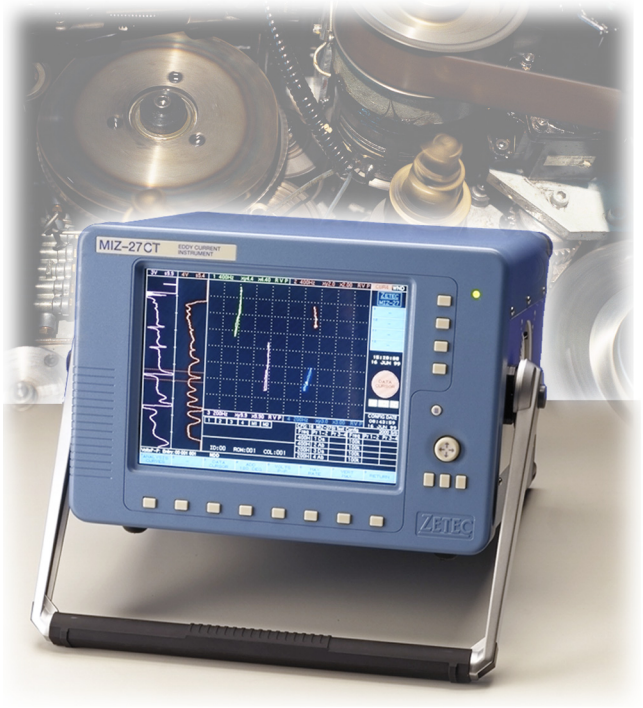
MIZ®-27CT



Component Test Instrument

Operating Guide

15 September 2003

ZETEC

C/N 2700-08-03 ITEM 10004847 Rev A

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15 September 2003

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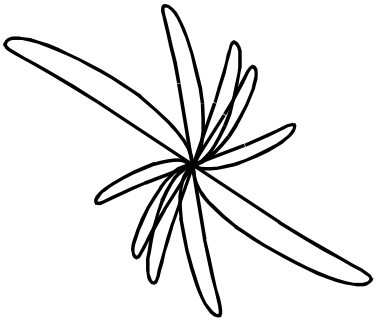
Printed in the United States of America



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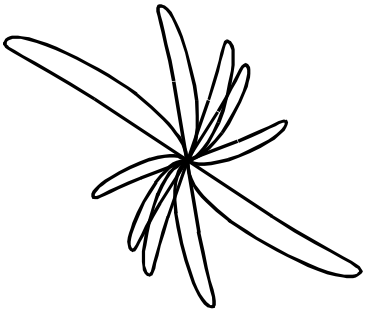

SECTION 1 General Description

The operating guide for the MIZ®-27CT is designed to familiarize the user with the specifications, operation, and applications of the instrument.* We recommend reading the entire manual through at least once, after which the table of contents can be used for a quick-reference to any specific subject. An alphabetic subject index is included at the end of this manual to further assist in quickly finding a specific topic or operation.

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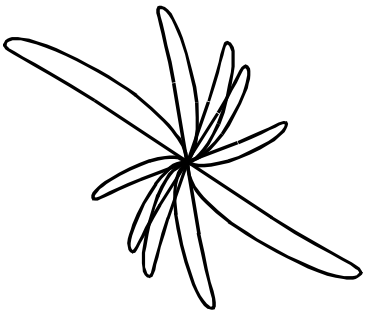
Before returning items, please call to obtain a "Return Merchandise Authorization" number. This RMA number will help us adjust your account as quickly as possible. To obtain your RMA number, you will need to give us: the reason for return, the date of purchase, your purchase order number (on the packing list), and our reference number (on the packing list).

If you suspect damage by the carrier, request the carrier's agent be present when the shipment is unpacked. If concealed damage is found immediately file a claim with the carrier.

The next section of this guide is a product description.



SECTION 2 Product Description

Zetec's MIZ-27CT offers color display, selectable data presentation, menu-driven user interface, high digital sampling rates, integrated Industrial I/O controls, two independent null controls, and alarm circuitry. This versatile, fully digital tester provides maximum stability, reliability, and sensitivity. Testing capabilities include metal sorting, hardness testing, weld inspection, and a broad variety of other eddy current applications. Packaged in a rugged portable carrying case, the MIZ-27CT is ideal for industrial environments. An environmental enclosure is also available for additional protection.

An active matrix color display lets you see test information from almost every angle. And, color provides quick channel identification without reading the setup screen. Our first true "Flying Dot" display constantly indicates the real-time data and closely emulates a storage oscilloscope display. The MIZ-27CT presents the phase and amplitude vectors of the eddy current signal as a two-dimensional Lissajous figure. Simultaneous display of 1, 2, or 4 Lissajous figures with 2 strip charts or 8 strip charts lets you efficiently monitor multiple data channels.

With the MIZ-27CT, four independent Industrial I/O control circuits provide up to four test enable inputs and Accept/Reject outputs for use with an external material handling controller. Two internal test enable (TE) channels are available for triggering as a result of an alarm gate on the selected internal test enable channel.

Industrial I/O features offer two methods of data logging—Test Data Logging (TDL) and raw data logging (RAW). The TDL method is used when a specific test data point is tested and the results are stored to mass storage. TDL is typically used in material hardness sorting. TDL results stored to mass storage are space delimited with "carriage return" end of lines for compatibility to PC spreadsheet software. Up to 200 data points can be stored in a circular buffer for review and alarm sizing. The second method, raw data logging, records the data during the complete test enable period. Raw data logging is used for crack detection with material handling systems.

To streamline MIZ-27CT operation during industrial applications, two operating modes are available. Full access mode lets you adjust the entire range of instrument functions. A limited access mode, with password protection, restricts the instrument's available functions to recalling configurations, adjusting alarms, and running a test.

An additional option is the MIZ-27 Internal Hard Drive. This hard drive adds 36 GB of data storage capacity to the MIZ-27 for data acquisition and tube list storage

For further detail, the remainder of this section describes the specifications and features of the MIZ-27CT. See section 4.0 for instructions in the actual operation of the instrument.

Basic Specifications

The MIZ-27CT has automatic switchover for line voltage. Operator selection is unnecessary. Basic specifications for the MIZ-27CT instrument are listed in table 2-1.

Table 2-1. Specifications

Power Requirements	100-130 VAC or 200-260 VAC
	47-400 Hz
	175 watts maximum, with all options
Size	10H × 13.5W × 15D inches
	25H × 34W × 38D centimeters
Weight	29 pounds
	13 kilograms
Temperature Range	Operating Temperature Range: 32°F to 110°F (0°C to 43°)
	Storage Temperature Range: -40°F to 185°F (-40°C to 85°C)
Humidity	100% non-condensing
Options	Second Analog Board adds 2 probe outputs (4 coils)
	Internal SCSI Hard Drive
	Remote Display
	MIZ-27 Shipping Case

Probe Options

The MIZ-27CT can be equipped with either one or two analog boards. Each board has two (Probe) output channels. Outputs can be configured as shown in table 2-2.

Table 2-2. Probe Options

Probe 1 (3)[1]	Probe 2 (4)[1]
Coil A Differential (self reference)	Coil B Differential (self reference)
Coil D Differential (self reference)	Coil C Differential (self reference)
Standard Driver-Pickup	Absolute (external reference)
Differential Driver-Pickup[2]	Differential Driver-Pickup[2]

1. () = Board #2 outputs.
2. The Differential Driver-Pickup requires a jumper in the probe connector.

Electronic switching allows using one connector for different probe configurations. When using Zetec manufactured probes with 12-pin connectors, special adaptors are unnecessary.

Adjustable gain and probe drive allow the eddy current probes of most manufacturers to be used with the MIZ-27CT.

Frequency Range

Four frequencies are available, each is independently adjustable from 100 Hz to 1 MHz.

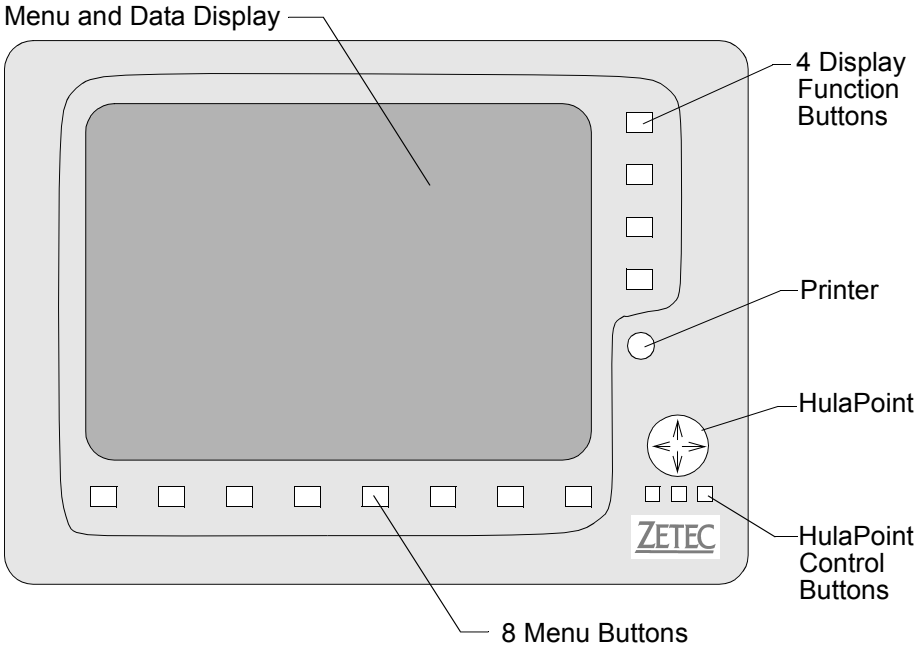
Instrument Control

Six types of instrument control are available with the MIZ-27CT: front panel, computer/terminal, remote, voice activation, keyboard, and Industrial I/O.

Front Panel Control

The MIZ-27CT features an active matrix color display with 13 button keypad and electromagnetic pointing device for effortless and accurate cursor control over numerous instrument functions. The 13 buttons emulate the 12 function keys on a standard keyboard with the printer button representing the "Print Screen" key.

Figure 2-1. Front Panel



Mounted on the MIZ-27 front panel is an electromagnetic pointing device—the HulaPoint. It provides control field selection, as well as increment and decrement functions. Three control buttons directly below the HulaPoint provide additional support for the pointing device. The center button activates and deactivates the HulaPoint control from field selection to field adjustment. When local field control is active, the left and right buttons are the increment and decrement control.

Computer/Terminal Control

Computer control of instrument functions is available through the RS-232 connector. Zetec offers a handheld terminal specifically designed to control data acquisition functions through this RS-232 connector.

Remote Control

The *REMOTE* connector has two inputs that can be programmed from the front panel to perform *Null*, *Clear*, *Tester Start* and *Tester Stop*. Zetec offers a push-button remote control for this function also.

Keyboard Control

Keyboard control of all button functions and hula point control is available through a standard keyboard connected via the rear panel keyboard (KYBD) connector. Keyboard function keys, F1 through F12, can be used in place of the front panel buttons. These front panel buttons are numbered 1 through 12 to correspond with the keyboard function keys, F1 through F12. The Print Screen key performs the same task as the printer button.

Arrow keys can be used in place of the HulaPoint for menu navigation. With a menu function selected, the Delete, End, and Page Down keys function as the three HulaPoint control buttons. When the cursor (CUR) is active, the arrow keys switch their function to let you scroll through data in the strip chart. In this mode, the up and down arrow keys are slow cursor control; the left and right arrow keys are fast cursor control.

In the Main Menu, you can position the cursor over the ID, ROW, or COL fields and use the + or – key to increment or decrement the tube encode. When either the ROW or COL field is highlighted, the keyboard's "Enter" key starts and stops recording.

The remainder of the keyboard can be used as a standard keyboard in the Message Editor menu for writing messages and summary forms, as well as defining Configuration Names and Report Entry Comments.

The keyboard "Num Lock" function must be ON for the keyboard controls to work properly.

Industrial I/O Control

Four independent Industrial I/O control circuits provide four test enable inputs and Accept/Reject outputs for use with an external material handling controller. Two internal test enable (TE) channels are available for triggering as a result of an alarm gate on the selected internal test enable channel.

Display

The MIZ-27CT uses a color 640 × 480 pixel active matrix display. This flat panel display offers the same resolution as a VGA computer monitor and is housed in a rugged, reliable solid-state package.

VGA Monitor Output

Front panel display can be viewed on a VGA monitor. The connection is available on a rear panel connector.

Remote Display

As an option, the Zetec Universal Remote Display System provides a separate, slim profile display that remotely operates the MIZ-17/MIZ-27 series of eddy current instruments. Now operators have the flexibility and convenience to take the display only into small, confined areas. Remote location of mainframe saves space, as well as reduces extra noise in test area. And, the consolidated mainframe provides more options for setup and environmental enclosure size.

The large color screen offers the same resolution as a VGA computer monitor and is clearly visible with a wide viewing angle. All instrument features and controls are managed with the display's front panel buttons.

The Universal Remote Display's slim profile allows easy mounting to existing Material Handling stations using industry-standard 75mm and 100mm VESA mounting patterns. The display is sealed and water resistant. It's built tough to eliminate the need for additional protection with an environmental enclosure. For more information about the Universal Remote Display, visit zetec.com or contact our Customer Service.

Data Display

The MIZ-27 displays two time-based stripcharts. The remaining X-Y display area can be configured as up to four separate displays with five different data presentation types. You can independently select each of these four presentation types according to your test parameters. All four areas can display the same or any combination of the following data display types:

- **X-Y (Lissajous figure) patterns with "Flying Dot" enhancement**
- **bar graph**
- **vector**
- **triggered sweep**
- **encoder**

Displays 3 and 4 have the following additional display capabilities as well as the preceding types:

- **plot water fall (PWF)**
- **C-scan**

Configuration Display

For easy verification of test setups in the Data Buffer mode, configuration information for the test in progress displays at the same time as the eddy current data. The display also lists the operating frequencies, coil arrangement, sample rate, drive voltage, scale, rotation, and channels using mixes or filters.

Display Rotation

The four signals in the X-Y display area rotate individually from 0 to 360 in one degree steps. When adjusting the display rotation, the phase setting updates in the comment line at the bottom left corner of the display.

Display Scaling

Signal scale within the four X-Y display areas adjust individually. The X and Y are adjustable simultaneously from 0.1 to 9.9 volts per division. The X value is also adjustable independently to ±20 times the combined X-Y value.

Voltage Multiplier

The MIZ-27 uses a voltage multiplier to scale the volts peak-to-peak value on the X-Y display. This function allows you to display signals in a standardized voltage scale according to job requirements or your preference. When the “V” field is highlighted, the voltage multiplier value displays in the comment line at the bottom left corner of the display. This value updates as you adjust the voltage multiplier.

Display Positioning

Four display operating points are independently positioned on the display. The “P” control field located in each XY display provides the position adjustment. The display’s XY data position is shown in the comment line at the bottom left corner of the display.

Display Paging

Display paging allows you to toggle Page 1 through Page 5 of the display. Pages 1-4 show up to four channels and their setups. In essence, you can configure up to 16 channels and easily toggle between the four pages to quickly view all 16 channels of eddy current data. Page 5 is a dedicated display specifically configured for eight channel strip chart review.

Features

The MIZ-27CT has many features that use advanced technology.

Swept Frequency Plot

A 100 Hz to 1 MHz frequency vs. data count plot is displayed for probe response evaluation. The data count represents the raw data value at the A/D converter.

Mixes

Two mix channels are available. The mix capability allows data taken at one frequency to be subtracted from data taken at another frequency. This technique enables flaw responses to be enhanced, by suppressing unwanted structures.

Probe Drive Adjustment

Probe drive voltage is adjustable from 1 to 16 volts peak-to-peak. Source resistance is normally 100 ohms which is switched to 50 ohms in the driver-pickup mode.

Probe Drive Plot

The Probe Drive Plot feature displays the demodulator circuit output in volts with reference to the increase of drive in volts for all channels. All active channels are plotted. The channel plot colors are grouped by frequency.

Set Maximum Drive

The probe drive for each frequency is automatically set to a predetermined maximum unsaturated level.

Gain Adjustment

Amplification of the demodulated signal is adjustable in five steps between 34 to 58 dB (50:1). When in the single coil or driver-pickup modes, the MIZ-27 provides x2 to x25 gain adjustment of the carrier signal.

Set Gain

With "Set Gain" you can define a value for a certain signal size. Using a "signal-of-interest" for reference, you press the Set Gain button to produce a signal size that matches the set value.

Electronic Null

A highly stable electronic null circuit quickly balances the selected channels with a touch of the *NULL-1* or *NULL-2* buttons. Null-1 and Null-2 functions are independently set to null only the selected channels.

Filters

Three filter types are available—bandpass, 1st-order differential high-pass, and 2nd-order differential high-pass. The bandpass filter is adjustable from 0 to 500 Hz.[1] The differential high-pass filters are a continuous balance type that is particularly useful for keeping the signal on screen when scanning across dissimilar materials.

Sample Rate

In order to save disk space when recording data, the instrument's sample rate is adjustable up to 8000 samples per second at one frequency and 2000 samples at four frequencies. A sample rate of 400 samples per second is generally acceptable as an adequate rate for probe speeds up to one foot per second.

Alarms

Four independent box alarms are provided for signals within the X-Y display area. Visual indications for each alarm appear on the display.

Up to 16 alarm channels can be active. Four optically-isolated logic alarm outputs are available via the Logic I/O connector that can be set with any "AND" or "OR" combination of the 16 channels. Alarms are also combined to drive a logic output on the Remote connector and turn on an audible alarm on the back panel. An On/Off volume control is provided for the audible indication.

1. The high end of the bandpass filter limit is relative to the sample rate setting.

Signal Measurement Capability

Several measurements are performed on data held in the buffer memory. These signal measurements are listed in table 2-3.

Table 2-3. Signal Measurement Capability

Measurement Type	Function	Display
Volts P-P	Determines the maximum signal amplitude in any phase.	Displays the amplitude and angle.
Vert Max	Determines the maximum signal amplitude in the vertical direction only.	Displays the amplitude.
Max Rate	Determines the greatest rate of change.	Displays the amplitude and angle.
Guess Angle	A manually operated electronic protractor.	Displays the amplitude and angle between two selected points.

Auto Measure

Auto Measure provides a real-time measurement of each data point as you acquire data or scroll the data cursor through a data file. Measurements are based on phase or volts according to the selected Analysis Curve.

Analysis Curves

The MIZ-27 bases its signal measurements on an Analysis Curve using phase angle or voltage values. The curve correlates these values to a percentage of wall loss, material thickness, conductivity, or other user-defined standards. Four calibration curve types are available—Angle Curve, Volt Curve, Angle Hi-Res, and No Curve.

Memory

The MIZ-27CT instrument has RAM memory for storage of eddy current data, as well as flash memory for test setups and user variables. Both types of storage are explained in the following paragraphs.

Data Storage

The MIZ-27 allocates up to 5.12 megabytes of RAM as a buffer memory for 40 seconds of eddy current data. This buffer provides memory for data review, signal measurement, and mix setups.

Data Logging Storage

A 200 data points buffer for data logging is present in non-volatile RAM. The data, alarm value, label, and status value are stored with each buffer entry.

Configuration Storage

Twenty-five test setups can be explicitly saved or recalled by the operator. The setups are saved in flash memory. At initial power-up, the MIZ-27 displays its “default” configuration.

A current working setup must be saved (press Save Config in the Hardware Config menu) before the instrument is turned off or else the setup is lost. To recall a saved setup when the instrument is turned on again, use the Recall Config function in the Hardware Config menu. With digital recording, specific test configurations can also be stored and recalled from the storage media.

Using the Config List menu, you can recall and store setups from one location to a new location. Configurations you recall from a disk can be stored to one of the MIZ-27’s 25 setup locations using the Config List menu.

Data Logging

An internal buffer logs the last 200 test entries for automatic alarm setup and statistical use. External data logging to a disk allows permanent record of the test results for both static and dynamic tests. For easy setup and quick identification, the MIZ-27CT provides alphanumeric part labels with color coding.

Analog Data Outputs

Eight analog outputs are available, which allow up to four X-Y pairs to be recorded on an instrumentation recorder or paper charts. The outputs are available on a 15-pin *D* connector.

An On/Off recorder control is available on the 15-pin connector. The recorder controls are active when recording is selected. During data acquisition, the *Aux Cntrl* button (F1) turns the recorder control on and off.

Data Recording

Two types of digital recording are available—local SCSI and external network drives. Digital recording provides local data recall on the MIZ-27 or post-analysis using Zetec's ET Analysis for *Windows*® and Eddynet® (UNIX) software. Configuration storage, data reports, data log (TDL/RDL) files, and firmware upgrades are available as well using digital recording.

At power-up, the MIZ-27 automatically searches to detect if a SCSI or network device is connected. If so, the "Disk" menu's recording keys display. If the MIZ-27 is unable to detect a SCSI or network device, these softkeys do not display.

As an option, an Internal Hard Disk can be installed in the MIZ-27. This option offers 36 GB capacity for data recording and tube list storage.

Printer Interface

A 25-pin D-connector printer interface provides the MIZ-27 screen dumps. Internal buffering allows several screens to be queued. Formatting is compatible with Hewlett-Packard's ThinkJet and DeskJet printer series.

The MIZ-27 supports color and black/white printing through its parallel port, as well as to storage media as a bitmap (BMP) image.

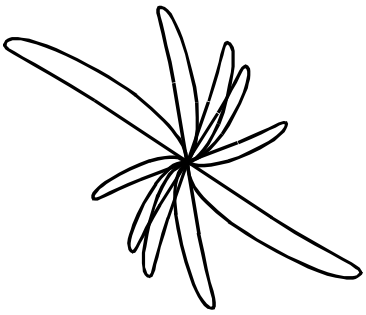
Self-test

The *CHECK CALIBR* touchkey turns on a self-test that automatically checks gain, quadrature, and linearity accuracy of the instrument. The self-test is always conducted without probes connected to the instrument.

Firmware Upgrade

Firmware (MIZ-27 embedded software) upgrades are available using the local and external drives, as well as using a file transfer protocol (FTP) program. For more information about, see *Firmware Upgrades on page 4-66*.

The next section of this operating guide gives details about the setup of the MIZ-27CT instrument.



SECTION 3 Before You Start

This section of the MIZ-27CT operating guide gives you information about the instrument's front display and back connector panel. After you are familiar with the different control and connector locations, continue to the next section for information about how to operate the instrument.

Safety Information

The MIZ-27CT operates from a single-phase power source with one of the current-carrying conductors (neutral conductor) at ground (earth) potential. However, operation from power sources in which both current-carrying conductors are live with respect to ground is also possible, as the instrument is equipped with overcurrent protection in both main conductors. None of the current-carrying conductors may exceed 260 V RMS with respect to ground potential. The instrument is provided with a three-wire electrical cord containing a three terminal polarized plug. The ground terminal of the plug is connected directly to the frame of the unit. For adequate protection against shock hazard, this plug must be inserted into a mating outlet containing a safety ground contact.

All signal grounds within the MIZ-27CT are grounded to the power line ground. As a result, rear panel connectors are not insulated from the chassis. No harmful voltages are present on any of these connectors. However, care should be taken that external instrumentation hooked up to the MIZ-27CT is adequately earth grounded.

Overcurrent Protection

The *POWER* switch contains integral 2-amp circuit breakers on both main power lines. Normally, this breaker will never trip. If the breaker does repeatedly trip, immediately return the unit to the factory for service.

Care of the Display Glass

When cleaning the display glass, care must be taken to avoid damage. For best results, use a lint free cloth with water or a mild detergent. Use only detergents or cleansers which are recommended for use on glass.

Removal and Installation of Covers

For most instrument maintenance, you must remove the top and bottom covers.

Removal

The top and bottom covers of the enclosure are removable using a phillips screwdriver. To do so, complete the following steps:

Step 1: Remove the six screws on the sides.

Step 2: Go to the rear panel feet and loosen the four screws.

Step 3: Pull the rear panel toward the rear (approximately 1/4 inch) until the cover can be slid to the rear and lifted out.

Installation

After removal, use the following steps to replace the covers:

Step 1: With the screws in the rear panel feet loosened and the rear panel pulled to the rear, position the cover on the tester and slide it forward into the front panel groove.

Step 2: Tighten the four screws in the rear panel feet.

Step 3: Install and tighten the six screws on the sides.

Display Layout

The display is divided into seven main areas:

❶ **Strip Chart Information/Control Field (Data Log Info when test data log is ON)**

❷ **X-Y Display Information/Control Field**

❸ **Display Function Buttons**

❹ **HulaPoint**

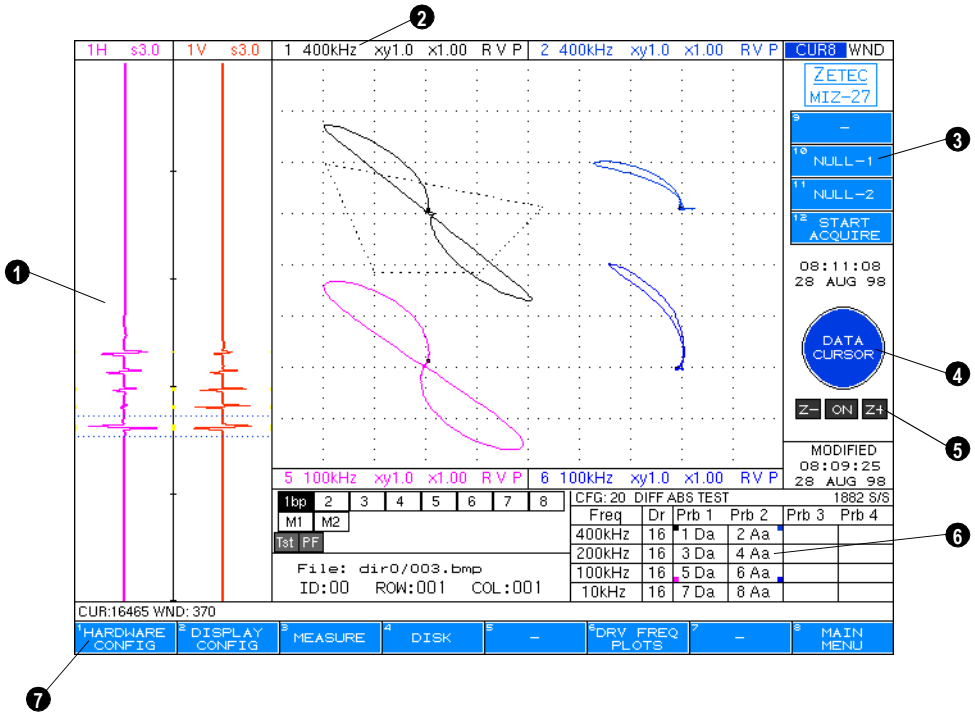
❺ **HulaPoint Control Buttons**

❻ **Configuration Summary**

❼ **Menu Buttons**

These seven main divisions of the display are shown in figure 3-1.

Figure 3-1. Display Layout



Information/Control Display

Location of each information line displayed on the MIZ-27CT screen is shown in figure 3-2.

❶ **Data Cursor**

❷ **Left Strip Chart ID**

❸ **Right Strip Chart ID**

❹ **X-Y Display ID 1-4**

❺ **Date and Time**

❻ **Configuration Date and Time**

❼ **Configuration Number and Name**

❽ **Samples/Second**

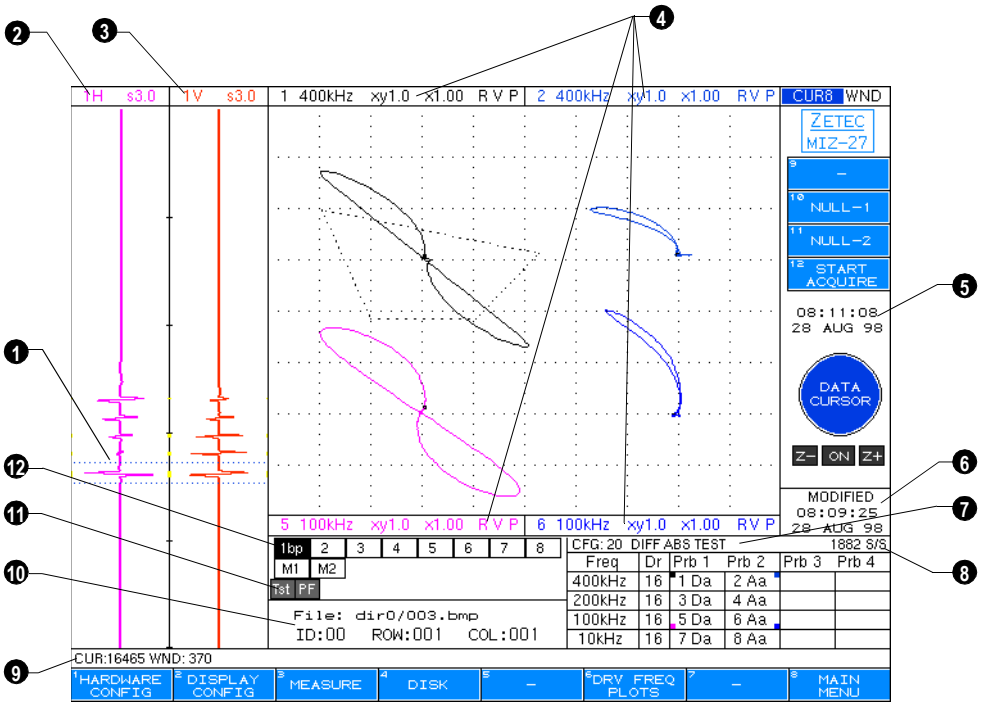
❾ **Comment Line**

❿ **Eddy Current Data File Name**

⓫ **Industrial I/O Display Information**

⓬ **Channel Alarm and Information**

Figure 3-2. Information Display



The numbers shown in this figure correspond with the numbered descriptions.

The numbers shown in figure 3-2 correspond with the following descriptions.

❶ Data Cursor (Data Review Mode only)

The data cursor indicates the area of the buffer memory from which the eddy current data shown in the X-Y and strip chart areas are displayed. The size of the cursor shows the amount, or "window" size, of data in the displays. The data cursor buffer location and its window size are shown in the comment line in the lower left corner of the display.

❷ Left Strip Chart ID

This portion of the display indicates the selected channel and the horizontal (H) or vertical (V) component, and the scaled value applied to the strip chart.

❸ Right Strip Chart ID

This portion of the display indicates the selected channel and the horizontal (H) or vertical (V) component, and the scaled value applied to the strip chart.

❹ X-Y Display ID 1-4

Separate fields for each X-Y display indicate the selected channel, frequency, X-Y scale, X scale, rotation, voltage multiplier, and position. The display ID fields are used as control fields. Moving the cursor to a display ID control field allows you to adjust any fields shown for the selected display ID. Adjustments to any of the X-Y display fields are shown in the comment line in the lower left corner of the display.

❺ Date and Time

Date and time are set in the Display Configuration menu, which is maintained by battery-backed RAM. For information about changing this setting, see *Real-Time Clock on page 4-38*.

❻ Configuration Date and Time

The date and time that the configuration was last stored is shown in the information display.

❼ Configuration Number and Name

The Configuration Number displays the number of the current test configuration, 0 through 24. Each configuration contains all the test parameter values and selections made by the operator while setting up the test.

Configuration names, using up to 20 alpha-numeric characters, can be assigned to identify a unique setup.

❽ Samples per Second

The Samples per Second line indicates the digital sampling rate that you select in the Hardware Configuration menu. (See *Sample Rate on page 4-20.)*

❾ Comment Line

Directly above menu buttons is a comment line that updates to indicate user adjustments to the cursor buffer location, cursor window size, signal rotation, voltage multiplier, and X-Y position.

When Industrial I/O channels are in use, this line displays accept and reject counts.

❿ Eddy Current Data File Name

The Eddy Current Data File Name is used with digital recording to identify the file entry. This line contains three sets of numbers—the ID, ROW number, and COL number. “File Names” is a control field that provides you with maximum flexibility for file name labels. The file name consists of three parameters, the first parameter has two places, the second and third parameters have three places each. These parameters can be labeled to best describe the part being tested.

The first parameter, ID, offers five label names: ID, UT, QD, SG, and WB. The ID can be any 2-digit number/letter combination. The second and third file name parameters offer six name selections: ROW, COL, TUB, LIN, X, and Y. Any combination of these labels can be set. The ROW and COL numbers can be any 3-digit number/letter combination. These parameters are stored with data and display with the data during later review.

"Name Field" controls allow you to select how many fields in the file name are adjustable. Each File Name field can operate as a sequential group number or set so each individual digit is independently adjustable. See *File Names on page 4-94* for more information about changing the file name.

These identification numbers are most often used in heat exchanger tubing inspections and are set by default to accommodate this type of tube encoding. But, the MIZ-27 has the flexibility to adapt to many other coordinate systems as well.

⓫ Industrial I/O Display Information

When the Industrial I/O option is installed, three display boxes are added to the display—Test Enable, Pass/Fail, and Watchdog—for each enabled Industrial I/O. The Industrial I/O displays provide a real-time indication of the Material Handling handshake. The Test Enable will be lit when the tester receives a Test Enable, the Pass/Fail will be green if the test result was Accept, and red when the test result was Reject. The watchdog (WD) will turn red if the watchdog timer has expired, indicating signals were not present on a channel for a preset time.

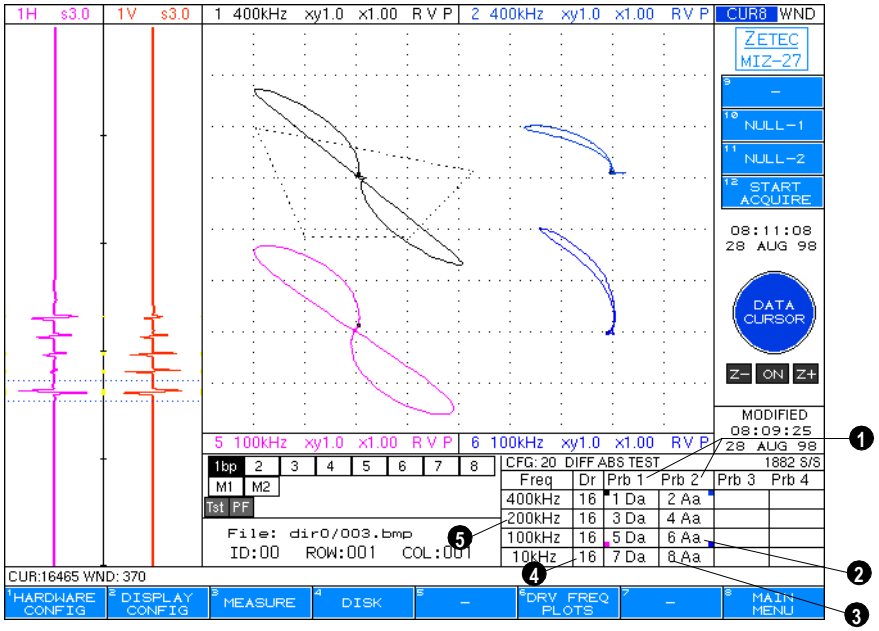
⓬ Channel Alarm and Information

All active channels are represented as a small display box. If you apply a filter to a channel, a "df" (1^{st} order differential), "ds" (2^{nd} order differential), or "bp" (bandpass) displays in that channel's box. When a channel alarm is active, the channel display box is green for an Accept condition and red for a Reject condition.

Probe Selection Summary

A summary of all the information about the probe selection is shown on the MIZ-27CT display. The numbers shown in figure 3-3 correspond with the following descriptions.

Figure 3-3. Probe Selection Summary



A summary of all information about the probe selection is shown on the MIZ-27CT display.

❶ Output Label

The Coil Label line shows the available coils. Probe outputs 1 and 2 are associated with Analog Board #1. If present, probe outputs 3 and 4 are associated with Analog Board #2. The column under each output indicates the coil combination selected for the specific output. Typically, only two time slots are used to configure multicoil array probes such as 8 x 1.

❷ Probe Type

This line displays the probe type selection for each output and frequency.

❸ Channel Number

This number indicates the channel number assigned by the instrument to the probe and frequency selection.

❹ Drive Voltage

The selected probe drive voltage, from 1 to 16 volts peak-to-peak, displays on this line. The drive voltage can be different for each frequency.

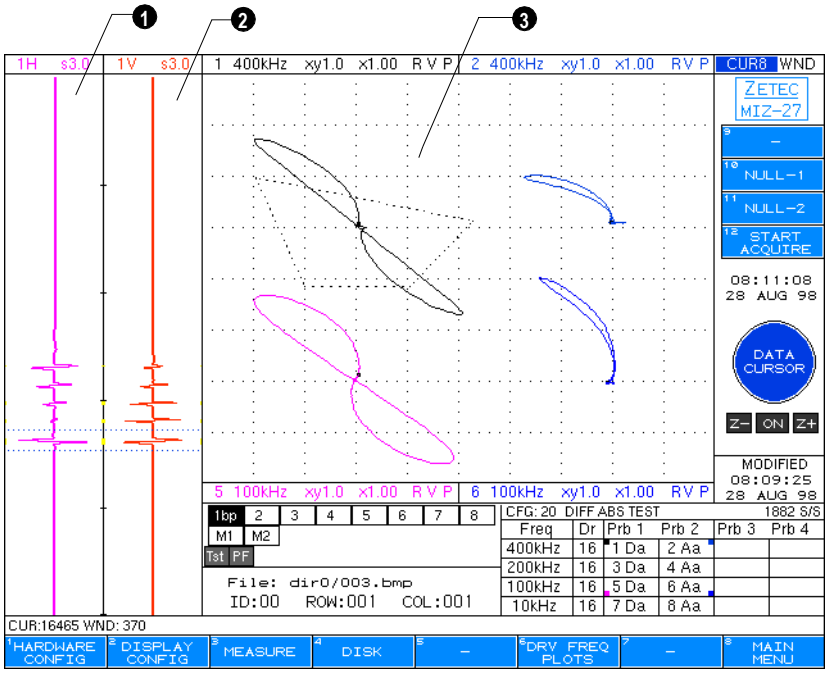
❺ Frequency 1-4

This section of the display shows the selected probe drive frequency. The frequencies are the same for each analog board.

Eddy Current Data Display

Eddy current data is shown on the MIZ-27CT display in three places; the left strip chart, the right strip chart, and the X-Y display. The numbers shown in figure 3-4 correspond with the following descriptions.

Figure 3-4. Eddy Current Data Display



Eddy current data displays in the left strip chart, right strip chart, and X-Y display.

❶ Left Strip Chart

The left strip chart displays the horizontal (H) or vertical (V) component of the selected channel. The phase and filter display parameters are the same as those chosen when the channel is displayed in the X-Y area. Scale adjustment is independent in the left strip chart.

❷ Right Strip Chart

The right strip chart displays the horizontal (H) or vertical (V) component of the selected channel. The phase and filter display parameters are the same as those chosen when the channel is displayed in the X-Y area. Scale adjustment is independent in the right strip chart.

❸ X-Y Display

The X-Y Display shows the X-Y (Lissajous figure), Bar Graph, Vector, Y-T (triggered sweep), PWF (cascaded Y-T) signals, and C-scan signals. At any one time it is possible to dynamically display any combination of four X-Y, Y-T, Bar Graph, and Vector displays. Or, you can display up to two C-scan or PWF displays with any combination of two or three X-Y, Bar Graph, Vector, and Y-T displays.

Alarm area boundaries display for each channel. The color of the alarm boundary corresponds to that of the probe channel.

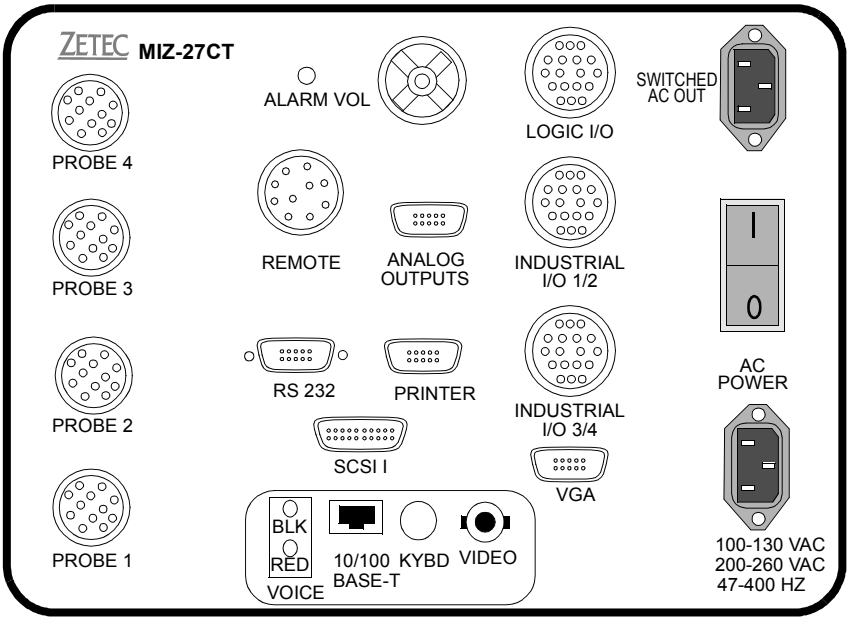
For applications that require up to 16 X-Y channels, the MIZ-27CT provides a Page 1-4 display feature. After setup, you can easily toggle between pages and quickly compare channels during data acquisition.

The “Flying Dot” feature is present only when X-Y displays are selected. The Flying Dot highlights the active pixels in white to provide an oscilloscope look to the X-Y display.

Rear Panel Connections

Locations for each rear panel connector are shown in figure 3-5.

Figure 3-5. Rear Panel Connections



The MIZ-27CT connectors are located at the rear of the instrument.

Probe 1-4 Connectors

The MIZ-27CT probe connectors provide for single (absolute) coil, driver-pickup, differential driver-pickup, and differential (both self-reference and external reference) probe types. Up to four probe assemblies (eight coils) can be connected and operated simultaneously with two analog boards installed.

Options for Probe Inputs 3 and 4 are possible only when the tester is configured with an additional second analog board.

Table 3-1 is a function listing of each probe connector pin.

Table 3-1. Probe Connector Pin-out

Board Output	Option	Test Name	Connector Pins							
			A	B	C	D	E	F	G	H
Prb 1 (3)	Df-a	Differential	RR	RC	----	----	----	----	TC	TR
	Df-d	Differential	----	----	RC	RR	TR	TC	----	----
	Dp-a	Driver-Pickup	PR	PC	----	----	----	----	DC	DR
	DD-a[1]	Differential DP	PR	PC	DC	DR	DR	DC	PC	PR
Prb 2 (3)	Df-b	Differential	RR	RC	----	----	----	----	TC	TR
	Df-c	Differential	----	----	RC	RR	TR	TC	----	----
	Ab-a	Absolute	RR	RC	----	----	----	----	TC	TR
	Ab-d	Absolute	----	----	RC	RR	TR	TC	----	----
	Dp=b	Driver-Pickup	PR	PC	----	----	----	----	DC	DR
	DD-b	Differential DP	PR	PC	DC	DR	DR	DC	PC	PR

1. Pins C/F and D/E are tied together in the probe connector.

LEGEND

TC - Test Coil
TR - Test Return
RC - Reference Coil
RR - Reference Return
DC - Drive Coil
DR - Drive Return
PC - Pickup Coil
PR - Pickup Return

VGA Output

VGA output allows the MIZ-27 screen to be displayed on a VGA monitor.

Remote

The 10-pin circular connector provides the interface for the Zetec Probe Gun and external tester control.

RS-232 Interface

A standard 9-pin "D" connector allows access to MIZ-27CT computer control and the Zetec handheld remote terminal.

Printer

A standard Centronics 25-pin "D" connector supports black and white as well as color graphics screen dumps to Hewlett-Packard printers.

Audible Alarm

The external alarm and respective volume control provides an audible signal depicting an alarm condition. Adjusting the volume control fully counter-clockwise disables the audible alarm.

Analog Outputs

Four X-Y pair analog outputs are available from the 15-pin "D" connector. The outputs are menu-selectable. Remote operation of up to two external recording devices is provided as well. An optically coupled relay closure is turned on by the start recording control process.

AC Power Switch

A toggle switch turns the MIZ-27CT on or off. With **1** depressed, the MIZ-27CT is ON. With **0** depressed, the MIZ-27CT is OFF. The power switch also serves as a two-amp circuit breaker.

Line Power

This receptacle accommodates a three-prong power cord. The MIZ-27CT automatically detects the line voltage present. Manual switching is unnecessary.

Switched AC Out

This receptacle accommodates a three-prong male cord. It is switched on and off by the AC power switch. The switched AC receptacle outputs the AC voltage supplied to the instrument.

Logic I/O

When the Industrial I/O option is installed, the Logic I/O connector provides up to four optically isolated alarm outputs, a combined alarm output, two external trigger inputs, and two isolated eddy current trigger outputs.

Industrial I/O Connectors

When the Industrial I/O option is installed, Industrial I/O 1/2 and 3/4 connectors provide independent external control and "Accept/Reject" indication. The Industrial I/O control consists of a test enable input signal and accept/reject output signals. Also available is test enable, accept, and reject indicator outputs, which provide drive for three LEDs.

SCSI 1

A SCSI 1 port provides communication with most SCSI-compatible drives using 512 and 2000 byte/sector format.

10/100BaseT

Network interface connection for private or Internet (WWW) networks.

Keyboard

Mini DIN connection for external keyboard connection.

Video

BNC connector allows connection to a video out (camera) signal. Camera power is available from the Remote connector.

Connector Pin-Outs

See table 3-2 for a complete listing of each connector pin for any connector other than a probe connector. (See table 3-1 for probe connector pin-outs).

Table 3-2. Connector Pin-outs

Connector	Pin #	Signal Name	Rating
Printer	1	Strobe	ALL LINES 0-5 V(TTL) max output 5 mA
	2	D0	
	3	D1	
	4	D2	
	5	D3	
	6	D4	
	7	D5	
	8	D6	
	9	D7	
	10	ACK\	
	11	Busy	
	12	Paper	
	13	Online	
	14	---	
	15	ERR	
	16	In Prime	
	17	---	
	18-25	GND	

Table 3-2. Connector Pin-outs *(Continued)*

Connector	Pin #	Signal Name	Rating
Remote	A	Ground	
	B	+12V DC	0.5 A max
	C	Combined Alarm Out	TTL 10 mA max
	D	CH1 Analog Out	± 10V @ ± 2 mA
	E	Sweep Trig In	Ground Closure
	F	+5V DC	1 A max
	G	Remote 2 In	Ground Closure
	H	Open	
	I	Remote 1 In	Ground Closure
	J	Open	
RS-232	2	TXD	RS-232 Levels
	3	RXD	RS-232 Levels
	8	RTS	RS-232 Levels
	4	CTS	RS-232 Levels
	5	GND	GND
Analog Output	9	CH1	±10 V @ 2 mA
	2	CH2	
	10	CH3	
	3	CH4	
	4	CH5	
	12	CH6	
	5	CH7	
	13	CH8	
	1 & 11	GND	
	14	Recorder 1 On/Off	
	7	Recorder 1 On/Off Return	100 mA @ 50 VAC/VDC
	15	Acquisition On	
	8	Acquisition On Return	

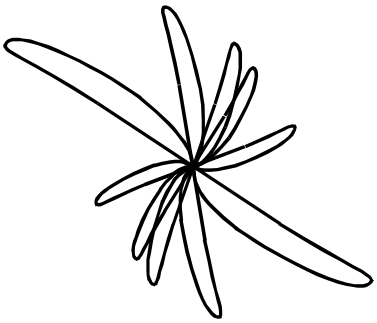
Table 3-2. Connector Pin-outs *(Continued)*

Connector	Pin #	Signal Name	Rating
Industrial I/O 1/2 & Industrial I/O 3/4	A	Optocoupler Enable 1 Return	
	B	Optocoupler-Enable 1 In	24 VDC/115 VAC 6 mA typical / 40 mA maximum voltage present = Enable On
	C	Reject 1	250 VDC/PK AC 240 mA maximum
	D	Accept 1	
	E	Reject 1/Accept 1 Common	
	F	Optocoupler Enable 2 In	24 VDC/115 VAC 6 mA typical / 40 mA maximum voltage present = Enable On
	G	Optocoupler Enable 2 Return	
	H	Reject 2	250 VDC/PK AC 240 mA maximum
	J	Accept 2	
	K	Reject 2/Accept 2 Common	
	L	Reject 2 Indicator Out	5 V @ 10 mA maximum
	M	Test 2 Indicator Out	5 V @ 10 mA maximum
	N	Accept 2 Indicator Out	5 V @ 10 mA maximum
	P	Accept 1 Indicator Out	5 V @ 10 mA maximum
	R	Test 1 Indicator Out	5 V @ 10 mA maximum
	S	Reject 1 Indicator Out	5 V @ 10 mA maximum
	T, U, V	Return	

Table 3-2. Connector Pin-outs *(Continued)*

Connector	Pin #	Signal Name	Rating
Logic I/O	A	Encoder 1Q	Optically Coupled 0-5V TTL Signal
	B	Encoder 2Q/External Trigger 2	Optically Coupled 0-5V TTL Signal
	C	Encoder 1A	Optically Coupled 0-5V TTL Signal
	D	Encoder 2A/External Trigger 1	Optically Coupled 0-5V TTL Signal
	E	Delayed Output 2	250 VDC/PK AC 240 mA maximum
	F	Delayed Output 1	250 VDC/PK AC 240 mA maximum
	G	Combined Alarm Return & Alarm 4 Return	
	H	Isolated +5V	200 mA maximum
	J	Alarm Output 4	250 VDC/PK AC 240 mA maximum
	K	Alarm Return 3	
	L	Alarm Output 3	250 VDC/PK AC 240 mA maximum
	M	Alarm Return 2	
	N	Alarm Output 2	250 VDC/PK AC 240 mA maximum
	P	Alarm Output 1	250 VDC/PK AC 240 mA maximum
	R	Alarm Return 1	
	S	+12V	700 mA maximum
	T	Delayed Output 2 Return	
	U	Delayed Output 1 Return	
	V	Combined Alarm Output	250 VDC/PK AC 240 mA maximum
	W, X, Y, Z	Return	

The next section of this guide describes how to operate the MIZ-27CT.



