X Null Position (X NULL POS)=0
DISPLAY=I-PLANE	Y Null Position (Y NULL POS)=0
Frequency 1 (FREQ 1)=2.00 MHz	Chart Recorder Display (CHART)=OFF
Frequency 1 Gain (F1 GAIN)=36dB	External Video (VIDEO)=OFF
Frequency 1 Rotation (F1 ROT)=0	Eddy Current Display Mode (EC DISP)=I-PLANE
Frequency 2 (FREQ 2)=OFF	Null Value Readout (NULL VAL)=OFF
Probe Drive (DRIVE)=HIGH	Auto Screen Clear (AUTO CLR)=OFF
Low Pass Filter (LP FLT)=200 Hz	Screen persistence (PERST)=OFF
High Pass Filter (HP FLT)=0 Hz	Language Select=ENGLISH

**5 US-454 EddyView™ Test Instrument Applications**

The following applications represent a range of tests the US-454 EddyView™ Test Instrument is capable of performing. These applications do not represent all possible uses of the US-454 EddyView™ Test Instrument. Rather, they are presented to highlight some of the features of the US-454 instrument and are intended as examples only. The details of an actual test may vary from the parameters specified. The operator should already be familiar with the operation instructions section of this manual.

### 5-1 Crack Detection with an Absolute Probe

#### Test Equipment Required

500KHz Absolute Probe

Aluminum Crack Standard with 0.40", 0.20", and 0.008" notches

Connect a 500 KHz Absolute Probe to the US-454 EddyView™ front panel and turn ON. Adjust the US-454 EddyView™ Test Instrument to the following parameters by rotating the Control Knob to scroll through all the available menu selections in the Master Menu. After the parameter is selected, and the Enter Key is pressed, the parameter is ready for modification. Do this by rotating the Control Knob to the left to decrease the value or to the right to increase the value.

EC DISP	Impedance Plane	LP FILT	100
FREQ1	500KHz	HP FILT	0
F 1 GAIN	40dB	X SENS	0.5V/div.
F 1 ROT	0	Y SENS	0.5V/div.

Place the probe on the aluminum crack standard. Slide the probe over the aluminum block with notches that are 8, 20, and 40 mils deep. Press the Null button while holding the probe still. Lift the probe from the sample. Place the probe back on the test sample. The Lift-off line should extend from the null point to the left. Try changing the gain to see how it affects the data. Also, use the strip chart to collect and display real-time data. Press the Erase button to erase the screen.

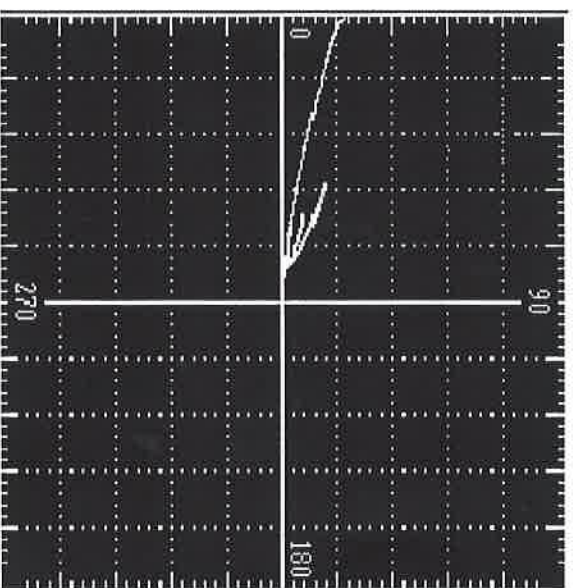


Figure 18. Sample Crack Signal

## 5-2 High Sensitivity Crack Detection

### Test Equipment Required

500KHz Absolute Probe

Aluminum Crack Standard with 0.40", 0.20", and 0.008" notches

Connect a 500 KHz Absolute Probe to the US-454 EddyView™ front panel and turn ON.