SECTION 4 Operating in Full Access Mode

Zetec's MIZ-27CT instrument operates in two modes—Full Access and Limited Access. In Full Access mode, you are able to control all aspects of instrument setup and adjustment. Password protection ensures that only authorized operators can switch between the two operating modes. With Limited Access mode, operators are restricted to basic functions, such as selecting a configuration, running a test, and adjusting alarms during data acquisition. For more information about Limited Access, see section 5.

This section details the MIZ-27CT when operating in the Full Access mode. To switch from Limited to Full Access mode:

Step 1: From the Start Up menu, press the **DEVELOP A TEST** (F6) button. This action requests a password.

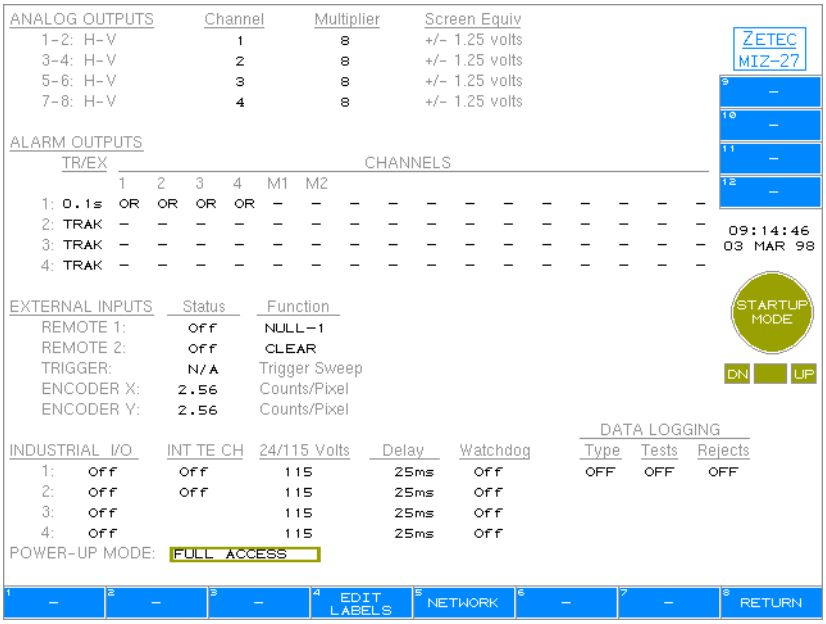
Step 2: Press F8 three times. This action puts you in the Data Review mode.

Step 3: Press **HARDWARE CONFIG**.

Step 4: Press **I/O CONFIG**.

Step 5: Use the HulaPoint to highlight the Power Up Mode field as shown in figure 4-1.

Figure 4-1. Changing Access Mode



Step 6: Use the HulaPoint control buttons to toggle between Limited and Full Access.

Step 7: Press **RETURN** to exit the I/O Config menu.

Step 8: Press **RETURN** until you reach the Setup/Review Menu (Data Review mode).

Using the Display Buttons and HulaPoint

Front panel display buttons and HulaPoint device provide your control of the MIZ-27CT instrument.

Display Buttons

Twelve buttons execute the corresponding command that is defined by its label. The button commands may change as the menus change and is indicated by its label changing. These buttons also correspond to the twelve function keys (F1-F12) on a standard computer keyboard. With the keyboard connected to the rear panel's KYBD connector, the keyboard can be used instead of the instrument's buttons.

The printer button provides a print screen function. If using a keyboard, the same print function is achieved when you press the Print Screen key.

HulaPoint

A sealed electromagnetic pointing device, HulaPoint, is used in conjunction with the twelve display buttons. The HulaPoint provides control field selection and adjustment. A control field is any parameter on the display that can be adjusted. The HulaPoint can index left, right, up or down enabling you to move the cursor between control fields. Increasing your finger pressure on the HulaPoint accelerates the cursor movement between control fields.

The HulaPoint has three control buttons. The center control button changes the action from control field selection to control field adjustment. When active for field adjustment, the HulaPoint status on the display turns red. With the HulaPoint active (red), pressing the HulaPoint provides function incrementing and decrementing. Pressing the center button again deactivates the selected function and enables cursor movement to a new control field when you press the HulaPoint.

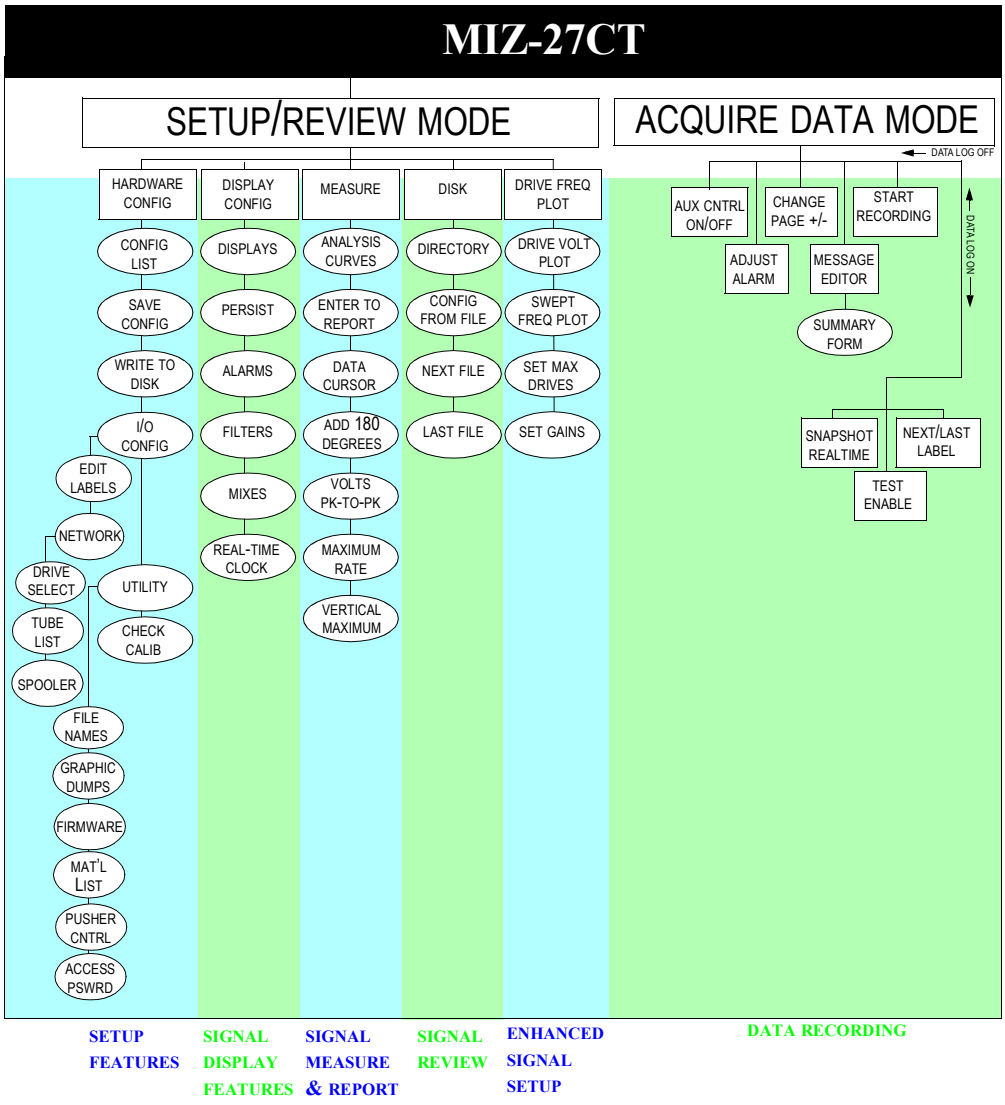
Left and right control buttons provide incrementing and decrementing in steps. The display labels the current HulaPoint status and the corresponding control buttons.

With a keyboard connected, the arrow keys reproduce the directional control of the HulaPoint. The "Delete," "End," and "Page Down" keys function as the HulaPoint control buttons.

Menu Structure

Figure 4-2 shows a "map" of the MIZ-27CT's menu structure. The MIZ-27CT operates in two modes—Setup/Review or Acquire Data. Features are grouped together by task, such as, initial instrument setup or signal review. Features are available according to the selected mode. As shown in the map, you select and adjust most features in the Setup/Review mode. Once setup, the Acquire Data mode enables you to quickly and efficiently acquire and record eddy current data for your inspection, as well as create documentation.

Figure 4-2. MIZ-27CT Menu Structure

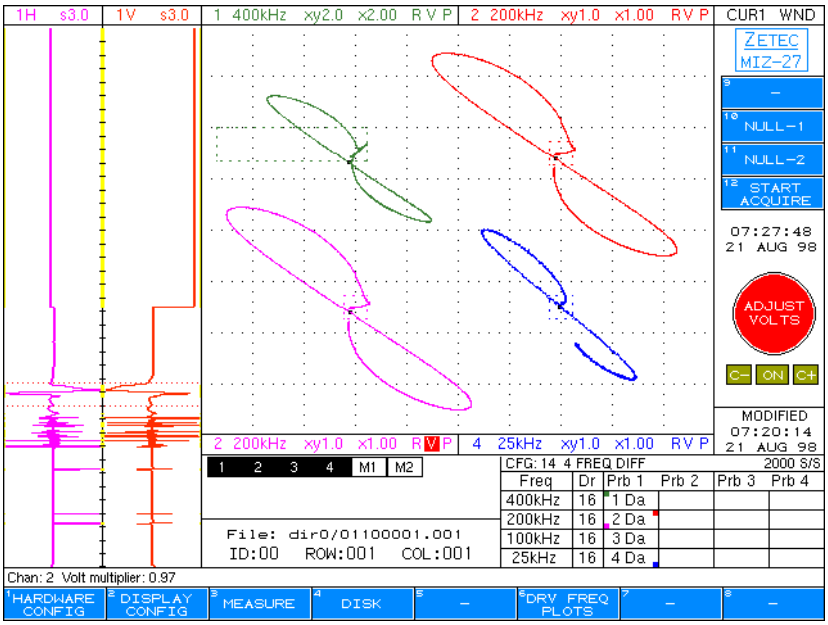


Setup/Review Mode

Setup/Review mode is active at power-up (Full Access) as shown in figure 4-3. Access to other menus is provided through the front panel display buttons. The MIZ-27CT uses five main menus for instrument control:

- **Hardware Configuration** The Hardware Configuration menu enables you to set up the test. For access, press the HARDWARE CONFIG button from the Setup/Review menu.
- **Display Configuration** To set the display features, such as filters, alarms, persist, mixes, and the clock, use the Display Configuration menu.
- **Measure** The Measure menu, provides tools for flaw measurement and analysis curve generation.
- **Disk** The Disk menu is present when a local or external SCSI device is detected at power-up. The Disk menu provides data and configuration storage/recall from the disk media.
- **Drive Frequency Plots** Tools for signal setup enhancement are available in the Drive Frequency Plots menu.

Figure 4-3. MIZ-27CT—Setup/Review Mode



To exit any menu, press the **RETURN** menu button.

Initial Setup

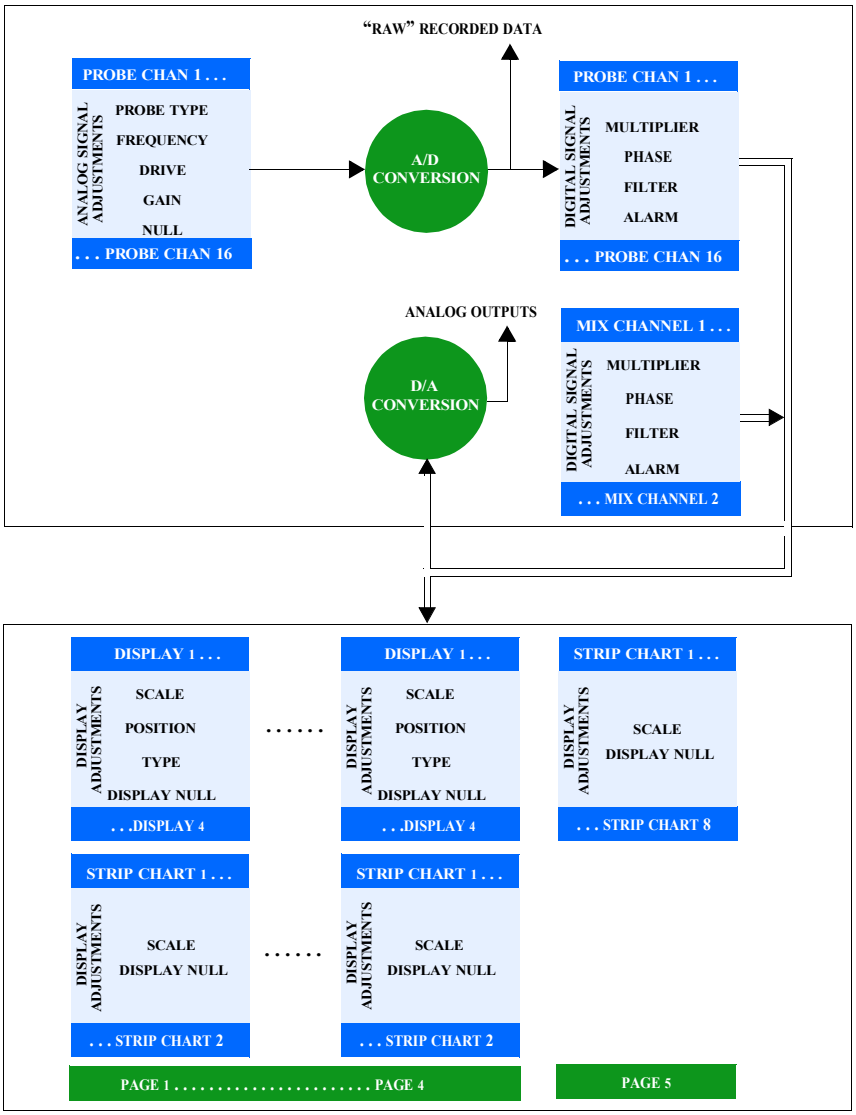
In order to set up an eddy current test, you must familiarize yourself with the instrument's controls and perform the following basic operations.

- ❒ **Connect the probe**
- ❒ **Locate controls and change menus**
- ❒ **Set the configuration parameters:**
  - **Frequencies**
  - **Probe Drive**
  - **Probe Types**
  - **Gain**
  - **Sample Rate**
  - **Null1/Null2**
- ❒ **Set the acquisition parameters:**
  - **Voltage Multiplier**
  - **Phase Rotation**
  - **Scale**
  - **XY Position**

Completing the above sequence puts a signal on the screen. Pages 4-7 through 4-24 discuss this sequence in more depth. The many additional features available with the MIZ-27CT are discussed in the remainder of this section.

Figure 4-4 is a block diagram that shows how changing the MIZ-27's parameters will affect the probe signal and display.

Figure 4-4. MIZ-27 Probe Signal and Display Adjustments



Connecting the Probe

The MIZ-27CT has either two or four active probe connectors, depending on whether one or two analog boards are installed. A standard differential probe can be plugged into any one of the active connectors. Generally, Probe 1 is chosen if only one probe is being used. See Applications for detailed information regarding the connection of various probe types.

Using Control Fields and Display Function Buttons

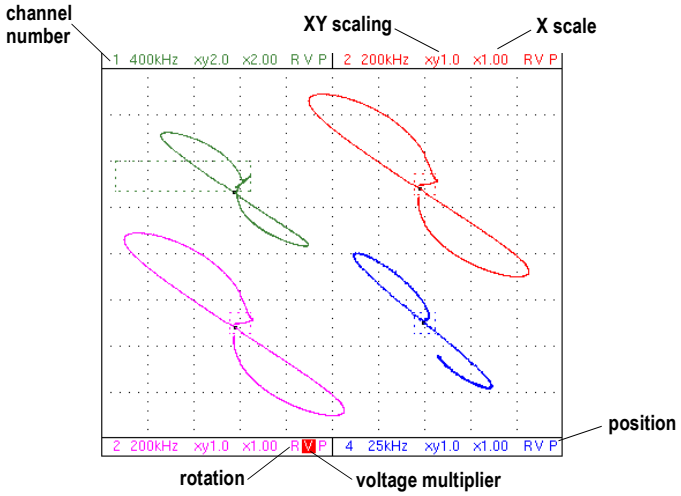
Control fields and display function buttons are used to set the configuration and acquisition parameters:

- ❒ **Control Fields:**
  - **Displays 1-4**
  - **Change Page**
  - **Cursor**
  - **Strip Chart Displays**
- ❒ **Display Function Buttons**
  - **Null-1 and Null-2**
  - **Display Null**
  - **Clear**
  - **Start Acquire**

Control fields and display function buttons are available in the Acquire Data and Setup/Review modes with the exception of the "cursor" control field and the "clear" acquisition button. The "cursor" control field is only available in the Setup/Review mode. The "clear" button operates only in the Acquire Data mode.

Displays 1-4. Four display areas are available on the MIZ-27CT screen (see figure 4-5). Each display contains the channel number, frequency, XY scaling, X scale, rotation (R), voltage multiplier (V), and position (P) control fields. These control fields can be adjusted in the Acquisition or Setup/Review modes.

Figure 4-5. Control Fields



To adjust a control field:

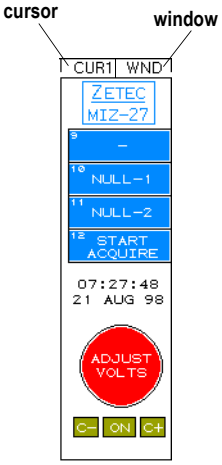
Step 1: Use the HulaPoint to highlight one of the following control fields:

- **Channel number** selects the channel. The selections include channels shown in the Probe Selection Summary as well as Mix 1 and Mix 2 or TE1 and TE2.
- **XY scaling** sets the display volts per division.
- **X scaling** independently sets the display X volts per division for signal suppression or enhancement.
- **Rotation (R)** rotates the signal's angle on the display.
- **Voltage Multiplier (V)** adjusts the digital gain of the selected channel from 0.5 to 5.00 in 0.01 increments.
- **Position (P)** moves the data around within the display.

Step 2: Press the center HulaPoint button (on/off) to activate the HulaPoint's local control. Depending on the field, press the HulaPoint or HulaPoint buttons to adjust the field.

Step 3: Press the center HulaPoint button (on/off) to deactivate the HulaPoint's local control.

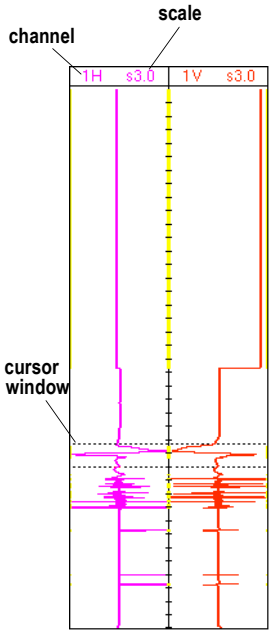
Change Page –/Change Page +. To expand the total number of channels that you can view, the "Page" feature lets you quickly toggle between five display screens (up to 16 channels) using the **CHANGE PAGE–/CHANGE PAGE+** menu buttons. All display types can be set up on four of the display pages. When data logging is off, an additional page is dedicated as an eight strip chart display.



Cursor. The **CUR1** and **WND** control fields are adjustable in Setup/Review mode and allow you to manipulate the data cursor in the strip charts. Each time you stop data acquisition and return to the Setup/Review mode, instrument control defaults to the CUR1 position so you can quickly select data for review. To adjust either control field:

Step 1: Use the HulaPoint to highlight either control field:

- **CUR1** positions the data review cursor window on the data segment. The left HulaPoint button provides a Zoom Out (Z -) function, which condenses the data currently shown in the strip charts. The right HulaPoint button provides a Zoom In (Z +) function, which magnifies the data shown in the strip charts.
- **WND** is the cursor window size, which ranges from 10 to 10,000 data points.



Step 2: Press the center HulaPoint button (on/off) to activate the HulaPoint's local control. Press the HulaPoint or HulaPoint buttons to adjust the field.

Step 3: Press the center HulaPoint button (on/off) to deactivate the HulaPoint's local control.

Strip Charts. The strip chart control fields are adjustable in the Acquisition or Setup/Review modes.

- **Channel** display selection of the X or Y component of any channel in the Probe Selection Summary, as well as the two mix channels.
- **Scale** is independent voltage scaling for the strip chart displays.

The four buttons on the instrument's right side, above the HulaPoint, are the Display Function buttons. With these buttons you start and stop data acquisition, as well as electronically null data and clear the display.

Null-1/Null-2. The MIZ-27 has two independent null functions during data acquisition. It calculates a voltage used on the analog boards to balance the offset in the probe signal. All channel selections for Null-1 or Null-2 are nulled in this manner, regardless of whether they are currently displayed. Null-1 or Null -2 should be used at least once when the probe is placed on or in defect-free material. Use either null again after changing the gain or probe drive. For more information about how to set the null functions, see *Null-1 and Null-2, on page 4-21*.

Clear. The "clear" function erases the XY display area while the strip charts and other screen areas remain unaffected. The automatic clearing function is described in *Variable Persistence Display on page 4-32*.

Start Acquire. To start or stop data acquisition, use the **START ACQUIRE** control button.

Configuration Parameters

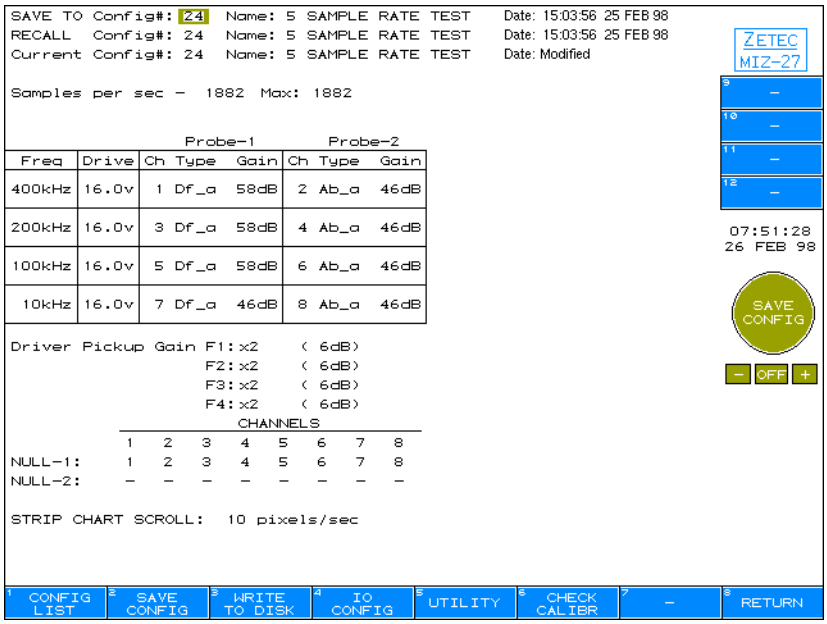
The configuration specifies the type of test the MIZ-27 performs. Up to 25 different test configurations can be stored or recalled from battery-backed flash memory. Or, you can direct the MIZ-27 to save configurations to a disk drive (see page 4-79). Test setups must be saved if you need to recall specific setups following a power-up cycle.

Configuration parameters consist of selecting:

- **How to Name a Configuration, on page 4-11**
- **Frequency, on page 4-12**
- **Setting the Probe Drive, on page 4-13**
- *Probe Type, on page 4-14*
- **Setting the Channel Gain, on page 4-18**
- **Sample Rate, on page 4-20**
- *Null-1 and Null-2, on page 4-21*

All of these parameters are selections in the Hardware Configuration menu. This is also where you can assign a configuration number and name to your setup. To open the menu shown in figure 4-6, press **HARDWARE CONFIG** from the Setup/Review menu.

Figure 4-6. Hardware Configuration Menu



Select the probe type and frequencies with the Hardware Configuration menu.

How to Name a Configuration. At the top of the Hardware Configuration menu are fields for configuration number and name. A name can consist of up to 20 characters using A-Z and 1-9 as well as a "blank" character. To save a configuration with a new name:

Step 1: Use the HulaPoint to highlight the "current config name" field."

Step 2: Press the center control button (on/off) to activate the HulaPoint local control and highlight the first character in the field.

Step 3: Press up/down on the HulaPoint to change the character.

Step 4: Press the left or right control button to move to a new character and change.

Step 5: Continue changing characters until

Step 6: Press the center control button (on/off) to deactivate the HulaPoint's local control.

Or, you can use an external keyboard to input the configuration name. The next paragraphs explain how to set each hardware parameter.

Frequency. Select the **HARDWARE CONFIG** button from the Setup/Review menu.

Step 1: Use the HulaPoint to highlight the frequency in the configuration table that you need to adjust.

Step 2: Press the center control button (on/off) to activate the HulaPoint local control.

Step 3: Press up/down on the HulaPoint to change the frequency.

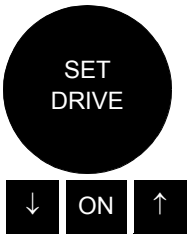
Step 4: Press the center control button (on/off) to deactivate the HulaPoint's local control.

Table 4-1 lists the increment adjustment, which is dependent on the frequency range.

Table 4-1. Frequency Adjustment

Frequency Range	Range Increment
100 Hz to 1 kHz	10 Hz
1 kHz to 10 kHz	100 Hz
10 kHz to 100 kHz	1 kHz
100 kHz to 1 MHz	10 kHz

Frequency is adjustable from 100 Hz to 1 MHz. Each of the four frequencies is independently adjustable. See *Applications section*; or *Performing a Mix, on page 4-37*, for more explanation about choosing the appropriate frequencies.



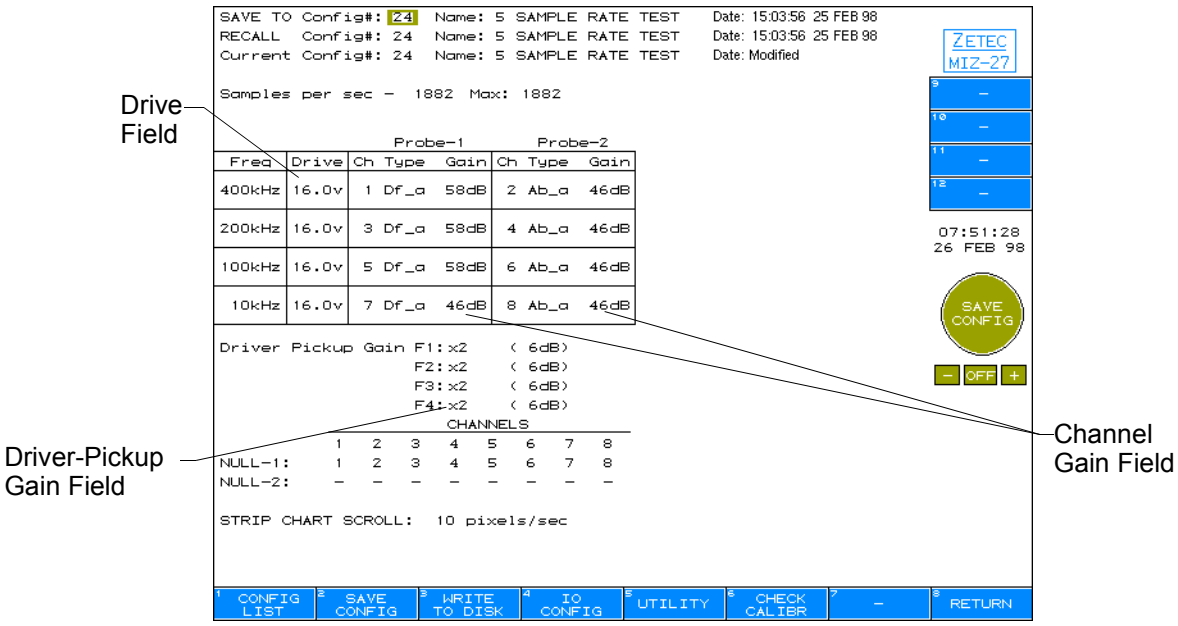
Setting the Probe Drive. To set the probe drive, go to the Hardware Configuration menu shown in figure 4-7. (For information about the Drive Volt Plot, see page 4-49.*)*

Step 1: Select the drive field with the HulaPoint.

Step 2: Press the center HulaPoint button to activate the HulaPoint local control.

Step 3: Set the drive to 16.0 volts.

Figure 4-7. Hardware Configuration—Probe Drive Adjustment



Step 4: Adjust the gain to 34dB. This setting ensures that the A/D converter will not saturate.

Step 5: If a Driver-Pickup coil is selected, set the Driver-Pickup gain to ×2.

Step 6: Press **RETURN** to recall the Setup/Review menu.

Step 7: Press **START ACQUIRE** to begin data acquisition.

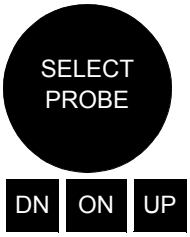
Step 8: Null the probe on, or in, known defect-free test material or setup standard.

Step 9: Scan the probe past the largest flaw, or other feature, that is required to be resolved in the test.

Step 10: Stop data acquisition.

Step 11: Review the largest flaw or test feature and verify that distortion is absent.

Step 12: If signal distortion occurs, repeat steps 1 through 11 and lower the drive one volt each time until distortion is eliminated.



Probe Type. Using the HulaPoint, highlight the probe output under the "Probe" column in the Hardware Configuration table. To change the probe type:

Step 1: Use the HulaPoint to highlight the correct probe output.

Step 2: Press the right or left HulaPoint control buttons to change the probe type.

Table 4-2 lists the available probe type options for the MIZ-27. Probe configurations are further illustrated in figures 4-8 to 4-9.

Table 4-2. Probe Configuration

Probe OUT 1&3	Probe OUT 2&4	USAGE
Df-a **Df-d**	**Df-b** **Df-c**	Use in DIFFERENTIAL (Self-Reference) testing, where the test coil is adjacent to, or on the same connector as, the reference coil.
N/A	**Ab-a** **Ab-d**	Use in ABSOLUTE (External-Reference) testing, where the test coil is physically separated from, or on a separate connector from the reference coil. Typically, the test probe is connected to input Probe 1 (or Probe 3) and the reference probe is connected to input Probe 2 (or Probe 4).
Dp-a	**Dp-b**	Use in STANDARD DRIVER-PICKUP testing, where the pickup coil is separate from the drive coil. There is no reference for the pickup coil.[1]
DD-a	**DD-b**	Use in DIFFERENTIAL DRIVER-PICKUP, where there are two pickup coils, both separate from the drive coil. One of the pickup coils acts as the reference for the other. Special jumper settings in the probe connector are required in order to use this selection. See page 3-12 for details.[2]
Trig	**Trig**	Must be selected in order to insert the trigger signal from a rotating probe (input into the MIZ-27CT on the REMOTE connector) into an eddy current channel. This allows recording of the trigger signal onto the media, along with the eddy current data. See Triggered Sweep Displays on page 4-31, for details.
Encd	**Encd**	Encoder signals can be inserted into an eddy current channel. The encoder data can be viewed with the data, used for data plotting, and alarm delays.
Swpr	**Swpr**	Use with Zetec MIZ-27 Scanner products. The “Swpr” selection provides a dedicated trigger sweep acquisition presentation.
Blnk	**Blnk**	Use when it’s preferred to remove a channel from the configuration without renumbering the remaining channels. For example, the “Blnk” channel works well in a multicoil application when a coil is going bad. By replacing the bad coil channel with a “Blnk” channel, all assigned channel numbers remain the same along with the related alarm and other channel-related parameters.

1. When DP is chosen for a particular output and frequency, the instrument will select DP for all the other frequencies under that output as well.
2. When DD is chosen for a particular output and frequency, the instrument will select DD for all the other frequencies under that output as well.

Figure 4-8. MIZ-27CT Probe Configurations—Probe 1 & Probe 3

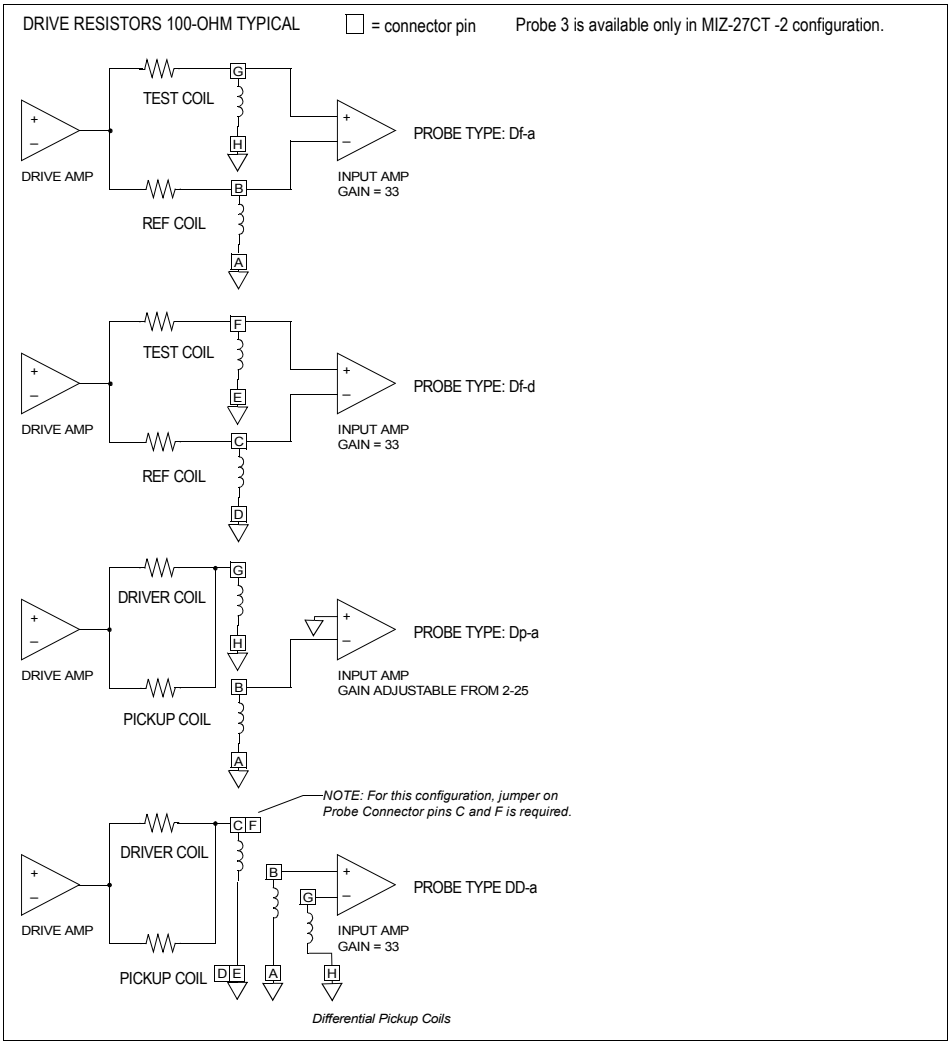
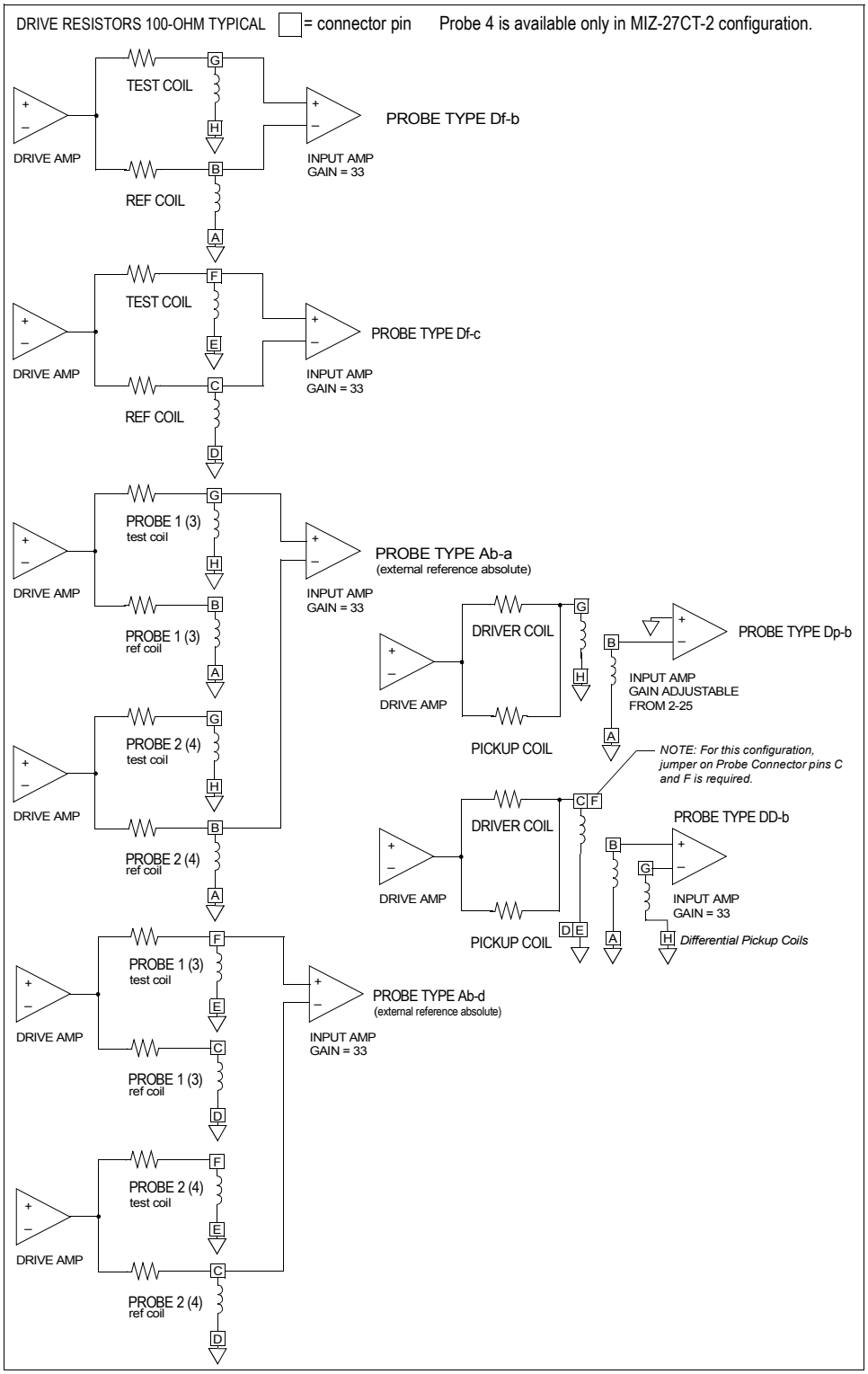


Figure 4-9. MIZ-27CT Probe Configurations—Probe 2 & Probe 4



Next, the driver-pickup gain can be adjusted.

Setting Driver-Pickup Gain. This section applies only when you are using a driver-pickup probe. A driver-pickup probe channel is indicated with a "Dp-a" or "Dp-b" in the Hardware Configuration Probe Summary.

To set the driver-pickup gain, go to the Hardware Configuration menu. The adjustment controls the gain of the circuit used to amplify the high-frequency signal, before it is demodulated. Since a balance (reference) coil is absent, this control is necessary to keep the amplifier out of saturation.

Step 1: Set the Driver-Pickup gain to ×2.

Step 2: Press **RETURN** to recall the Setup/Review menu and start acquisition.

Step 3: Scan the probe past the largest feature that is required to be resolved.

Step 4: Adjust the scale value, if required, to make the signal large enough for viewing, and within the screen borders.

Step 5: Verify signal distortion is absent. Repeat steps 1 through 4, incrementing the gain up to the point where the signal begins to distort.

Step 6: Repeat the null as necessary between adjustments. The driver-pickup gain can be adjusted in 4 steps from ×2 to ×25.

Channel gain can now be adjusted.

Setting the Channel Gain. To set the Channel Gain, go to the Hardware Configuration menu. Gain selection is also available during acquisition in the Adjust Alarm menu.

Channel Gain amplifies the demodulated signal before it's presented to the analog-to-digital converter. It is provided to maximize the detection capability and signal-to-noise ratio of the instrument.

Step 1: Set the gain to 34 dB.

Step 2: Return to the Setup/Review menu and start acquisition.

Step 3: Scan the probe past the largest feature to be resolved.

Step 4: Adjust the scale value, if required, to make the signal large enough for viewing and within the screen borders.

Step 5: Verify signal distortion is absent when scanning the largest feature to be resolved.

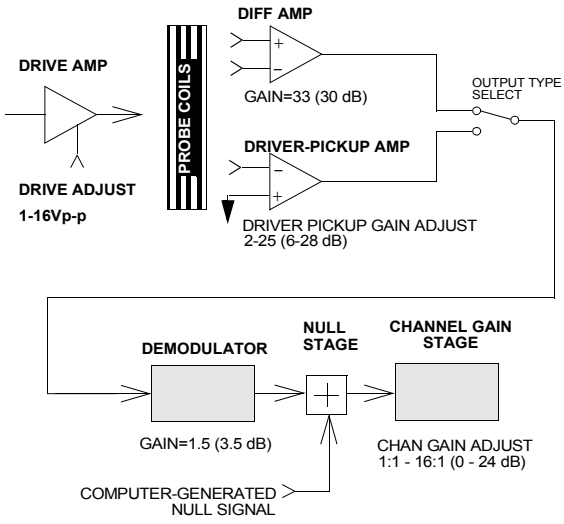
Step 6: Repeat steps 1 through 5 incrementing the gain up to the point where the signal begins to distort.

Step 7: Repeat the null as necessary between adjustments.

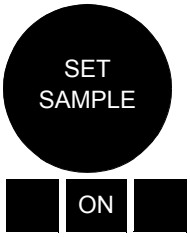
The dB value is calculated from the following formula: $dB = 20\log\frac{Gain1}{Gain2}$

If the gain doubles, for instance, this adds 6 dB to the dB value. The gain is adjustable in 6 dB steps from 34 to 58 dB. The MIZ-27CT gain stages are diagrammed in figure 4-10.

Figure 4-10. MIZ-27CT Gain Stages



GAIN	SINGLE COIL AMP SELECTED	DIFF AMP SELECTED
FRONT END GAIN	×25 (28 dB)	×33 (30 dB)
DEMOD GAIN	×1.5 (3.5 dB)	×1.5 (3.5 dB)
CHANNEL GAIN	×16 (24 dB)	×16 (24 dB)
TOTAL GAIN	×600 (55.5 dB)	×750 (57.5 dB)



Sample Rate. The definition of sample rate for the MIZ-27CT is the number of times per second that the probe signals are demodulated and digitized at each frequency. A single sample contains the X and Y signal components from all probes and all frequencies.

Setting the Sample Rate. Complete the following steps to adjust the sample rate:

Step 1: Use the HulaPoint to highlight the Samples per Second control field.

Step 2: Press the center HulaPoint button (on/off) to activate the HulaPoint's local control.

Step 3: Press the HulaPoint control button to adjust the sample rate.

Step 4: Press the center HulaPoint button (on/off) to deactivate the HulaPoint's local control.

Sample Rate Limitations. To set the maximum possible sample rate, turn on a probe channel in frequency slot 1 only and set the samples/sec to 8000. As probe channels are added in additional frequency slots, or frequencies are set below 15 kHz, the sample rate automatically adjusts to the maximum allowable rate. The sample rate displays above the Probe Selection Summary, see figure 4-12.

Normally, the sample rate can be set to its maximum. You may prefer to set the rate lower if:

- **recording data and want to save media space**
- **using Internal Test Enable with a slowly moving test piece, and want to avoid false triggers**

The maximum sample rate is limited by the following factors:

- **Number of Frequencies Chosen—**When multiple frequencies are chosen, the frequencies are applied to the probe sequentially. Therefore, it takes more time to acquire a given sample. For instance, if a single frequency of 400 kHz is chosen, the maximum sample rate is 8000. If the number of frequencies is increased to four (all above 15 kHz), the maximum rate is 2000.
- **Values of the Test Frequencies—** As the value of the test frequency is lowered, more time is required to detect the signal. For instance, if two frequencies of 200 kHz and 400 kHz are chosen, the maximum rate is 4000 samples/sec. If the frequencies are 10 kHz and 20 kHz, the maximum rate is 3555. Frequencies below 15 kHz will affect the sample rate.

Null-1 and Null-2. Separate null controls are present in the MIZ-27CT Acquire and Setup/Review modes—Null-1 and Null-2. These hardware null controls allow different channels to be electronically nulled at separate times.

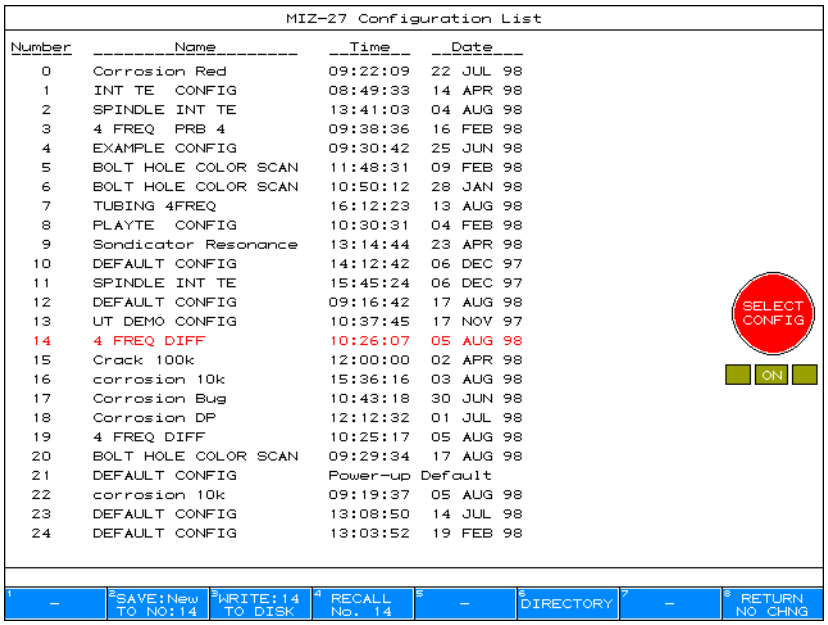
Step 1: Go to the Hardware Configuration menu (see figure 4-6).

Step 2: Highlight the channel number next to Null-1 or Null-2 with the HulaPoint.

Step 3: Use the HulaPoint left and right buttons to select which null the channel is to use.

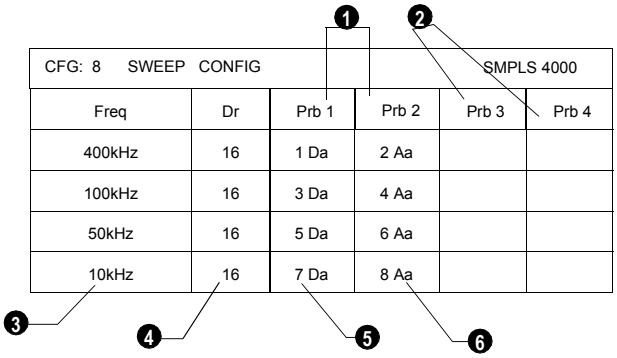
After a configuration is set up, named, and saved, you can go to the Configuration List menu, shown in figure 4-11, activate the HulaPoint to highlight and recall any configuration shown in the list. For more detailed information about the Configuration List, see page 4-25.

Figure 4-11. Configuration List



After configuring the MIZ-27CT, the Probe Selection Summary displays the current probe type and frequency selections. Figure 4-12 is an illustration of the Probe Selection Summary that you view in the main menu.

Figure 4-12. Probe Selection Summary



❶ Probe 1/2 designates the probe connections to Analog Board #1. The letters correspond to the labelling on the rear panel probe connectors.

❷ Probe 3/4 designates the probe connections to Analog Board #2.

❸ Frequency selection is listed in the first column. The same frequencies are used for each analog board. Keep in mind that the fewer frequencies used, the higher the sample rate can be set.

❹ Drive voltage associated with each frequency is listed in the second column.

❺ Channel numbers are assigned by the instrument to each probe and frequency combination.

❻ Selected probe types.

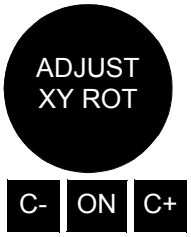
Data Acquisition Parameters

In order to optimize the data presentation task to best suit your test material and type, you adjust the instrument's acquisition parameters. This section describes the parameter adjustments needed as a minimum to acquire meaningful data for a test and subsequent "fine-tuning" adjustments. The acquisition parameters discussed in this section are:

- ❒ **Phase Rotation, see page 4-23**
- ❒ **Scale, see page 4-24**
- ❒ **Voltage Multiplier, see page 4-24**
- ❒ **XY Position (Data Dot), see page 4-24**

Phase rotation and voltage multiplier adjustments apply to the signal in the selected probe channel. Adjustments to these parameters allow you to equalize the output of different probe channels. Scale and XY position change the selected display only, independent of the probe channel (see figure 4-4). The HulaPoint cursor and HulaPoint control buttons let you select and adjust. As you adjust these parameters, the current value updates in the comment line.

Next, the phase rotation, scale, and voltage multiplier adjustments can be set. Analog signals are unaffected by these adjustments; they affect the probe channel only to optimize the presentation to the viewer. It's most convenient to set the rotation, scale, and voltage multiplier adjustments in the Setup/Review mode, since you can make adjustments without repeatedly scanning the feature of interest. Either phase or scale is set first. It may be necessary to alternate the adjustments in order to obtain the best display.



Phase Rotation. Often, flaw signals are set to deflect in a particular direction as an aid to signal analysis. For instance, when using the triggered sweep (Y vs. Time) feature, it's important to set the flaw vertically and noise horizontally, because only the vertical signal component is displayed. To set the phase, go to the Setup/Review menu and start acquisition.

Step 1: Scan the probe past the feature to create a signal that is to be rotated.

Step 2: Press the **STOP ACQUIRE** button.

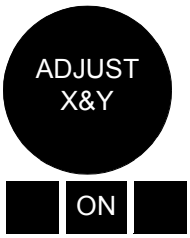
Step 3: Using **CUR1** and **WND** control fields, scan through the data until the signal of interest displays.

Step 4: On the display of interest, highlight the **R** (rotation) control field.

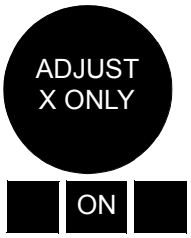
Step 5: Using the HulaPoint, adjust the phase angle in one degree increments from 0 to 360 degrees. The **C-** and **C+** HulaPoint control buttons are used to change data channels.

Rotation is also adjustable in the Start Acquire mode, real-time.

For more information on advanced phase setup, see *page 4-49*.



Scale. The X and Y scale are adjustable simultaneously from 0.1 to 9.9 volts per division. The X value is also adjustable independently to ±20 times the combined XY value. To adjust the scale, go to the Setup/Review menu and start acquisition.



Step 1: Scan the probe past the smallest and largest features to create signals for rotation.

Step 2: Stop acquisition.

Step 3: Using **CUR1** and **WND** control fields, scan through the data until the signals of interest display.

Step 4: Highlight the XY or X scale control field of the display.

Step 5: Use the HulaPoint to set the magnification for the signals of interest.

Step 6: Scan the largest feature necessary to be on screen at the same time, and make any compromise in the adjustment necessary to see both features.

Voltage Multiplier. The voltage multiplier is a digital gain control. The MIZ-27 uses the voltage multiplier to fine-tune the gain of each probe channel. To adjust the multiplier, go to the Setup/Review menu and start acquisition.

Step 1: Scan the probe past the feature of interest to generate signals.

Step 2: Stop acquisition.

Step 3: Using **CUR1** and **WND** control fields, scan through the data until the signals of interest display.

Step 4: Highlight the **V** (Voltage Multiplier) control field of the display.

Step 5: Use the HulaPoint to set the voltage scale to a preferred value for the signals of interest.

XY Position (Data Dot). Four display operating points are independently positioned on the display. The “P” control field located in each XY display provides the position adjustment. The display’s XY data position updates in the comment line at the bottom left corner of the display. To adjust the data dot position:

Step 1: Highlight the "P" control field of the display.

Step 2: Press the center HulaPoint control button to activate the cursor control.

Step 3: Use the HulaPoint to move the data dot to a preferred location.

Aside from the basic configuration and acquisition parameters, several other features affect the manner in which the data displays. These features, along with their default settings, are listed in table 4-3. Turn to the page listed to find more information about changing these parameters.

Table 4-3. Default Settings for Display

Feature	Default	For More Information
C-scan	OFF	see page 4-28
Triggered Sweep	OFF	see page 4-30
Variable Persist (Autoclear)	OFF	see page 4-32
Filters	OFF	see page 4-35

Configuration Storage and Recall

A group of defined display settings and acquisition parameters is known as the "configuration." With the MIZ-27CT, you can name, store, and recall configurations. Storing and recalling configurations can help you save time during setup and data review. Configurations are saved in flash memory. Or, you can direct the MIZ-27 to save configurations to a disk drive (see page 4-83).

Up to 25 test configurations are stored or recalled from battery-backed flash memory. To permanently store the configuration file to battery-backed flash memory, you must press the **SAVE CONFIG** button in the Hardware Configuration menu. Operating setups must be saved if you need to recall specific setups following a power-up cycle. Stored configurations record all operator settings. In addition, when a **NULL** is performed, the null values calculated by the instrument are stored with the configuration. When using the same probe and test piece, the identical signal in the same position on the screen will always be generated by the same configuration.

Configurations can be "stored to" or "read from" the storage device as well as flash memory. In the Hardware Configuration menu, the **WRITE TO DISK** button stores the active configuration file to the storage device. For more information about data storage to disk, see page 4-80.

File names for a configuration use the ".CFG" extension. In the Directory submenu, the **READ CONFIG** button recalls the selected configuration file (.CFG file) and writes over the active configuration in RAM only.

To store or recall configurations, go to the Hardware Configuration menu, and complete the following steps:

Step 1: To select a configuration number, highlight either the **SAVE TO CONFIG** or **RECALL CONFIG** control fields.

Step 2: Press the HulaPoint buttons to toggle through the available configuration numbers. The selected number displays in the information line above the Probe Select Menu.

Step 3: To save a configuration, select the configuration number and press the **SAVE CONFIG** button. This action overwrites the configuration previously stored at that location.

Step 4: To recall a configuration, move the cursor to the Recall Config field. (Notice that the F2 button label changes from **SAVE CONFIG** to **RECALL CONFIG**.)

Step 5: Activate the HulaPoint for increment/decrement control and select the configuration number in the field.

Step 6: Press the **RECALL CONFIG** button.

The MIZ-27 retains the date the configuration was stored for your reference. This date is shown on the display below the HulaPoint control buttons, as well as in the Hardware Configuration submenu. If the configuration is changed but not saved, the display reads "MODIFIED" along with the modification time and date.

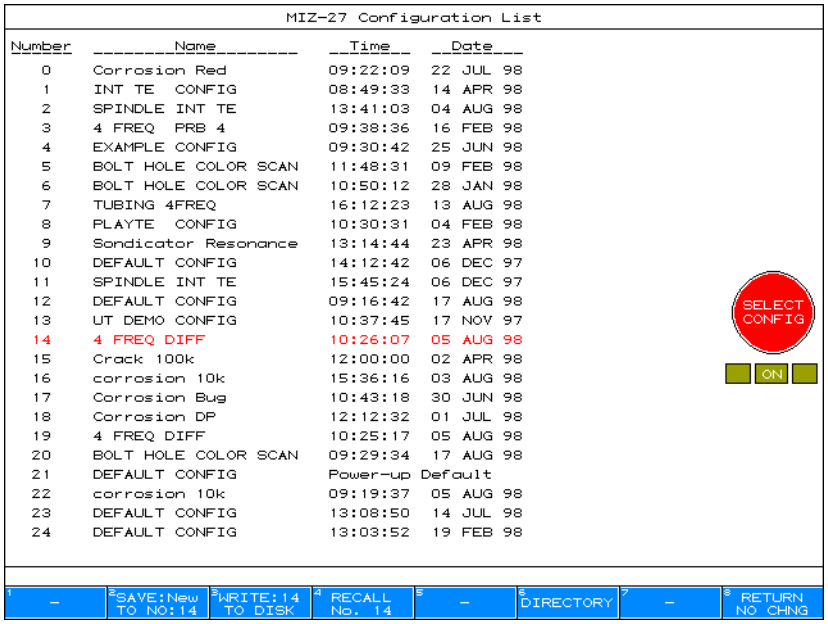
Configurations can also be saved and recalled from the Config List menu shown in figure 4-13. To go to the Config List menu:

Step 1: From the Setup/Review menu, press the **HARDWARE CONFIG** menu button.

Step 2: In the Hardware Configuration menu, press the **CONFIG LIST** menu button.

In the Configuration List menu, activate the HulaPoint to highlight and recall any configuration shown in the list. This action updates the menu buttons to show the current selection.

Figure 4-13. Configuration List



Step 3: Press the **RECALL NO. 14** menu button to recall the configuration.

Step 4: Press the **RETURN** menu button to go back to the Hardware Configuration menu.

Signal Display Type

As described in *Initial Setup, on page 4-6*, the MIZ-27CT requires adjustments to the basic configuration functions, such as, frequency, gain, scale, and phase, in order to display an eddy current signal. In addition to these basic functions, several features are available for further signal processing and display.

Displays

Up to four channels simultaneously display in the XY area. All four areas can display the same or any combination of the following display types:

- **XY (Lissajous figure) patterns with "Flying Dot" enhancement**
- **bar graph**
- **vector**
- **triggered sweep**
- **video (full screen or 1 quadrant)**

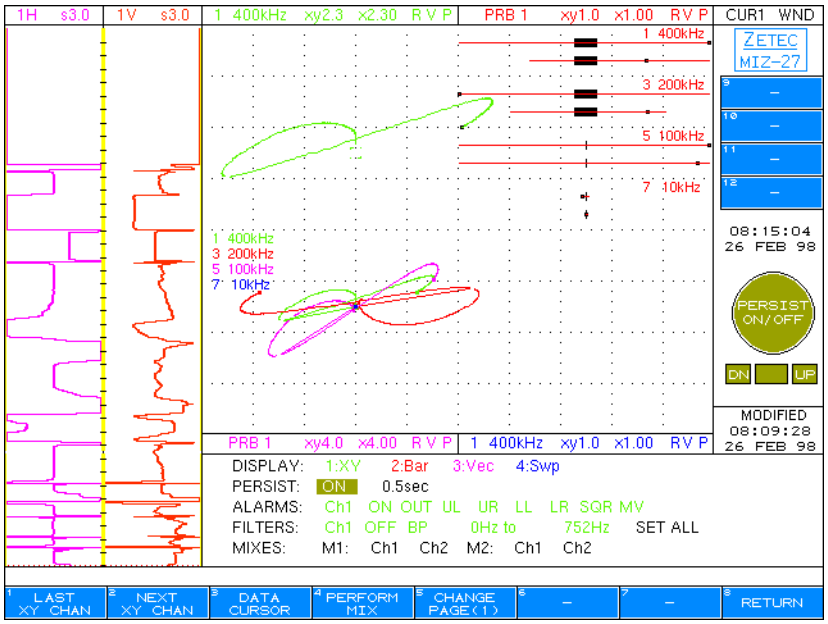
Displays 3 and 4 have the following additional display capabilities as well as the preceding types:

- **plot water fall (PWF)**
- **C-scan**

When PWF, C-scan, or video are active, the overall display divides into equal quadrants. Each quadrant is a defined data area for PWF, C-scan, or video data. In addition, the SWP function will reduce scan length from entire screen width down to a single quadrant display size.

Selecting Display Type. Display type selection is made in the Display Configuration menu shown in figure 4-14.

Figure 4-14. Display Configuration Menu



To select a display type, highlight the display number and press the right or left HulaPoint button to toggle through the available display types.

Adjusting Display 1. In addition to all display types available on all four displays, Display 1 has the following display capabilities:

- **Signal measurement features found in the Measure menu**
- **Precise phase angle setup using the Vpp measurement feature**
- **Mixing**

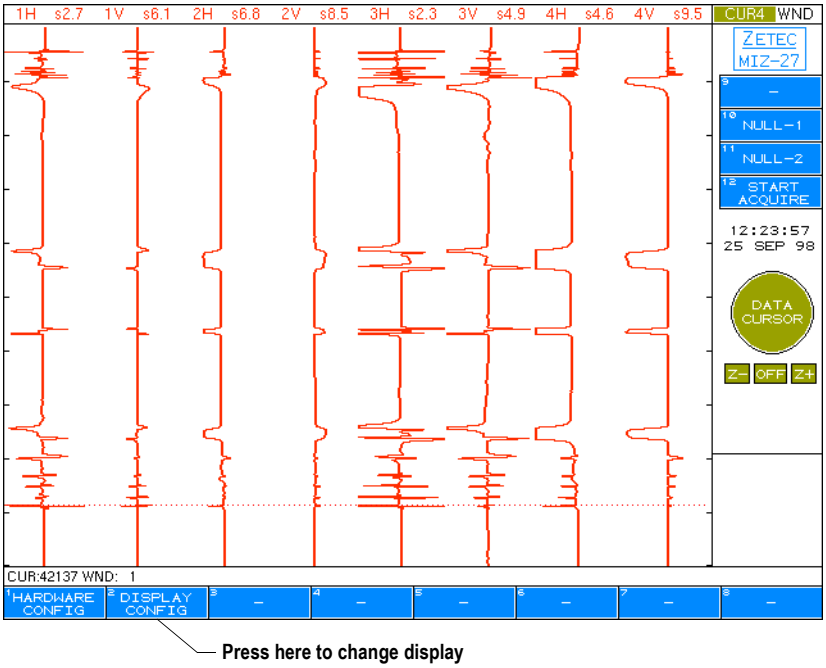
Strip Chart Displays. Two continuous strip chart displays are presented on the left side of the screen. A tick mark is placed between the charts at one second intervals. In both the Setup/Review and Acquire Data modes, the H or V component channel number can be selected. The strip chart scroll rate is adjustable by number of pixels. To adjust, change the “number of pixels per second” field in the Hardware Configuration menu.

Strip chart scales can be independently adjusted. Other display parameters affecting the charts are rotation, filter, and gain. See *Signal Review, on page 4-39*, for more information about how to review strip chart data in detail.

Strip charts aid in displaying an alarm condition with reference to time. If the MIZ-27 ET detects an alarm condition during data collection, the center and perimeter edges of the strip charts display in yellow.

8 Strip Chart Display. One of the five MIZ-27 display pages is dedicated to an eight strip chart display as shown in figure 4-15. In Acquire Data mode, using the **CHANGE PAGE–/CHANGE PAGE+** menu buttons to toggle through the display pages for the 8 Strip Chart Display. Like the two strip charts, scales are independently adjustable. The display parameters affecting the charts are rotation, filter, and gain.

Figure 4-15. 8 Strip Chart Display



Triggered Sweep Displays. Triggered sweep displays (Y vs. Time) can be chosen as the display type. In the triggered sweep mode, the display trace moves horizontally across the entire screen, while displaying the vertical (Y) component of the selected channel. When the four quadrant display is active (SWP, C-scan or video is selected), the SWP function reduces its scan length from entire screen width down to a single quadrant display size.

To display a triggered sweep in Acquire Data mode, Setup/Review mode, or to record sweep data, data must be acquired with the TRIG probe type selected as a channel in the configuration. This inserts the trigger signal into an eddy current channel, enabling reconstruction of sweeps during playback. For more information about Triggered Sweeps, see *Probe Type, on page 4-14,* and the *Bolthole Crack Example* in the *Applications* section of this guide.

For best results, phase should be rotated in the vertical direction (see *Phase Rotation, on page 4-23*) to maximize the signal-to-noise ratio. It's recommended to adjust phase rotation by first setting up on a standard in the XY Display mode.

Description of Triggered Sweeps. The sweep synchronizes from a ground-closure signal on pin five of the *REMOTE* connector. The MIZ-27CT automatically adjusts the time base of the sweep to match the repetition rate of the trigger. Each sweep will then correspond to the time between triggers.

In the absence of a trigger signal, the display will sweep in a free-running mode. In this case, the sweep time is based on the time it takes to fill a 400 data point buffer. The sweep time is directly proportional to the sample rate.

The sweep displays as SWP (A-scan), PWF, or C-scan. The SWP redraws each sweep across the same line on the screen. The PWF incrementally moves each successive line upwards and to the right on the screen, presenting a 3-dimensional view of the data. Touch **CLEAR** to restart the function manually. The C-scan presents the sweep as a color amplitude plot. Its perspective is looking from the top downwards.

Selecting the Triggered Sweep Display. Use the following steps to select a triggered sweep display:

Step 1: Press **DISPLAY CONFIG** from the Setup/Review menu to view the display type options. The SWP sweep is selectable on Display 1, 2, 3, or 4.

Step 2: Highlight the corresponding display field.

Step 3: Press the right and left HulaPoint control buttons to toggle to the SWP selection. Four SWP displays, or any combination of four SWP and XY displays, can be simultaneously viewed on the screen.

To enable the PWF or C-scan, use the same steps to toggle the field to PWF or C-scan as the display type. During data review, the SWP, C-scan, and PWF may be selected as one of the displays. See *Signal Review, on page 4-39*, for more details.

Variable Persistence Display

Variable persistence provides a convenient method to periodically clear old data off the screen while retaining the newer data.

To activate variable persistence, press **DISPLAY CONFIG** from the Setup/Review menu. Highlight the Persist control field and toggle between the persistence and non-persistence modes. The **PERSIST TIME** control field selects the persistence time, which is the minimum duration that data will appear on-screen before it is erased.

When acquiring data in the Acquisition mode, it may be necessary to save a signal before the variable persistence clears it off the screen. In this case, stop acquisition. This action halts acquisition and freezes the image for viewing. Additionally, data is always available for review in the Setup/Review mode.

Alarms

The MIZ-27CT offers up to 16 alarm channels. A 4-axis alarm shape is available for each channel. Independent adjustments for each boundary corner, as well as the height, width, and screen position are available in individual alarm adjustment submenus. The alarms can be set to activate when the signal is either inside or outside the boundary, as well as turned on or off. When an alarm is on, the respective alarm boundary appears in the X-Y and vector display areas.

Description of Alarms. Visual indication, audible, and logic alarm outputs activate only when the instrument is in the Start Acquire mode. As the visual indication, the alarm channel box (below the X-Y display area) lights when an alarm condition is present. An audible alarm is active when any alarm is on. The audible alarm is located on the rear panel of the MIZ-27CT. The adjacent control adjusts the volume from OFF to FULL.

The TTL (0/5V) compatible logic alarm signal is located on pin 3 of the *REMOTE* connector. Optically-coupled alarm outputs are available on the Logic I/O and the Industrial I/O connectors (see page 4-58).

Adjusting the Alarm. During data acquisition, alarm size and location are set in the Adjust Configuration menu. In data review mode, the alarms are adjusted in the Display Configuration menu. During acquisition, adjustments affect only the channel shown in Display 1. The **Next/Last Channel** buttons toggle through the channels that display in Display 1. Any adjustments made to a channel in Display 1 carry through if you select that channel in Displays 2-4.

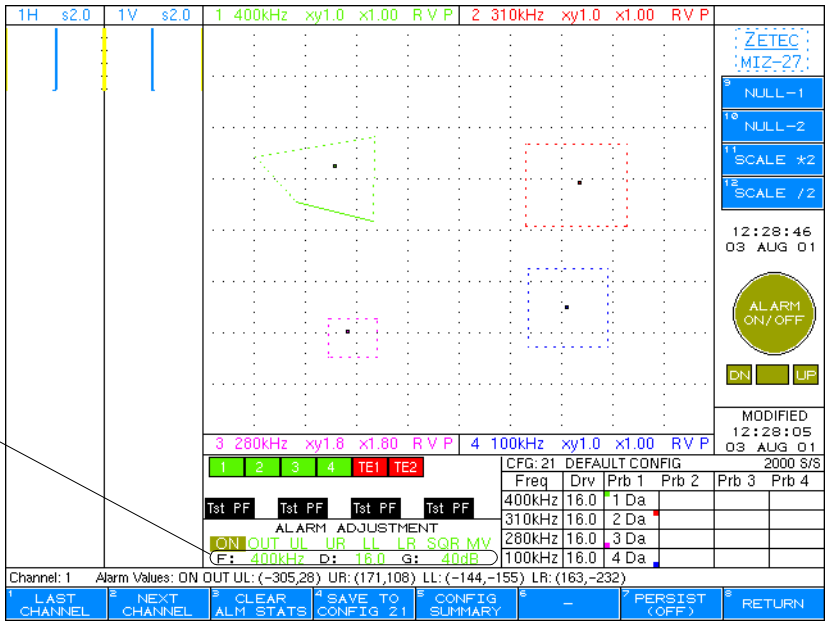
Use the following steps to adjust the alarms in the Display Configuration menu.

Step 1: Move the cursor to the channel number control field in the Alarm Setup line.

Step 2: Select one of the available channels and the corresponding adjustment menu displays.

Step 3: Use the HulaPoint to highlight the control field to be adjusted. Eight alarm adjustments are available—ON/OFF, IN/OUT, UL, UR, LL, LR, SQR, and MV.

Figure 4-16. Alarm Size and Location Adjustment



On-the-fly adjustments for frequency, drive, and gain: Use HulaPoint to move cursor to field and make an adjustment.

Step 4: To activate the alarm channel, highlight the on/off control field and select **ON**.

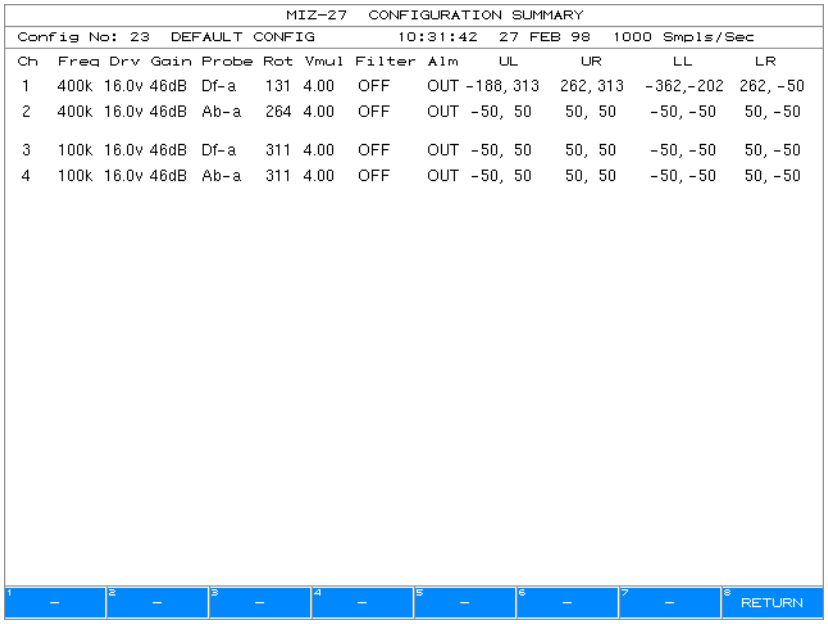
Step 5: Set the In/Out alarm logic as "In" to alarm when the data enters the alarm boundary or "Out" to alarm as the data exits the alarm boundary.

Step 6: Set the alarm boundary size using the UL, UR, LL, LR, and SQR control fields. These fields make the following adjustments to the alarm boundaries:

- **SQR—adjusts size of upper right and lower left corner points**
- **UL—adjusts the upper left corner point**
- **UR—adjusts the upper right corner point**
- **LL—adjusts the lower left corner point**
- **LR—adjusts the lower right corner point**

Step 7: To move the alarm boundary, use the MV control field.

Figure 4-17. Configuration Summary



While acquiring data, you can go to the Adjust Alarm menu and open the Configuration Summary, shown in figure 4-17, which details the configuration settings including the alarm setup.

Filters

Filter adjustments do not affect the analog probe signal. They are digital filters that optimize the presentation to the viewer and aid with signal analysis. This allows you to experimentally set the filters in the Setup/Review mode—different settings can be tried without the necessity of reacquiring data.

Description of Filters. Three filter types are available—bandpass, 1st-order differential high-pass, and 2nd-order differential high-pass.

The bandpass is a 21-coefficient digital filter, with sharp cutoff characteristics. It's useful in suppressing a variety of unwanted signals, including motion components, undesired structures, and electrical interference.

The 1st-order differential filter displays the difference between the present data point and a previous data point. The closer the data points are together in time, the more high-pass action the filter creates. The process is sometimes known as continuous balance, because the displayed signal has been compared to some recent value, rather than to a fixed point. The differential filter is useful when the probe is scanned across dissimilar materials, as it tends to keep the signal always on screen. You will notice that the differential filter is sensitive to the direction of the data change. Rising edges will show as positive signals, and falling edges will show as negative signals. For this reason, a single unfiltered pulse, which deflects upwards and then returns to null, would appear filtered as a positive, and then a negative signal.

The 2nd-order differential high-pass filter applies the same processing technique as the 1st-order filter and then processes the data in a similar manner a second time. Using the 2nd-order differential high-pass filter provides the necessary additional processing to display the filtered signal similar to its original form.

Setting the Filters. Filters are set in the Display Configuration menu. To set a filter for optimum response, a signal as close as possible to actual test conditions should be generated. Observe the signal in the XY area and the strip charts while adjusting filter settings.

To adjust a filter, place the cursor on the Filter control field and select the channels. To turn on a filter for the highlighted channel, move the cursor to the ON/OFF control field and select ON. Complete the following steps to set up a filter:

Step 1: Locate the signal of interest in the data cursor window.

Step 2: In Display 1, select the channel to filter.

Step 3: Select a filter type as either bandpass or differential.

Step 4: To set the bandpass filter, highlight the low and high cutoff frequency fields and adjust them to the appropriate value. The minimum setting (low pass) can be set at 0 Hz minimum and the maximum setting (high pass) set to 1/2 the sample rate.

Step 5: To set the differential filter, highlight the "filter # pts" control field and activate the HulaPoint for increment/decrement control.

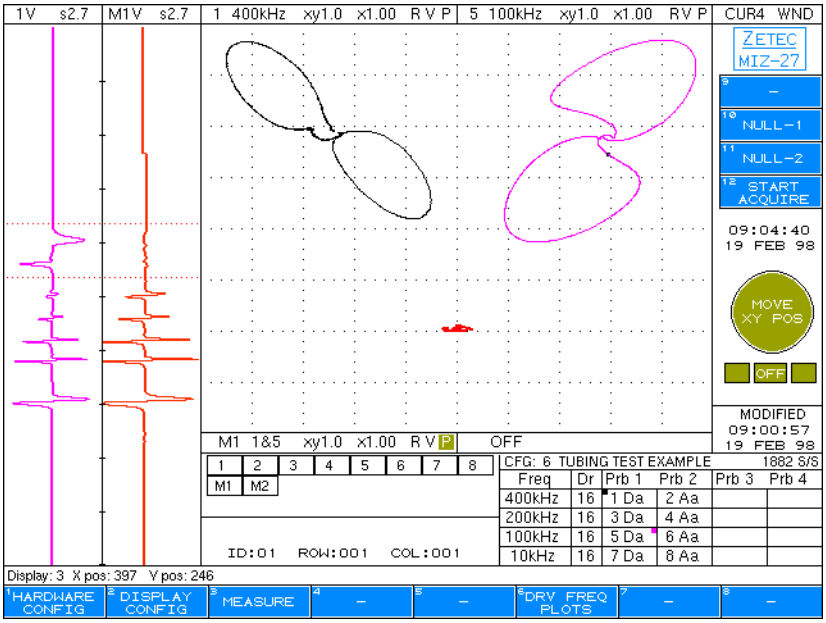
The "number of points" adjustment varies the distance, in terms of the number of data points, between the present data point and the reference data point. When the filter is ON, it's the difference between the values of these data points that is displayed to the screen.

Once filters are set for a channel, they will remain set, even if that channel is no longer selected for the X-Y display. With this feature, strip chart or analog output channels can be filtered even though the channel may not appear on the X-Y display. To save the same settings to all active channels, highlight the **SET ALL** control field and press any HulaPoint button.

Frequency Mixing

Two dual-frequency mixes are available in the MIZ-27CT. The mixes are generally used to suppress unwanted signals generated from structures adjacent to the test area as shown in figure 4-18. Mixes are selected for viewing in the Start Acquire and Setup/Review modes. To display a mix channel, highlight the channel field on the display of choice and press the HulaPoint's DN and UP buttons to select M1 or M2.

Figure 4-18. Two-Frequency Mix



DISP-1 shows response to the tube support ring, while DISP-3 shows the same response with a mix enabled.

Description of Mix. A common application of mixing is to reduce interference from tube support members in heat exchanger tubing inspections. The mix works as a subtractive process. One frequency is set low, which will react primarily to the support member. The other frequency is set higher, but still within a range that will detect flaws at the interface of the tubing and supports. The signals at the lower frequency will be subtracted from those of the higher, helping to eliminate the effects of the supports on the flaw signals.

Typically, you will need to experiment with mix parameters when you set up on new materials. Ideally, frequencies are chosen that allow the optimal suppression of unwanted signals, without adversely affecting response to flaw signals of interest.

Performing a Mix. Follow the step-by-step instructions below to perform a mix procedure.

Step 1: Set the appropriate two (2) frequencies in the Hardware Configuration menu in the range of ratios from 2:1 to 4:1.

Step 2: Press the **START ACQUIRE** button.

Step 3: Press **NULL**.

Step 4: Scan the probe past the structure to be mixed out. Assure that the data is valid at both frequencies.

Step 5: Press the **STOP ACQUIRE** button to switch to the Setup/Review mode.

Step 6: Press **DISPLAY CONFIG**.

Step 7: Go to Display 1 and select M1 or M2 as the mix channel.

Step 8: In the Mix 1 and Mix 2 control fields, select the channels to be mixed.

Step 9: Use the **CUR1** and **WND** functions to isolate the feature to be suppressed.

Step 10: Press **PERFORM MIX** to activate the selected mix.

Step 11: Return to the Start Acquire mode.

Step 12: Scan the test piece to verify that the unwanted signal has been considerably reduced in amplitude.

Real-Time Clock

The real-time clock display is located above the HulaPoint. This feature can function as a time and date stamp for the inspection, whether the record is made on printer hard copy, videotape, or digital recorder.

Step 1: To set the clock, press the **DISPLAY CONFIG** button from the Setup/Review menu. Use the HulaPoint to highlight the time and date fields.

Step 2: Press the right (UP) or left (DN) HulaPoint buttons to change the date and time.

Signal Review

When you stop data acquisition, the MIZ-27 switches to its Setup/Review operating mode. In Setup/Review mode, 40 seconds of data are visible on the strip charts. This eddy current data is continually stored in a dynamic data buffer. (Or, if data has been recorded to disk, data can be recalled from disk.) The buffer size depends on the sample rate and the number of channels as shown in the following expression:

(channels × sample rate) × 4 × Data Display Time = Data Buffer Size

As an example, if you operated a differential and absolute probe setup at four frequencies, there would be eight channels. If the sample rate is set to 400, the data buffer size is expressed in the following equation:

(8 × 400) × 4 × 40 = Data Buffer Size = 512 KBytes

The data cursor window (horizontal dash lines in the strip charts) points to the area of memory that displays in the XY area. Notice that although the channel may be different for the XY display than the strip charts, all channels display from the same area of memory. Using the data cursor window and its expansion capability allows you to closely examine data in the data buffer. The following control fields, in conjunction with the up and down HulaPoint buttons, aid in locating data. To quickly review how to use any of these functions, turn to listed page.

- **Cursor, see page 4-9**
- **Expand Chart, see page 4-10**
- **Window, see page 4-10**
- **X-Y Position, see page 4-24**
- **Null, page 4-10**

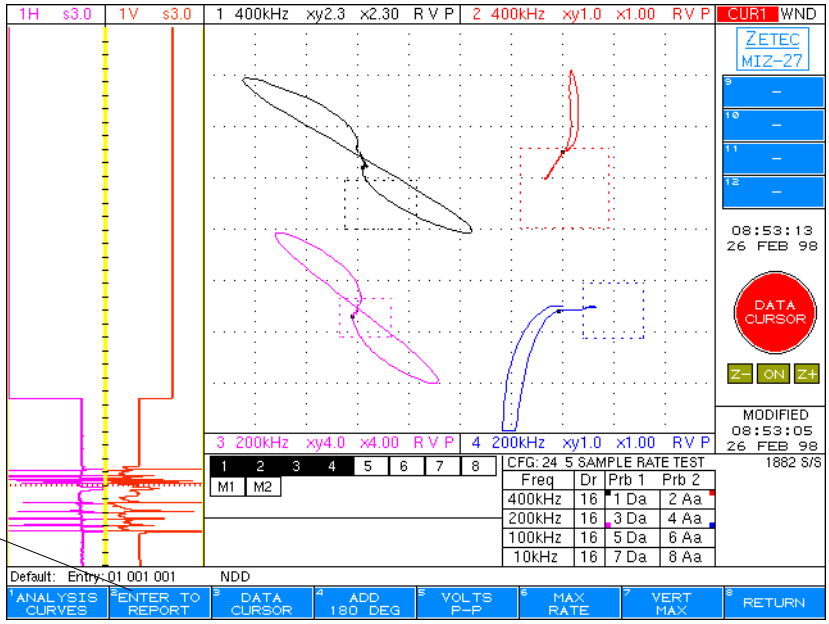
Depending on the number of channels and the sample rate, either more or less data may be available for review than appears on the screen during acquisition.

Signal Measurements and Reports

Signal measurements are useful when calibrating your setup with an eddy current standard, as well as when reviewing or analyzing data. In review mode, you can apply several types of measurements to a selected signal, either manually or automatically. And when a disk is configured with the MIZ-27, you can create a list, or report, of measurements that you save to disk along with the tube information. Report entries are stored as files with the ".rpt" file extension. For information about recalling report files from disk, see page 4-91. This section details the following tasks:

- ❒ **Analysis Curves**
- ❒ **Measuring a signal**
- ❒ **Creating a report**

Figure 4-19. Measurement Functions



Report button displays only when disk functions are available

The MIZ-27 only measures the signal in Display 1 of the X-Y Display area. The **DATA CURSOR** menu button returns the instrument control to the CUR1 field for quick access to data when measuring multiple indications.To access the measurement functions shown in figure 4-19, press the **MEASURE** button.

Analysis Curves

The MIZ-27 bases its signal measurements on an Analysis Curve using phase angle or voltage values. The curve correlates these values to a percentage of wall loss. By default, the instrument uses the Zetec ZQA 4.1 angle curve, unless other values are selected. (The ZQA 4.1 curve assumes data acquisition using the "optimum test frequency" for the material.) For the most accurate measurements, you can modify the curve values according to measurements on a specific calibration standard.

Four calibration curve types are available—Angle Curve, Volt Curve, Angle Hi-Res, and No Curve. The Angle Curve uses phase angle information to determine the percent of wall loss for the signal of interest. The Volt Curve is based on signal magnitude. The Angle Hi-Res is available for conductivity and thickness measurements as well as material sorting applications that need higher measurement resolution information. With No Curve selected, the percent of wall loss for the signal of interest is not displayed as part of the measurement.

In conjunction with Analysis Curves, the Auto Measure feature can be used for automatic display of the measured signal. For more information about Auto Measure, see page 4-45.

In the Analysis Curves menu (see figure 4-20) you:

- **Select the channel and curve type**
- **Adjust values according to calibration standard**

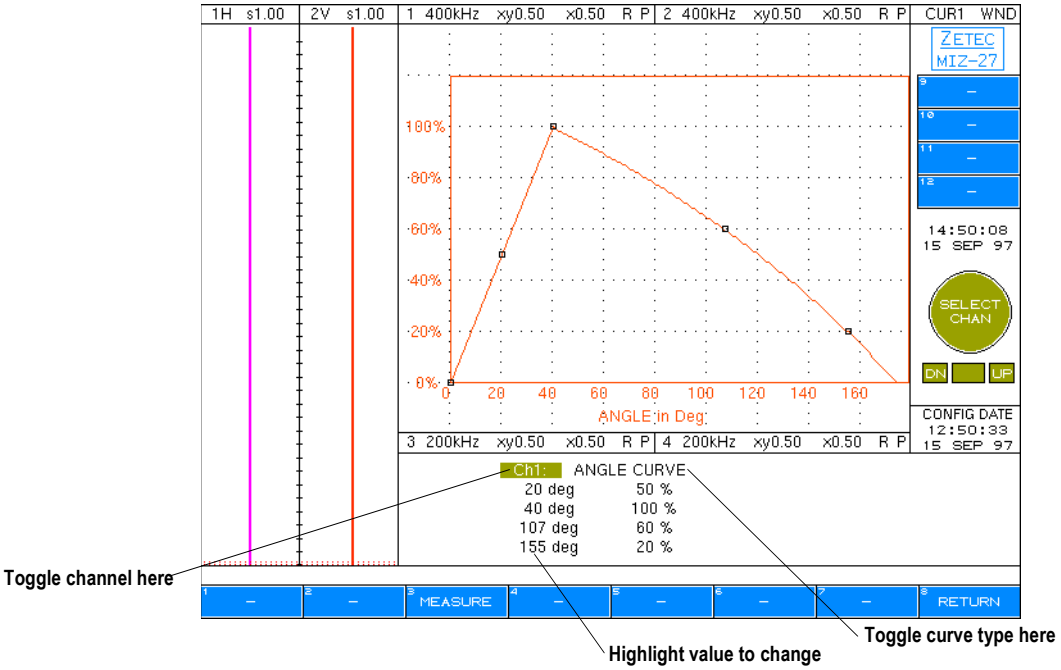
Use the following steps to modify the Angle Curve values:

Step 1: Go to the Analysis Curve menu.

Step 2: Highlight the channel field and toggle to the channel that is configured with the optimum test frequency.

Step 3: Highlight the field for curve type and toggle to Angle Curve.

Figure 4-20. Analysis Curves



Step 4: Highlight the actual values and adjust to match those of your calibration standard.

Step 5: Press **RETURN** to exit the Analysis Curves menu and return to the Measurement menu.

After you select an analysis curve, complete the following steps to make a basic “Volts Peak-to-Peak” measurement:

Step 1: In the strip chart, move the data cursor to locate the signal of interest.

Step 2: Go to Display 1 and select the channel for measurement.

Step 3: Press the **VOLTS P-P** menu button. The MIZ-27 measures the signal on Display 1 and displays the measurement in the comment line along with the tube information.

If the MIZ-27 is configured for disk recording, you can choose to save the measurement as a report entry using **ENTER TO REPORT** menu button before continuing on to the next signal of interest. See *Creating a Report, on page 4-44* for more information.

Measuring a Signal

The MIZ-27 offers many methods to measure a signal. The Measurement menu's tools are used for signal review of data in the data buffer or data recalled from disk storage. Measurement results can be stored to a report file (see *Creating a Report, on page 4-44*). The following descriptions summarize all the measurement types available with the MIZ-27's menu buttons:

NDD. Each time you enter the Measure menu, NDD[1] displays as the default measurement. If no other measurement type is made, NDD is entered to the report for that data location when you press the **ENTER TO REPORT** menu button.

Add 180 Degrees. Adds 180 degrees to the measurement on screen.

Volts P-P. Determines the maximum signal amplitude in any phase. Displays the amplitude and angle.[2]

Adjust Angle. Once you press **VOLTS P-P**, the HulaPoint becomes a manually operated electronic protractor and displays the angle between two selected points. **ADJUST ANGLE** enables you to use the HulaPoint to vary the angle.

Max Rate. Determines the greatest rate of change. Displays the amplitude and angle. Max Rate works by determining the greatest change over three data points. Therefore, Max Rate is affected by slow pull speeds or a sample rate that greatly oversamples the flaw.

Vert Max. Determines the maximum signal amplitude in the vertical direction only. Displays the amplitude.

1. NDD commonly indicates, No Detected Defect.
2. If the displayed channel is changed after a Volts P-P measurement is performed, the values for the new channel will be displayed from the same point in time as was the original channel. To obtain the true Volts P-P for the new channel, touch Volts P-P again.

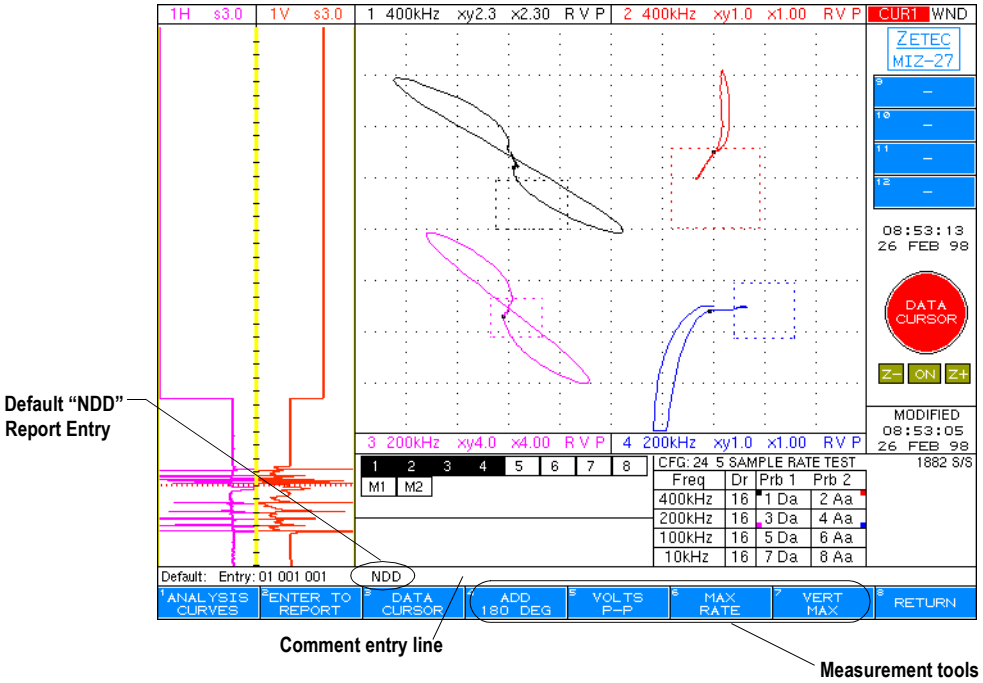
Creating a Report

The report feature is only available when the MIZ-27 is configured for disk recording. When available, the **ENTER TO REPORT** menu button records the measurement result and the tube ID to the storage media. The format for each entry uses the following convention:

```
Entry ID  ROW  COL VOLTS  DEG PCT Comment
  1   04  000  004 0.56    0  34
  2   04  000  004 0.27    0  24
  3   04  000  004 0.82    0  40
  4   04  000  001 0.84    0  55
  5   04  000  001 0.52    0  42
  6   04  000  001 0.21    0  22
  7   04  000  003 0.99    0  59
  8   04  000  003 0.40    0  36
  9   04  000  004 0.70    0  50
```

A forty-character comment can be added to each entry using an external keyboard. By default, the MIZ-27 identifies a report entry with the ".rpt" file extension. Recorded report entries are recalled using the Directory List. For more information about how to set up disk recording, see page 4-83.

Figure 4-21. Measure Menu



To create a report:

Step 1: Measure the flaw of interest using the measurement tools.

Step 2: When the measured signal represents the flaw analysis you want to report, press the **ENTER TO REPORT** menu button.

To create a report comment:

Step 1: When the measured signal represents the flaw analysis you want to report, use an external keyboard to type a comment using up to 40 characters.

Step 2: Press the **ENTER TO REPORT** menu button.

To create an NDD entry for a tube without flaws:

Step 1: Without applying a measurement, press the **ENTER TO REPORT** menu button.

A report file can be recalled and printed with the MIZ-27. Or, you can import a report file to a PC using Microsoft Excel for editing and printing.

Auto Measure

Auto Measure provides a real-time measurement of each data point as you acquire data or scroll the data cursor through a data file. Auto Measure only measures data for the channel shown in Display 1.

Measurements are based on phase or volts according to the selected Analysis Curve. The Angle Hi-Res is available for Auto Measure applications that require a higher resolution of phase angle information, such as, conductivity and coating thickness measurements and material sorting. Auto measure relies on set up and selection of an Analysis Curve. For information about how to set a curve, see page 4-41.

Complete the following steps to enable the Auto Measure feature:

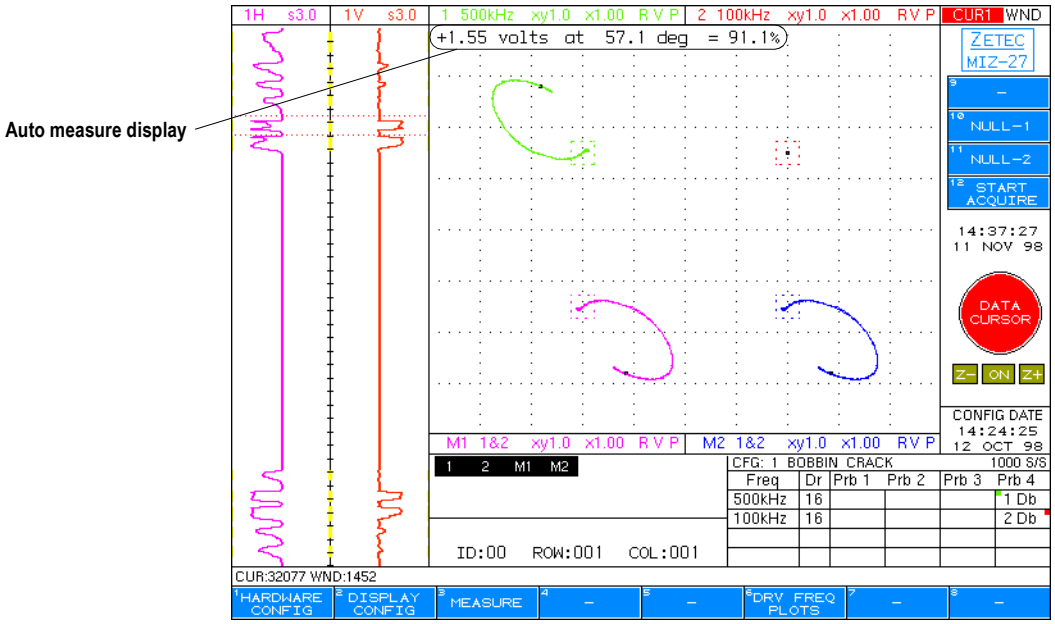
Step 1: Go to the **MEASURE** menu.

Step 2: Go to the **ANALYSIS CURVES** menu.

Step 3: Set the curve type and values according to your test standard. For more information about Analysis Curve setup, see page 4-41.

Step 4: Press the **MEASURE IS MANUAL** menu button to enable the Auto Measure mode. This action changes the button label to **MEASURE IS AUTO**.

Figure 4-22. Auto Measure



Step 5: Press the **MEASURE** menu button.

Step 6: Press **DATA CURSOR** to move the HulaPoint control back to the cursor field.

Step 7: Use the HulaPoint to scroll through the data. As you scroll, measurements update at the top of the MIZ-27 display as shown in figure 4-22.

To use Auto Measure during data acquisition:

Step 1: Press **Return**.

Step 2: Press **Start Acquire**. As parts are measured, the active data point of Display 1 is shown on the screen.

Probe Speed Check

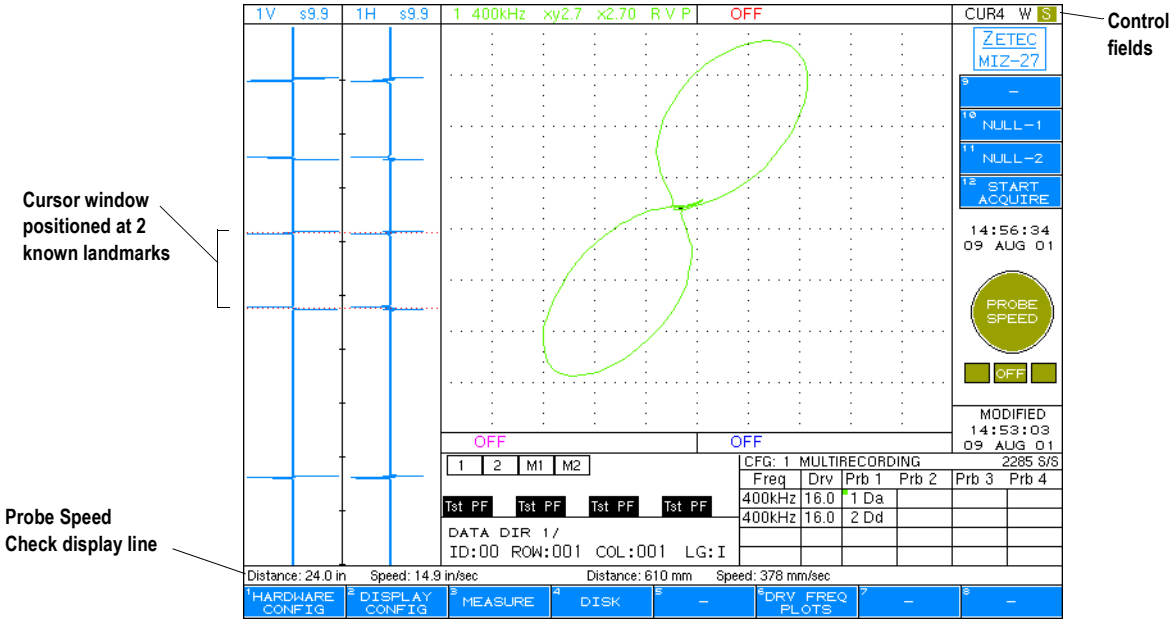
The Probe Speed Check feature allows the operator to review the probe speed after acquisition. After defining a known distance between landmarks in the data file, the operator can scroll through data and the MIZ-27 calculates the probe's travel distance and speed. This information updates on the MIZ-27 display as the data cursor moves. To set up the Probe Speed Check, complete the following steps:

Step 1: Move the HulaPoint cursor to the **CUR** control field.

Step 2: Press the middle HulaPoint button to activate the HulaPoint's local control of the data cursor position.