In this application, filtering is added to the previous crack detection application. Filtering enhances the signal to noise ratio. This example illustrates the effect of filters on the data. Notice in Figure 19, *Changes in Scan Rate Using a Filter* that the filter reduces the lift-off noise, but imposes a speed limit on probe scanning.

Adjust the US-454 EddyView™ Test Instrument to the following parameters:

EC DISP	Impedance Plane	LP FILT	50
FREQ1	500KHz	HP FILT	2
F 1 GAIN	40dB	X SENS	0.5V/div.
F 1 ROT	0	Y SENS	0.5V/div.

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Move the probe across the crack sample. Moving too fast or too slow will reduce the size of the crack signal. The figure below shows an example of the same flaw (20 mils) at slow, medium, and fast rates. These speeds are relative to the filter settings. From the Master Menu, select Print Screen to hold and print the display. Turn OFF the filters and note the difference in the signal.

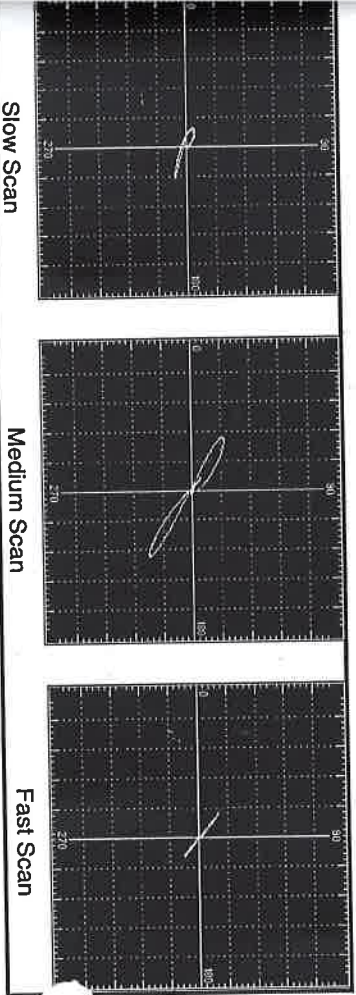


Figure 19. Changes in Scan Rate using a Filter

### 5-3 Second Layer Crack Detection

Test Equipment Required

200 Hz Ring Probe

Fastener

Connect a 200 Hz Ring Probe to the US-454 EddyView™ front panel and turn ON.

This test penetrates through a layer of the metal to detect a crack in a fastener. For this reason, use a low frequency of 200 Hz and a ring probe. Center the ring probe over the fastener. A probe frequency of 200 Hz provides a skin depth of 500 mils in aluminum.

Adjust the US-454 EddyView™ Test Instrument to the following parameters:

EC DISP	Impedance Plane	LP FILT	10
FREQ1	200 Hz	HP FILT	0
F 1 GAIN	40dB	X SENS	0.5V/div.
F 1 ROT	0	Y SENS	0.5V/div.



Center the probe over a fastener, known to be good, and press the Null button. Slide the probe slightly off the fastener. This will cause the signal to move to the left when the probe is moved off center of the fastener. Figure 20, *Second Layer Crack in Fastener* shows the signal created when the probe was placed over a fastener with a known crack. Try adjusting gain to optimize the crack signal. Be sure to null and rotate the signal after significant gain changes.