Step 3: Position the bottom line of data cursor window on a known landmark, such as a tube support or the top of the tube sheet, as shown in figure 4-23.

Figure 4-23. Probe Speed Check



Step 4: Press the middle HulaPoint button to deactivate the HulaPoint's local control.

Step 5: Move the HulaPoint cursor to the **W** control field.

Step 6: Press the middle HulaPoint button to activate the HulaPoint's local control of the cursor window size.

Step 7: Position the upper line of data cursor window on another known landmark.

Step 8: Press the middle HulaPoint button to deactivate the HulaPoint's local control.

Step 9: Move the HulaPoint cursor to the **S** control field.

Step 10: Press the middle HulaPoint button to activate the HulaPoint's local control for Probe Speed Check.

Step 11: Press the HulaPoint to adjust the distance readout in the status bar to the known distance between the two landmarks.

The MIZ-27 is now able to calculate the probe speed and update as the distance field changes.

Enhanced Signal Setup

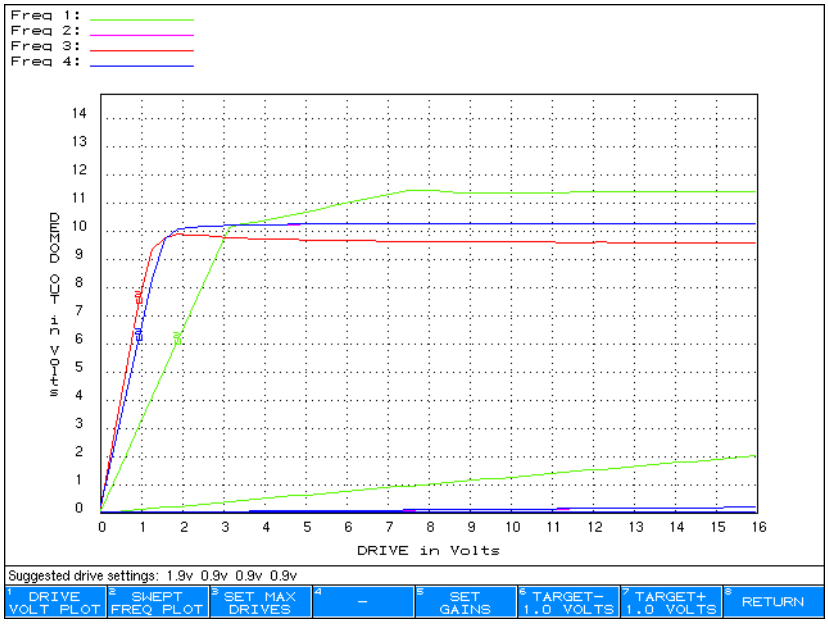
The MIZ-27 offers five enhanced signal setup functions that aid you to determine the best settings for drive, frequency, and gain for a test. These semi-automatic signal setup features are located in the **Drive Freq Plots** submenu.

- **Drive Volt Plot**
- **Set Max Drives**
- **Swept Frequency**
- **Set Gains**
- **Materials List**

Drive Volt Plot

To help you determine the best drive voltage setting, a drive voltage plot is available. Pressing the **DRV FREQ PLOTS** display button in the Setup/Review menu opens this submenu. With this function, you can display the demodulator circuit output in volts with reference to the increase of drive in volts for all channels. All active channels are plotted. The channel plot colors are grouped by frequency. For example, all channels in frequency 1 are the same color.

Figure 4-24. Drive Voltage Plot



For well-balanced probes, the “Demod Out” will remain below the 10 volt saturation level, and the suggested drive will be 16 volts. Probes that do approach and go into saturation, a conservative drive voltage setting will be displayed in the comment section. The suggested drive voltage is also indicated on the graph at approximately six volts on the “Demod Out.”

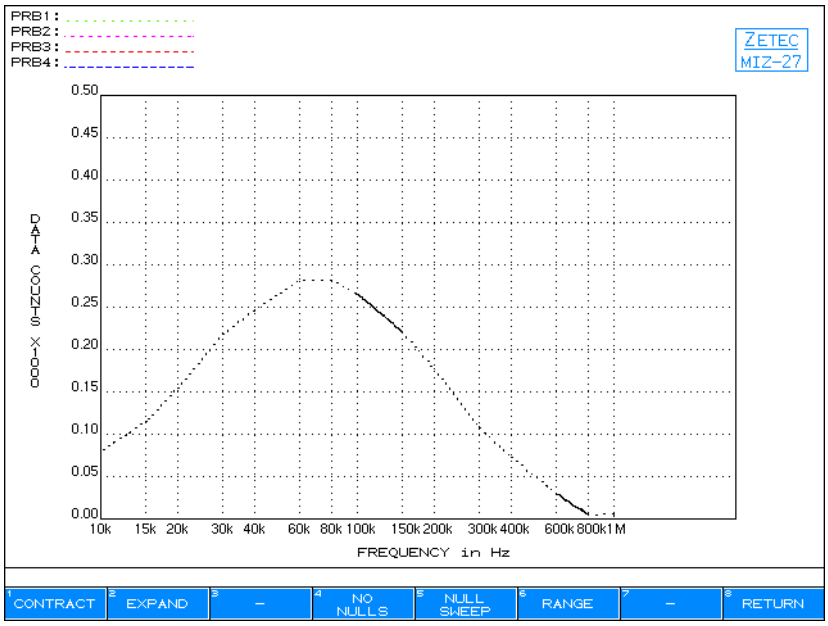
Set Max Drives

The **SET MAX DRIVES** button is located in the **DRV FREQ PLOTS** submenu of the Setup/Review menu. Pressing the **SET MAX DRIVES** button sets the drive voltage on the configuration to the suggested drive settings. If the instrument’s recommended drive voltage looks too high or too low according to the plot, the drive can be set in the Hardware Configuration menu.

Swept Frequency Plot

The Swept Frequency Plot function is located in the **Drive Freq Plot** submenu of the Setup/Review menu. This function provides a real time display of the probe’s performance over a frequency range of 100 Hz-30 kHz, 1 kHz-300 kHz, or 10 kHz-1 MHz as shown in figure 4-25. The **RANGE** menu button enables you to select between the ranges. The performance is shown in Data Counts, which is the value of the raw data at the A/D Converter. The **EXPAND** and **CONTRACT** menu buttons select the Data Count scale. The Swept Frequency Plot can be used as an aid in selecting test frequencies for connected probes 1-4. Each probe is plotted in a separate color that is identified in the upper left corner.

Figure 4-25. Swept Frequency Plot



The **NO NULLS** menu button clears the null or balance values for all the frequency data points. The **NULL SWEEP** menu button electronically balances the probe when it's in a "known good" test position. The Null Sweep function should place the plots at the baseline position. To examine the operating point of the test probe:

Step 1: Place the probe in a known good or balance position.

Step 2: Press the **NULL SWEEP** menu button.

Step 3: Move the probe to a flaw or reject position.

Step 4: Use the **CONTRACT**, **EXPAND**, and **RANGE** menu buttons to achieve the best Swept Frequency display.

Set Gains

The **SET GAINS** and **TARGET VOLTS** ± buttons are located in the **DRV FREQ PLOTS** submenu of the Setup/Review menu. These functions are used to automatically set the gain of the instrument with a probe and a known material or indication. Before setting the gains the target voltage must be set using the **TARGET VOLTS** – and **TARGET VOLTS** + buttons. The MIZ-27 adjusts the gain and drive to set the signal amplitude to the desired target voltage.

To set gains:

Step 1: Place the probe on a known good (defect free) material.

Step 2: Press **NULL**.

Step 3: Move the probe to the known defect, or area of interest.

Step 4: Press **SET GAINS**.

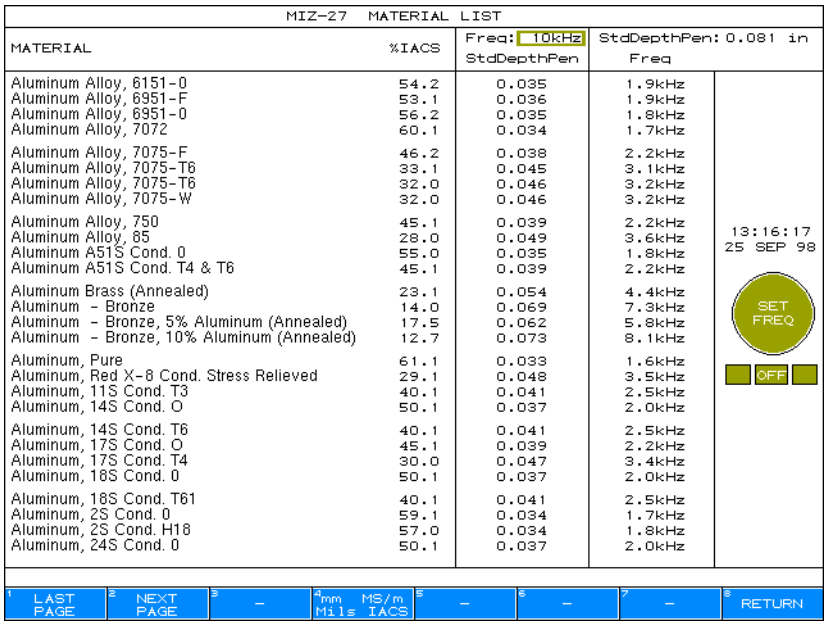
Following the gain setting, it's required to place the probe on good or defect free material and press **NULL**.

Material List

The MIZ-27CT provides a list of materials with a cross-reference table to %IACS or MS/m. To view the Material List menu shown in figure 4-26, go to the **UTILITIES** menu and press the **MATERIAL LIST** menu button.

The list has two control fields that help you determine the best test frequency or depth of penetration for a certain material. With the target material highlighted, use the HulaPoint to adjust the "frequency" control field. As the frequency changes, you'll see the display update the value for depth of penetration. If you adjust the "depth of penetration" control field, the display updates the test frequency requirement for all materials.

Figure 4-26. Material List



To view additional pages in the list, use the **LAST PAGE** and **NEXT PAGE** menu buttons. You can also easily switch measurement units between %IACS-inches and MS/m-millimeters with the menu button.

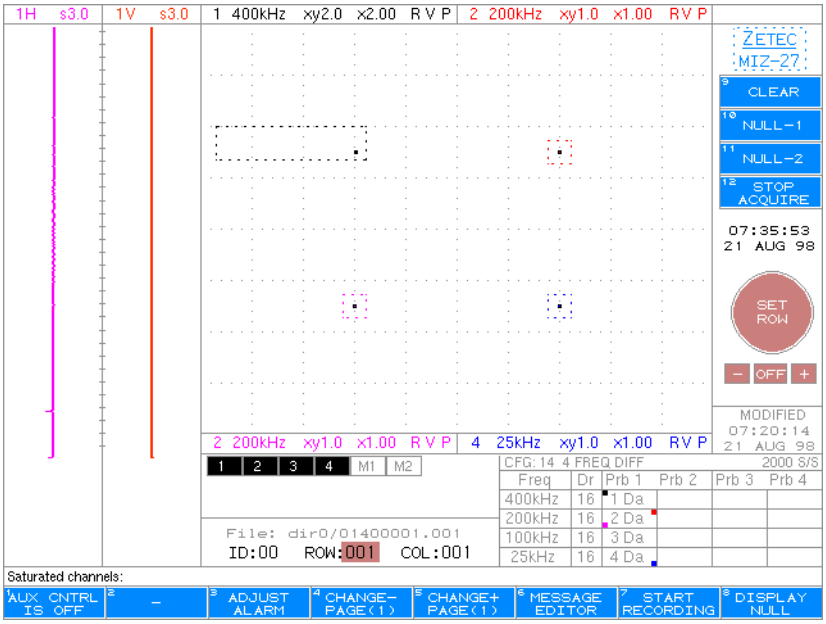
Acquire Data Mode

Whenever you press the **START ACQUIRE** function button, the MIZ-27 goes to the Acquire Data mode shown in figure 4-27. At this time, the instrument nulls, the strip charts start to scroll, and the instrument is ready to read back data from the probe. During data acquisition, tester functions are limited to what is needed to acquire data:

- **Alarm adjustment**
- **Message file creation**
- **Summary file creation**
- **Data recording**
- **Display paging**
- **Display null**
- **Auxiliary control on/off**

When you press the **STOP ACQUIRE** function button, data acquisition stops and the instrument goes to the Setup/Review mode.

Figure 4-27. MIZ-27CT—Start Acquire Mode



The following descriptions explain each function available in the Acquire Data mode.

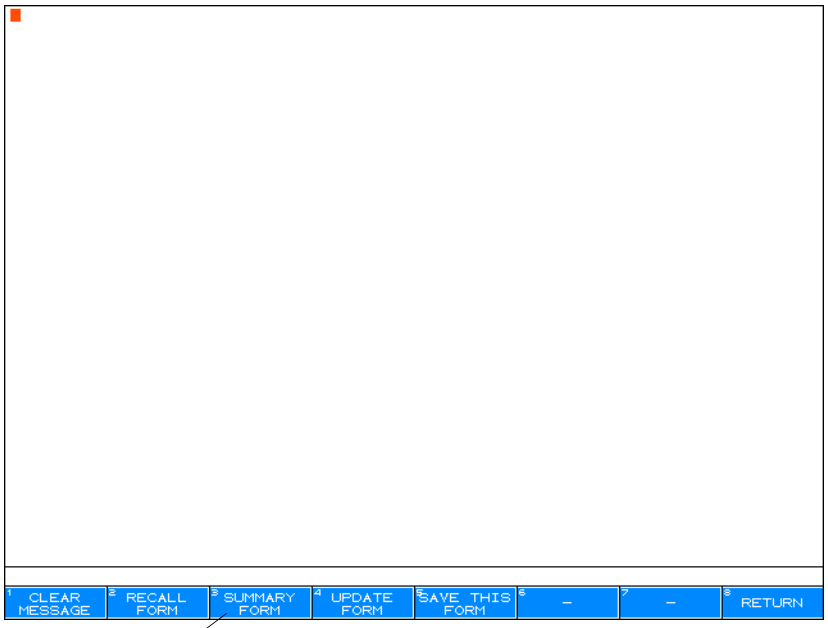
Adjusting Alarms

Alarm size and location are adjustable during data acquisition in the Start Acquire mode or the Display Configuration menu (Setup/Review mode). For more information about how to adjust alarms, see page 4-33.

Creating Messages

When used in conjunction with an external PC keyboard, the Message Form lets you create a message file in the same directory as the data files and save that message with the raw data file. To access the Message Form, the MIZ-27 must be in the "Start Acquire" mode. Press the **MESSAGE EDITOR** menu button to open the menu shown in figure 4-28.

Figure 4-28. Message Editor



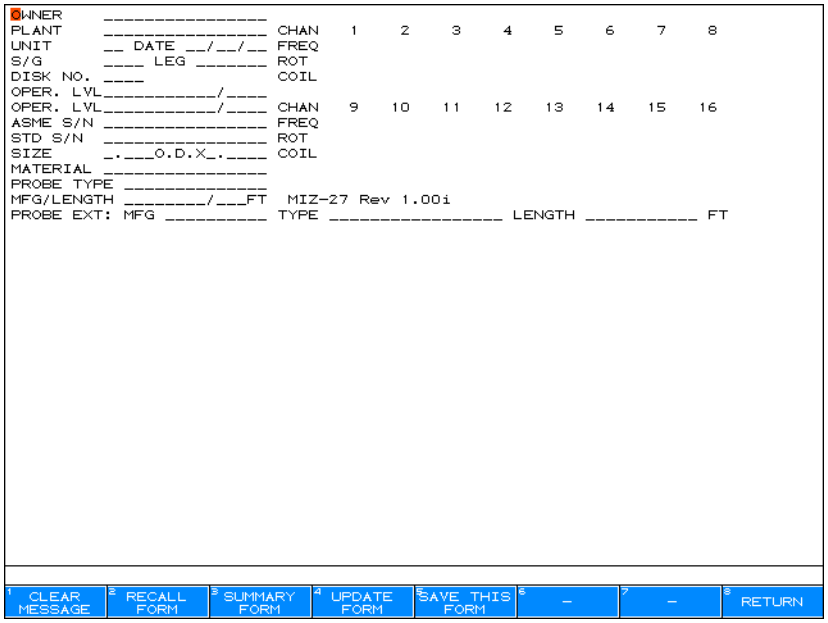
After typing the message with an external keyboard, use the **SAVE THIS FORM** menu button to save the message file to disk. By default, message files are saved with the "MSG" file extension. You can easily review the Message files with the **RECALL FORM** menu button.

Writing Summaries

The Summary Form is a template for documenting the data recorded on disk. The format of the Summary Form is taken from the ASME Boiler and Pressure Vessel Code, Section XI, 1983 Edition. After initial use, the form displays the last summary that was recorded. At this time, the summary can be repeated, modified, or completely rewritten before saving the form.

After typing information into the Summary Form with an external keyboard, use the **SAVE THIS FORM** menu button to save the file as part of the message file. By default, message files are saved with the "MSG" file extension.

Figure 4-29. Summary Form



Recording Data

When the MIZ-27 is configured with a disk for data storage, you can direct the MIZ-27 to start and stop data recording from its front panel button. For more information about how to set up disk recording, see page 4-83.

Press the **START RECORDING** button to begin the recording process. The word, "recording," flashes, as well as an animated "reel-to-reel" symbol, to indicate that data is recording to the media. Press the **STOP RECORDING** button to end the recording process. The HulaPoint control defaults to the file name field to increment or decrement numbering for production testing.

For quick data review, use the **LAST/THIS/NEXT FILE** buttons in the Disk menu. For more information on data review, see *Directory List, on page 4-91*.

When recording data, the **MARK FILE** menu button is available. The Mark File button is used to "tag" a file as a tube of interest for later review. The file is marked with an asterisk in the Directory List. The MIZ-27 offers maximum flexibility for file name labels during data recording. To customize your file labels, see page 4-94.

Data Time Stamp. The Greenwich Mean Time (GMT) setting corresponds with the world time center located near London. The "Hours west of GMT" control field sets the time zone where data is being recorded. This time stamp allows data to be reviewed in any time zone with the proper time. The time zone is set in the Utility Menu.

Display Paging

To expand the total number of channels that you can view, the "Page" feature lets you quickly toggle between five display screens (up to 16 channels) using the **CHANGE PAGE–/CHANGE PAGE+** menu buttons. All display types can be setup on four of the display pages with one page being dedicated to an eight strip chart display.

Auxiliary Control ON/OFF

Eight analog outputs are available, which allow up to four XY pairs to be recorded on an instrumentation recorder or paper charts. The recorder controls are active when recording is selected. During data acquisition, the **AUX CNTRL** button (F1) turns the recorder controls on and off. For more information about analog outputs, see 4-133.

Display Null

While acquiring data, the Display Null function centers the data back on the original hardware null point. (The Display Null does not repeat the Hardware Null function.)

Component Test Features

Eddy current testing is ideal for high-speed inspection and, because it is nondestructive, supports 100% inspection of component productions. To support component testing with eddy current, the MIZ-27CT incorporates up to four Industrial I/O connections for two-way communication with a Material Handler, as well as test status indication. Flexible alarm configurations allow logic combinations to meet any test situation.

Industrial I/O and Logic Alarm Configuration

The Industrial Input/Output interface for the MIZ-27CT instrument comprises the following three connectors that enable communication with an external controller:

- **Logic I/O Connector**—provides interface to five opto-isolated alarm outputs and two delayed outputs
- **Industrial I/O 1/2 Connector**—provides two opto-isolated test enable inputs, opto-isolated accept and reject outputs, and drive for three LEDs that indicate status for enable, accept, and reject at each input
- **Industrial I/O 3/4 Connector**—provides two additional opto-isolated test enable inputs, opto-isolated accept and reject outputs, and drive for three LEDs, which indicate status for enable, accept, and reject

Figures 4-30 and 4-31 illustrate the equivalent circuits for all optically coupled inputs and outputs:

Figure 4-30. Input Circuit

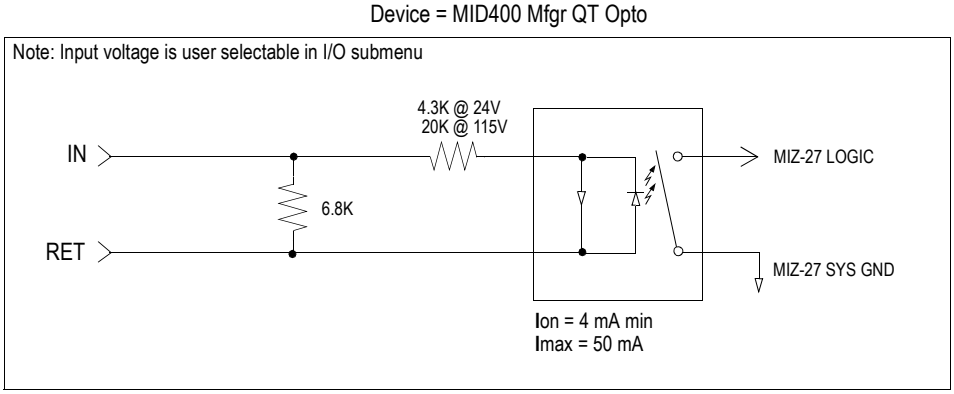
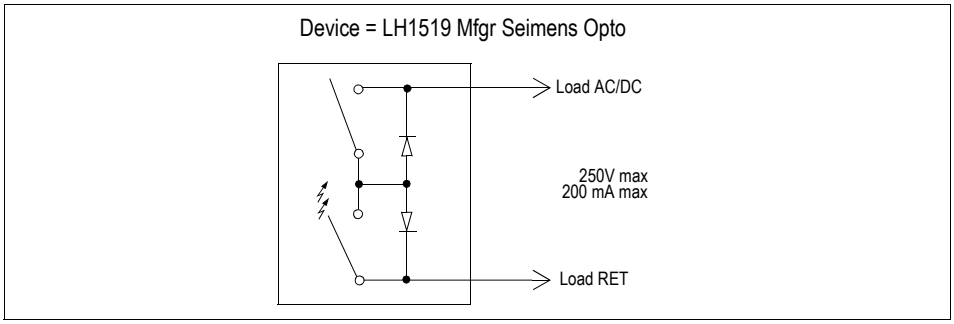


Figure 4-31. Output Circuit

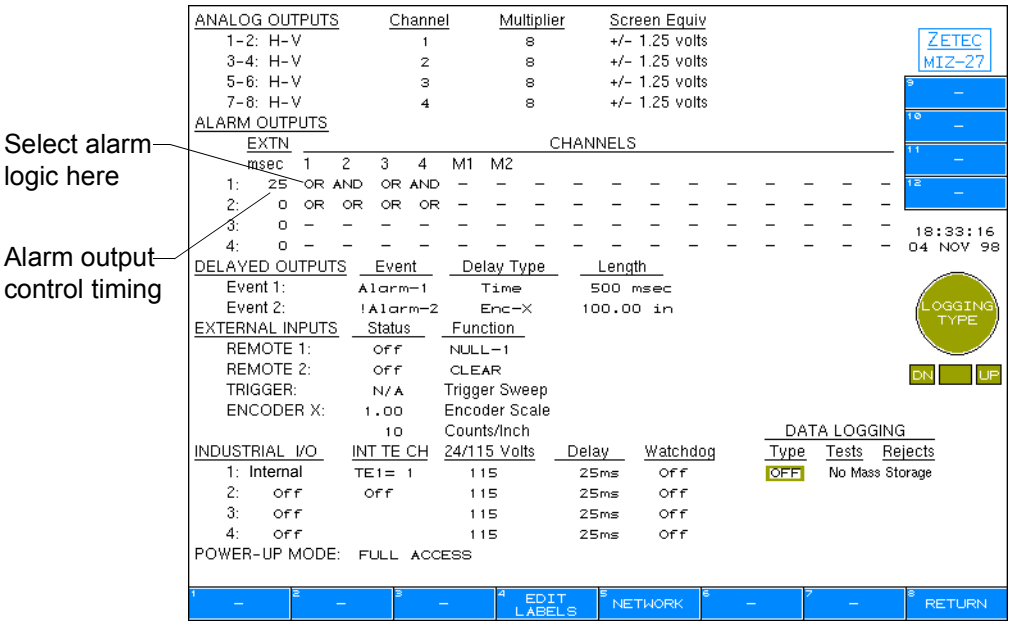


Logic I/O Connector

The MIZ-27CT rear panel Logic I/O connector provides seven optically-isolated outputs—Alarm 1 to 4, Combined Alarm, and Delayed Outputs 1 & 2.

ALARM OUTPUTS. The alarm outputs are set up in the Hardware Configuration menu's I/O Configuration submenu. Alarm outputs can each combine any of the 16 possible probe and mix channel alarms in an "AND" or "OR" logic manner as shown in figure 4-32. If any one alarm channel asserts, the logical Combined Alarm output will assert as well.

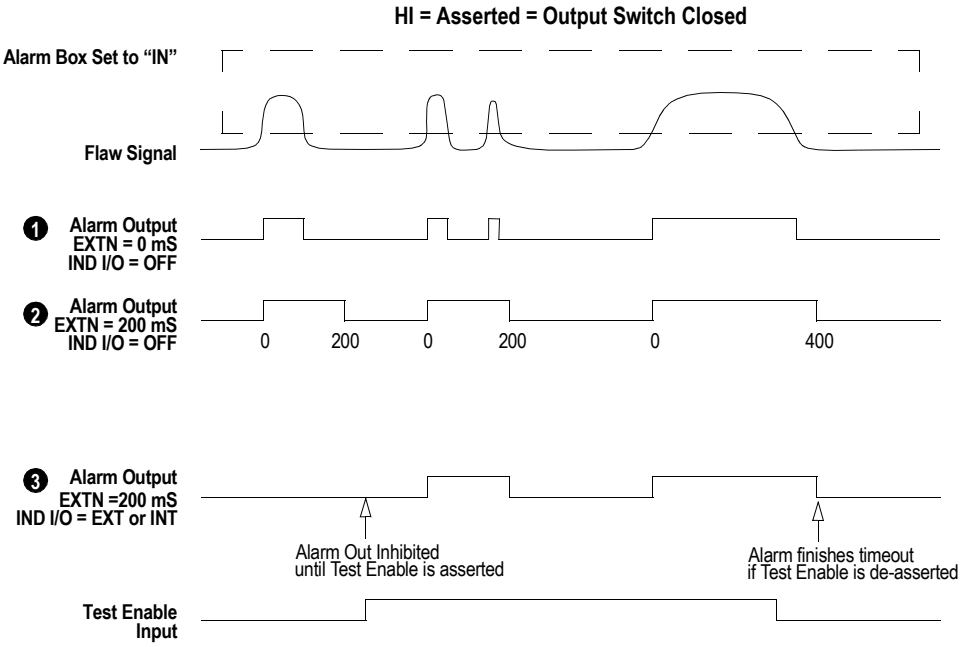
Figure 4-32. I/O Configuration with Alarm Logic



The Logic I/O alarm outputs continuously track the data. If a reject condition occurs, the output is asserted. When the reject condition is removed, the alarm is de-asserted. The minimum assertion time is set in the EXTN column. The alarm will be asserted in increments of the number of milliseconds entered. If the number is set to zero, the alarm will exactly follow the duration of the eddy current signal causing the alarm.

Alarm outputs 1-4 run continuously when the corresponding Industrial I/O selection is set to “Off.” Otherwise, the alarm output is gated by the test enable signal. The Industrial I/O 1/2 and 3/4 section on page 4-62 discusses the test enable selections in detail. Figure 4-33 shows an alarm output in three different setup situations. For clarity in illustrating the timing, the flaw signal that causes the alarm is shown Y-versus-Time Mode.

Figure 4-33. Alarm Output Timing



Delayed Outputs. The Delayed Outputs fields set up two optically-coupled delayed outputs for situations where it is preferable to delay an output signal.

The Event column provides selection for one of several sources for the delayed signal. "Alarm 1 & 2" and the inverted "!Alarm 1 & 2" refer to the signals set up in the Alarm Output fields. Pass and Fail 1 & 2 are the signals set up in the Industrial I/O fields.

The primary difference between alarm and pass/fail signals is:

- **alarms** track the presence of the eddy current indication as it moves in and out of the alarm box
- **pass/fail** signals latch the accept/reject condition

The Delay Type column allows selection of either an encoder measurement or a time delay. If an encoder is used, a data channel must be assigned to an encoder. See page 4-10 to page 4-15 for information about how to assign channels. The encoder must be scaled as well, in the External Inputs section of the I/O menu. Set the Encoder Scale to the preferred divisor of the encoder count. For example, if the encoder is 100 counts/revolution and you

need 10 counts, set the Encoder Scale to 10.00. Set the Counts/Inch according to the scaled count. Figures 4-34 and 4-35 illustrate delayed outputs based on time and encoder values. In these figures, Alarm 1 has been designated as the source for Delayed Output 1.

Figure 4-34. Time-Based Delayed Output

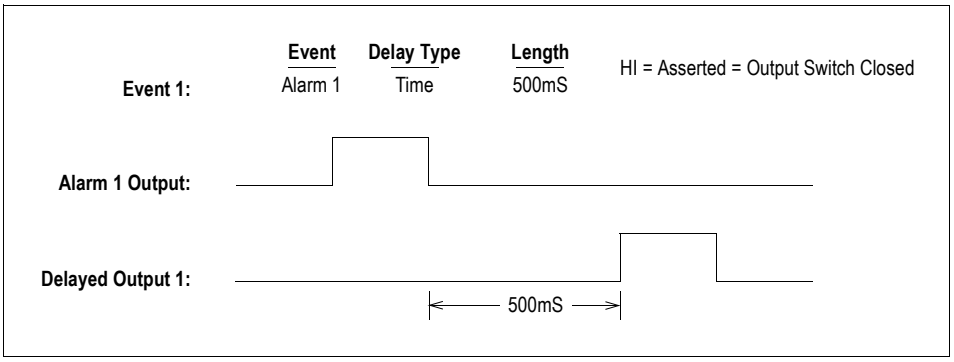
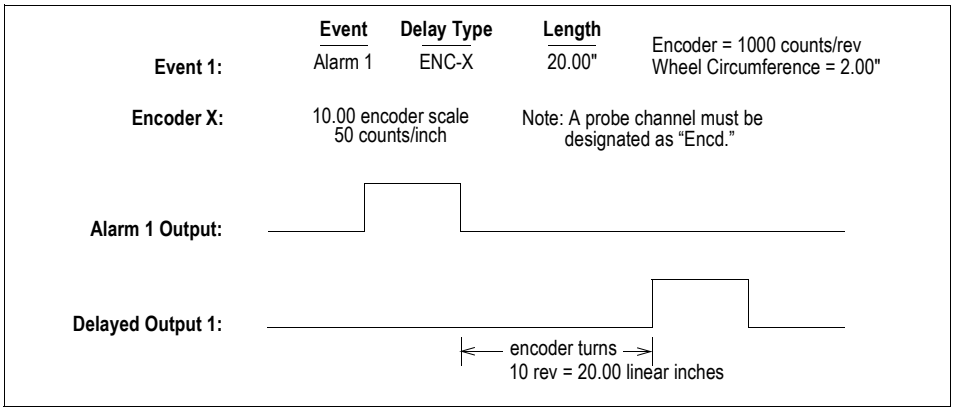


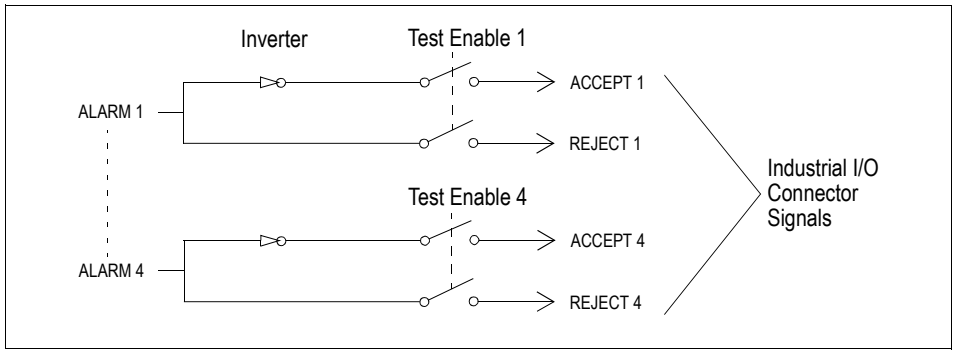
Figure 4-35. Encoder-Based Delayed Output



Industrial I/O 1/2 and 3/4

The MIZ-27CT provides four independent industrial I/O PLC interface controls. Each I/O section is comprised of a Test Enable input and a Pass and Fail Output. The alarm signals selected in the Alarm Outputs menu are controlled by the Industrial I/O as shown in figure 4-36.

Figure 4-36. Industrial I/O Alarm Output Control



Separate Test Enable signals for each I/O allows for four independent tests by the MIZ-27. The Test Enable signals are selected in the IND I/O ENABLE column at the bottom of the I/O screen.When an Industrial I/O is set to Off, the Accept/Reject lines will also be off (open circuit). When an Industrial I/O is set to EXT WIND, EXT EDGE or INT, a test enable signal is required to assert the Accept/Reject lines. In addition, each I/O can be assigned a test delay, a test enable input voltage, and a Watchdog timeout. The test enables can also be set to log test results to internal RAM or to disk (see page 4-70 for more information about Data Logging).

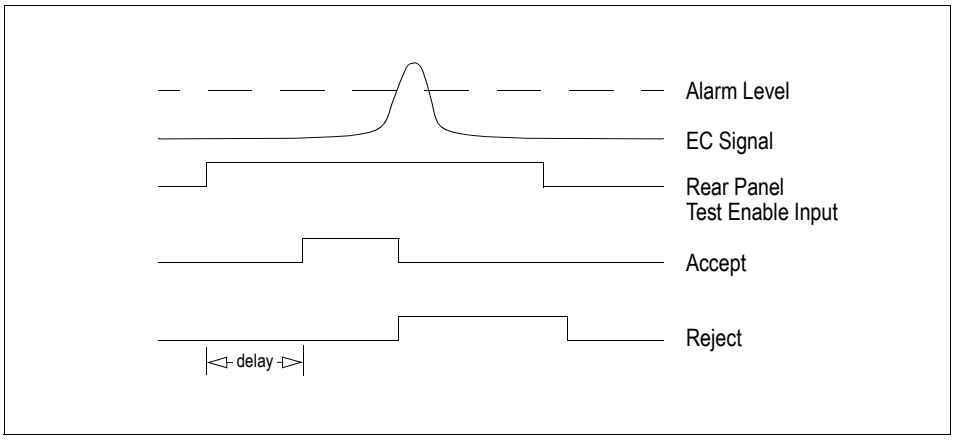
All Logic Alarm Outputs and Industrial I/O outputs will set to the Reject state unless the instrument is acquiring data in the Start Acquire menu. This is a failsafe feature to insure that parts are properly tested.

Test enable signals function as follows:

EXT WIND (External Window). In the Window mode, an external test enable signal from the rear panel Industrial I/O connector sets a “window,” during which data is continuously sampled. The Accept/Reject lines will set to ACCEPT until a reject condition occurs. If a reject occurs, the lines latch in the reject state, regardless of the duration. Both the Accept and Reject lines will de-assert when Test Enable is removed.

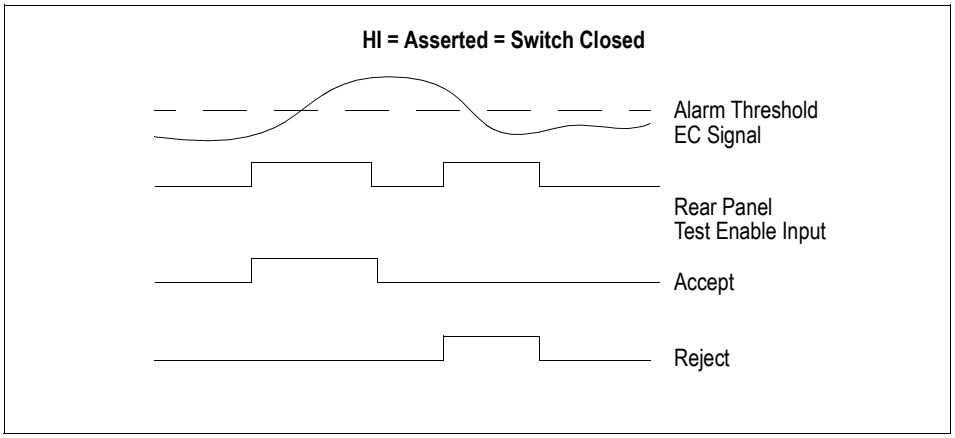
For the External Enables, the Delay adjustment sets a time interval between the arrival of the test enable signal and the performance of the test. This provides a convenient means of allowing for probe settling, without the necessity of making a change in the PLC program. If a delay is selected, the MIZ-27 will wait the delay time before beginning the test. Figure 4-37 illustrates the External Window mode using a non-zero delay.

Figure 4-37. External Window Timing



EXT EDGE (External Edge). The external test enable signal from the rear panel Industrial I/O connector causes a single sample to occur at the moment Test Enable is asserted. The Accept/Reject lines will set accordingly and remain asserted until Test Enable is removed. Figure 4-38 illustrates both an accept and a reject result with the delay set to zero.

Figure 4-38. External Edge Timing



INTERNAL. The Internal Test Enable uses the eddy current signal itself to trigger the test. The Internal Enable can be assigned only to I/O 1 and 2.

The Internal Enable functions like a built-in proximity switch. It uses a selected alarm area that is set large enough to indicate the presence of any part, whether it is a reject or an accept. The peak value of the signal will be stored, and compared against the alarm limits at the end of the test. The Accept or Reject line will be set for the duration designated by the Delay time.

To use the Internal Test Enable, both the Industrial I/O and the test enable alarm area need to be set up, which are explained in the following steps.

Internal Test Enable I/O Setup. Use the following steps to set up the Internal Test Enable.

Step 1: Set the **IND I/O ENABLE** column to Internal.

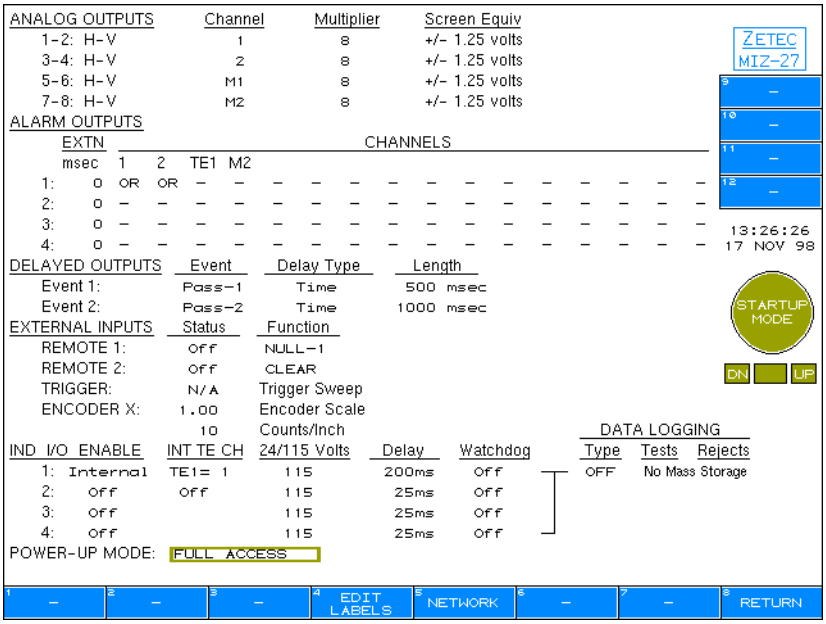
Step 2: Under **INT TE CH** (Internal Test Enable Channel), select the probe channel that will be used to detect part proximity.

This probe channel is independent of the channels used in the Alarm Output assigned to the I/O. It can be one of the same channels, or it can be different. For instance, you can use a low frequency channel to detect proximity and a higher frequency channel to perform the test.

Step 3: Set the **DELAY** time for the duration that you want to have the accept/reject signal asserted.

If a new test is performed before the delay times out, the accept/reject lines will de-assert, then set again with the results of the new test. Figure 4-39 is an illustration of a setup for a single-coil, two-frequency internal enable test:

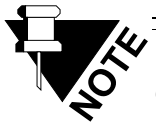
Figure 4-39. Internal Test Enable



Internal Test Enable Alarm Area Setup. Use the following steps to set up the Internal Test Enable Alarm Area.

Step 1: After the Industrial I/O menu is set up, return to the Setup/Review menu.

Step 2: Assign the internal test enable channel (TE1 or TE2) to one of the four displays (see page 4-8, Displays 1-4).



TE1 and TE2 replace MIX1 and MIX2. As a result, you cannot display the Mix when using the Internal Test Enable.

Step 3: Start acquisition, and verify that Snapshot/Realtime is set to **REALTIME**.

Step 4: Set the scale and rotation so that the test enable signal deflects horizontally to the right as the probe is brought to the part.

Step 5: Go to the **Adjust Alarm** menu.

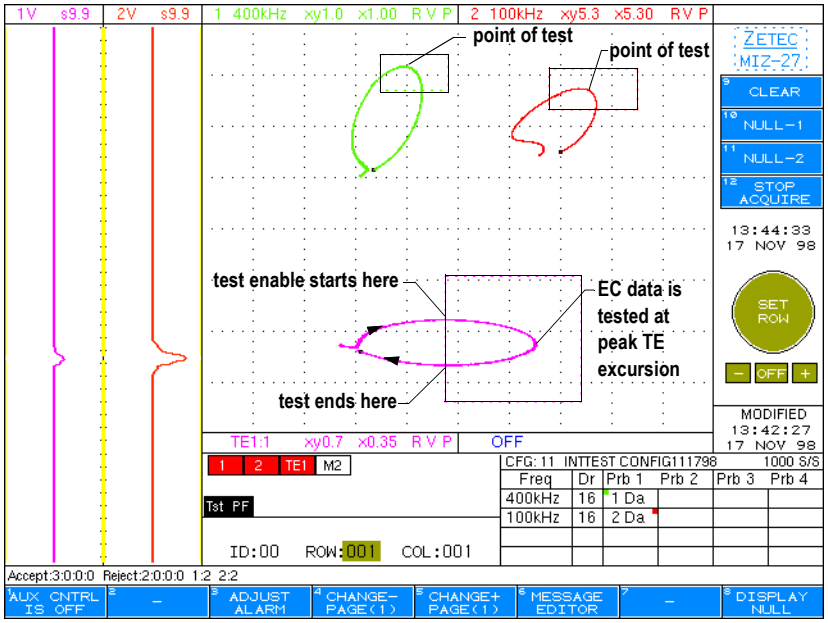
Step 6: Select the TE channel, and set the alarm to ON and OUT.

Step 7: Size the alarm box so that the signal is encompassed as the probe is brought into proximity of the part.

Step 8: Set up the alarms for the probe channels included in the Alarm Output menu corresponding to the Industrial I/O channel. Alarms can be set up either manually (page 4-32) or automatically as described in Alarm Sizing (page 4-77).

In the internally-enabled type of testing, the probe alarms will generally be set to "OUT." In this case, the reject condition occurs when the eddy current reading lies outside of an acceptable area. The test is actually performed when the test enable signal exits its alarm area; however, the data that is tested corresponds to the readings present at the rightmost peak excursion of the test enable signal. Figure 4-40 shows the signals and alarm boxes for a two-frequency, single coil test. The bottom signal is being used for the test enable, and the top signals are used for flaw detection.

Figure 4-40. Internal Test Enable



NOTE

The jitter in a signal from slow-moving parts may trigger a test when the part "enters" the alarm area, rather than on the peak. Lower the instrument sample rate (see page 4-20) to reduce this possibility. A sample rate of 400 is generally acceptable for a part moving 12 inches per second.

Watchdog Timer. Watchdog Timer is a probe/system monitoring function. The timer is set in the "watchdog" column in the Hardware Configuration I/O menu. The Watchdog Timer works only when the I/O selection is other than "OFF." If the Alarm Output corresponding to the Industrial I/O selection does not produce an alarm within the user-defined time, the Watchdog (WD) Timer produces a reject alarm state. The MIZ-27 monitors the Alarm Output independent of the Test Enable—if a signal generates an alarm at any time, the Watchdog is reset.

If the alarm activates due to a watchdog time-out, the letters WD appear below the X-Y display area. The watchdog time-out occurs only once and remains until cleared. An indication will be cleared if:

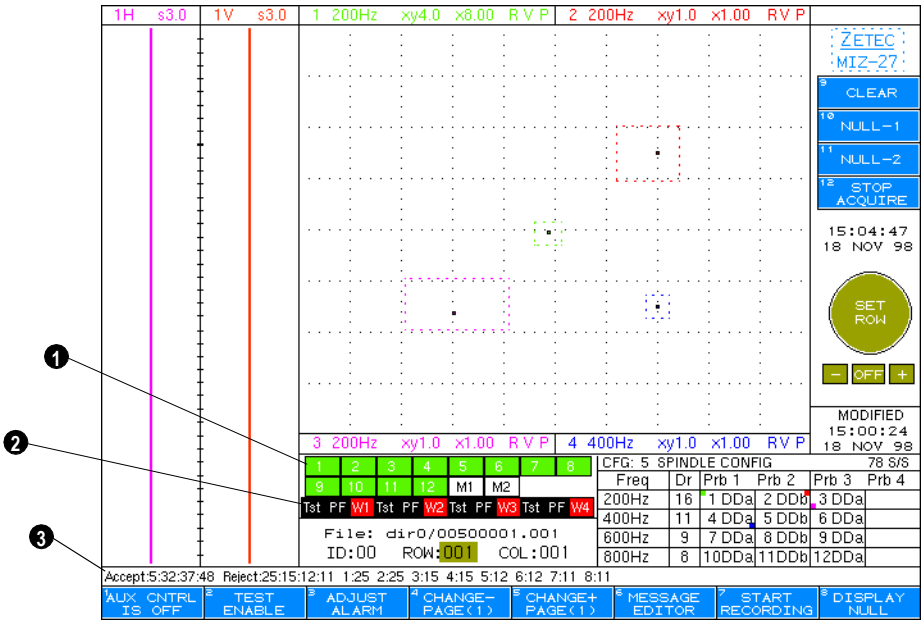
- **the failed channel alarm signal enters the reject area**
- **you touch** *CLEAR* **or** *NULL* **on the instrument**
- **you exit the Start Acquire menu**

The MIZ-27 does not monitor the Watchdog Timer for the Internal Test Enable, because the channel for the Internal Test Enable is generally set to reject "OUT." The constant reject state keeps the Watchdog Timer reset, so it's not useful in this situation.

Test Delay. As explained on page 4-61, the delay setting has a dual function, depending on the Test Enable selection. If the setting is **EXT EDGE** or **EXT WIND**, a delay is inserted between the receipt of test enable signal and performance of the test. If the selection is **Internal**, the delay is the duration that the accept or reject signal is asserted. The minimum setting for delay time corresponds to 25 data points. If the sample rate is 1000 Hz, for example, the minimum delay setting is 25 mS.

Industrial I/O and Alarm Display Information. During data acquisition, information about the Industrial I/O setup and alarm status displays in the area to the left of the configuration, as well as the total accept and reject test counts in the comment area. Figure 4-41 shows the location of this information and provides additional details.

Figure 4-41. Industrial I/O & Alarm Status



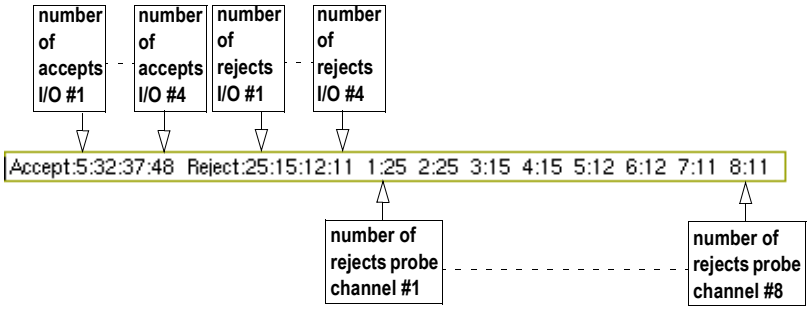
❶ **Real-time alarm status:**

- green—accept
- red—reject
- clear—alarm off for that channel

❷ **Industrial I/O Status—displays if I/O channel is set to other than OFF:**

- TST yellow—test is enabled (Since EXT EDGE is instantaneous, TST does not light for this mode)
- TST gray—test is not enabled

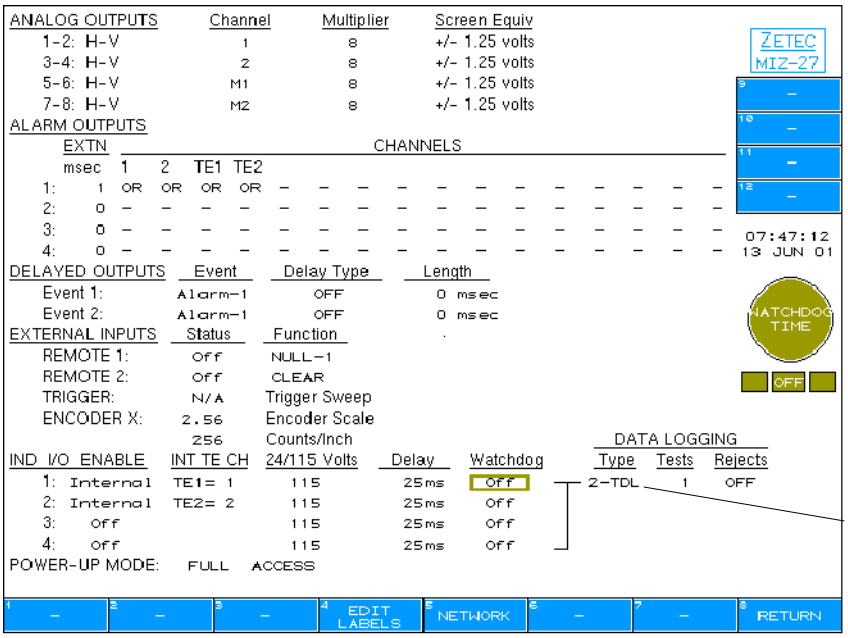
❸ **Test Counts—display if any I/O channel is not set to OFF:**



Data Logging

The Industrial I/O Enable can be used to log test results. The MIZ-27CT offers two methods of data logging—Test Data Logging (TDL), and raw data logging (RAW). Test Data Logging logs the specific data point used for the alarm decision. Raw Data Logging logs all the data taken while the test enable is asserted. Data Logging type is selected in the I/O Configuration menu shown in figure 4-42.

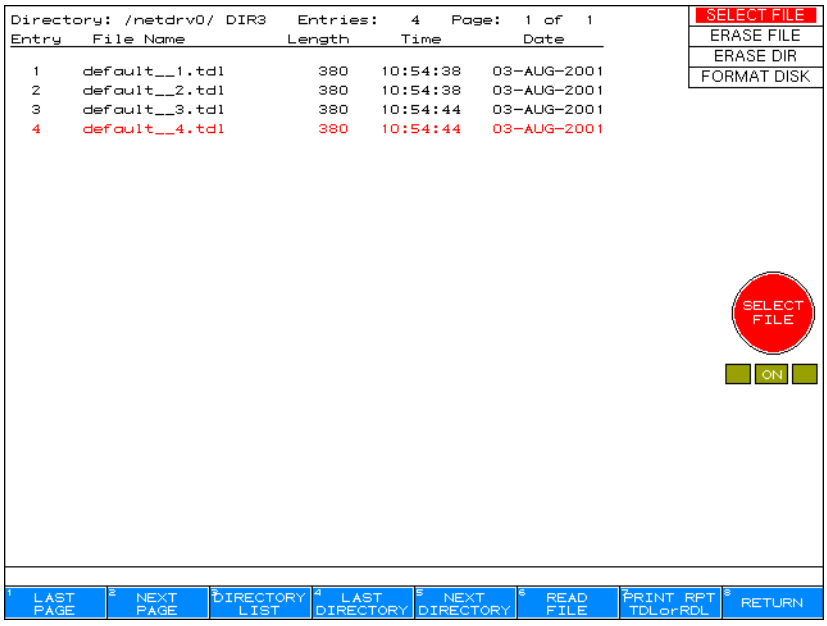
Figure 4-42. Data Logging



The TDL method is typically used in material hardness sorting, or other tests where the result of interest is from one point in time. TDL logs the test data to RAM memory, where up to 200 data points can be stored in a circular buffer for review and alarm sizing. If mass storage is available the results can be simultaneously stored to disk, in which case the data is limited only by the media size.

When storing TDL files to disk, a single file is kept with the configuration name and a ".TDL" file name extension. The file is appended for each new log entry. The MIZ-27 is able to record multiple TDL files at the same time; one file for each configured test station, up to four. The file names will be the first eight letters of the configuration name followed by a -1, -2, -3, or -4 according to the selection in the data logging type field as shown in figure 4-43.

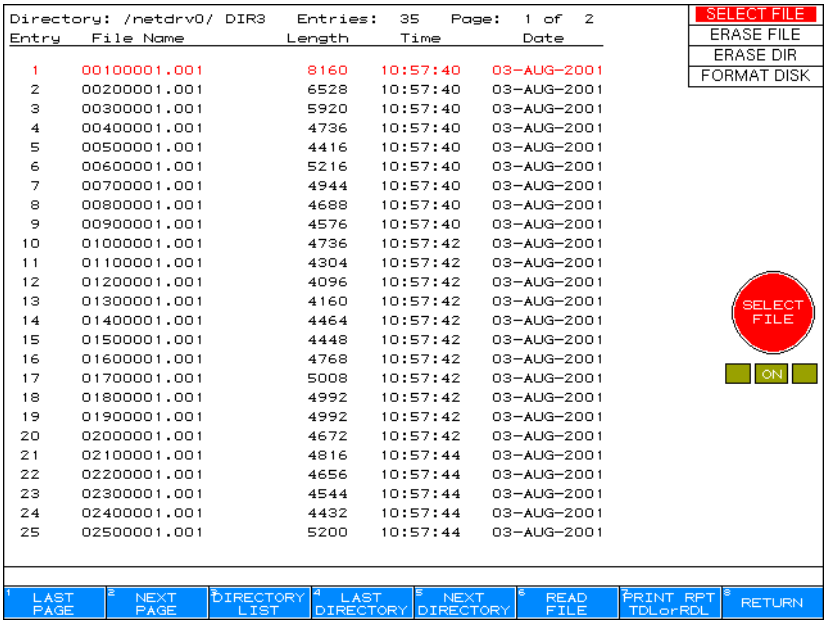
Figure 4-43. TDL File List



RAW data logging is the method of choice in crack testing, where the test piece or the probe is generally moving, and the result of interest is a group of data. RAW data logging is only used with mass storage. It records all the same data as when the **START RECORDING** button is pressed during data acquisition. The only difference is that the RAW log is gated by the test enable signal. When RAW files are recorded, a new file is stored for each log entry. The files have the format: I I I I D R O W. C O L, where ID, ROW

AND COL are set by the user in the data acquisition menu, and III is an index that the instrument automatically increments. Up to 499 entries are possible in a single directory. If a directory is full, the MIZ-27 automatically increments to the next directory number.

Figure 4-44. RAW Data File List



To set up data logging, highlight the Industrial I/O 1 control field and select the required test enable type. Next, select the buffer control field and select "TDL" or "RAW" for the type of data logging application. If "TDL" is selected, the tests control field can be used to select the interval between tests (0-99) to log data. The Rejects control field can be turned "on," which will log reject condition tests only.

With "RAW" selected as the data logging method, the raw data during the test enable period is stored on the selected mass storage media. Using the "RAW" data logging method, data is recorded from the selected test enable at the interval selected in the "Tests" control field. The "Rejects" control field doesn't apply when "RAW" is selected as the data logging method.

When the data logging setup is complete, return to the Setup/Review menu. If the "TDL" method is being used, the data point results and count will be displayed in place of the two strip chart displays. The MIZ-27CT maintains the 200 points in the battery backed RAM buffer until overwritten with new data points, or erased under the user's direction in the Review Buffer menu.

Data Point Labeling

The MIZ-27CT provides a method to assign labels to data points in the data log buffer. The labels can be changed during data acquisition so that different parts can be assigned unique designations.

In order to label, the TDL function must be assigned to an Industrial I/O channel (see the previous section on data logging). Whenever a data point is added to the log, it will automatically be labeled.

Four functions relate to data point labeling:

- ❒ **Edit Labels (I/O Config submenu)**
- ❒ **Last/Next Label (Start Acquire menu)**
- ❒ **Box Labels (Setup/Review menu)**
- ❒ **Point Labels (Setup/Review menu)**

Edit Labels

The MIZ-27CT provides up to 100 different labels for identifying the various parts being sampled with the data logging test method. Each label can be assigned a color and 1 or 2 alphanumeric characters in the Edit Labels menu.

To locate the "Edit Labels" screen, go to the Hardware Configuration menu, then the I/O Configuration menu, and press the **EDIT LABELS** button. This screen lists 100 label options.

To change the two character label or its color, complete the following steps:

Step 1: Move to the "Num" control field.

Step 2: Using the HulaPoint control buttons, choose which number of the label to edit.

Step 3: Select the "Lbl" field to set the first or second alpha-numeric character.

Step 4: To change the Edit Char from 1 to 2, turn the HulaPoint off and press it left or right.

Step 5: Select the color (Clr) field and use the HulaPoint to select the label color.

Next/Last Label

The Last and Next Label functions select the label that will be assigned to the next data point tested. The functions appear in the Start Acquire menu, when TDL is enabled.

Use Next and Last Label to select the label number that will be applied to the ensuing data points. The label will remain the same until another label is selected. The label can be changed at any time in order to distinguish data from different parts.The labels that are applied are not visible until the log is reviewed in the Review Buffer mode.

Box and Point Labels

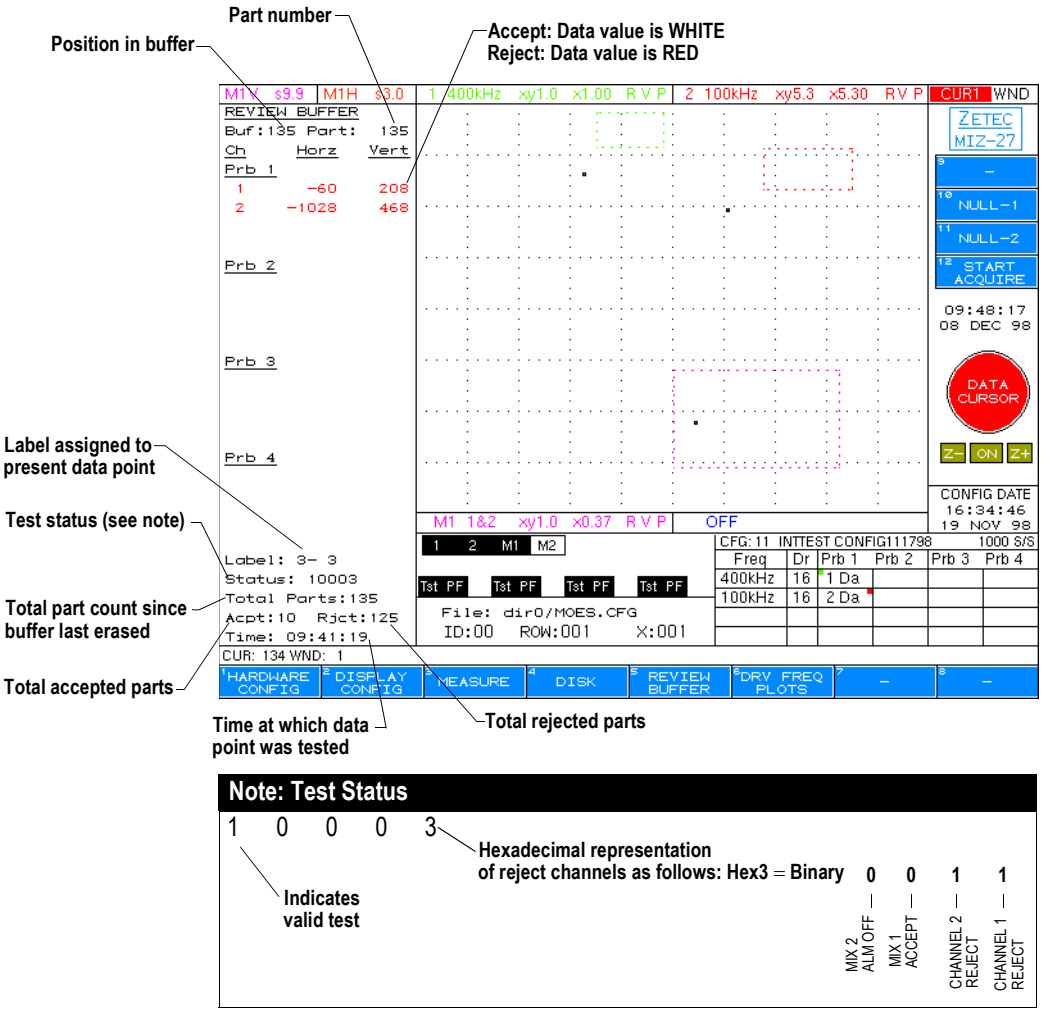
The Box and Point Label functions allow you to view the labels assigned to data points in the log. To access these functions, select **Review Buffer**, which is visible when TDL is enabled, in the main Setup/Review screen. Both Box and Point Labels operate on all data points in the buffer for the channel selected in Display 1.

Box Label draws a rectangle around all data points of the Display 1 channel with the same label. A separate box draws for each label type. Point Labels draws the labels for all data points of the Display 1 channel.

Review Buffer

The Review Buffer menu is accessible from the Setup/Review menu when TDL is enabled. A limited Review Buffer also displays when reading a TDL log back from disc. The Review Buffer status area displays information about the data point selected for review, as shown in figure 4-45.

Figure 4-45. Review Buffer Status



Note: Test Status

1 0 0 0 3

Indicates valid test

Hexadecimal representation of reject channels as follows: Hex3 = Binary

0	0	1	1
MIX 2 ALM OFF	MIX 1 ACCEPT	CHANNEL 2 REJECT	CHANNEL 1 REJECT

Review Buffer provides several functions:

- **Allows data buffer review**
- **Provides automatic alarm box sizing**
- **Enables data label viewing**

Review Buffer features are explained in the following sections.

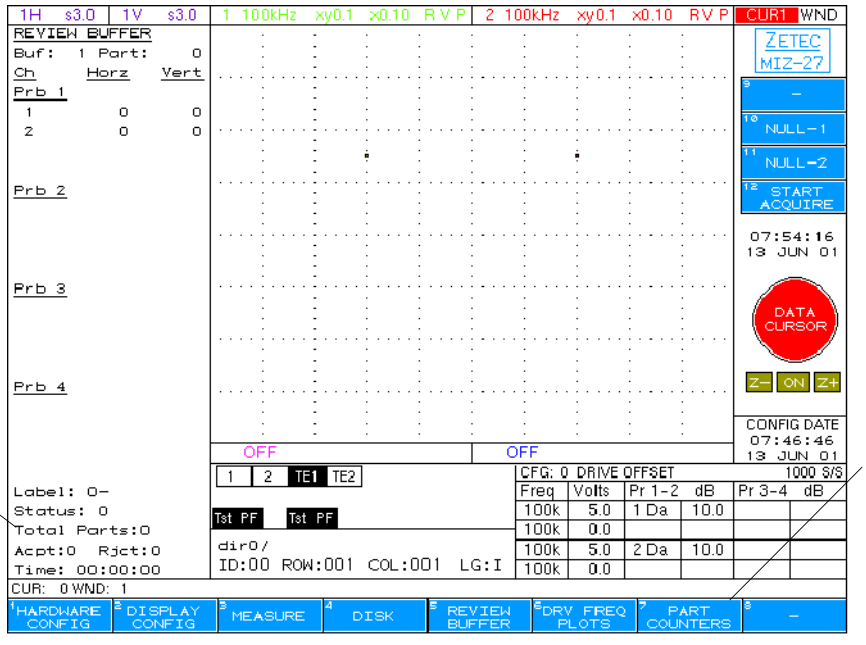
Data Buffer Review

Data buffer review is also available with limited functionality in the Review/Setup menu and the Read File menu. In the **REVIEW BUFFER** menu, several functions are available to assist in data buffer review:

Data Cursor. The HulaPoint, along with its associated control buttons, is used to scroll the data cursor through the 200 points in the buffer. To turn the HulaPoint cursor off or on, place the menu cursor on CUR1 in the upper-right corner of the screen and press the center Hula Point control button.

Part Counters. When using TDL recording, the MIZ-27 displays a **PART COUNTERS** menu button in the Setup/Review Menu as shown in figure 4-46. Each test station enabled for TDL recording has its own separate counter status display. These counters display the number of parts tested, accepted, and rejected for each test station.

Figure 4-46. Part Counters for TDL Recording

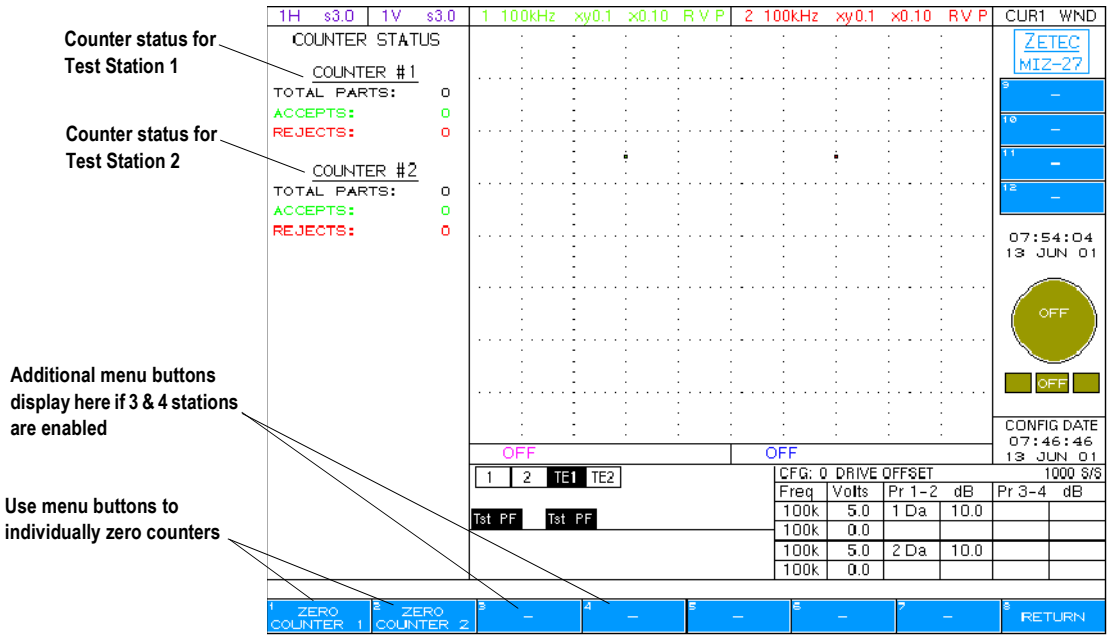


Review Buffer displays status for both Test Enables, see Part Counters for individual Test Enable status

Press PART COUNTERS menu button to view counter status

Press the **PART COUNTERS** menu button to view the Counter Status shown in figure 4-47. The counters zero individually. The data buffer contains the last 200 parts tested. Total parts tested with both test enables are shown in the Review Buffer.

Figure 4-47. Zero TDL Counters



Show Buffer. Press the **SHOW BUFFER** button buffer to display all the valid data points in the buffer for the display channels selected. If the buffer is partially filled, only the data up to that point displays. Also, if **ERASE ENTRY** is used to delete a particular data point, it will not display with Show Buffer.

Erase Entry. To erase the presently selected data point, press **ERASE ENTRY**. This data point displays as zeros if selected by the data cursor. An erased entry will not display at all if the buffer is displayed using **SHOW BUFFER**. Also, if an alarm box is automatically created using **SET CHANNEL(S)**, erased entries are ignored.

Erase Buffer. The **ERASE BUFFER** button clears all the data in the log, and sets the buffer and part count to 1, the first position in the log. Use **ERASE BUFFER** when gathering a new set of data for alarm sizing.

Alarm Box Sizing

The MIZ-27CT provides an automatic alarm box sizing feature to assist in creating the optimal alarm box. This function first rotates all the data from the selected channel to the best horizontal fit, then draws an alarm box that clears the data on all sides by a user-selectable margin.The **REVIEW BUFFER** menu also provides a manual Adjust Alarm menu, which can be used as described in *Adjusting the Alarm, on page 4-33*.

Data is rotated horizontally in order to form the smallest possible rectangular alarm box, enabling the best discrimination of out of tolerance parts. If the data were left in a diagonal grouping, it would generally require a larger alarm box to encompass the same set of data points.

To set the alarm boxes, first collect data from a representative set of good parts (or bad parts, if this is what you want included in your alarm box). TDL must first be turned on in the I/O Config menu in order to log the data points. The data can either be logged manually by using the Test Enable button, or by use of an internal or external test enable signal. Be sure to use the Erase Buffer control to clear the buffer of any unwanted data points before collecting data. When collecting data, it is a good idea to include all the mechanical variations in probe placement, as well as variations in the parts themselves.

Controls used for automatic alarm box sizing are **SET CHANNEL**, **SET ALL CHANNELS**, and **OVERSIZE ALARM** +/–. The **SHOW BUFFER** and **POINT LABELS** buttons, as well as the data cursor, can be used to view data points before drawing the alarm. The **ERASE ENTRY** button can be used to eliminate individual outlying data points, if necessary.

SET CHANNEL creates an alarm box for the data from the channel selected in Display 1. **SET ALL CHANNELS** creates alarm boxes for all channels.Use the **OVERSIZE ALARM** +/– buttons to set how much larger the alarm box should be than the data grouping. The number associated with Oversize Alarm is a data value, not a pixel value. The actual alarm margin visible on the screen depends on the scale settings.

Set Channel controls do not work for the Internal Test Enable and Mix channels. It is assumed these will be set manually. This is especially important when using Internal Test Enable, where the proper liftoff phase (horizontal, to the left) must be maintained.

Data Label Viewing

The **REVIEW BUFFER** menu provides the Box and Point label functions to enable viewing data points with their labels. See *Data Point Labeling, on page 4-73* for more details.

Disk and Network Data Storage

The MIZ-27CT offers mass storage to a SCSI or network device, which provides permanent record of raw data, summaries, messages, configurations, display bitmaps, test data logs, and report entries. The MIZ-27CT also has the ability to recall raw data, summaries, messages, configurations, reports, and test data logs (TDL) from a mass storage device. Local SCSI devices include SCSI compatible drives that the MIZ-27 has been designed to support. The network device is a Network File System mount device.

The external network drive supports a Network File System (NFS) mount device if your HP-UX or Windows NT computer has the appropriate 3rd-party software installed, such as, DiskShare™ NFS Server for Windows NT.*

* NFS server software is a 3rd-party product that is sold separately from the MIZ-27 or Windows OS.

External Disk Drive and Media Support

Currently, the MIZ-27CT supports the following local SCSI mass storage devices:

- **640MB Magneto Optical (MO) drives**—media support includes 3-1/2" 230 or 540MB MO disks with 512 bytes/sector format and 640MB MO disks with 2048 byte/sector format[1]
- **1.3GB Magneto Optical (MO) drives**—media support includes 1.3GB MO disks with 2048 byte/sector format as well as media listed for the 640MB MO drive
- **Iomega Jaz 1GB and 2GB drives**—media support includes 1GB and 2GB disks. (The 1GB drive will only accept 1GB disks, 2GB disks will not physically fit into a 1GB drive. The 2GB drive will accept 1GB and 2GB disks but the MIZ-27 only supports the 2GB disk when formatted to 1GB.)
- **5-1/4" Magneto Optical (MO) drives**—commonly used with Eddynet®
- **Adtron Accent Compact Flash Drive**—media support, when used with a New Media compact flash adapter, includes 256MB Lexar Media and 512MB Sandisk compact flash disks.

1. HP-UX supports 230 and 540MB MO media with 512 bytes/sector format. HP-UX does not support the 640MB or 1.3GB MO media with 2048 byte/sector format.

Each of these SCSI devices must be terminated as listed in table 4-4. For information about the optional internal hard drive, see section 5.

Table 4-4. SCSI Device Termination

Drive Model	Switch	Position	Termination Type	Media Format Capacity
Fujitsu DynoMo 640	4	down	internal	640MB max.
Fujitsu DynoMo 640SE	6	up	internal	640MB max.
Fujitsu DynoMo 640SF	1	on	internal	1.3GB max.
Zip 100MB or 250 MB	5	up	internal	250MB max.
Jaz 1GB or 2GB	A	auto	internal	1GB max.
5-1/4" MO	Contact Zetec for more information			

Data Storage to Disk

To select a local SCSI device:

Step 1: Press the **HARDWARE CONFIG** button.

Step 2: Press the **I/O CONFIG** button.

Step 3: Press the **NETWORK** button. This sequence displays the Network menu (see figure 4-48) on the MIZ-27 display.

Step 4: Under “Mass Storage Selection” parameters, use the HulaPoint to highlight the “Drive selected” field.

Step 5: Press the HulaPoint Up/Down control buttons to select **Local SCSI**.

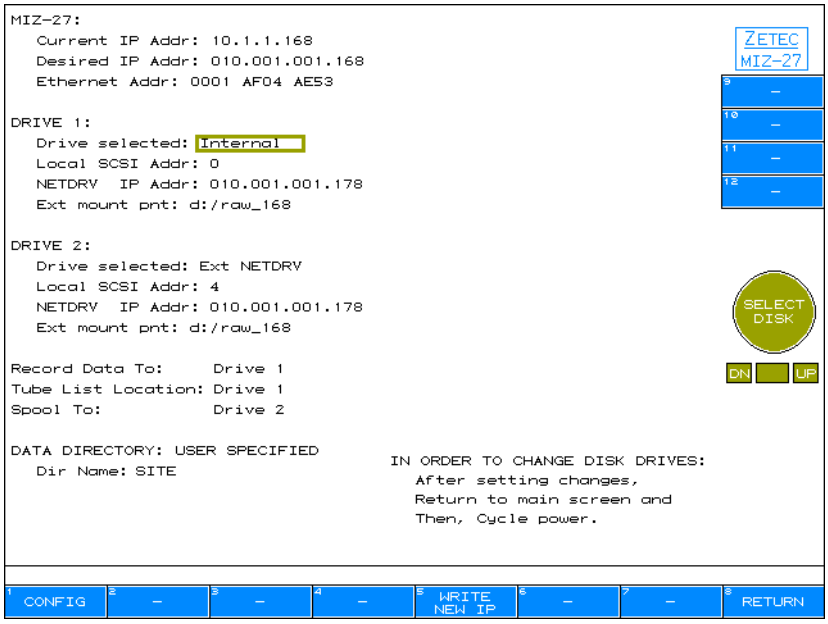
Step 6: Use the HulaPoint to highlight the “Local SCSI Addr” field.

Step 7: Press the HulaPoint Up/Down control buttons to input the correct Bus address for the SCSI drive.

Step 8: To activate your changes, return to the Setup/Review menu and cycle power on the MIZ-27.

Step 9: Return to the Network menu to verify your setup.

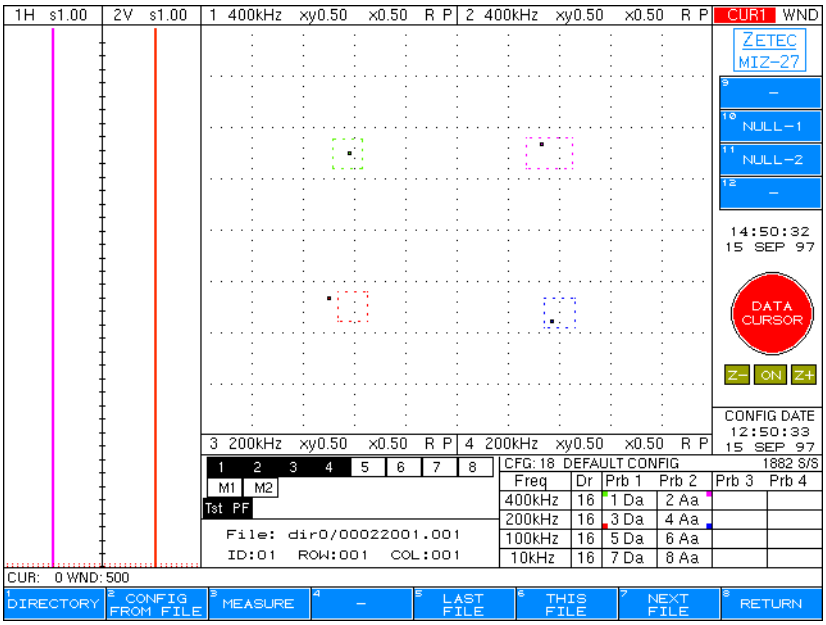
Figure 4-48. Network Menu: SCSI Device Selection



At power-up, the MIZ-27CT detects if either mass storage device is present. If a mass storage device is found, the drive type and size displays in the comment line of the start up screen and the **DISK** button shows on the Setup/Review menu. For the Local SCSI device to be detected, the drive must be on, the MIZ-27CT's local SCSI address must match the drive, and media is installed into drive. If media is not DOS-format, the MIZ-27CT returns a "disk full" error message when you start recording. To format the disk:

Step 1: Go to the **DISK** menu shown in figure 4-49.

Figure 4-49. Disk Functions



Step 2: Press the **DIRECTORY** menu button.

Step 3: Highlight the **FORMAT DISK** field.

If you intend to review your MIZ-27 ET/CT data utilizing the ACQ-to-Eddynet program found in the Eddynet Software Suite, you must format your media with a PC computer and the format software supplied with your data storage drive. The MIZ-27 ET/CT format function will not work with ACQ-to Eddynet.

Step 4: Simultaneously, press both **FD** HulaPoint control buttons.

Before storing data to the disk, select a directory using the **NEXT/LAST DIRECTORY** buttons in the Directory submenus. If the directory name uses standard format, the default first directory is dir0. If User-Defined directory name is selected, the directory name reflects the operator input on the Network menu. For more information about Directory selection, see page 4-93.

Data Storage to Network Drive

The MIZ-27 offers data storage to a network drive. Network drives provide convenient, large capacity data storage, data recall, online analysis, procedure and report writing, as well as in-depth laboratory setup documentation. The network drive system requires a PC operating with Windows NT, a 10/100BaseT network card installed, and a network File System (NFS) server software installed such as DiskShare™. The MIZ-27 also supports HP-UX NFS drives.

The MIZ-27 operating system works with the standard TCP/IP protocol

Network Drive Connections

To connect to a network drive, complete the following steps:

Step 1: Use a 10BaseT **Crossover** cable to connect directly from the MIZ-27 to a PC or HP-UX workstation. Or, use a 10BaseT **Patch** cable to connect from the MIZ-27 into a network hub or switch.

Step 2: Connect the 10BaseT cable to the connector on the MIZ-27 rear panel.

Step 3: On the MIZ-27 front panel, press **HARDWARE CONFIG**, **IO CONFIG**, and **NETWORK** to access the Network menu shown in figure 4-50.

Step 4: Set the MIZ-27 IP address. If connecting to a multi-user network contact the system administrator for a valid IP address.

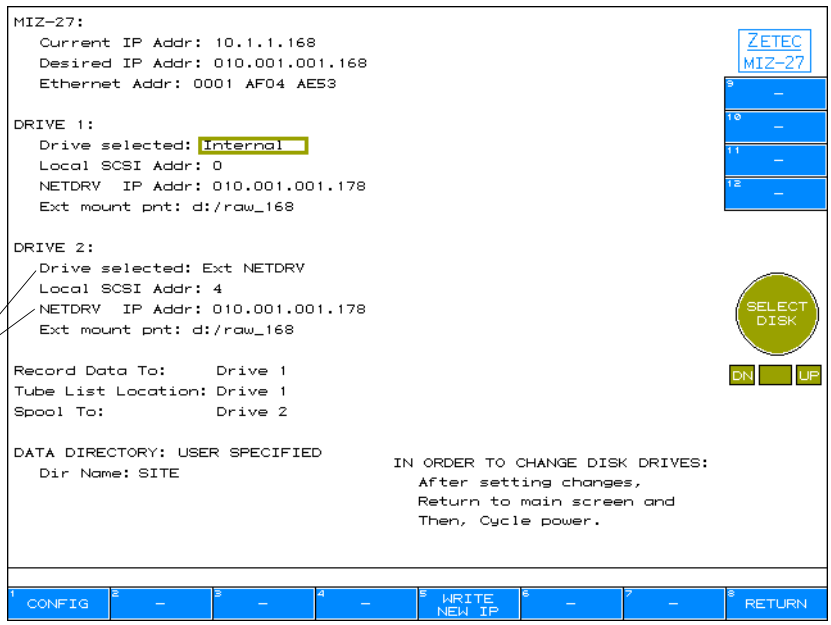
Step 5: In the “Drive selected” field, select **ExtNETDRV**.

Step 6: In the “NETDRV IP Addr” field, input the correct IP address for the external drive.

Step 7: In the “Ext mount pnt” field, select the drive letter that corresponds to the external drive. For example, “c:” for a hard drive or “d:” for a magneto optical disk.

Step 8: At the PC, create a raw data directory that corresponds to your external mount point path. The directory name must match exactly, for example, c:\raw_XXX (where XXX = last field of the MIZ-27's IP address, excluding any zeros, i.e., if IP address is 206.213.075.168, the directory name is raw_168).

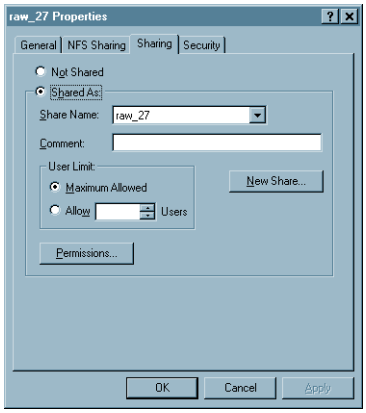
Figure 4-50. Network Menu



Two file system types are available with the NT operating system—NTFS and FAT. If your raw data directory is set up on a FAT file system, complete steps 9 and 10. If your raw data directory is set up on a NTFS file system, complete the steps in *User Manager Setup, on page 4-85*.

Step 9: Verify your selected raw path is NFS shared. To do so, go to the file explorer and right click the mouse on the raw data directory and select **Sharing** in the pop-down menu. This action opens the Sharing Properties dialog box shown in figure 4-51. The "Shared Name" field must match the raw directory's name (your mount point).

Figure 4-51. Sharing Properties



Step 10: Cycle power on the MIZ-27. When the network drive connection is recognized, the "Network Drive has been mounted" message appears in the MIZ-27 comment line.

User Manager Setup

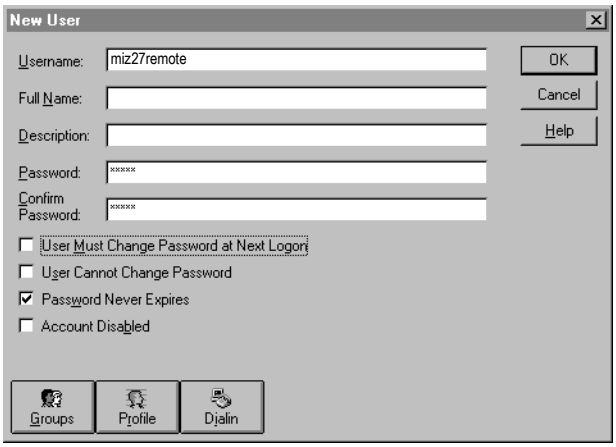
With the User Manager, you create a user account for the MIZ-27 instrument and include its name as a member of the NT group named users. To do so:

Step 1: Go to the **Start** menu and choose **Programs**, **Administrative Tools**, and **User Manager**.

Step 2: This action opens the User Manager dialog box.

Step 3: From the **User** pull-down menu, select **New User**. This action opens the dialog box shown in figure 4-52.

Figure 4-52. User Manager Dialog Box



Step 4: Type the user name as: **miz27remote**

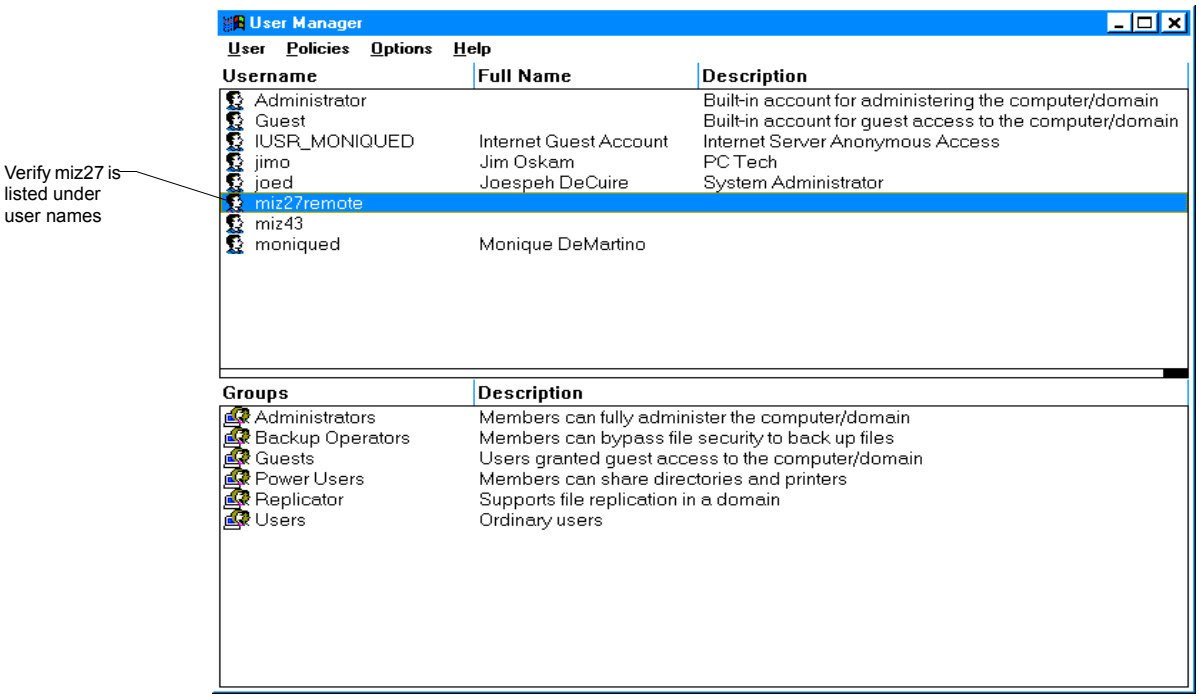
Step 5: Type the password as: **miz27remote**

Step 6: Type the same password a second time in the **Confirm Password** field.

Step 7: Select the "**Password Never Expires**" option. The remaining options should remain blank.

Step 8: Click on **OK** to add the "miz27remote" user name to the User Manager as shown in figure 4-53.

Figure 4-53. User Manager Setup



After creating the user name (miz27remote), you need to create an NFS user mapping and an NFS group mapping. To do so:

Step 1: Go to the windows explorer and right click on the "raw_XX" directory name. Select **Sharing** from the pop-down menu.

Step 2: Select the NFS sharing tab. Click on **Modify/View Permissions**.

Step 3: Click **Configure** in the NFS Share Permissions dialog box to open the DiskShare Configuration dialog box.

Step 4: Click **Configure User/Group Mappings** to open the DiskShare User/Group Mapping Configuration dialog box. In the **User Mappings** tab, click **Edit** and enter the following information into the Password File Editor dialog box:

```
New User Name: nfsmiz27remote
New User UID: 2001
New User GID: 100
New Password: leave blank
Confirm Password: leave blank
```

Step 5: Click on **ADD** and **OK**.

Step 6: Go to the **User Mappings** tab, click on the NFS Users entry, **nfsmiz27remote{2001)**, and the Windows Users entry, **miz27remote**, then click on **ADD**.

Step 7: Go to the **Group Mappings** tab.

Step 8: Click on the Edit button and enter the following information into the Group File Editor dialog box.

```
New Group Name: miz27group
New Group ID: 100
```

Step 9: Click on **ADD** and **OK**.

Step 10: In the Group Mappings tab, click on the NFS Groups entry, **miz27group{100}**, and the Windows Groups entry, **Users**, then click on **ADD**.

Step 11: Click **OK** in the User/Group Mapping dialog box.

Step 12: Click **OK** in the DiskShare dialog box

Step 13: Click **OK** in the **raw_XX** Properties dialog box

Cycle power on the MIZ-27SI to verify that the "**Network Drive has been mounted"** message appears during the boot-up sequence and that you are able to record data to the raw_XX directory.

Recording Data to a Network Drive

With the External Network drive mounted and directory folders created at the workstation, the MIZ-27 is ready to record data to the network drive. To select a recording path and record data:

Step 1: Press **DISK** and **DIRECTORY** to open the Directory List menu.

Step 2: Press **LAST DIRECTORY** or **NEXT DIRECTORY** to select the directory for recording.

Step 3: Press **RETURN** until you reach the Setup/Review Menu

Step 4: Press **START ACQUIRE**.

Step 5: Use the HulaPoint buttons to select the tube number file name.

Step 6: Press the **START RECORDING** button to begin the recording process. The word, "recording," flashes, as well as an animated "reel-to-reel" symbol, to indicate that data is recording to the media.

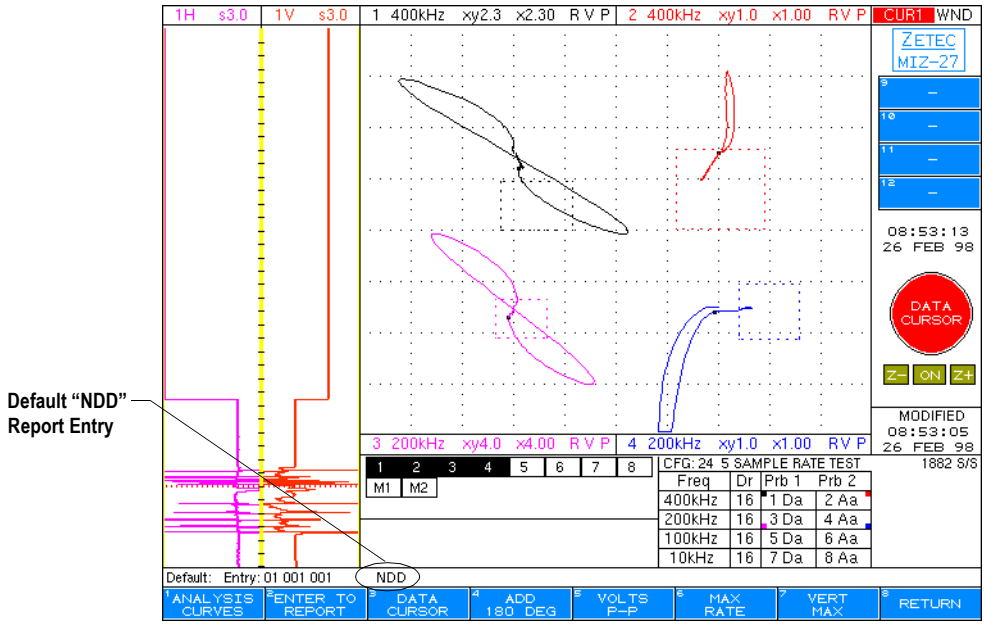
Step 7: Use probe to acquire data from test object.

Step 8: Press the **STOP RECORDING** button to end the recording process. Once again, the control is placed on the file name field to increment or decrement numbering for production testing.

Step 9: After recording, go to the Directory List to verify that the new data file is listed. For more information about the Directory List and recalling stored files, go to page 4-91.

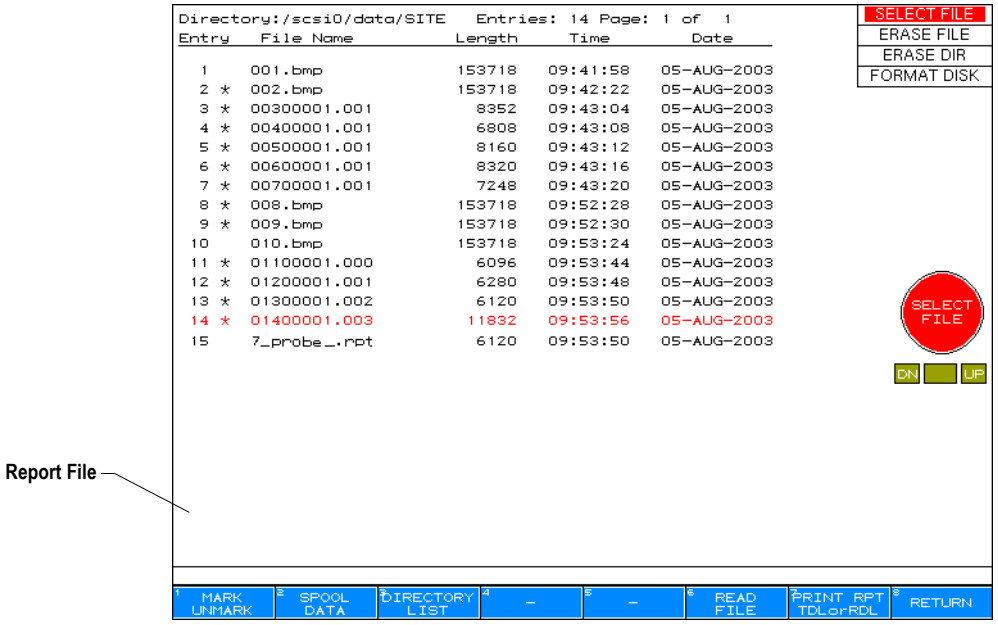
Like data recording, you can also save report files to a network drive. When you review signals in the Measure menu as shown in figure 4-54, the **ENTER TO REPORT** button stores the data file name and the measurement results to the disk. The file name with a ".RPT" extension is recorded to disk.

Figure 4-54. Measure Menu



In figure 4-55, only one file is listed with a ".RPT" extension. All entries are stored to this one report file, which is named according to the test configuration's name.

Figure 4-55. Directory List



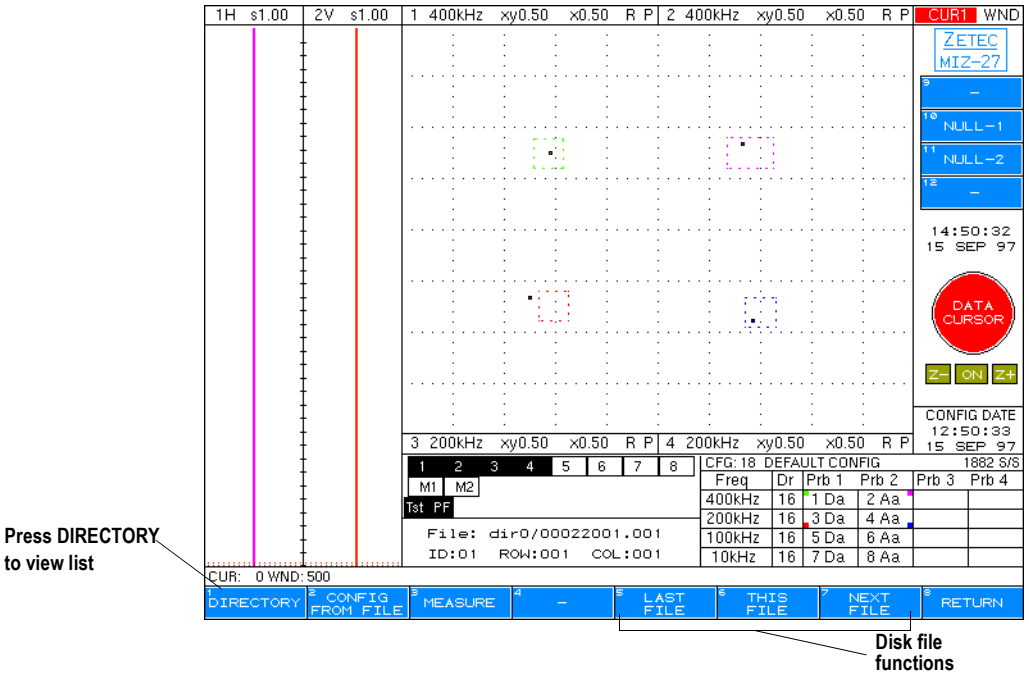
Directory List

When the MIZ-27 is configured with a disk, you are able to access the files stored to disk with the Directory List. These files include raw data, messages, report entries, data logs, and configurations. The Directory List is opened through the Disk menu and lists the stored files for the currently selected mass storage device. MIZ-27CT disk selection is set up in the Network submenu. For more information about this setup, see *Disk and Network Data Storage, on page 4-79*. (If you change the mass storage selection, you must cycle the instrument power to detect the change.)

To open the Directory List menu, complete the following steps.

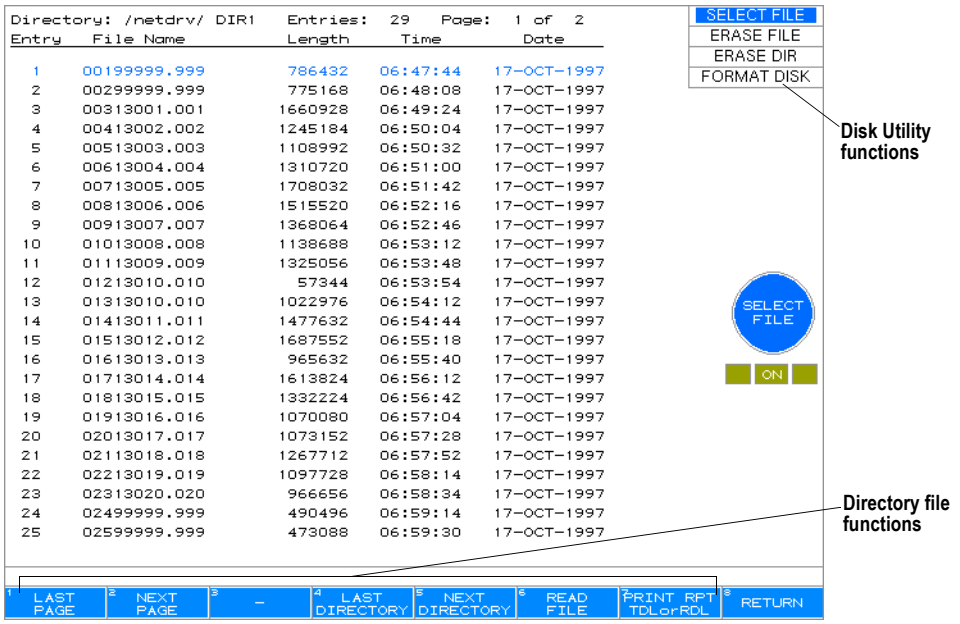
Step 1: Go to the **DISK** menu shown in figure 4-56.