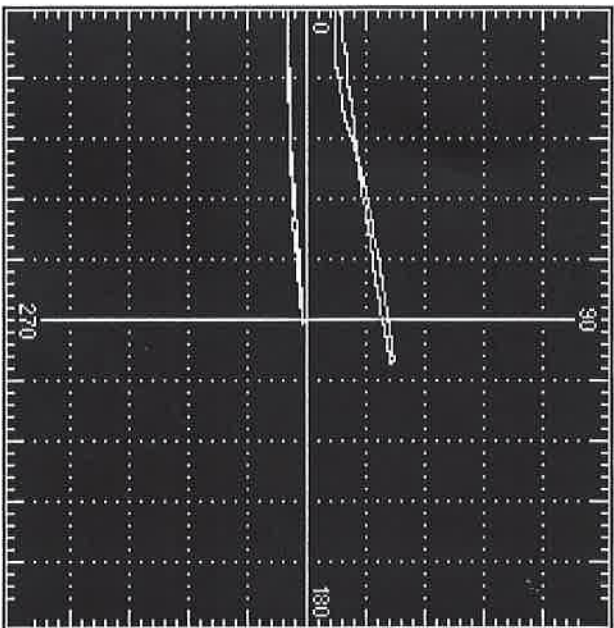


Figure 20. *Second Layer Crack in Fastener*

#### 5-4 Aircraft Skin Corrosion

##### Test Equipment Required

*500KHz Absolute Probe*

*Corroded Sample of Aluminum*

This test looks for thinning of a metal sheet, such as, an aircraft skin thinned by corrosion. The ideal probe frequency causes a 90° separation angle between the lift-off line and thinning signal. The actual frequency depends on the metal conductivity and thickness.

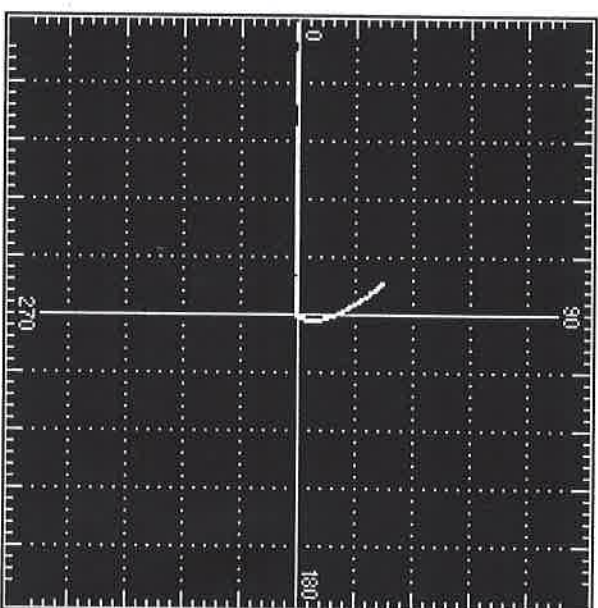
Adjust the US-454 EddyView™ Test Instrument to the following parameters:

EC DISP	Impedance Plane	LP FILT	OFF
FREQ01	500KHz	HP FILT	OFF
F 1 GAIN	40dB	X SENS	0.5V/div.
F 1 ROT	0	Y SENS	0.5V/div.

Connect an Absolute probe and set the frequency to 500 KHz to start. Turn OFF filters and place the probe over an area known as good (not corroded or thinned). Move the probe to a corroded area and adjust the gain to optimize sensitivity.

The separation angle is proportional to frequency. If the angle is greater than desired, decrease the frequency. If smaller than desired, increase the frequency. **Note:** When the frequency is changed, the lift-off angle and sensitivity also changes, and requires adjustment using the Rotation and Gain controls.

The example shown in Figure 21, *Example of Skin Corrosion* used a corroded sample of aluminum. The probe was moved from a 120 mil thickness area to a badly corroded portion that averaged about 62 mils thick.



**Figure 21.** *Example of Skin Corrosion*

**5-5 Tube Inspection with a Differential ID Probe**

Test Equipment Required

100 KHz Differential Probe

Tube reference of same material and diameter

As in other testing, tube testing requires a set of references. A tube reference is made from the same material and has the same dimensions as the tube under test. The reference will have various holes and turned down areas of reduced diameter to simulate defects.

Adjust the US-454 EddyView™ Test Instrument to the following parameters:

EC DISP	Impedance Plane	LP FILT	30 Hz
FREQ1	100 KHz	HP FILT	
F 1 GAIN	45 dB	X SENS	0.5V/div.
F 1 ROT		Y SENS	0.5V/div.