Figure 4-56. Disk Menu



Step 2: Press the **DIRECTORY** menu button. This action opens the submenu shown in figure 4-57.

Figure 4-57. Directory List



The MIZ-27CT file types are identified by the three-letter extension added to the file name. The file name convention for the MIZ-27CT is a three digit (###) entry number, a two digit (**) component ID field, a three digit (@@@) tube ID field, and a second three digit (XXX) tube ID field. The following line is a MIZ-27 example file name:

###**@@@.XXX

File name extensions used by the MIZ-27 are listed in table 4-5:

Table 4-5. File Name Extensions

File Type	3-letter Extension
Data	**.XXX**
Configuration	**.CFG**
Report	**.RPT**
Bitmap	**.BMP**
Test Data Log	**.TDL**
Reject Data Log	**.RDL**
Message or Summary	**.MSG**

Disk Utility Functions

Disk utility functions are the Display Function buttons located in the Directory List submenu. These functions include

- **Select File**
- **Erase File**
- **Erase Dir**
- **Format Disk**

These functions are highlighted using the HulaPoint and then adjusted using the HulaPoint after pressing the center HulaPoint control button to enable its control. The **SELECT FILE** function allows the user to select stored data files or files with the RPT, TDL, and RDL extensions. The **ERASE FILE** function allows the user to delete a file from the disk. To prevent accidental file erasing, the left and right HulaPoint control keys must be pressed simultaneously for this function to work. The **ERASE DIR** function will delete the entire directory from the disk. Once again, both HulaPoint control keys must be pressed simultaneously for this function to work. The **FORMAT DISK** function applies to removable media. It reformats the entire disk when both HulaPoint control keys are pressed simultaneously. When the MIZ-27 formats the disk it creates the structure of 25 directories. These directories are named DIR0 to DIR24.

Directory File Functions

The Hula Point up/down control buttons aid in reviewing the directory list shown in figure 4-57. If more than one page of entries is present in the selected directory, these control buttons take you from page to page. The number of entries per directory is limited to 500. The **LAST DIRECTORY** and **NEXT DIRECTORY** buttons provide access to the 25 different directories available on the Local SCSI mass storage device. The **READ FILE** menu button recalls the selected file from disk for presentation and review on the MIZ-27's display. (TDL files are read with a ±8 data value accuracy due to the conversion losses.) When stored files are displayed, the **PRINT RPT**, **TDL**, or **RDL** menu button enables you to print the recalled file to a default printer.

Disk File Functions

After you select a specific directory and return to the Disk menu, the menu buttons at the bottom of the menu let you quickly select files in the current directory. The **CONFIG FROM FILE** button resets the instrument configuration to the same configuration as recorded with the data file. The **LAST FILE** button loads the previous file from the Directory List into memory for

display. The **THIS FILE** button loads the data file that is the current selected file in the Directory List. The **NEXT FILE** button loads the next file from the Directory List into memory for display. If the data file contains more than 40 seconds of recorded data, a **NEXT BUFFER** button lets you load the next 40 seconds of data from the same file into memory.

File Names

Before collecting data, you can use the MIZ-27 to format a file naming convention. The MIZ-27 offers many options for setting up the file name labels. The File Names are set up in the Utility menu.

"File Names" is a control field that provides you with maximum flexibility for file name labels that best describe the part being tested. The file name consists of three parameters, the first parameter has two places, the second and third parameters have three places each.

The first parameter offers five label names: ID, UT, QD, SG, and WB. The second and third file name parameters offer six name selections: ROW, COL, TUB, LIN, X, and Y. Any combination of these labels can be set. These parameters are stored with data and display with the data during later review.

"Name Field" controls, shown in figure 4-58, allow you to select how many fields in the file name are adjustable. To increase flexibility, each identifier can be set up as a single field or as two and three active fields that increment independently.

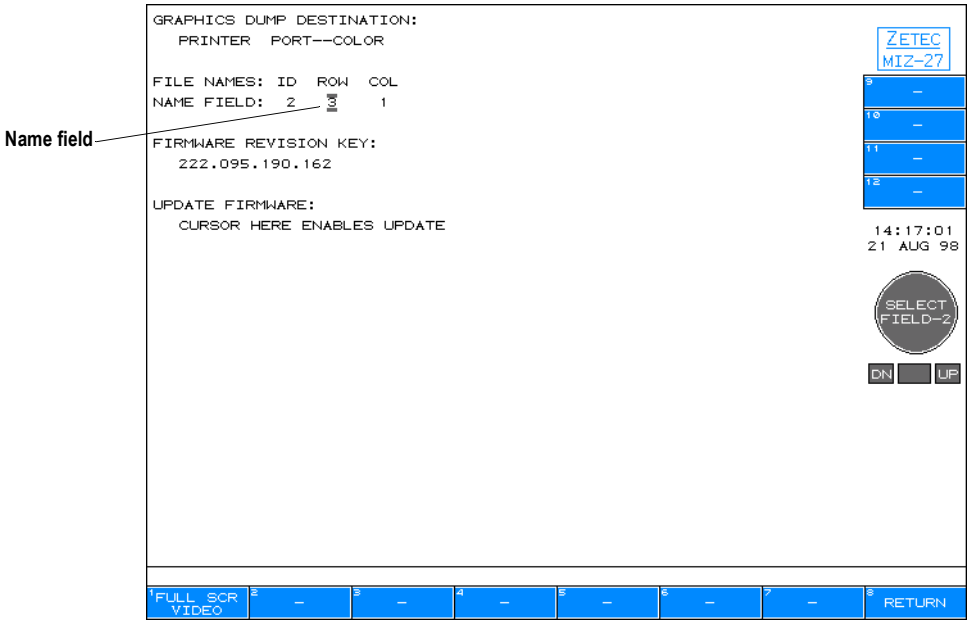
Table 4-6 lists the file name options with their associated label ranges.

Table 4-6. Label Identifiers

File Name Identifiers									
Field Set		**1**		**2**			**3**		
Toggle label between:		ID, UT, QD, SG, or WB		ROW, COL, TUB, LIN, X, or Y			ROW, COL, TUB, LIN, X, or Y		
Active fields selected:	-1	00-99		000-999			000-999		
	-2	0-Z	0-Z	N/A			N/A		
	-3	N/A		0-Z	0-Z	0-Z	0-Z	0-Z	0-Z

Once the file names and fields have been selected in the Utility menu, return to the Setup/Review menu. Press the **START ACQUIRE** button. (The marquis around the Zetec MIZ-27 logo rotates to indicate that the tester is acquiring data.) At this time, the HulaPoint controls default to file name control.

Figure 4-58. File Name Selection



With multiple field control, you'll notice that the label on the HulaPoint updates as you move the cursor through the fields. These labels indicate which field will change with the HulaPoint control. The -1 label indicates the first parameter; -2 adjusts the second parameter, and -3 adjusts the third. To change a field, press the center HulaPoint control to give the HulaPoint local control, and use the HulaPoint to dial in the number or letter combination of choice. Pressing the left or right HulaPoint control buttons will increment or decrement the number or letter sequence. Turn the HulaPoint control off and press it right or left repetitively to move you to the next file name field.

Eddynet Network Recording Setup

The MIZ-27 supports NFS mount to an Eddynet98 work station via a LAN connection. Ideally, the Eddynet work station has a separate drive for each NFS mounted MIZ-27 in order to store raw MIZ-27 data on individual hard drives.

IP Address Setup

At a properly configured Eddynet98 work station, verify that the */etc/hosts* file has both the Eddynet98 work station and MIZ-27 IP addresses listed. If not, this file will require editing using the vi editor or other text editor. The MIZ-27 IP address should have the same subnet mask class as the Eddynet98 work station. For example, if the Eddynet98 work station has the IP address 9.120.240.*1* then the MIZ-27 should have an IP address of 9.120.240.*2* The first three octets should be the same, while the last octet must be unique. Typically, it's best to adjust the MIZ-27 IP address rather than the Eddynet98 work station due to Eddynet network considerations.

To change the MIZ-27 IP address:

Step 1: Use a 10BaseT **Crossover** cable to connect directly from the MIZ-27 to the HP-UX workstation. Or, use a 10BaseT **Patch** cable to connect from the MIZ-27 into a network hub or switch.

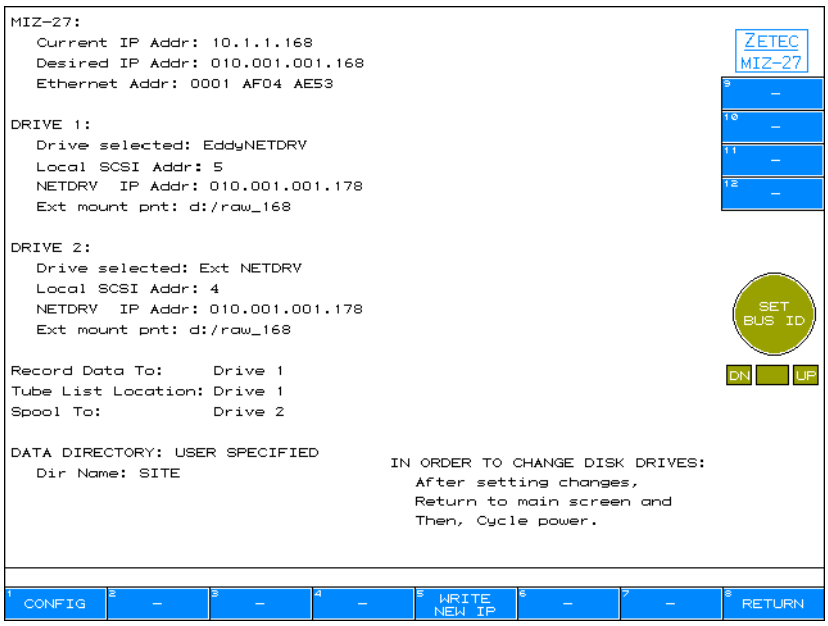
Step 2: Connect the 10BaseT cable to the connector on the MIZ-27 rear panel.

Step 3: On the MIZ-27 front panel, press **HARDWARE CONFIG**, **IO CONFIG**, and **NETWORK** to access the Network menu shown in figure 4-50.

Step 4: Set the MIZ-27 IP address. If connecting to a multi-user network contact the system administrator for a valid IP address.

Step 5: In the "Drive selected" field, select **EddyNETDRV** as shown in figure 4-59.

Figure 4-59. Network Menu



Selecting EddyNETDRV automatically changes the file name format to support Eddynet. An example file name is: DIR001C001I001. Eddynet data format uses the following conventions:

1 2 3### 7### 11###

1 = D, M, S, or E
D = Data file
M = Message file
S = Summary file
E = End of tape flag

2 = I or O

I = Inlet
O = Outlet

3 = C, R, T or L followed by a three digit number

C = Column
R = Row
T = Tube
L = Line

7 = same as 3

11 = I for Index followed by a three digit number

Step 6: In the "NETDRV IP Addr" field, input the correct IP address for the external drive.

Step 7: Set the "*Ext mount pnt*" field to **/mnt/rod2/raw/** using the HulaPoint control buttons.

The "2" equals the last octet of the MIZ-27 IP address. Your IP address may be different!

Before exiting this menu, it's important to press the **F5** button that is labeled **WRITE NEW IP**. Notice at the bottom of the Hardware Configuration menu that you are prompted to cycle power on the MIZ-27. Before power down:

Step 8: Press the **F8** button labeled as **RETURN**.

Step 9: Power off the MIZ-27. **DO NOT POWER UP THE MIZ-27 AT THIS TIME**. Directories must be created at the Eddynet98 work station before you power up the MIZ-27.

Eddynet98 Work Station Setup

At the work station, use the following steps to create directories for the MIZ-27 acquisition data. Text shown in **bold** indicates commands that are typed at the Eddynet work station.

Step 1: Click the Eddynet icon found on the Desktop's Front Panel.

Step 2: From the Eddynet Global Menu, select **File**, **Administration,** and **Eddynet Mount**. If not familiar with Eddynet programs, refer to the program's user guide for additional information.

Step 3: In the *Local Device Files,* select a file that corresponds to the SCSI device to be mounted and used as a storage device for MIZ-27 data, such as, **c0t2d0**. This would represent a SCSI device with an address of 2. The fourth character from the left represents this SCSI address.

Step 4: Create custom mount points by clicking on the **Config Mount Pts.** button. Click on **Add**, after the */mnt/rod* type in the last octet of the MIZ-27 IP address. In our example, this is **2**. The resulting string now reads **/mnt/rod2**.

Step 5: Click on **Save** to enter the new mount point.

Step 6: Click **Done** to exit.

Any additional MIZ-27's to be added would require their own unique storage device and mount point using these same steps.

Step 7: In the *Mount Points* field, scroll down and select the newly created mount point **/mnt/rod2**.

The newly created /mnt/rod2 directory must now be exported. This is a requirement of NFS protocol, allowing remote hosts to remotely mount directories (such as the MIZ-27).

Step 1: Under *Export Options*, toggle on the **Export Read-Write** option.

Step 2: To create the mount connection, click on **Mount Read/Write** button. In the *Eddynet Local Mount Status* field below this button, the new mount should be displayed.

Step 3: Select **Exit** to close the Eddynet Mount program.

The MIZ-27 creates the directory structure.

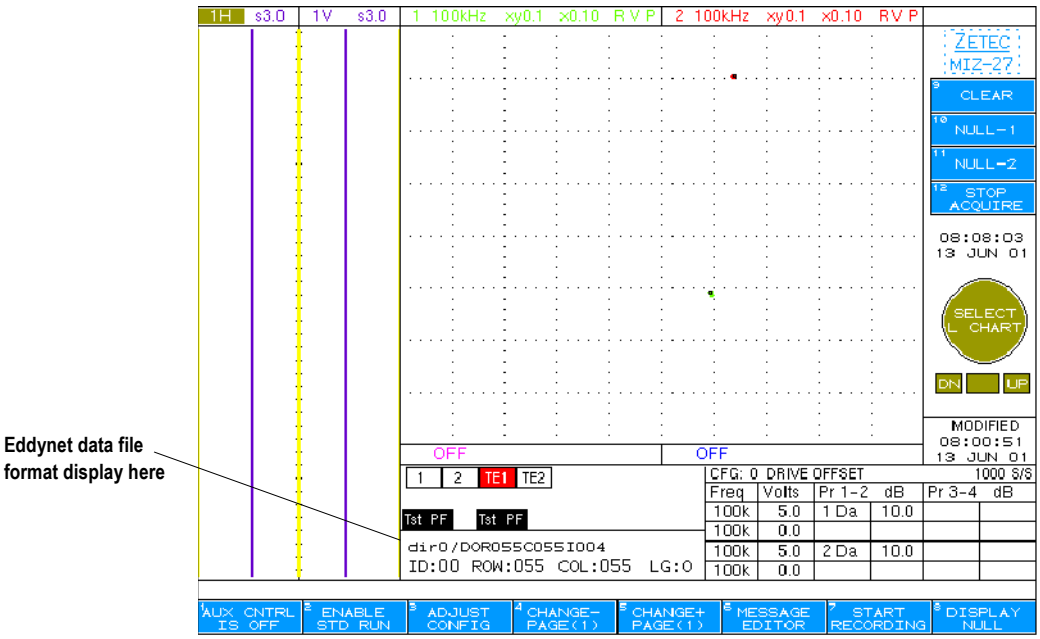
MIZ-27 Data Acquisition

After mounting the network drive, power up the MIZ-27. Carefully, watch the lower part of the screen during boot-up, The “Network Drive has been mounted” message displays to confirm that the network mount is good. If this message does not appear check the network connection and previous steps in this section.

Step 1: To set the directory recording path of MIZ-27, select **DISK** and then **DATA DIRECTORY**.

Step 2: Use the **LAST DIRECTORY** and the **NEXT DIRECTORY** buttons to select the directory as dir0 or directory of choice as shown in figure 4-60. Or, select **DIRECTORY LIST**, scroll to a directory, and press the **OPEN DIRECTORY** menu button.

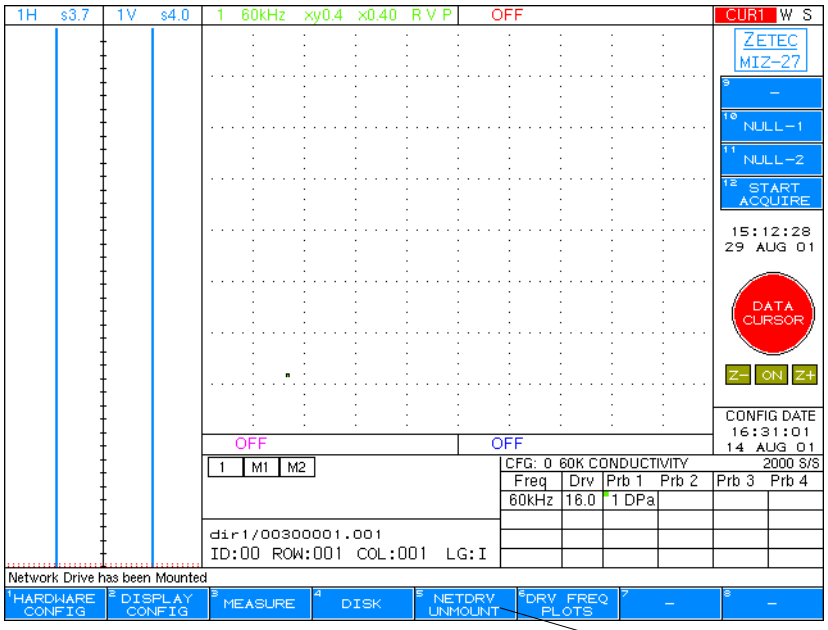
Figure 4-60. Eddynet Data File Format



Step 3: Operate the MIZ-27 as normal for data acquisition, as well as recording data, summaries, and messages. Data records directly to the Eddynet98 work station drive.

At the end of data acquisition or before turning off power to the MIZ-27, press the NETDRV UNMOUNT button shown in figure 4-61 to break the NFS mount on the HP-UX file system. Otherwise, the NFS mount remains active and you cannot remove the optical disk from the network drive.

Figure 4-61. Mount/Unmount Network Drive



Data Review in Eddynet98 Analysis

After recording to the Eddynet Network drive (EddyNETDRV), MIZ-27 acquisition data is available for review on the Eddynet98 work station. This section assumes that you are logged onto the Eddynet98 work station and the Eddynet98 Analysis software is installed with proper access/license. To access the MIZ-27 data for review only, no reporting, complete the following steps:

Step 1: From the *Eddynet Analysis Control Panel,* select **Data Directory**.

Step 2: Select **TO /MNT** to view the available mounted rods that contain MIZ-27 data.

Step 3: Double-click on the correct Rewritable Optical Drive (ROD) such as, **rod2**.

Step 4: Double-click on **raw**.

Step 5: Double click on the directory for review, for example, dir0.

Step 6: Double click on file name to open the file.

Step 7: Click **OK** when the message "*Got a new MIZ-27 setup from tube header"* displays.

Step 7 occurs only when you open the first file in a directory.

Eddynet Data Conversion

MIZ-27 Data that has been recorded using the **ExtNETDRV** must be converted before review with Eddynet Analysis. Conversion is unnecessary if EddyNETDRV selection is used for network drive selection when recording data, see page 4-96.

Stored data on work station hard drives is accessed by the Eddynet98 Analysis software for "datacop" or "data review" purposes only. In order to analyze and create report entries, the data must be converted from MIZ-27 to Eddynet98 format using the script:

/opt/eddynet/sbin/acq_to_eddynet.

The script rearranges the *row, column,* and *index* fields. It's important to execute the conversion only after all data has been acquired for a given directory, because only one conversion per directory is allowed. The ***acq_to_eddynet*** script moves and/or copies the data. As a result of the completed conversion, data is still available in MIZ-27 format, and is also available to analyze and create report entries with Eddynet98 Analysis.

Because the conversion process can be performed only once per destination directory, it's recommended that all data collection is complete for a given directory before applying the conversion routine. To convert data from MIZ-27 format to Eddynet98, follow these steps:

Step 1: Open an Hpterm window and change directories to */opt/eddynet/sbin*:

```
cd /opt/eddynet/sbin <Return>
```

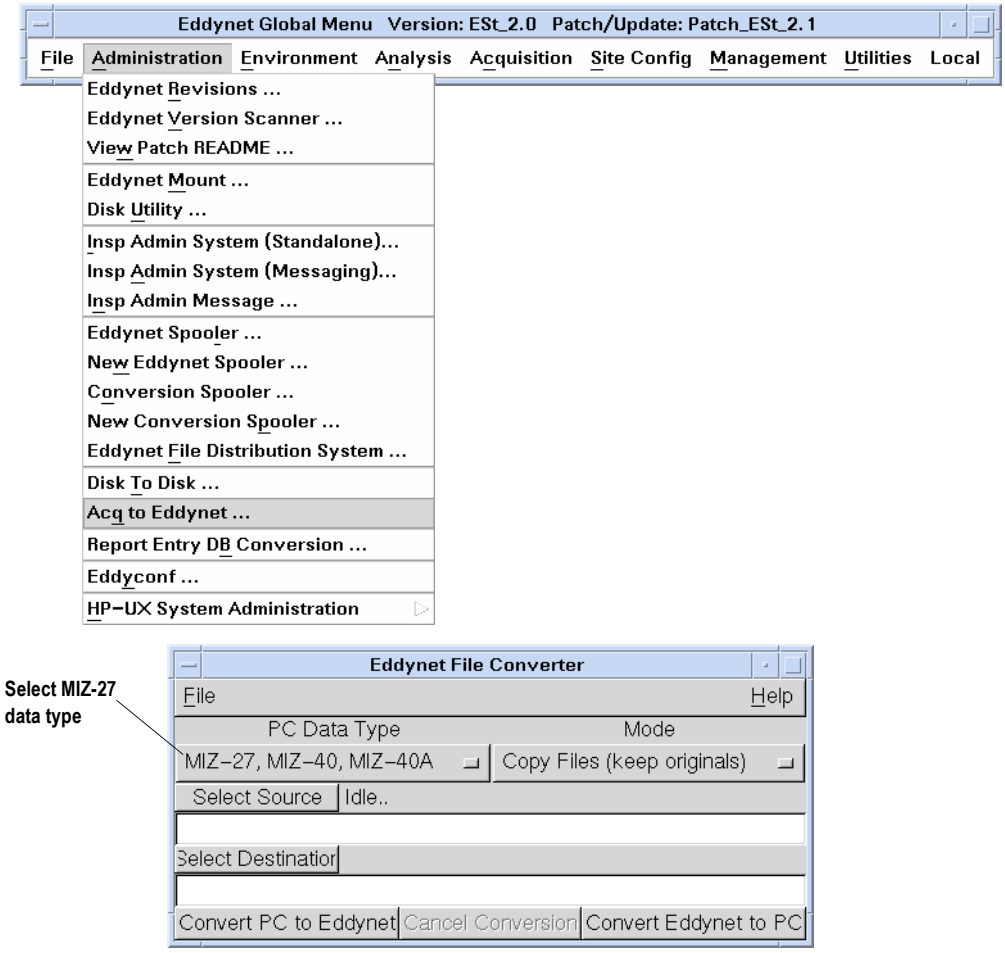
Step 2: Start the acq_to_eddynet program:

```
./acq_to_eddynet <Return>
```

Step 3: Alternately, select **Administration** > **Acq to Eddynet** in the *Eddynet Global Menu*.

This action opens the conversion program window shown in figure 4-62.

Figure 4-62. Acquisition to Eddynet98 Conversion Program

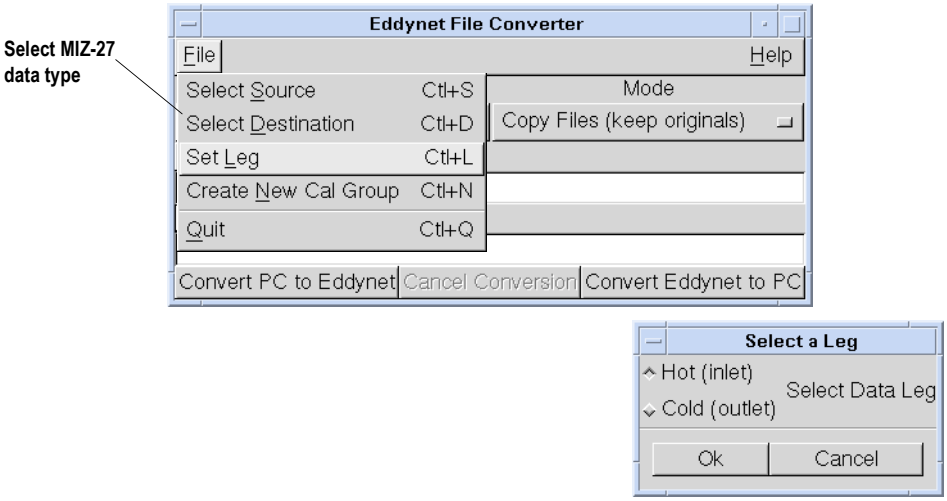


Step 4: In the program, select the *MIZ-27, MIZ-40, MIZ40A* option.

Step 5: Select the desired *Mode* of conversion.

Step 6: Click **File** > **Set Leg**.

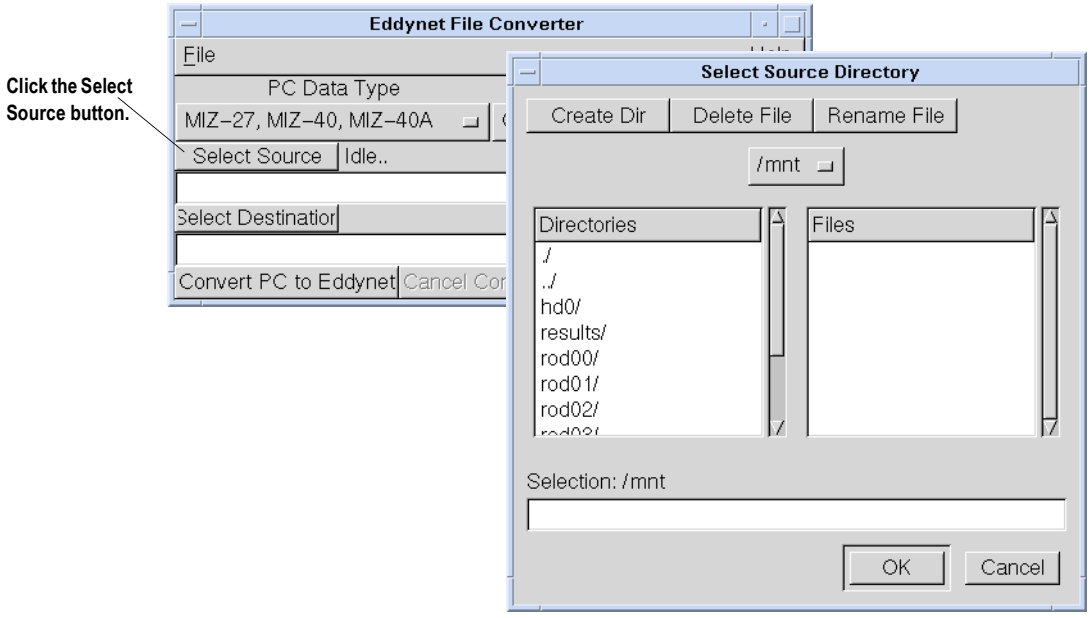
Figure 4-63. Select Data Leg



Step 7: Select the correct *Data leg* and click **OK**.

Step 8: Press the **Select Source** button. This opens the *Select Source Directory* window.

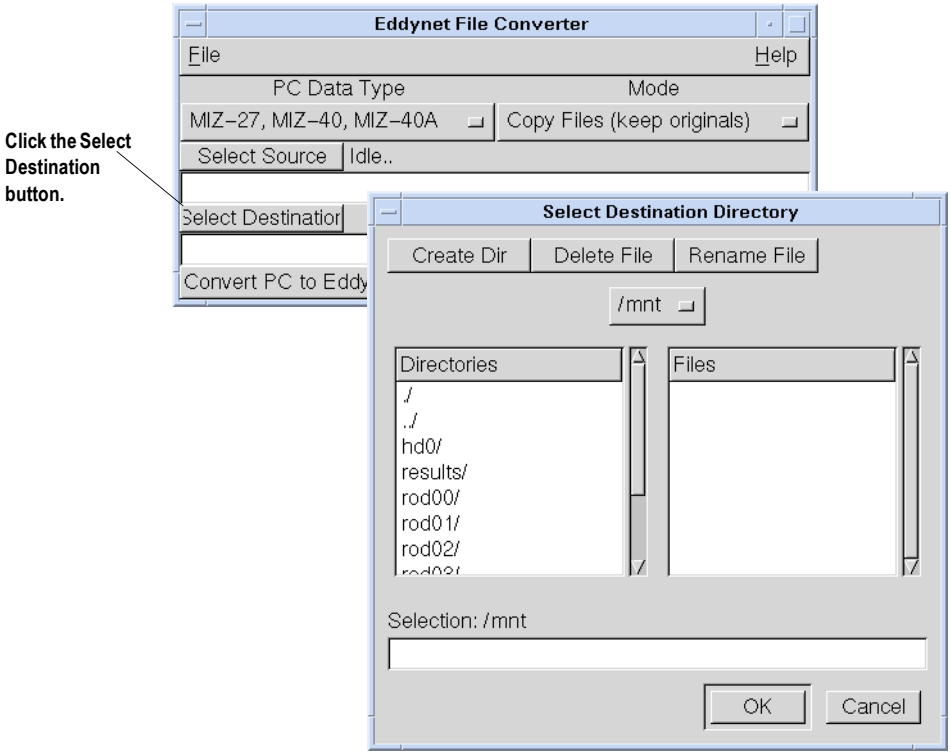
Figure 4-64. Select Source Directory



Step 9: Select the source directory for the data to be converted and click **OK**.

Step 10: Press the **Select Destination** button. This opens the *Select Destination Directory* window.

Figure 4-65. Select Destination Directory

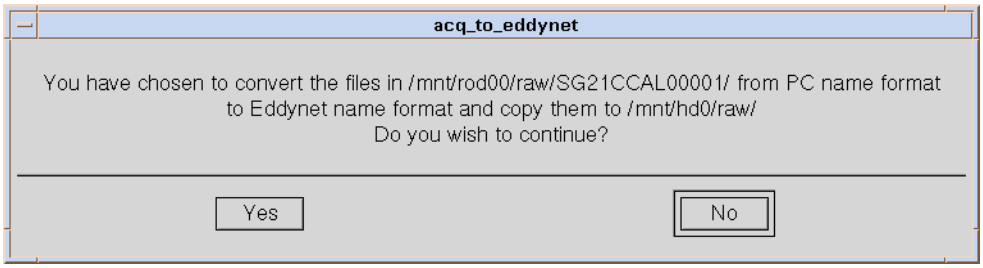


Step 11: Select the destination directory for the data to be converted and click **OK**.

Step 12: Once you have the correct source and destination directories selected, click either **Convert PC to Eddynet** or **Convert Eddynet to PC** as applicable.

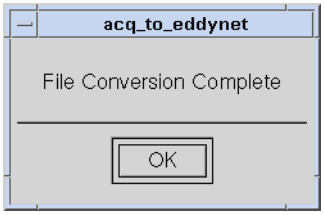
Step 13: When prompted to confirm your choices, select **Yes** to continue.

Figure 4-66. Confirm Directories



Step 14: When conversion is complete, click on **OK**.

Figure 4-67. Conversion Complete



To review converted MIZ-27 data and create report entries, go to *Data Review in Eddynet98 Analysis, on page 4-102*.

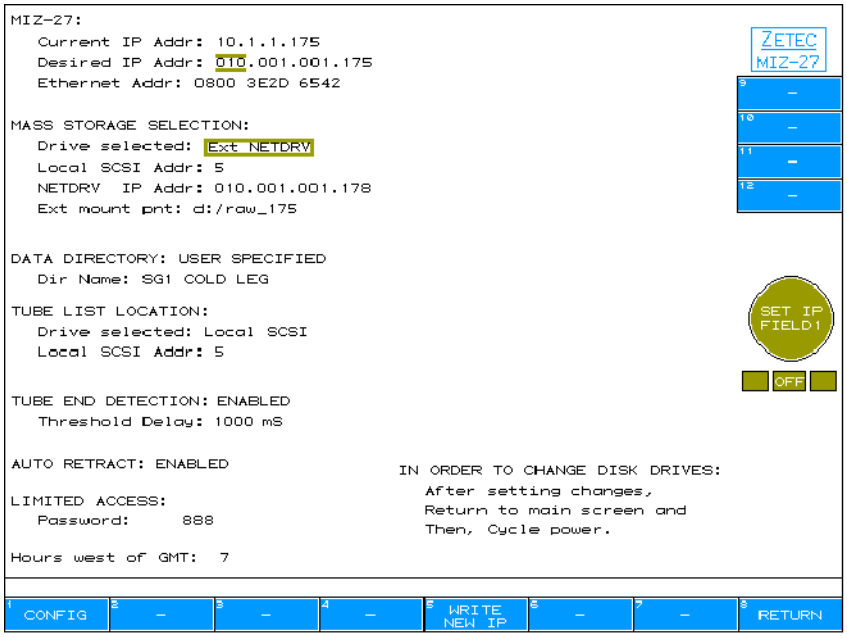
Network Functions

The MIZ-27 is capable of communicating on a network using TCP/IP protocol. Its network capabilities allow the MIZ-27 to store data to a network device as well as access the Internet. The built-in Web server provides MIZ-27 instrument diagnostics and screen image capture using any Web browser on your workstation.

The Network menu, shown in figure 4-68, allows you to select the MIZ-27 network functions:

- ❒ IP address
- ❒ Mass storage device type
- ❒ External network drive IP address
- ❒ External drive recording path
- ❒ Data directory names
- ❒ Tube list importing
- ❒ Tube end detection
- ❒ Auto retract
- ❒ Limited access mode with password protection
- ❒ Greenwich Mean Time (GMT) settings

Figure 4-68. Network Menu



The MIZ-27 IP address is for networking applications. If the "Desired IP Address" is changed, the **WRITE NEW IP** button stores the new address to battery-backed RAM.

The "Drive selected" control field identifies the currently selected mass storage device. The MIZ-27CT offers three options for mass storage—local SCSI device, external network drive, or Iomega Jazz drive as well as a "none" selection. If a change is made to the mass storage device selection, you must return to the Setup/Review menu and cycle instrument power for the change to be recognized.

If an external network drive is selected, the address specified in the "NETDRV IP Addr" field must correspond to the IP address of the network target device. If no mass storage device is being used, the "Drive Selected" field should be set to "None."

The "Ext. Mount Pnt" control field selects the drive where data is stored.

A "raw_#" directory (folder) must be present on the network drive for the data to be written. The "#" is the last number of the MIZ-27 IP address, i.e., 20.

Data Directory. In the Network menu, the Data Directory field has selections for Standard or User Defined. When Standard is selected, the directory structure defaults to the convention of DIR0, DIR1, etc., up to DIR200.

When User Defined is selected, the operator can input a custom directory name of up to 15 characters using the HulaPoint or optional keyboard. User Defined directory names provides the operator with flexibility to match naming conventions that support HP-UX networks and Zetec Eddynet software. More information about accessing a directory is found in *Directory List, on page 4-91*

Tube List Location. This field enables the TMARS tube list feature that supports tube lists that reside on any removable media that the MIZ-27 currently supports. Under "Tube List Location" is a selection for "Local SCSI Addr." This field requires the SCSI address of the local drive with TMARS tube list (currently, this function does not support a network drive).

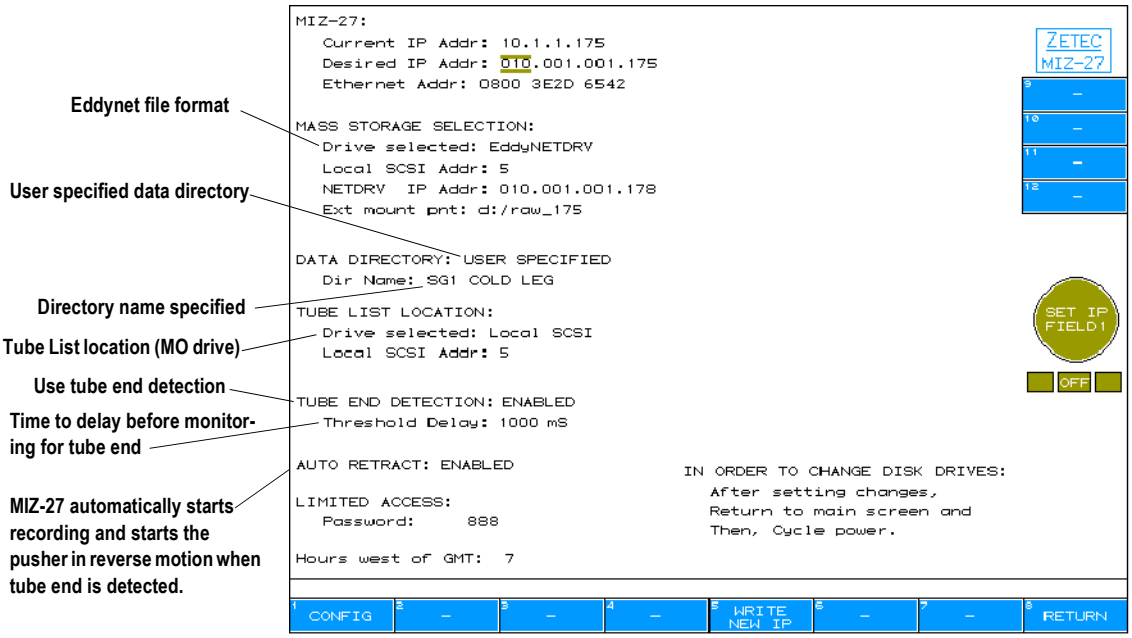
The MIZ-27 supports up to two local SCSI devices that are daisy-chained together. These devices must be addressed correctly to prevent conflicts.

Tube End Detection. The Network menu has selections that enable semi-automatic data acquisition and supports the Model III Power Supply and Control system. Tube end detection is enabled or disabled in the Network menu.

Threshold Delay. This time delay sets the time in milliseconds for the MIZ-27 to wait before checking for a threshold signal. The delay prevents a false tube end detection when the probe initially enters the tube.

Auto Retract. If Auto Retract and Tube End Detection are both enabled, when the MIZ-27 detects the far tube end in the forward direction, it automatically starts recording and starts the probe pusher moving at the reverse speed selected on the Model III Controller. When the near tube end is detected moving in the reverse direction, the MIZ-27 automatically stops recording and stops the probe pusher. When disabled, the operator has manual control of the data acquisition functions.

Figure 4-69. Enabling the Auto Acquisition Features in Network Menu



Data Time Stamp. The Greenwich Mean (GMT) setting corresponds with the world time center located near London. The "Hours west of GMT" control field sets the time zone where data is being recorded. This time stamp allows data to be reviewed in any time zone with the proper time.

Limited Access. You can password protect the MIZ-27's Full Access mode using a numerical password with up to seven digits. The Password control field is located in the Network menu. To enter or change the password, highlight the password control field, activate the HulaPoint control, and use the HulaPoint to define the password. If necessary, the MIZ-27 recognizes an override password—3925316. The override password always allows access to all MIZ-27 functions.

Firmware Upgrades

TCP/IP protocol is an integral feature of the MIZ-27CT. Using this protocol, you can quickly and conveniently update the instrument firmware at your office or job site. Information about your instrument's current firmware version displays at the top of the Calibration menu. Version information also displays during the instrument's initial power-up sequence.

For maximum flexibility, four update methods are available according to your available hardware:

- **Local SCSI drive**
- **External network drive**
- **FTP to MIZ-27 RAM disk**
- **FTP to magneto optical disk**

Uploading Firmware from Zetec's FTP Site

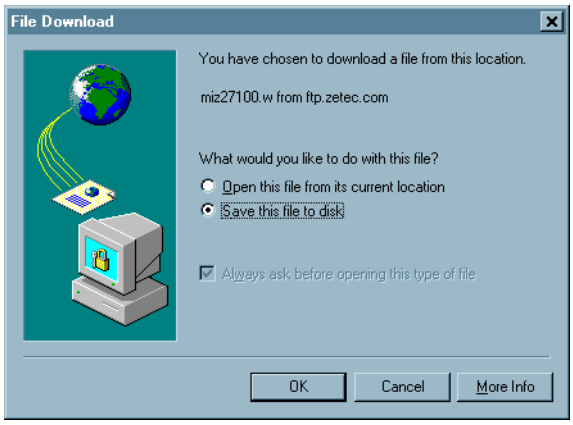
The current version of MIZ-27 firmware is available on disk or at Zetec's FTP site. To use Zetec's FTP site, complete the following steps:

Step 1: At your Web browser, type "ftp.zetec.com" into the address field.

Step 2: After connecting to the Zetec FTP site, go to the "dist/firmware/miz-27" directory.

Step 3: Click on the firmware revision you want to download. This action opens the Windows File Download dialog box shown in figure 4-70.

Figure 4-70. File Download



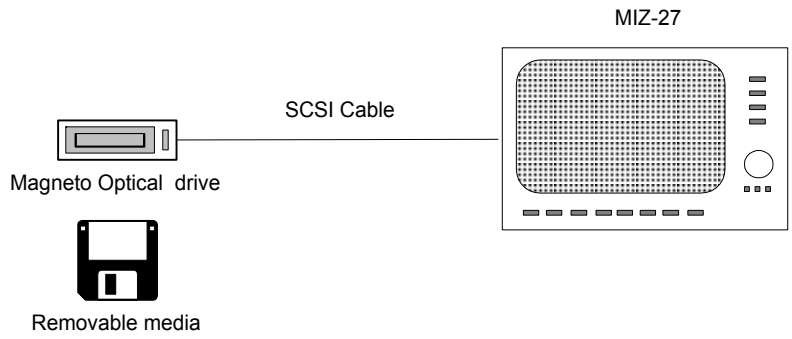
Step 4: Follow the prompts in dialog box to complete the file transfer to your preferred disk drive.

Each version of firmware requires a unique "revision key" to enable the upgrade. These key codes are also listed at the FTP site in the "dist/firmware/miz27/revkey.txt." file. The key code is entered in the Utility submenu before you update the MIZ-27 firmware.

Local SCSI Drive Firmware Upgrade

During the power-up sequence, the MIZ-27CT searches for the mass storage device, such as a magneto optical drive, that is selected in the Network menu. When detected, the **Disk** button displays as a Setup/Review menu selection. Figure 4-71 shows an example setup using a magneto optical drive.

Figure 4-71. Firmware Upgrade—Local SCSI Drive



For information about how to set up the mass storage type, see page 4-79. Use the following steps to update the MIZ-27CT firmware from magneto optical disk:

Step 1: Power-up magneto optical drive.

Step 2: Insert magneto optical disk with update into drive.

NOTE

The new firmware file name is: **MIZ27101.X** *(X=revision letter.) This file must reside at the root directory of the magneto optical disk.*

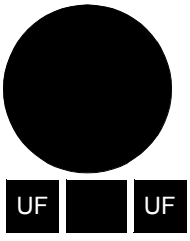
Step 3: Power-up the MIZ-27.

Step 4: Press the **HARDWARE CONFIG** button.

Step 5: Press the **UTILITY** button. Verify that the firmware revision key is correct for the version of firmware to be uploaded.

Step 6: Using the HulaPoint control, select "**cursor here enables update**."

Step 7: Using the HulaPoint control buttons, simultaneously press both "**UF**" (upgrade firmware) buttons.



Step 8: When the MIZ-27CT finds the "MIZ27101.X" file, press the **CONTINUE** button to complete the update to flash memory.

Do not interrupt instrument power while the firmware update is in progress. An interruption can corrupt memory and require factory service.

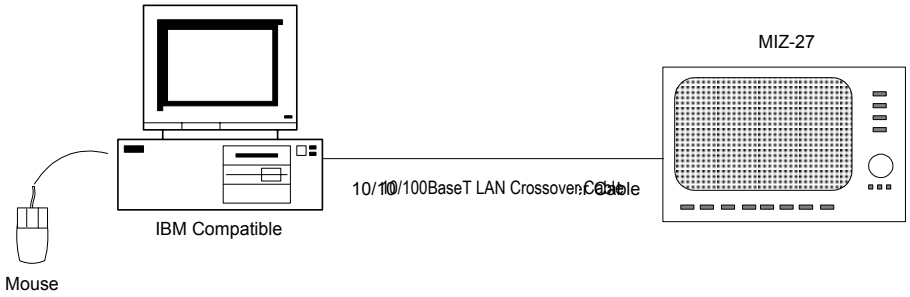
At this time, the MIZ-27 locates the "MIZ27101.X" file on the mass storage device and copies the file to the 2 MB flash disk. The copy process takes less than 30 seconds. Once the upgrade is complete, cycle power on the instrument to start the tester using new software.

External Network Drive Firmware Upgrade

You can upload a firmware upgrade that resides on an external drive via the network to your MIZ-27CT. This file must reside at the root of the shared directory (\raw_XX), which is also known as the root directory of the external mount point.

Figure 4-72 shows an example setup using a PC as an external network drive. During the power-up sequence, the MIZ-27CT automatically detects if an external network drive is connected to the instrument through the 10/100BaseT LAN connection (see page 4-83 for more information about the network drive connections). When detected, the Disk button displays as a Setup/Review menu selection.

Figure 4-72. Firmware Upgrade—External Network Drive



Use the following steps to complete the firmware update from external network drive:

Step 1: Ensure that the external network drive is properly connected and has power.

Step 2: Verify that the **`MIZ27101.X`** firmware file resides at the root of the shared directory (**`\raw_XX`**).

Step 3: Power-up the MIZ-27.

Step 4: Press the **HARDWARE CONFIG** button.

Step 5: Press the **I/O CONFIG** button.

Step 6: Press the **NETWORK** button. This sequence displays the Network menu (see figure 4-68) on the MIZ-27 display.

Step 7: In the "Drive selected" field, select the **Ext NETDRV**.

Step 8: In the "NETDRV IP Addr" field, input the correct IP address for the external drive.

Step 9: In the "Ext mount pnt" field, select the drive letter that corresponds to the external drive. For example, "c:" for a hard drive or "e:" for a magneto optical disk.

Step 10: Cycle power on the MIZ-27 and return to the Network menu.

Step 11: Press the **HARDWARE CONFIG** button.

Step 12: Press the **UTILITY** button. Verify that the firmware revision key (see page 4-112) is correct for the version firmware to be uploaded.

Step 13: Using the HulaPoint control, select "**cursor here enables update**."

Step 14: When the instrument finds the "MIZ27" file, press the **CONTINUE** button to complete the update to flash memory.

At this time, the MIZ-27 locates the "MIZ27" file on the network and copies the file to the 2 MB flash disk. The copy process takes about 30 seconds.

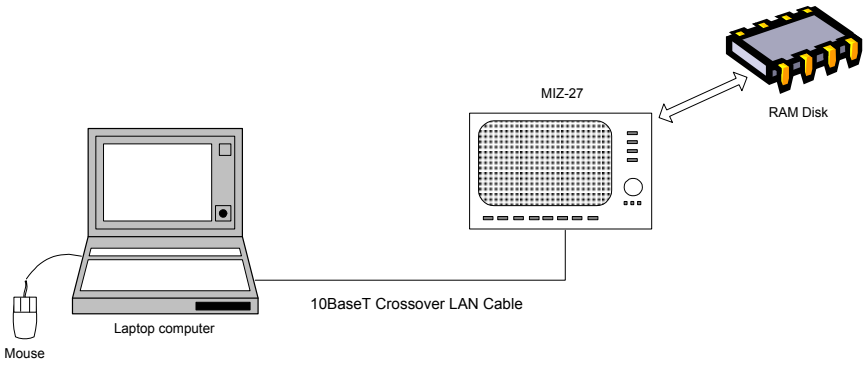
Do not interrupt instrument power while the firmware update is in progress. An interruption can corrupt memory and require factory service.

FTP to MIZ-27 RAM Disk

File Transfer Protocol (FTP) is an application for transferring files between your local system (PC) and a remote system (MIZ-27CT). FTP can connect to any system that has a valid Internet Address and contains an FTP server program.[1] Using FTP, you can connect to a MIZ-27 from your PC and transfer files between the systems.

To connect to a remote system using FTP, the remote system must be running an FTP server program, which is built-into the MIZ-27. The FTP client is installed as part of the normal Windows 95 or NT installation. The FTP server runs as a network service, and allows multiple users to connect to the server simultaneously. Figure 4-73 shows the typical hardware and interconnectivity for FTP.

Figure 4-73. Firmware Upgrade—FTP to MIZ-27 RAM Disk



To set up the MIZ-27:

Step 1: Power-up the MIZ-27.

Step 2: Press the **HARDWARE CONFIG** button.

Step 3: Press the **I/O CONFIG** button.

Step 4: Press the **NETWORK** button. This sequence displays the Network menu (see figure 4-68) on the MIZ-27 display.

Step 5: In the “Drive selected” field, select the **NONE**.

1. Windows NT operating system is required for NFS File Server.

Step 6: Cycle power on the MIZ-27.

Step 7: At the PC, open a DOS command window.

Step 8: Change directories to the directory with the MIZ-27 update file.

Step 9: Type the DOS commands shown in figure 4-74. Replace the IP address shown on line 1 with the address from your MIZ-27 Network menu. Do not use any leading zeros.

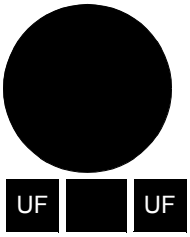
Figure 4-74. FTP to MIZ-27 RAM Disk with TERM Window

```
$ ftp 206.213.75.24
Connected to 206.213.75.24.
220 VxWorks (5.3.1) FTP server ready
Name (206.213.75.24:name): target
331 Password required
Password: password
230 User logged in
ftp> cd /ramdisk/
250 Changed directory to "/ramdisk/"
ftp> bin
200 Type set to I, binary mode
ftp> put miz27100.h
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
1638152 bytes sent in 1.52 seconds (1051.28 Kbytes/s)
ftp> bye
221 Bye. . .see you later
$
```

Use the following steps to complete the firmware update to the MIZ-27 RAM disk:

Step 1: Press the **HARDWARE CONFIG** button.

Step 2: Press the **UTILITY** button.



Step 3: In the Utility submenu, enter the "Firmware Revision Key" number.[1] This number is unique according to the firmware revision. You must obtain this number from Zetec by fax or phone. (Also available at ftp.zetec.com.)

Step 4: Using the HulaPoint control buttons, simultaneously press both "UF" (upgrade firmware) buttons.

Step 5: When the MIZ-27 finds the "MIZ27" file, verify that the upgrade file name and size is correct.

Step 6: Press the **CONTINUE** button to complete the update to flash memory.

Do not interrupt instrument power while the firmware update is in progress. An interruption can corrupt memory and require factory service.

Step 7: Cycle MIZ-27 power.

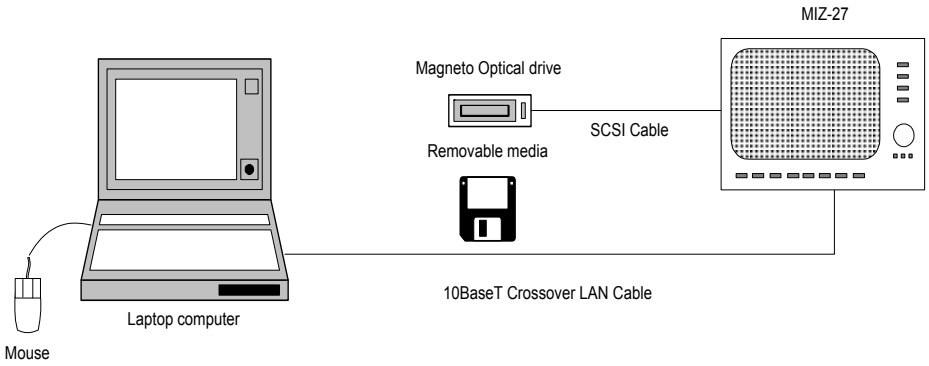
At this time, the new firmware revision displays as the MIZ-27 powers up.

FTP to Magneto Optical Disk

You can use FTP to transfer the MIZ-27 firmware upgrade from your PC to a magneto optical disk that is connected to the MIZ-27 instrument. Figure 4-75 is an example of the hardware configuration for this firmware upgrade option.

1. The Firmware Revision Key ensures that the upgrade file has correctly transferred and verifies the file integrity.

Figure 4-75. Firmware Upgrade—FTP to Magneto Optical Disk



To set up the MIZ-27:

Step 1: Power-up the MIZ-27.

Step 2: Press the **HARDWARE CONFIG** button.

Step 3: Press the **I/O CONFIG** button.

Step 4: Press the **NETWORK** button. This sequence displays the Network menu (see figure 4-68) on the MIZ-27 display.

Step 5: Verify the MIZ-27 IP address for FTP.

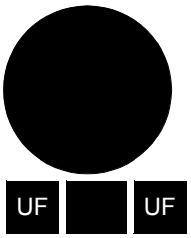
Step 6: In the "Drive selected" field, select **Local SCSI**.

Step 7: Cycle power on the MIZ-27.

In the DOS command window, use the same process as preceding section except you specify "/SCSI" as the transfer destination (see figure 4-76.)

Figure 4-76. FTP to MO Disk with TERM Window

```
$ ftp 206.213.75.24
Connected to 206.213.75.24.
220 VxWorks (5.3.1) FTP server ready
Name (206.213.75.24:name): target
331 Password required
Password: password
230 User logged in
ftp> cd /scsi/
250 Changed directory to "/scsi/"
ftp> bin
200 Type set to I, binary mode
ftp> put miz27100.h
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
1638152 bytes sent in 1.52 seconds (1051.28 Kbytes/s)
ftp> bye
221 Bye. . .see you later
$
```



Use the following steps to complete the firmware update to the MIZ-27 MO disk:

Step 1: Press the **HARDWARE CONFIG** button.

Step 2: Press the **UTILITY** button.

Step 3: In the Utility submenu, enter the "Firmware Revision Key" number.[1] This number is unique according to the firmware revision. You must obtain this number from Zetec by fax or phone. (Also available at ftp.zetec.com.)

Step 4: Using the HulaPoint control buttons, simultaneously press both "UF" (upgrade firmware) buttons.

Step 5: When the MIZ-27 finds the "MIZ27" file, verify that the upgrade file name and size is correct.

Step 6: Press the **CONTINUE** button to complete the update to flash memory.

Do not interrupt instrument power while the firmware update is in progress. An interruption can corrupt memory and require factory service.

Step 7: Cycle MIZ-27 power.

At this time, the new firmware revision displays as the MIZ-27 powers up.

1. The Firmware Revision Key ensures that the upgrade file has correctly transferred and verifies the file integrity.

HTTP Web Interface

The MIZ-27 instrument includes a built-in Web server, which allows your instrument to operate as an HTTP (Hypertext Transfer Protocol) server. The HTTP protocol is based on a request/response paradigm. A client (i.e., the PC) establishes a connection with a server (i.e., the MIZ-27) and sends a request to the server. The server responds with a status line. Using this basic process, you can request and receive information from a MIZ-27 through the familiar interface of your PC's Web browser. To do so:

Step 1: At your Web browser, type the MIZ-27 IP address into the "http" address field (omit any leading zeros).

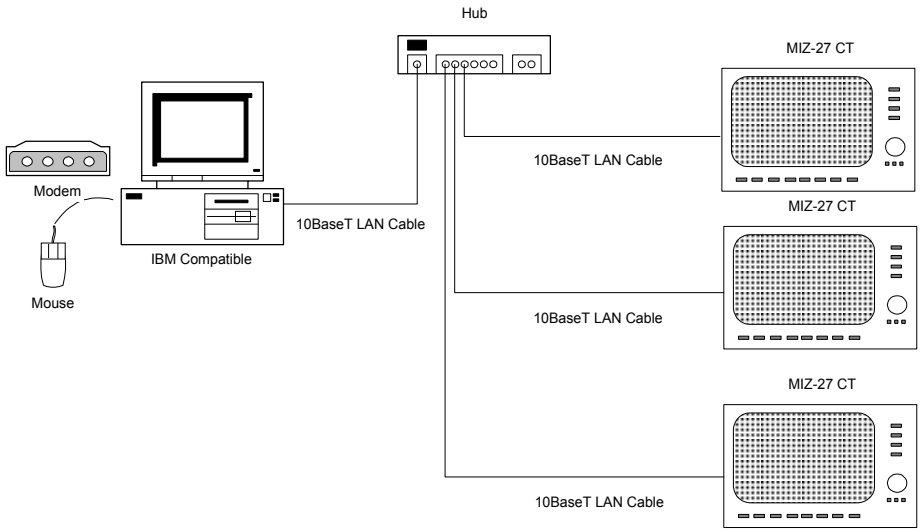
Step 2: The MIZ-27 server responds with its Web Interface page.

With its Web page you can remotely perform useful tasks from your PC to one or more MIZ-27 instruments networked together on a LAN, such as:

- **Review Statistics (Configuration Summary and Event Log)**
- **Screen Dumps**
- **Monitor Diagnostics**

Figure 4-77 shows a typical network configuration using multiple MIZ-27CT instruments.

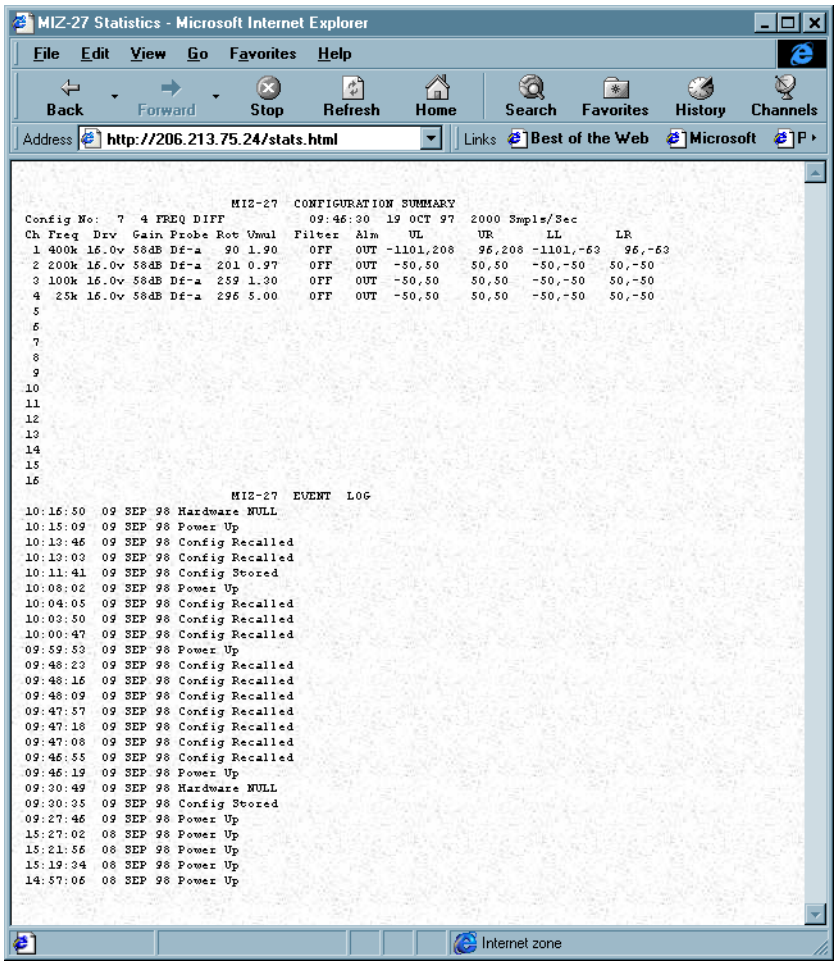
Figure 4-77. HTTP Web Interface Feature



Review Statistics

A copy of the MIZ-27's current configuration, as well as a log of events, is available through the Web page as shown in figure 4-78. This information is useful for remote monitoring of the instrument.

Figure 4-78. MIZ-27 Web Page Interface for Statistics



Screen Captures

To view the MIZ-27 display in your PC's Web browser and save this picture as a file, complete the following steps:

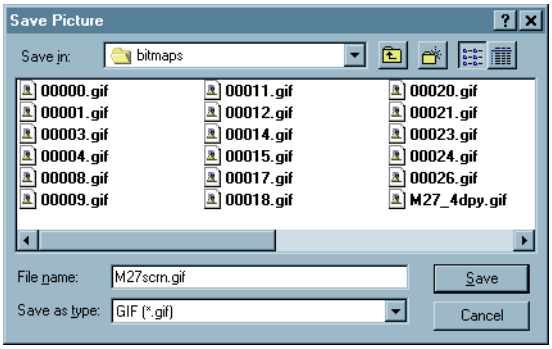
Step 1: At the MIZ-27 Web page, click on **Screen Dump**. This action displays the current MIZ-27 screen in your browser.

Step 2: To save a copy of the screen to file, position the mouse cursor anywhere over the screen picture.

Step 3: Click the right mouse button to reveal the mouse menu.

Step 4: Click on the **Save Picture As** option. This action opens the dialog box shown in figure 4-79.

Figure 4-79. Save Picture Dialog Box



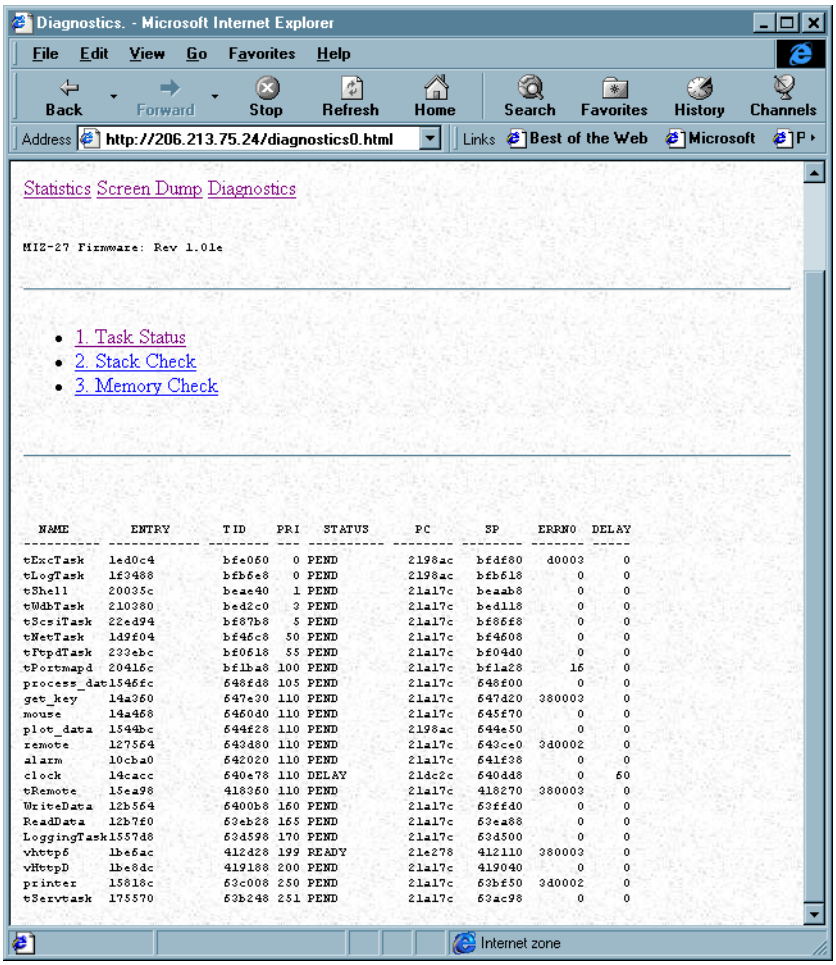
Step 5: Select a directory, and name the file. You have the option to save the picture in either "bmp" or "gif" format.

As you work with the MIZ-27, you can update the Web page with the browser's **Refresh** button. Use the preceding steps to capture each additional screen shot.

Monitor Diagnostics

From the MIZ-27 Web page, you can check the task status, stack, and memory as shown in figure 4-80. These are troubleshooting aids that can help you determine a problem's source.

Figure 4-80. Diagnostics



Optional Features

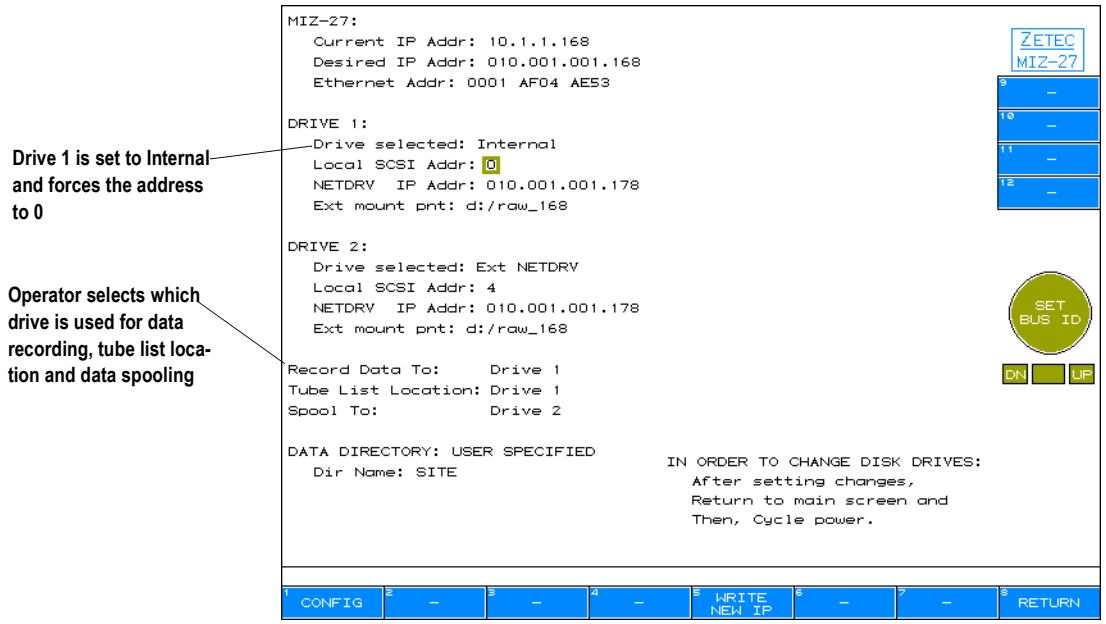
The MIZ-27CT Eddy Current Instrument is available with an optional Internal Hard Drive.

Internal Hard Drive

The optional MIZ-27 Internal Hard Drive adds 36 GB of data storage capacity to the MIZ-27 for data acquisition and tube list storage. The option is available only as a factory installation. With the addition of an internal drive, both data and test plans/tube lists can exist on the same media. This option features the ability to spool data files off the internal drive to the external drive.

The MIZ-27 can be configured for two drives. Either drive can be configured as Internal, Local SCSI, Ext NETDRV, Ext EDDYNETDRV, Local ZIP, or NONE. When a drive is set to Internal, the Local SCSI address is forced to 0. Only one drive at a time can be set to internal. Drive 1 and Drive 2 setup is located in the Network menu as shown in figure 4-81.

Figure 4-81. Network Menu: Internal Drive Setup



Record Data

The operator can choose the drive where data will be stored. Valid selections are Drive 1, Drive 2, or None.

Tube List Location

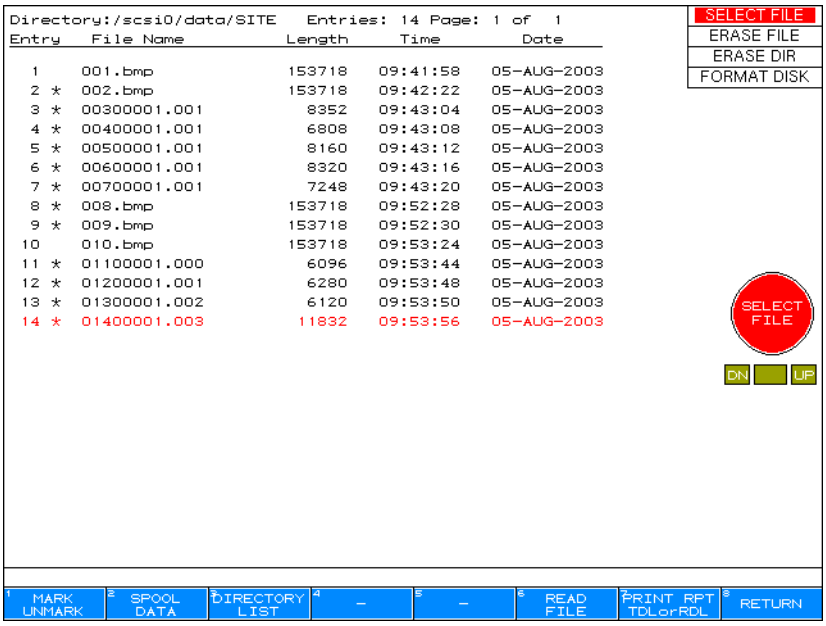
The operator can choose the drive where the tube list will be stored and where test plans are imported. Valid selections are Drive 1, Drive 2, or None. Tube lists can't reside on a network drive.

Tube Lists can be created on the Internal Hard Drive. And, test plans can be imported from an external drive to the Internal Hard Drive.

Spool

The "Spool To" field indicates the drive where the data from the internal drive is sent. The Record To and Spool To drive selections can't be the same. Spooling of a data file takes place on a separate task (Spooler) and is activated when the **Stop Recording** button is pressed. Individual files or directories of files on the internal drive can be spooled from the Data Directory using the **SPOOL DATA** button. Spooled files are marked as read (*) to indicate they have been spooled. The **MARK/UNMARK** button can be used to toggle the read setting. When a Data Directory has more than one page, use the HulaPoint up and down control buttons to access the next or last page. Figure 4-82 shows the Data Directory

Figure 4-82. Data Directory



Importing a Test Plan

When used in conjunction with Zetec's EIMS-BOP or TMARS software, the MIZ-27 can import test plans from an external SCSI drive to the optional internal hard drive and display the tube lists created with the software application to show the sequence of tubes for testing with their extents. As data acquisition proceeds, the MIZ-27 is then able to encode the data files as you move from tube to tube collecting and recording data.

The MIZ-27 supports test plan files with both the *.csv (EIMS-BOP) and *.pln (TMARS) format. The Comma Separated Values (CSV) format must have the *.csv file extension. The format of the CSV file is:

```
SECTION,ROW,COLUMN,EXTENT
```

Each field is separated by one comma. The **row** and **column** fields are required, while the **section** and **extent** fields are optional. Empty lines or lines beginning with non-alphanumeric characters (other than comma) are considered free format comment lines and are ignored. See the following format example:

```
// Sample test plan
// Test plan for section 8
* Tester Smith
* 7/2003
# Power, Inc.
#

8,1,0,Full
8,1,1,Half
,1,2,Left
,1,2,Right
8,1,4,12345678
8 ,1,5
8, 1,6,1
8,1 ,7,Full
8,1, 8,Half
8,1, 8,Half
8,1,9 ,Left
8,2,0, Right
8 , 2 , 1 ,F/L
08,02,04,F/L
88,02,05,F/L
888,222,777,F/L
```

To display a tube list, the inspection test plan must reside on media in a dedicated external SCSI device or internal hard drive. The SCSI device must be selected in the Tube List Location field and correctly addressed on the Network menu. For more information about device selection, see Tube List Location, on page 4-127.

When correctly selected, the MIZ-27 automatically detects the media in the SCSI drive and enables the **TUBE LIST DIRECTORY** menu button in the **DISK** menu.

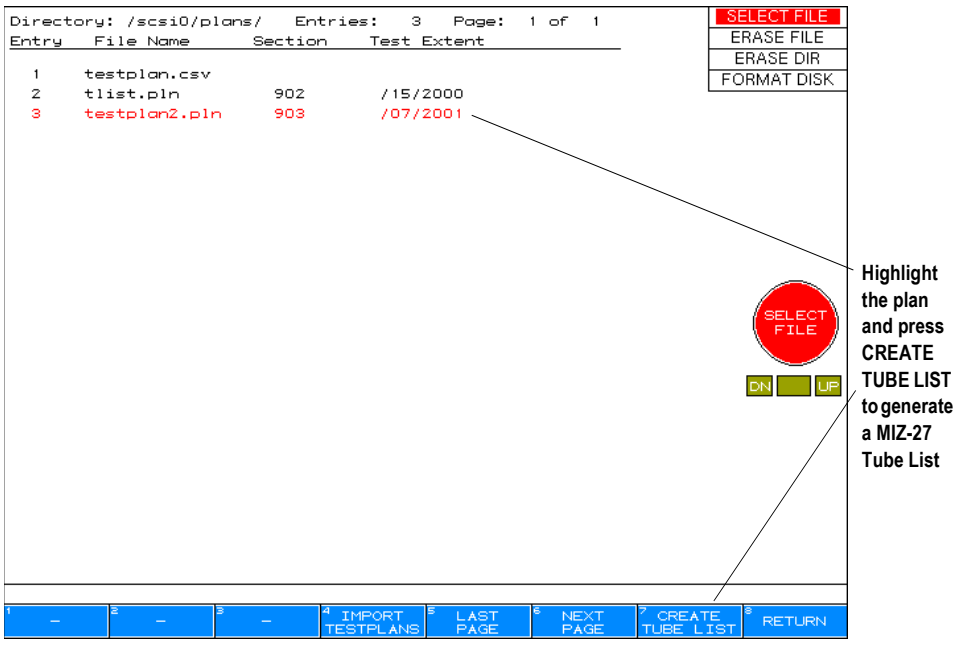
To create a tube list, complete the following steps:

Step 1: Place a *.csv or *.pln file at the tube list location (external drive) or import the test plan file to the internal hard drive.

Step 2: Go to the Main menu, press the **DISK** menu button. The button labels change to offer a **TUBE LIST DIRECTORY** menu button.

Step 3: Press the **TUBE LIST DIRECTORY** menu button. This action displays the test plan files shown in figure 4-83.

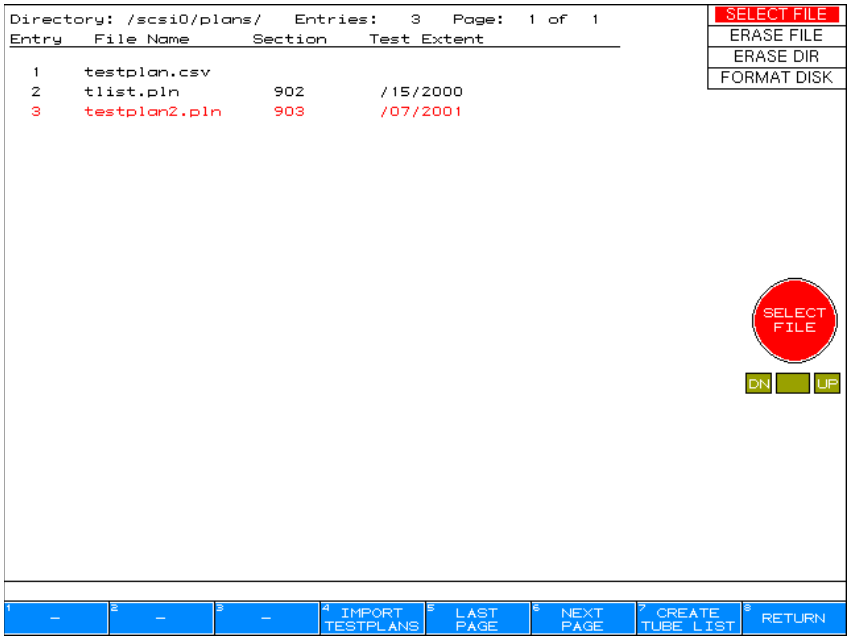
Figure 4-83. Tube List Directory



Step 4: Press the **CREATE TUBE LIST** menu button.

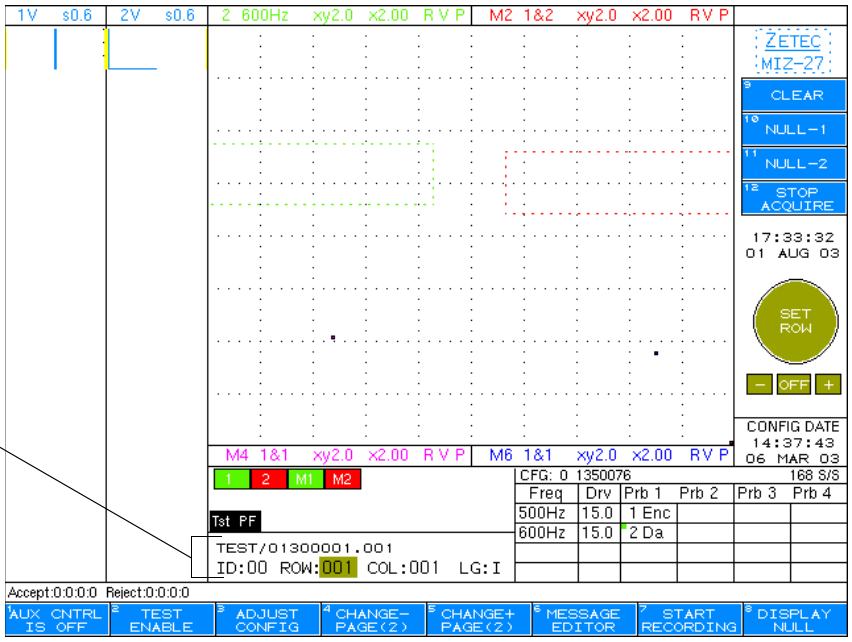
The MIZ-27 reads through the test plan file and picks out all tubes and extents to generate its own tube list as shown in figure 4-84. The tube list should be the only file on the media in local drive. When the MIZ-27 creates its tube list, all existing files are removed in the directories needed by the tube list. The list will have 200 entries/directory. If the directory exists, all files will be deleted and replaced by the list, if the directory doesn't exist, it will be created.

Figure 4-84. Test Plan File Display



When you return back to the Acquire menu, the list is checked for the first untested tube. The tube row and column updates and the test extent displays as shown in figure 4-85. When you press **START RECORDING**, the tube is marked with an asterisk and the row, column, and extent updates to the next tube for testing. Tubes can be marked and unmarked when displaying the tube list using the **MARK/UNMARK** menu button.

Figure 4-85. Next Tube Test Display



Auxiliary Features

Many auxiliary features for the MIZ-27 offer extended flexibility for graphic output selection, calibration checks, and instrument control options.

Graphics Dump

Five types of graphic dump destinations are available with the MIZ-27 CT. You select the destination in the Utility submenu. (To access the Utility submenu, go to **Hardware Config** and press **Utility**.) The "Printer Port—B/W" and "Printer Port—Color" selections provide a graphics dump to the HP printer connected to the parallel port. The "Disk Mass Storage" selection stores a bitmap file to the selected mass storage device. The "Disk & Printer—B/W" and "Disk & Printer—Color" selections provide a graphics dump to both the printer port and the mass storage device. The Graphics Dump function executes any time you press the printer icon button located on the front panel.

Analog Outputs

The MIZ-27 provides four pairs of Analog Outputs for recording data on instrumentation recorders, paper charts, or any other interface to the analog data. The Analog Outputs and Brush Recorder On/Off Control signals are present at the rear panel in the Analog Output 15 pin "D" Connector. The Analog Output range is ±10Vdc.

To set up the Analog Outputs press the **HARDWARE CONFIG** button and then the **IO CONFIG** button. The Analog Outputs are labeled:

- 1-2 H-V
- 3-4 H-V
- 5-6 H-V
- 7-8 H-V

Move the cursor to the Channel control field to assign a channel to an output. Press the Up/Dwn Hula Point buttons to select the channel for the corresponding output.

The Analog Outputs function has a Multiplier feature similar to the display's volt (V) multiplier. As the multiplier increases, the analog output signal multiplies, changing the signal amplitude required to generate a full ±10 volt signal at the analog output. For example, a multiplier of 1 requires a signal amplitude of 10 volts to produce a 10 volt analog output. A multiplier of 2 requires a 5 volt signal on the screen to produce a 10 volt output. As the multiplier changes, the new screen equivalent range is displayed in the column to the right. The screen equivalent values will only correlate when the volt (V) multiplier on the display is set to 1. Any other setting on the volt (V) multiplier will add additional multiplication to the signal going to the analog output.

External Inputs

The External Inputs provide two Remote control switch inputs and a method of interfacing with two external Encoders. The Remote control inputs can be used to perform a Null, Clear, or Record Start/Stop using a remote switch closure. The encoders can be used to develop a delayed alarm output, or to measure and display axial distance. To access the External Input setup, press the **HARDWARE CONFIG** button and then the **IO CONFIG** button.

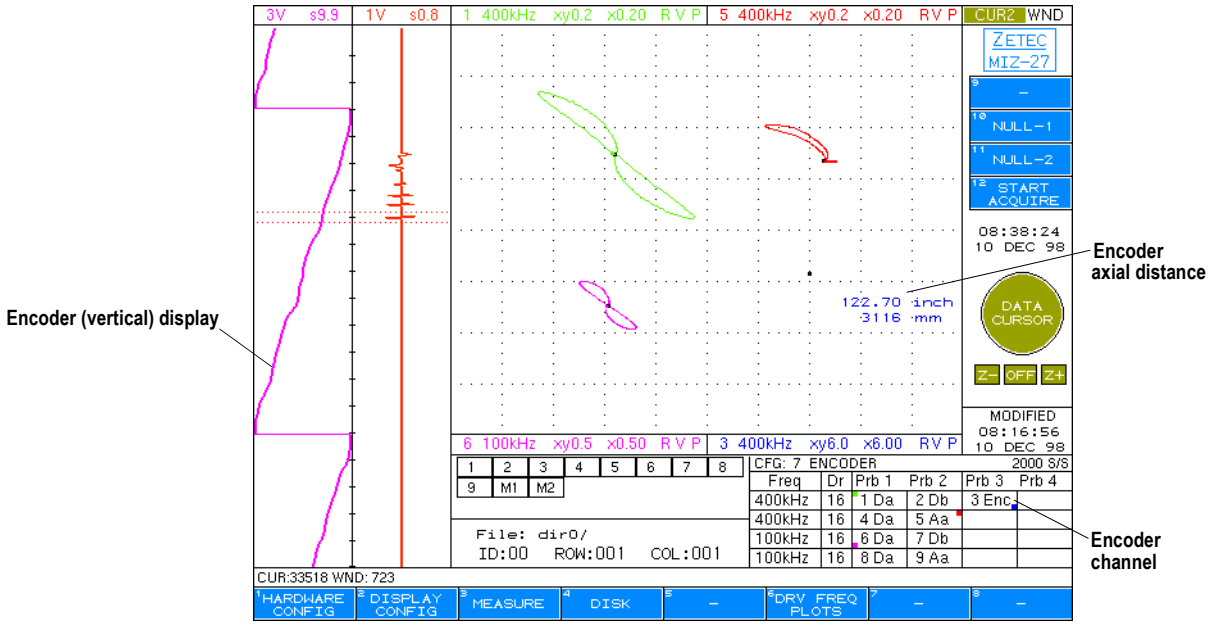
To enable the Remote 1 and Remote 2 controls, place the cursor on the corresponding status field and press the Up/Dwn HulaPoint buttons. Once enabled, the Remote 1 and Remote 2 controls can be set to activate the Clear, Null-1, or Recording Start and Stop functions. To set the function, place the cursor on the corresponding Function field and press the HulaPoint Up/Dwn buttons. A ground closure between pin G and A for Remote 1, or pin I and A for Remote 2, performs the function set in the Function control field. See table 3-2 for the pin out information of the Remote connector.

Two Encoders can be interfaced and controlled with the MIZ-27. The function of the encoders is to develop a delayed alarm output or measure and display axial distance. For more information about this setup, see *Delayed Outputs, on page 4-61*. If an encoder is used, a data channel must be assigned to an encoder. Pages 4-14 to 4-15 have more information about how to assign channels.

To set up an encoder to measure and display an axial distance, press the **HARDWARE CONFIG** button and **IO CONFIG** button. Place the cursor on the Encoder Scale field and set the preferred divisor for the encoder count. For example, if the encoder is 100 counts per revolution and you want 10 counts

per revolution, set the Encoder scale to 10. Set the Counts/Inch value according to the scaled count. While acquiring data, the encoder value can be displayed by viewing the encoder channel in one of the displays. Setting a strip chart to display the vertical component of the encoder channel allows a view of the encoder operation over time as shown in figure 4-86. As you collect data, the encoder value is stored with the data. When reviewing data, as the cursor moves through the data buffer, the encoder value updates on the encoder channel's display. The encoder value displays in both inches and millimeters. The volt (V) multiplier on the encoder channel's display must be set to a value of 1.00.

Figure 4-86. MIZ-27 with Encoder Display



Self-Test

The MIZ-27CT has a built-in self-test, which can be activated to assure that the instrument is within calibration specifications.

To perform the self-test, disconnect any probes attached to the instrument.

Step 1: Press the **HARDWARE CONFIG** button from the Setup/Review menu, then press **CHECK CALIBR**.

Step 2: Press the **QUAD/LINEAR** menu button to display the self-test triangles.

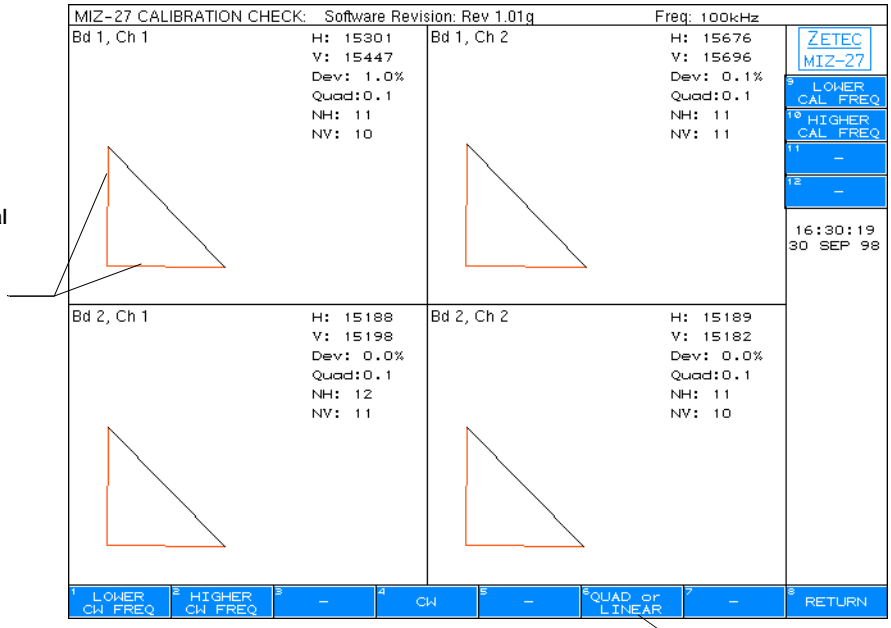
All channels present (two channels with one analog board, four channels with two analog boards) are represented on the display. A series of H,V, Dev, Q, NH, and NV values list on the right side of the XY display area. A triangle is drawn on the screen using 100 kHz, and the H and V values display. The Dev, which represents the H-V deviation, should be less than five percent. The Q values should be 3.0, maximum. The numbers are derived from ASME specifications for steam generator inspection.

H and V are gain figures for the demodulator circuitry on the analog boards. Q is the quadrature value, which measures the phase accuracy of the instrument. The triangle is a graphical representation of the H and V gain of the channel that is highlighted in the Probe Selection Summary. The horizontal and vertical legs should be of equal length, and the lower left corner should be a right angle. It is natural for the triangle to be rotated somewhat on the screen as shown in figure 4-87.

You can change the calibration frequency with the **LOWER** and **HIGHER CAL FREQ** buttons. H and V values vary across the frequency range. The instrument amplitude is specifically set using 100 kHz.

NH and NV indicate noise values for the horizontal and vertical components. The NH noise value is an RMS noise measurement with the drive frequency turned on; it typically measures 20. The NV noise value is an RMS noise measurement without the drive frequency; it typically measures 10. These noise values are provided as troubleshooting aids.

Figure 4-87. Quad Self-Test Display



The triangle's horizontal and vertical legs should be equal lengths.

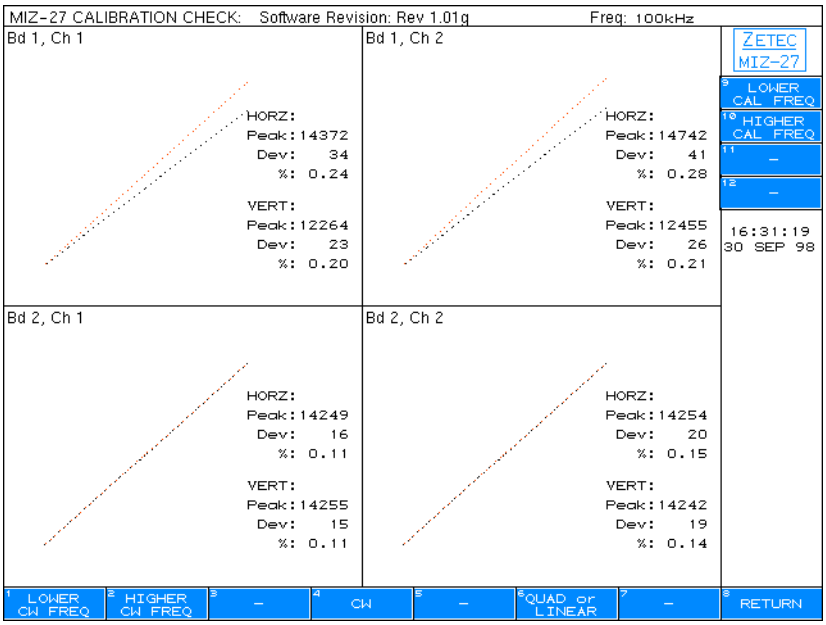
Press LINEAR menu button to switch self-test modes.

Step 3: Press the **CW** button to place the instrument in a "continuous wave" mode for frequency measurements.

Step 4: Adjust the CW frequency with the **LOWER** and **HIGHER CW FREQ** buttons.

Step 5: To perform the linearity test, press the **LINEAR** menu button. This action tests the linearity of the analog circuits and displays % for each channel on the display as shown in figure 4-88. The linearity specification is ±2%.

Figure 4-88. Linearity Self-Test Display



Step 6: To exit the self-test, press the **RETURN** button, which takes you to the Hardware Configuration menu.

Step 7: Reconfigure the instrument, as necessary, from the Hardware Configuration menu.

Computer Control Functions

The MIZ-27CT has several remote control functions that can be executed by sending a single character remote control operations. A user-supplied communications program can be used. Complete the following steps to access these functions:

Step 1: Connect a serial cable to the MIZ-27CT.

Step 2: Start the terminal program on the host computer. Communication parameters are 9600 Baud, 8 Bit, 1 Stop Bit, No Parity.

Step 3: Turn the MIZ-27CT power on. A copyright message displays on the computer.

Step 4: Send the single character and the corresponding function will execute:

Letter	Function
C	Screen Clear
N	System Null
B0	Setup/Review Menu
B1	Front Panel Menu Button 1
B2	Front Panel Menu Button 2
B3	Front Panel Menu Button 3
B4	Front Panel Menu Button 4
B5	Front Panel Menu Button 5
B6	Front Panel Menu Button 6
B7	Front Panel Menu Button 7
B8	Front Panel Menu Button 8
B9	Front Panel Display Function Button 1
BA	Front Panel Display Function Button 2
BB	Front Panel Display Function Button 3
BC	Front Panel Display Function Button 4
F1	ID
F2	Record On/Off
F3	Row
F4	Display Null
F5	Column
F6	Clear

Terminal Remote Control

The handheld Zetec Remote Control Terminal provides remote control of the MIZ-27 tester. The terminal connects to the RS-232 input using the MIZ-27 Remote Terminal Adapter.

Terminal remote control uses a command set specifically designed to be used in conjunction with digital recording. This allows the operator to manipulate the probe and record the inspection without having to repeatedly use the tester's local control.

To install the Zetec terminal, plug it into the RS-232 connector. Power is provided to the terminal through the connector. At power-up, self-test data appears on the terminal display, followed by a blinking cursor.

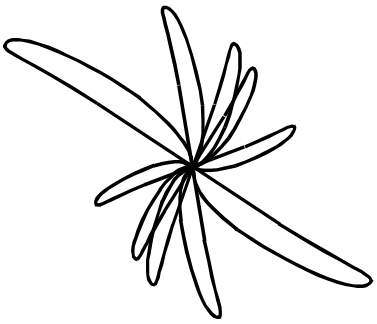
To use the terminal for digital recording control, enter the Start Acquire menu. The terminal can be used for *DISPLAY NULL* or *CLEAR*, regardless of whether a digital recording device is in use. All the MIZ-27 local controls are active along with the terminal command keys. The terminal display updates with ID/ROW/COL information and recorder status whenever you use a terminal key. Use the terminal commands as outlined in table 4-7.

In order to use the Remote Terminal control with the ID/ROW/COL functions, the "Name" field for those file names must be set to "1." See the Utility Menu on page 4-95.

Table 4-7. Terminal Remote Control Commands

Command	Action
RECORD ON/OFF	Turns the recorder on or off.
NULL	Performs DISPLAY NULL.
CLEAR	Performs CLEAR.
ID	Displays ID label plus a 2-digit number. To increment the two consecutive digits on the keypad, press ID again or the "." character to increment the number by 1, or "-" to decrement by 1.
ROW	Displays ROW label, plus a 3-digit number. Press ROW again or the "." character to increment the number by 1, or "-" to decrement by 1. Alternately, press three consecutive digits on the keypad to enter a number from 000 to 999.
COL	Displays COL label, plus a 3-digit number. Press COL again or the "." character to increment the number by 1, or "-" to decrement by 1. Alternately, press three consecutive digits on the keypad to enter a number from 000 to 999.

The next section of this operating guide is about the MIZ-27CT Limited Access Mode.



SECTION 5 Operating in Limited Access Mode

Zetec's MIZ-27CT instrument operates in two modes—Full Access and Limited Access. In Full Access mode, you are able to control all aspects of instrument setup and adjustment. Password protection ensures that only authorized operators can switch between the two operating modes. With Limited Access mode, operators are restricted to basic functions, such as selecting and saving a configuration, running a test, and adjusting alarms during data acquisition. For more information about Full Access, see section 4.

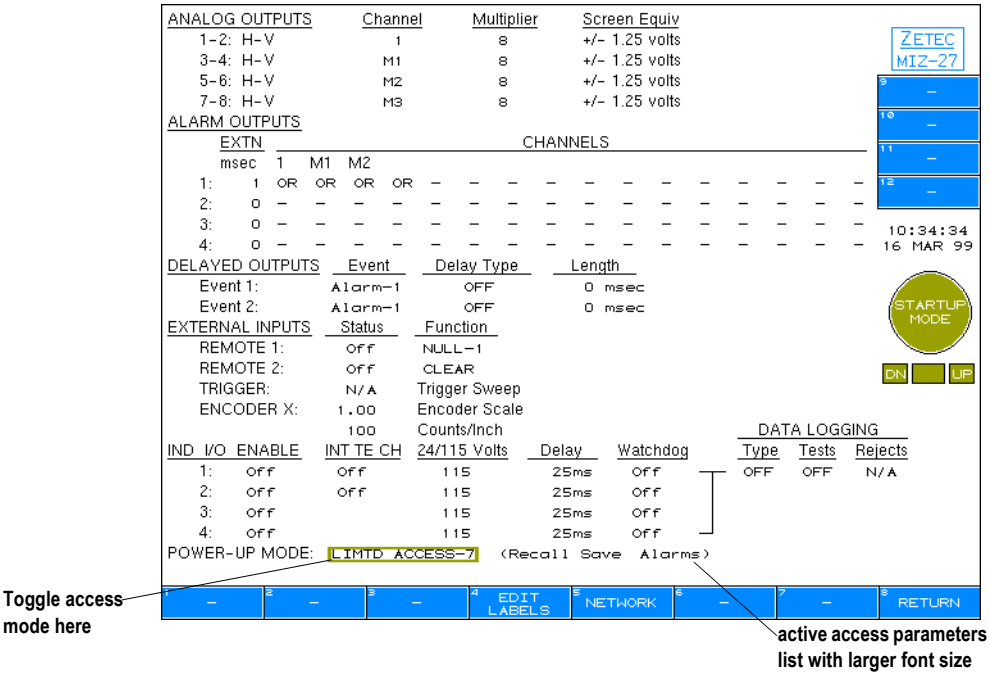
This section details the MIZ-27CT when operating in the Limited Access mode. To switch from Full Access to Limited Access mode:

Step 1: From the Main Menu, press **HARDWARE CONFIG**.

Step 2: Press **I/O CONFIG**.

Step 3: Use the HulaPoint to highlight the Power Up Mode field as shown in figure 5-1.

Figure 5-1. Changing Access Mode



Step 4: Use the HulaPoint control buttons to toggle between Full Access and the eight different Limited Access modes.

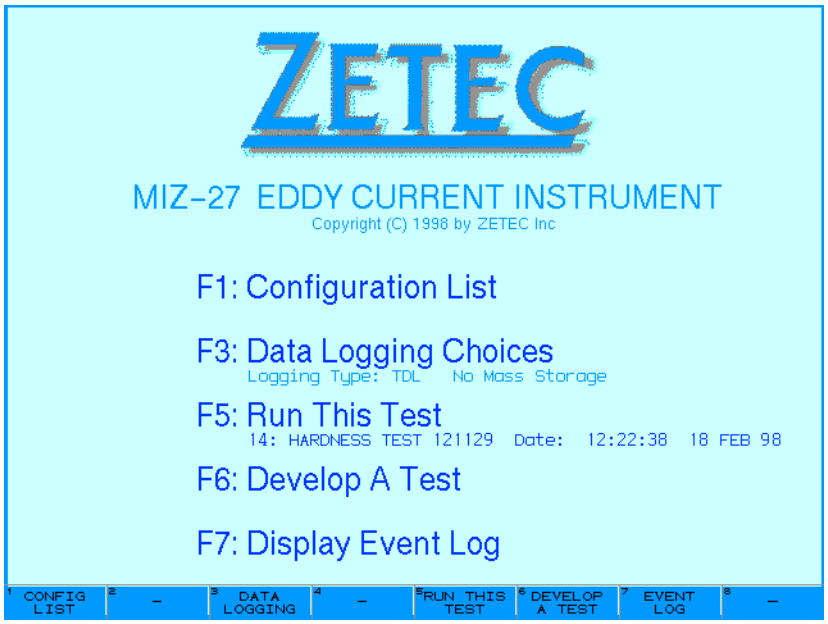
Three parameters, Save, Recall, and Alarms, are selections that further define the level of Limited Access. The “Save” parameter allows the operator to save a configuration, the “Recall” parameter allows the operator to recall a configuration, and “Alarms” allows the operator to adjust the alarm boxes. For maximum flexibility, any combination of these three parameters is selectable.