**NOTE:** Various regulatory agency codes often govern tube inspection. *For example:* the ASME B&PV (Boiler and Pressure Vessel) Code specifies the proper frequency for tube testing as the frequency that produces a 150° ±20° response from a 20% of wall outside diameter (OD) defect when a 100% through-wall defect is set at 40°. Probe wobble is set to 0°.

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Set the instrument to the specified frequency, insert the differential probe into the reference sample and adjust the rotation to make the wobble signal 180° (to the right). Adjust the gain to keep the largest signal within the screen boundaries. The example shown above in Figure 22, Example of Tube Crack used a gain of 45 dB, probe frequency of 100 kHz, and a low pass filter setting of 30 Hz.

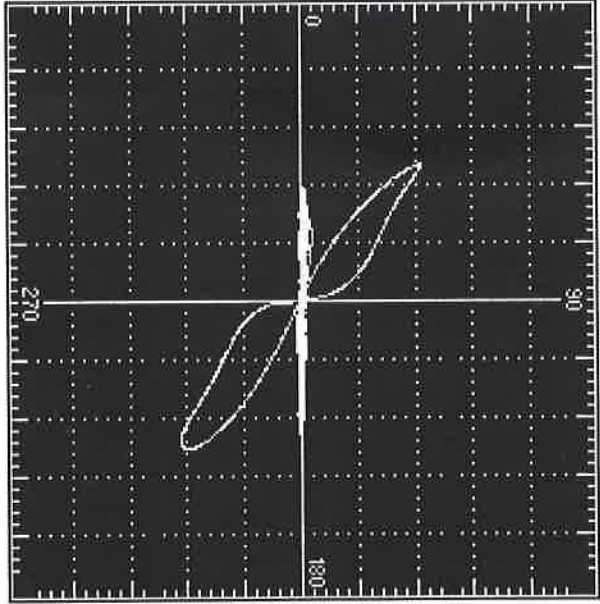


Figure 22. Example of Tube Crack

**5-6 Bolt Hole Inspection with an FR Type Probe (Bolt Hole Probe)**

Test Equipment Required

JF-15 Scanner

JF-15 Scanner Cable (P/N # 96633)

2 MHz FR Type Probe

Reference of same material and diameter

As in other testing, bolt hole testing requires a set of references. A reference is made from the same material and has the same diameter as the bolt hole under test. The FR type probes come in a wide range of diameters (.187 - .625) and are application specific.

Adjust the US-454 EddyView™ Test Instrument to the following parameters:

EC DISP	Impedance Plane	LP FILT	800 Hz
FREQ1	2 MHz	HP FILT	200 Hz
F 1 GAIN	47 dB	X SENS	0.5V/div.
F 1 ROT		Y SENS	0.5V/div.

1. Attach the cable to the JF-15 Scanner.
2. Insert a small piece of pliable material in the probe tip saw slot, ONLY if the probe ball diameter does NOT fit snugly in the bolt hole.
3. Apply a small square piece of Teflon tape over the probe coil.
3. Insert probe into the JF-15 Scanner.
4. Be sure probe is seated properly.
5. Turn On JF-15 Scanner.

## 6 US-454 EddyView™ Test Instrument Maintenance and Servicing Instructions

### 6-1 Periodic Preventive Maintenance

Periodic preventive maintenance is based upon regularly scheduled inspections performed to detect and correct conditions that lead to malfunctioning of the US-454 EddyView™ Test Instrument. The regularly scheduled inspections should consist of a visual and electrical check.

#### Visual Check

A *Visual Check* should be performed on a regular basis to ensure maximum system performance. Listed below is a sample of a few visual checks that should be performed.

- > Inspect probes for damage
- > Examine all cable connections
- > Examine seating of all mating connectors
- > Inspect instrument base unit and display for damage
- > Inspect JF-15 scanner for damage

#### Electrical Check

*Electrical Checks* should be performed on a regular basis. This is to ensure that the US-454 EddyView™ Test Instrument maintains electrical consistency. That is, the eddy current signal path is verified for signal to noise and consistency between the probes, and the US-454 EddyView™ Test Instrument.

## 6-2 Troubleshooting Guide

### Test Equipment Required:

NONE required

Problem	Fault Isolation	Corrective Action
Instrument will NOT turn on	Is instrument plugged in? Is battery installed? Is battery charged?	Connect AC adapter to instrument and plug-in. Install charged battery.
No signal from probe	Bad cable? Bad probe?	Try another cable. Try another probe.
No video signal	Is video function turned ON? Is internal device turned ON? Is cable OK?	Turn ON video function. Power-up device.
Scanner will NOT rotate	Is scanner connected and turned ON?	Plug-in and turn ON.
No signal from scanner	Is probe seated? Is probe malfunctioning?	Make sure probe is plugged in all the way. Replace probe.

## 6-3 Servicing the US-454 EddyView™ Instrument Replaceable Parts

The US-454 EddyView™ Instrument has no operator replaceable parts. If it is necessary to return the US-454 EddyView™ Instrument for servicing or replacing parts, please see Section *Returning Instruments For Service* at the front of this operation manual.

### Calibration

The US-454 EddyView™ Instrument should be calibrated and certified per the owners QC policy for inspection. See Section *Calibration Intervals* at the front of this operation manual.

## 7 JF-15 Scanner

The JF-15 Scanner is a compact high speed rotating eddy current scanner used with the US-454 EddyView™ Test Instrument for inspecting small diameter holes such as bolt holes.

The JF-15 scanner attaches to the front panel of the US-454 EddyView™ Instrument. A wide range of probe diameters in the URB style is available.



Figure 23. JF-15 Scanner

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## 7-1 JF-15 Scanner Specifications

<i>Speed</i>	1500 RPM
<i>Frequency Range</i>	30 kHz–6 MHz
<i>Operating Voltage</i>	24 VDC
<i>Weight</i>	15 oz.
<i>Dimensions</i>	4.35 L x 2.40 H x 1.22 W
<i>Mounting</i>	Vertical, Horizontal, Angled
<i>Probe Connector</i>	4 pin Fischer
<i>Coil Type</i>	Differential, Reflection
<i>Signal Coupling</i>	Rotary Transformer
<i>Encoder</i>	RPM control
<i>ON/OFF</i>	2 position Rocker Switch
<i>Power Indication</i>	Red LED

### Cable Specifications

<i>Connector</i>	15 pin Fischer
<i>Length</i>	15 ft.

## Addendum A

1. On the main menu, the item "MEASURE VIDEO" may be used to calibrate a scale for the measurement cursors. (Reference Section 4.1)
2. The alarm functionality has been enhanced. The changes improve when an Alarm signal is produced and what logical signal is produced for the Alarm Output. ALARM OUTPUT, under the system setup menu, will determine the polarity of the analog output. The ALARM REGION, also under the system setup menu, will determine when to signal the alarm. (Reference Section 4.2)
3. Low Frequency Parameters have been added for custom applications. In the system setup menu are two new items: LFMB FREQ and LFMB GAIN. Together these items improve control of the gain structures for low frequency applications only. These items are not applicable for most users of the US-454 Eddy Current Instrument, but they have been added for a specific application. (Reference Section 4.2)



**Addendum B**

1. On the main menu, the item "BURST DATA" may be used in conjunction with external software to transfer a defined set data via the parallel port. For this process to succeed, the US-454 instrument must be setup with the proper parameters and a Laplink™ style cable is used to connect the US-454 ECI and a PC.

**WARNING!** Any other kind of parallel cable could result in hardware damage to the US-454 or the PC.

The required parameters are listed in the "ENTER SETUP" menu. The "PARALLEL PORT" parameter must be set to "COMPUTER INTERFACE". "DATA BURST SAMPLES" should be set to define the number of samples that will be collected and sent to the PC once the "DATA BURST" command is issued.

The external software must be installed on the connecting PC. The software must also be running to collect the data once the US-454 has been commanded to do a "DATA BURST".

2. The US-454 has an automatic software upgrade feature. Instructions on how to take advantage of this feature accompany "upgrade cards".