Step 5: Press **RETURN** to exit the I/O Config menu.

Step 6: Press **RETURN** to reach the Main Menu.

Step 7: Press **MAIN MENU** to reach the Start Up Menu shown in figure 5-2.

Figure 5-2. Start Up Menu—Limited Access Mode



For more information about how to set up or change the password, see page page 5-6.

In Limited Access mode, you have five menus for instrument control:

- ❒ **Configuration List** — View and select from a list of available test configurations.
- ❒ **Data Logging Choices** — Displays the current logging type. Enables test number and reject log selection, as well as, save config and start new logs.
- ❒ **Run This Test** — Starts data acquisition according to the selected test configuration. Alarm adjustment during acquisition is available.
- ❒ **Develop A Test** — Provides access to the password protected Full Access mode.
- ❒ **Display Event Log** — Displays a list of operator initiated events:
  - *Power Up*
  - *Hardware Null*
  - *Recall Configuration*
  - *Save Configuration*
  - *Alarm Size Adjustments*
  - *Data Logging changes made in Limited Access mode*
  - *Coil Change*
  - *Cable Change*

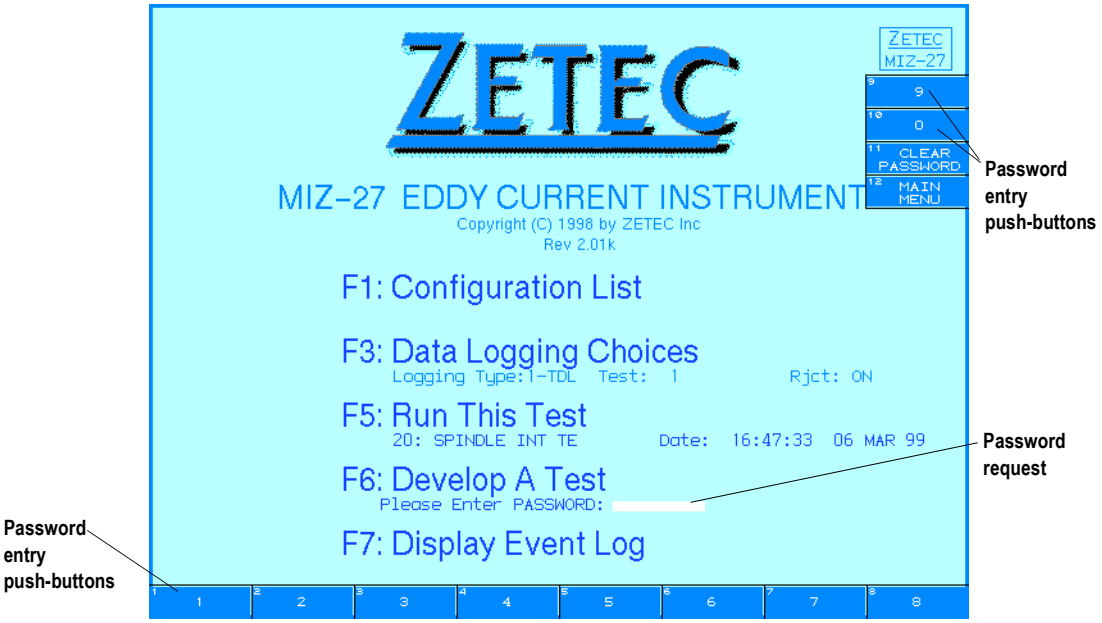
To exit any menu, press the **RETURN** menu button.Or, press **MAIN MENU** to return to the Start Up Menu.

To switch from Limited Access to Full Access mode:

Step 1: From the Start Up menu, press the **DEVELOP A TEST** (F6) button. This action requests a numerical password before you can continue.

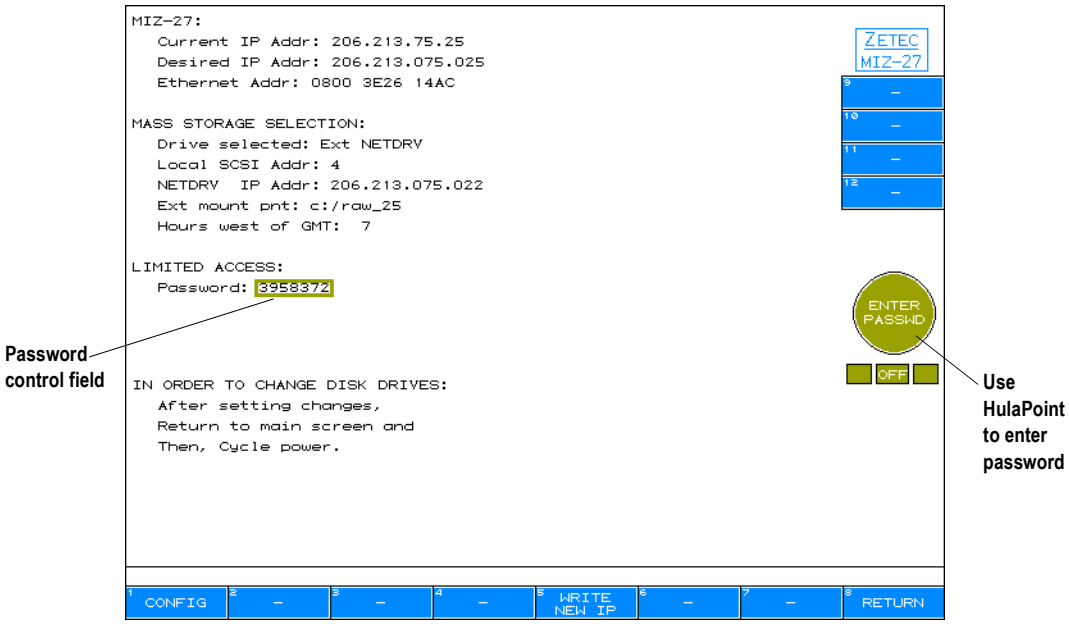
Step 2: Using the front panel push-buttons, see figure 5-3, enter the password. This action puts you in the Data Review mode.

Figure 5-3. Password Protection



You can password protect the MIZ-27's Full Access mode using a numerical password with up to seven digits. The Password control field is located in the Network menu as shown in figure 5-4. To enter or change the password, highlight the password control field, activate the HulaPoint control, and use the HulaPoint to define the password. If necessary, the MIZ-27 recognizes an override password—3925316. The override password always allows access to all MIZ-27 functions.

Figure 5-4. Network Menu—Password Control Field



After you enter the correct password, continue with these steps to change to Full Access mode:

Step 3: Go to the Setup/Review menu and press **HARDWARE CONFIG**.

Step 4: Press **I/O CONFIG**.

Step 5: Use the HulaPoint to highlight the Power Up Mode field as shown in figure 5-1.

Step 6: Use the HulaPoint control buttons to toggle to **FULL ACCESS**.

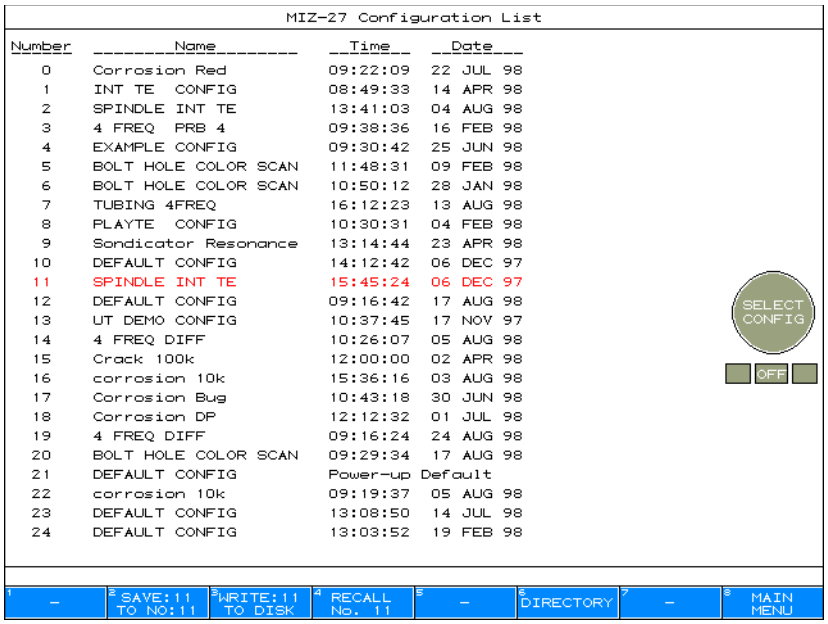
Step 7: Press **RETURN** to exit the I/O Config menu.

Step 8: Press **RETURN** until you reach the Setup/Review menu (data review mode).

Configuration List

In the Limited Access mode, you can easily highlight and select a test configuration from a list of all available configurations. Configurations are setup and modified in the Full Access mode. See, *Setting the Configuration Parameters, on page 4-7*, for more information.

Figure 5-5. Configuration List



As you view the configuration list, the green text indicates the current configuration. Red text indicates the selected configuration, which will become the current configuration when you press the Main Menu button.

To select a configuration, activate the HulaPoint local control and use the Hula Point to highlight the configuration name. Press the **RECALL** menu button to load the configuration. You can copy a configuration to a new configuration while in the Configuration List menu. To copy:

Step 1: Recall the configuration to be copied.

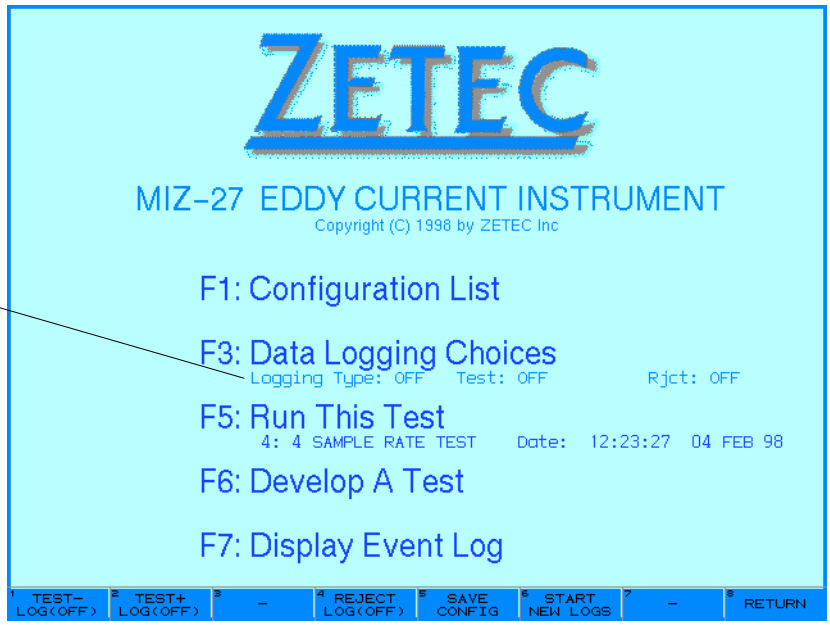
Step 2: Highlight the configuration to save it to. Notice that the **SAVE** menu button indicates the configuration number being saved and the location it will save it to.

Step 3: Press the **SAVE** menu button to copy the selected configuration to a new configuration.

Data Logging Choices

Data Logging has three fields—logging type, test number increment/decrement, and reject log on/off as shown in figure 5-6. The logging type is a display field that can only be changed when in the Full Access menu. For information about changing this field, see *Data Logging, on page 4-51*.

Figure 5-6. Data Logging Menu



The **TEST**– and **TEST**+ menu buttons along the bottom of the menu let you increment and decrement the test interval, as well as turn on and off the reject log options. These selections display as part of the Start Up Menu. With the **SAVE CONFIG** menu button you are able to save your Data Logging choices to the current configuration.

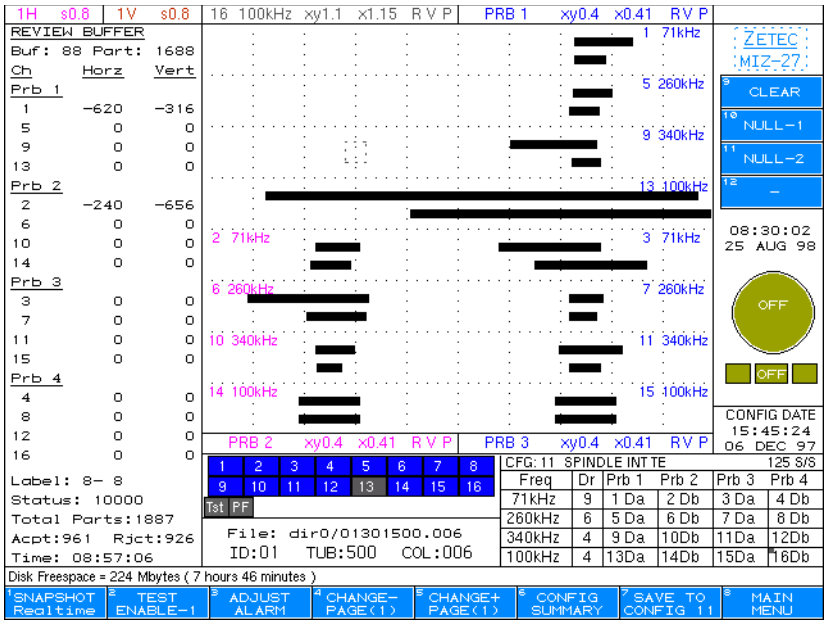
To erase all data logs and start with new logs, press the **START NEW LOGS** menu button. The **RETURN** menu button takes you to the Start Up Menu.

Run This Test

When you press the **RUN THIS TEST** menu button, the MIZ-27CT starts data acquisition (see figure 5-7) according to the selected configuration and provides controls for the following:

- **Clear screen**
- **Null-1/Null-2**
- **Main Menu**
- **Snapshot/ Real-time (if TDL is selected)**
- **Test Enable (if industrial I/O is enabled)**
- **Alarm adjustment**
- **Change Page –/Change Page +**
- **Configuration Summary**
- **Save to Configuration**

Figure 5-7. Run This Test



The **CLEAR** function erases the X-Y display area while the strip charts and other screen areas remain unaffected. The automatic clearing function is described in *Variable Persistence Display on page 4-30*.

Null Functions

The MIZ-27 has two independent null functions during data acquisition. It calculates a voltage used on the analog boards to balance the offset in the probe signal. All channel selections for Null-1 or Null-2 are nulled in this manner, regardless of whether they are currently displayed. NULL-1 or NULL-2 should be used at least once when the probe is placed on or in defect-free material. Use either null again after changing the gain or probe drive. For more information about how to set the null functions, see *Null-1 and Null-2, on page 4-14.*

A password protected Null lockout feature is built into the Limited Access mode. If this feature is turned ON in the I/O Configuration menu, see figure 5-8, a window pops up asking for password input each time you press NULL while acquiring data, see figure 5-9. The password is the same as the Limited Access password.

Figure 5-8. Password Protection for Null Function

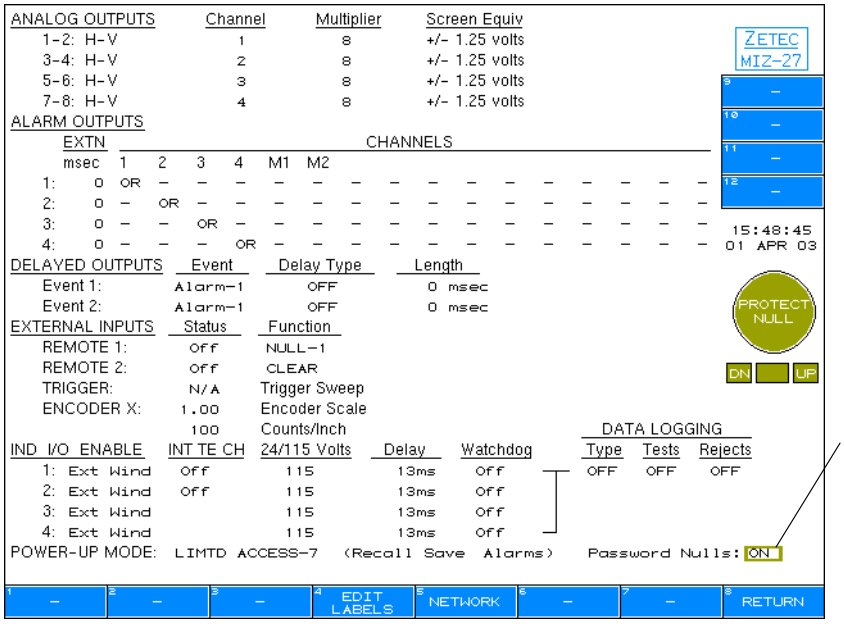
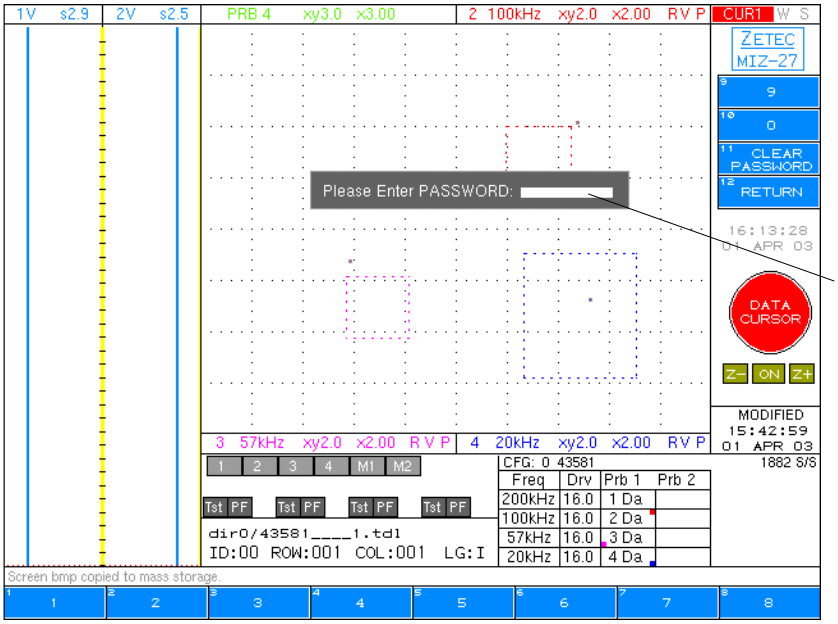


Figure 5-9. Password Request for Null Function



Main Menu

After you start acquisition with the **RUN THIS TEST** menu button, the **MAIN MENU** function button stops data acquisition and returns you to the Main Menu.

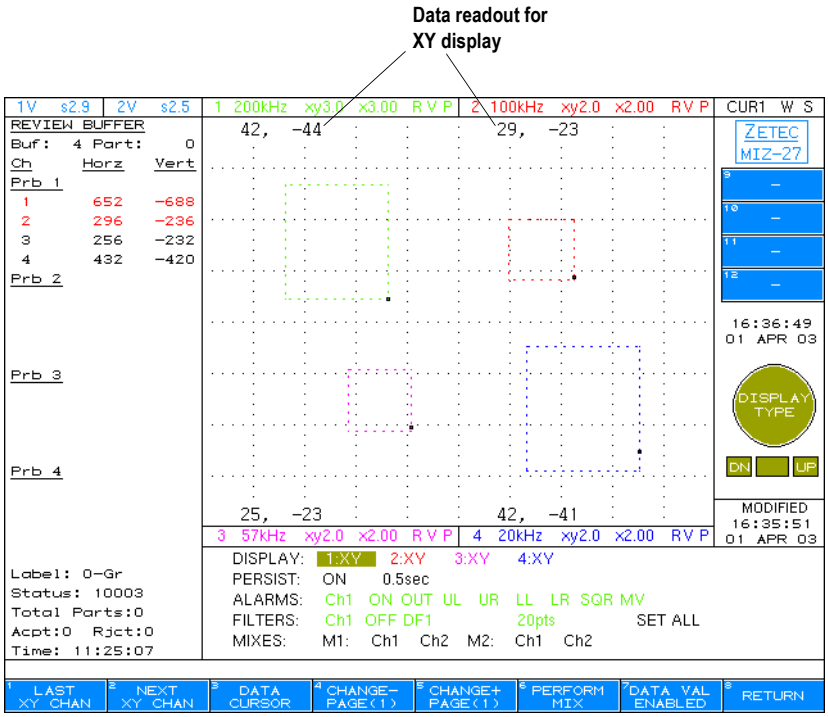
Snapshot Real-Time

The MIZ-27CT's Snapshot/Real-time feature is available with Test Data Logging (TDL) selection. Using Snapshot, you see the data point location at the instant the test is performed. Or, using Real-time, you see the entire trace enter and exit the display window.

To indicate which feature is active, the active feature displays in capital letters on the menu button label. The inactive feature displays in lowercase letters on the menu button label.

If selected, a real-time data readout displays in each XY quadrant as shown in figure 5-10. This feature is turned on and off in the Display Configuration menu. The data values that display are the same values that get recorded to the TDL file.

Figure 5-10. TDL Data Value Display



Test Enable

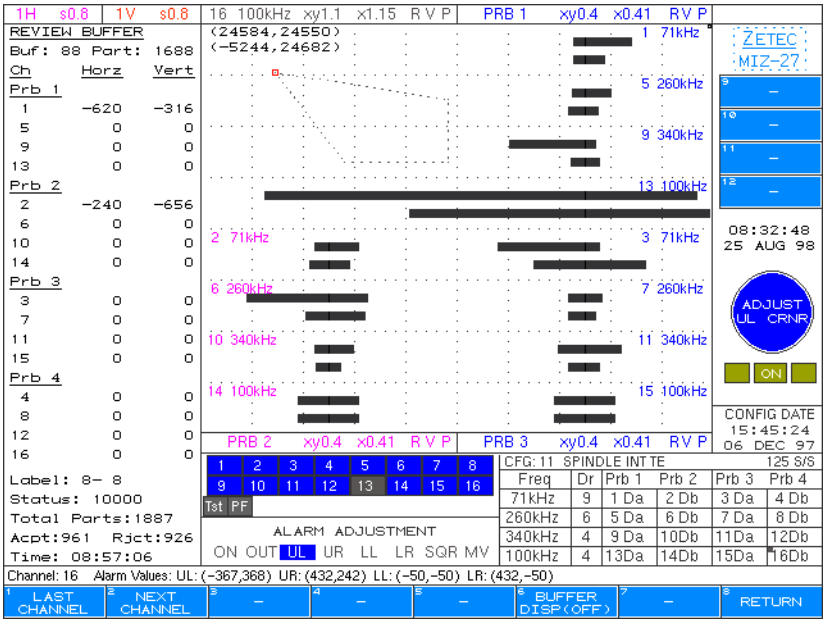
To collect a test point data set during data acquisition, repetitively press the **TEST ENABLE 1** menu button. Once the data set is in the buffer, you are able to review the data in the **DEVELOP A TEST** menu and adjust alarms accordingly.

Or, to manually test parts, place probe on part and press the **TEST ENABLE 1** menu button. The MIZ-27's PF field will display green for accept or red for reject.

Adjust Alarm

Channel alarm windows can be manually set using the **ADJUST ALARM** button in the Start Acquire menu. In the Adjust Alarm menu shown in figure 5-11, select the channel for adjustment using the **LAST CHANNEL** and **NEXT CHANNEL** buttons. The new alarm values can be stored to the current configuration by pressing the **SAVE TO CONFIG** button.

Figure 5-11. Alarm Adjustment



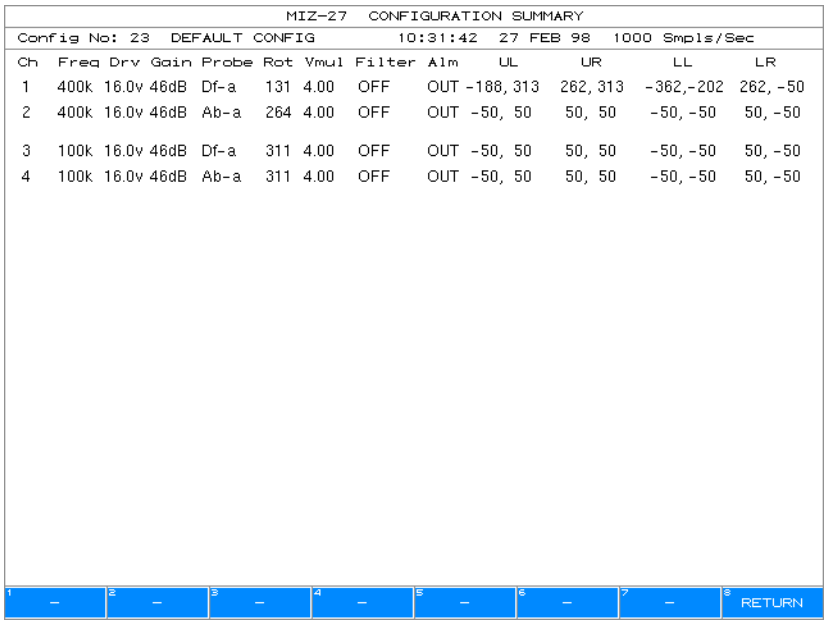
Change Page –/Change Page +

To expand the total number of channels that you can view, the “Change Page” feature lets you quickly toggle between five display screens (up to 16 channels) using these menu buttons. “Page 5” is a dedicated screen setup for eight strip charts. With eight strip charts, you can view eight channels of data in a single screen.

Configuration Summary

The **CONFIG SUMMARY** menu button opens the display menu shown in figure 5-12. The Configuration Summary details the configuration including the alarm setup.

Figure 5-12. Configuration Summary



Save to Configuration

The **SAVE TO CONFIG** menu button saves any changes made to the alarm or any other setup parameters to the current configuration.

Develop a Test

Develop a Test provides the doorway to enter the Full Access operating mode. When you press the Develop a Test menu button, the MIZ-27CT requires that you enter the password to continue. To do so, press the F8 menu button three times. This action takes you to the Main Menu of the MIZ-27. For more information about changing the operating mode, see page 4-1.

Display Event Log

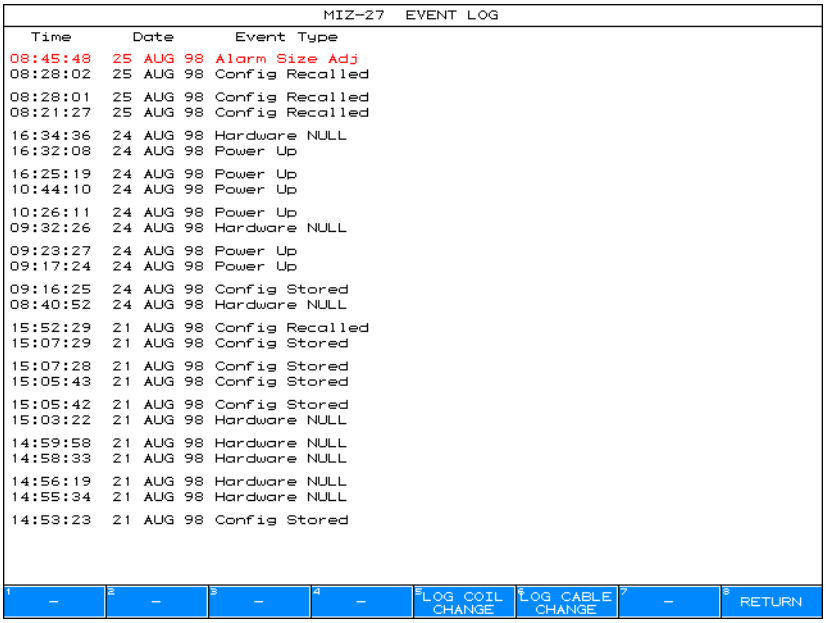
The MIZ-27CT stores a log of certain events in memory. This log provides a useful record that verifies operator actions, such as, the last instrument null or alarm adjustment. The last 25 events are saved with the MIZ-27CT discriminating to only log the following types of events:

- **Power-up**
- **Hardware null**
- **Recall configuration**
- **Save configuration**
- **Alarm size adjustments**
- **Data logging changes made in Limited Access mode**

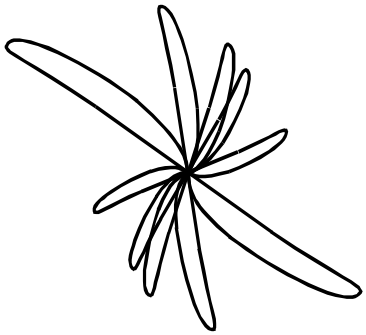
To display the Event Log shown in figure 5-13, go to the Start Up menu and press the **EVENT LOG** menu button.

Two additional items can be logged at the time the event occurs—a coil or cable change. To log the time of a coil change or cable change, press the respective menu buttons in the Event Log menu.

Figure 5-13. Event Log



The next section of this operating guide outlines application examples for the MIZ-27CT.



SECTION 6 Application Examples

Since so many attributes of an object can be examined with eddy current testing, each particular situation requires its own unique test setup. However, we must consider several fundamental variables in order to optimize results. The relative importance of each depends upon the specific test.

This section is dedicated to the test configurations that are preset at the factory. Materials required to duplicate the setups are listed at the beginning of each configuration followed by a brief procedure about the instrument settings.

Test Design Considerations

The type of test probe has a significant bearing on the outcome of a test. The shape of the probe is important, since it needs to have close contact with the test piece for good sensitivity. Small changes in the coupling of the source magnetic field to the test object can cause variations in results that will overwhelm the desired test data.

In addition to the shape of the probe, several coil configurations are available. The coils in an eddy current system must generate the source magnetic field as well as detect the secondary magnetic field from the test piece. The same coil can do both jobs, and the simplest version of this is the single coil. The instrument detects changes across this coil with no other reference to “zero” the large initial offset generated by the coil itself. Hence, the gain of such a system is somewhat limited.

An improved situation is to include a second coil to electrically balance out the first. This is called a differential probe. The second coil is sometimes contained within the probe connector or even in the instrument itself. The best sensitivity for a differential configuration is achieved when the second coil is mounted in such a way as to "see" a similar material as does the test coil. In this way, maximum balance and highest gain is achieved. When the two coils are mounted in close proximity to each other, the test is typically called *Differential*. When the second coil is in a separate location, the test is called *Absolute*.

A variation on both single and differential probes is the reflection, or "driver-pickup" configuration. In this case, the source coil is separated from the sense coil(s). This is particularly useful in low frequency work, where the source coil tends to heat up and change shape. Since drive current does not flow through the sense coil, it does not undergo these geometry changes, which would otherwise introduce drift into the signal.

Eddy current coils are optimized for certain frequency ranges, and the frequency chosen depends in turn upon the desired depth of penetration of the test object.

Depending on probe sensitivity and instrument gain, an operating frequency of 100 Hz might penetrate a half-inch of aluminum; however, smaller flaws may be missed at this frequency. A one-MHz signal will provide excellent response to surface variations; but, this frequency may generate unwanted noise due to variations in contact between the probe and the material. Some degree of experimentation is generally required to optimize the frequency for a particular test.

The test procedure itself is as important as choosing the probe and operating frequency. Every instrument has a certain bandpass, which means that the signal of interest must be present for a certain minimum period of time before it will generate a response. This is an important consideration in automated testing, where the material of interest may be moved past the probe very quickly. Generally, a rate of 400 samples per second would allow a probe traverse speed of 12 inches per second (ips).

Another procedural consideration is temperature. Both probes and test materials are subject to changes from temperature. If a portable instrument is moved between temperature extremes, some stabilizing time should be allowed for the probe before tests are performed. Similarly, for a test such as conductivity, an instrument should be calibrated on a standard that is close to the same temperature as the object under test.

Examples of common eddy current tests performed with the MIZ-27CT are included as general guidelines. Many creative variations are possible. Note that specific gain and phase values are probe, instrument, and material dependent. The exact settings for a similar result will vary according to the situation.

The application examples in this section correspond to the configurations in table 6-1 that are preset in the MIZ-27CT instrument at the factory.

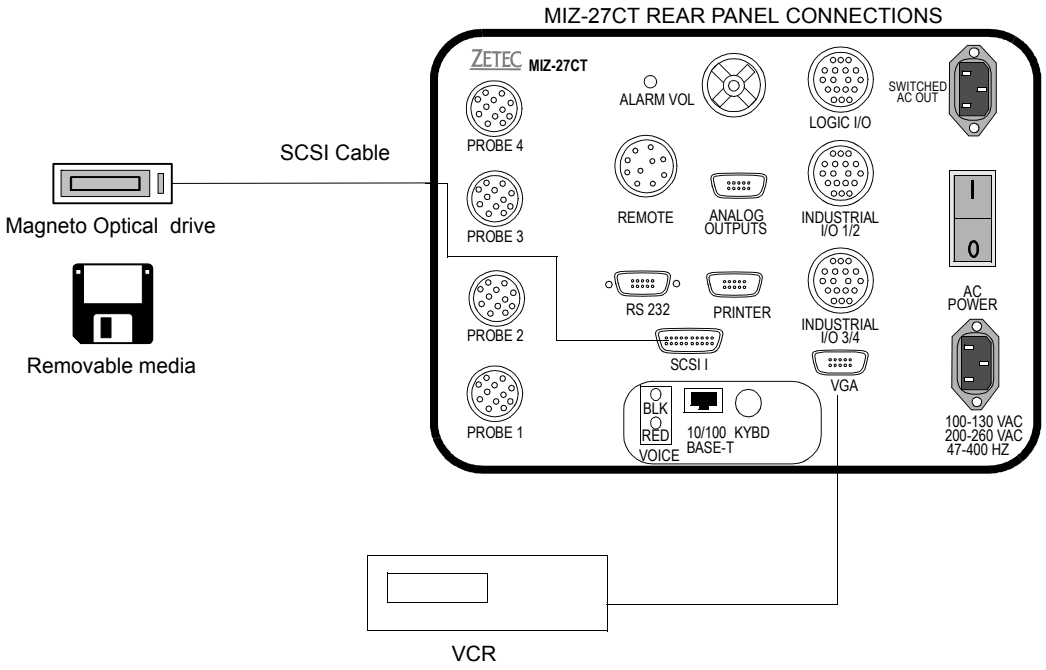
Table 6-1. Preset Factory Configurations

Configuration Number	Application Example	Page Number
1	Component Sorting	page 6-5
2	Component Crack Detection	page 6-13
3	Surface Crack	page 6-16
4	Sub-Surface Crack	page 6-22
5	Conductivity Measurement	page 6-28
6	Bolthole Crack	page 6-34
7	Tubing Test	page 6-40
8	Finned Tubing—Single Probe	page 6-46
9	Finned Tubing—Two Probes	page 6-52

MIZ-27CT Acquisition Systems

Figure 6-1 illustrates a basic interconnection scheme. It should be noted that these interconnections can be varied to reflect the needs of the inspection.

Figure 6-1. Multifrequency Digital Recording with MO Drive Option



Component Sorting

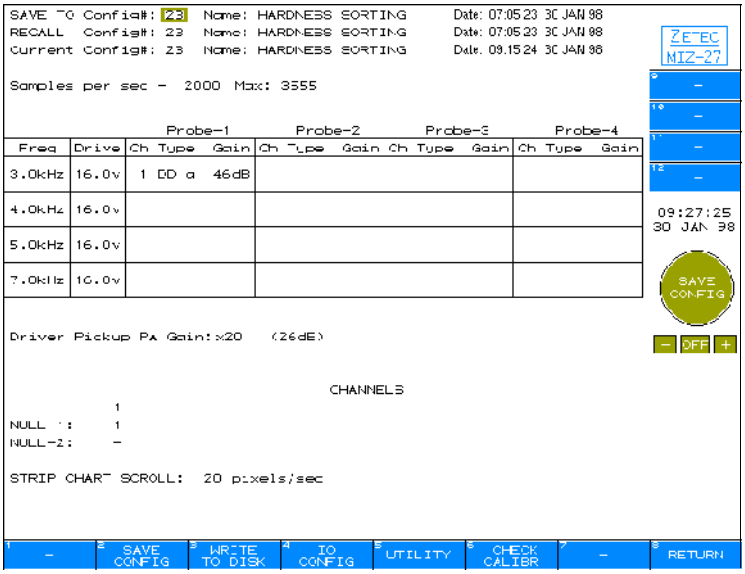
This example uses a Differential Driver-Pickup Encircling coil to test small roller bearings. The bearings in this example were delivered to the coil by an automatic feed device for dynamic testing. Most Component Tests are customized according to a wide variety of parts and conditions. As a result, probes, standards, and setup parameters can be as varied as the test parts. The following example is meant as a guideline only to highlight the MIZ-27CT's capabilities.

Setup

Step 1: After power up, select **Hardware Config** and select a test frequency (see figure 6-2).

Typically, when using a Differential Driver-Pickup probe for sorting, low frequencies between 100 Hz to 10 kHz work best. If the test frequency is unknown, up to four frequencies can be selected so that you can monitor all four simultaneously in the XY display, or step through each channel during or after data is collected. This can help you to determine the best test frequency that provides the greatest separation between your acceptable and rejectable components. For proper comparison between frequencies, ensure that the gains, drives, XY and X adjustments are all the same on each channel. Also, if more than one test frequency is displayed simultaneously, ensure the "volt" settings are the same in each quadrant as well.

Figure 6-2. Hardware Configuration



MIZ-27 hardware configuration for component testing.

Step 2: Manually adjust the probe drive for each channel by moving the cursor to the drive setting. Or, use the **Drive Volt Plot** feature to set it automatically on all channels at the instrument recommended settings.

Step 3: Set desired gain levels. Start at a mid range point, 46db is usually best. Gain can be changed later if necessary.

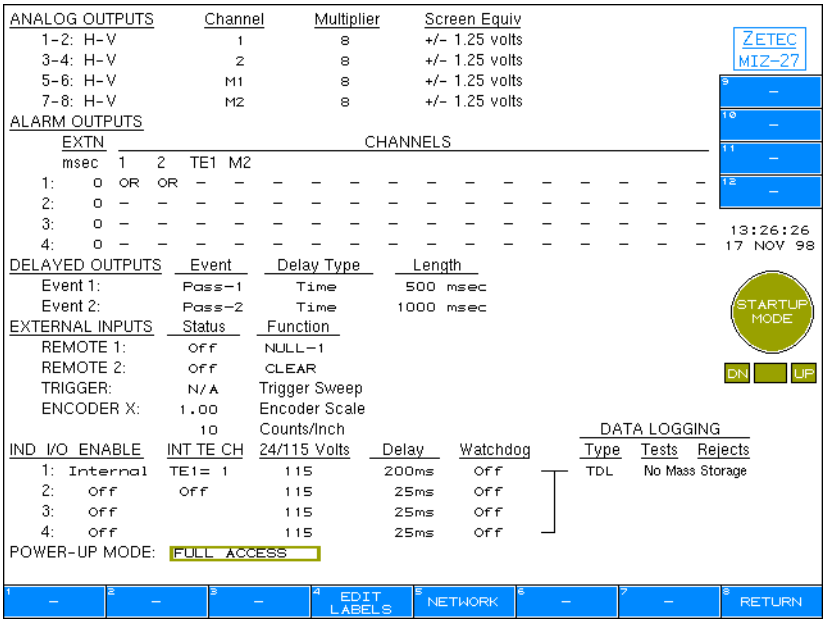
Step 4: Set the sample rate as desired.

Step 5: If testing components statically, enter the **I/O Config** menu (see figure 6-3) and turn on the **enable** in I/O slot #1.

Step 6: Activate **TDL** under “Data Logging Type.”

When testing statically, each time the probe or part is positioned, you will need to press the “Test Enable” button to test and log each part. If testing dynamically, also activate “TE1=1” under the “INT TE CH,” (Internal Test Enable Channel). (For this application example, use dynamic testing.)

Figure 6-3. I/O Configuration



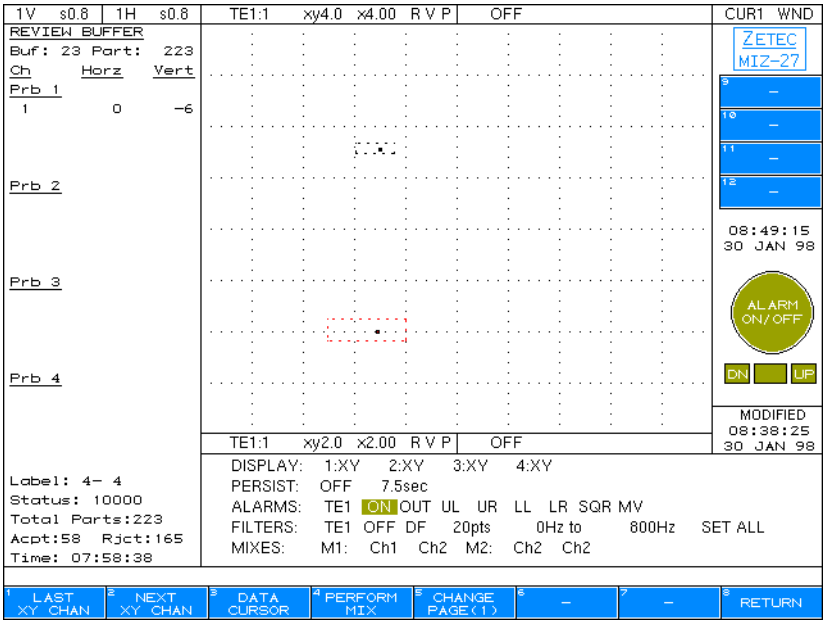
Turn on the enable in I/O slot #1.

Step 7: Exit the configuration menus and return to the main screen. Set the upper left quadrant to Channel 1. If testing statically, skip to step 8. If the internal Test Enable is to be used, set another quadrant (possibly lower left), to display the TE1:1 channel.

Step 8: Press **Display Config** and activate the alarm for the TE1:1 channel.

Step 9: Return to the main screen as shown in figure 6-4. (Make sure to change the upper left quadrant back to channel one if necessary).

Figure 6-4. Main Screen

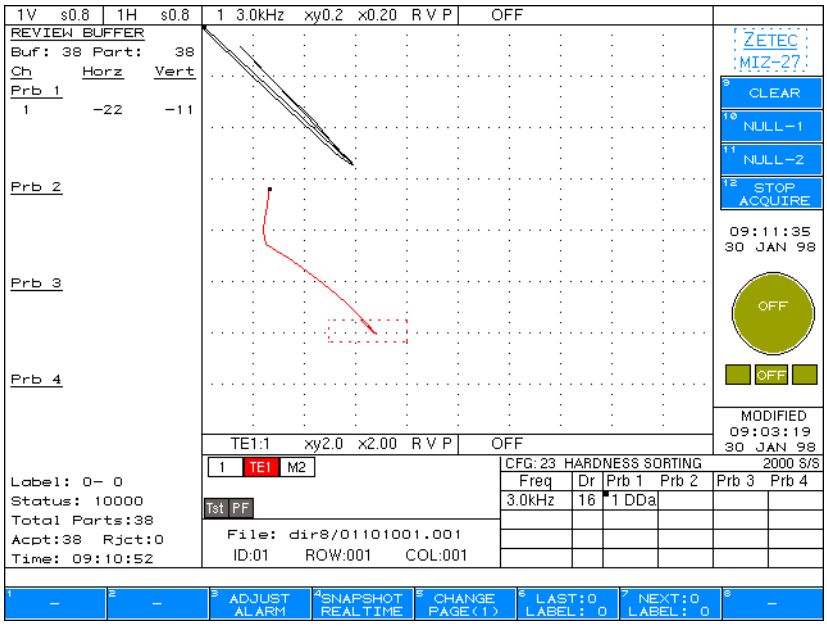


If necessary, change the upper left quadrant to channel 1.

Step 10: Press **Start Acquire** and null the instrument on a known good sample.

Step 11: Activate the **Snapshot Real Time** to view the entrance and exit signals, rather than just the peak data points as shown in figure 6-5.

Figure 6-5. Snapshot/Realtime



View the entrance and exit signals, rather than just the peak data points.

Step 12: Once nulled, test a batch of known good samples. These should be considered your masters. From this batch you may want to select a single sample that has a data point somewhere in the middle of all as a master "null" part.

Step 13: If you select a master "null" part, clear the instrument's buffer and null on the new master part and test the batch again.

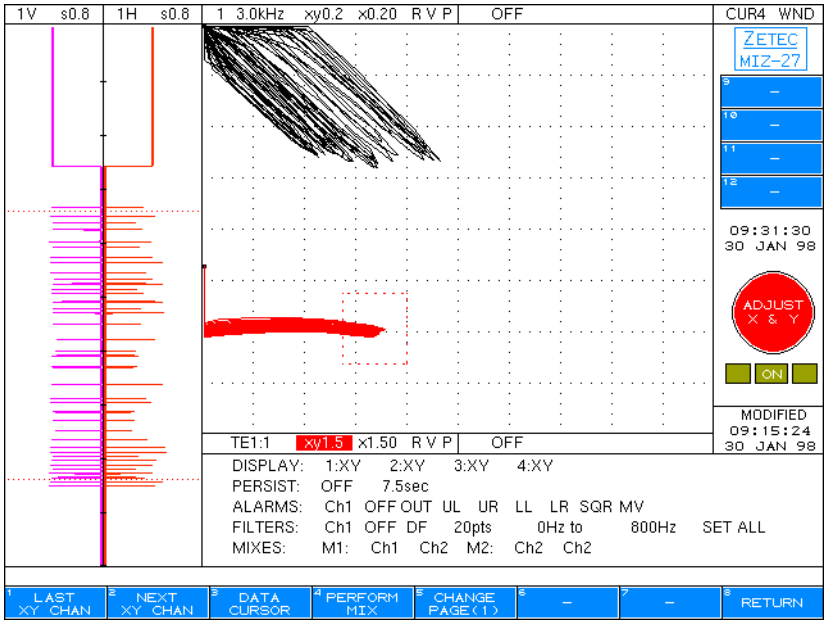
Step 14: Press **Stop Acquire**, press **Hardware Config**, **I/O Config**, and deactivate the "TDL" under "Data Logging Type."

Step 15: Return to the main screen, open a strip chart window, and move cursor to encompass all of the acceptable samples just tested.

Step 16: Adjust the phase rotation of TE1 channel until the entrance signals move from left to right. The right most peaks of this data must be within the alarm (enable) box.

Step 17: Resize the box to ensure adequate space around the signal peaks in all directions as shown in figure 6-6. If the box is too small and the entrance signal from a part doesn't enter within it, that part will pass through untested because the instrument was never enabled.

Figure 6-6. Rotation and Box Size Adjustment



Resize the box to ensure adequate space around the signal peaks in all directions.

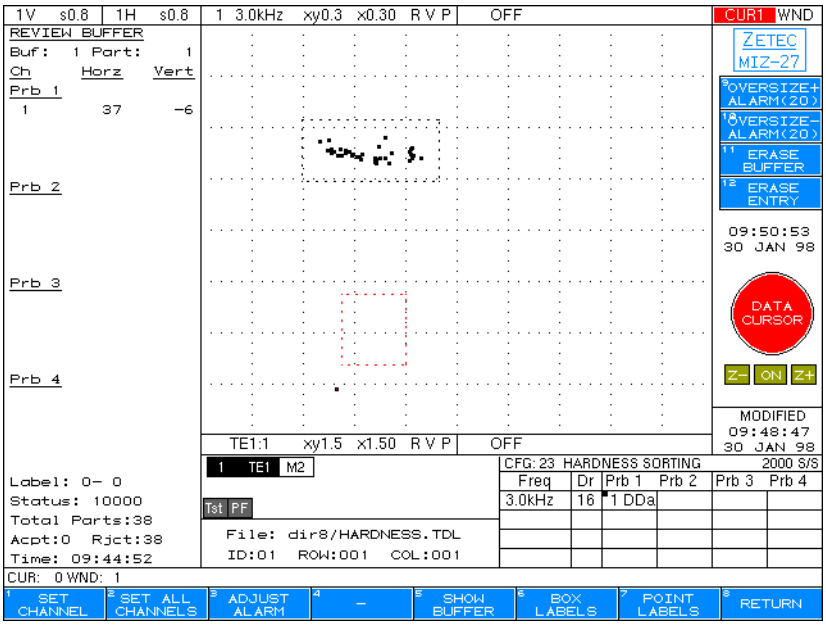
Step 18: Adjust the XY scaling for this quadrant if the TE1:1 channel is visually interfering with the test channel.

Step 19: Go back to the "I/O Config" menu and re-activate "Data Logging Type" to "TDL."

Step 20: Return to the main screen and press **Review Buffer** and **Show Buffer**. This displays all of the previously tested data points of the acceptable samples (see figure 6-7).

Step 21: Press **Set Channel** (or, **Set All Channels** if using more than one test frequency).

Figure 6-7. Show Buffer



Previously tested data points from acceptable samples display with the Show Buffer feature.

These actions automatically adjust the phase of the test channel(s), rotate the buffered data points to an optimum orientation, and then create an alarm box around them. The alarm box size is adjustable using the "Oversize Alarm ±" buttons, or the shape can be custom-fit to the acceptable group of samples in the "Adjust Alarm" menu. (If the "Oversize Alarm" is used for some adjustments, the "Set Channel" button must be pressed so changes take effect).

The instrument should now be ready to sort out any parts which are dissimilar to those used for the setup (see figures 6-8 and 6-9).

If wanted, each batch of samples can be individually labeled numerically or by color. This is helpful for fine tuning your setup, or to create a multiple group sort using the Alarm Output logic in the "I/O Config" sub menu. To perform a multiple group sort, it would be necessary to have master groups of each sort condition.

Figure 6-8. Show Buffer Data Points

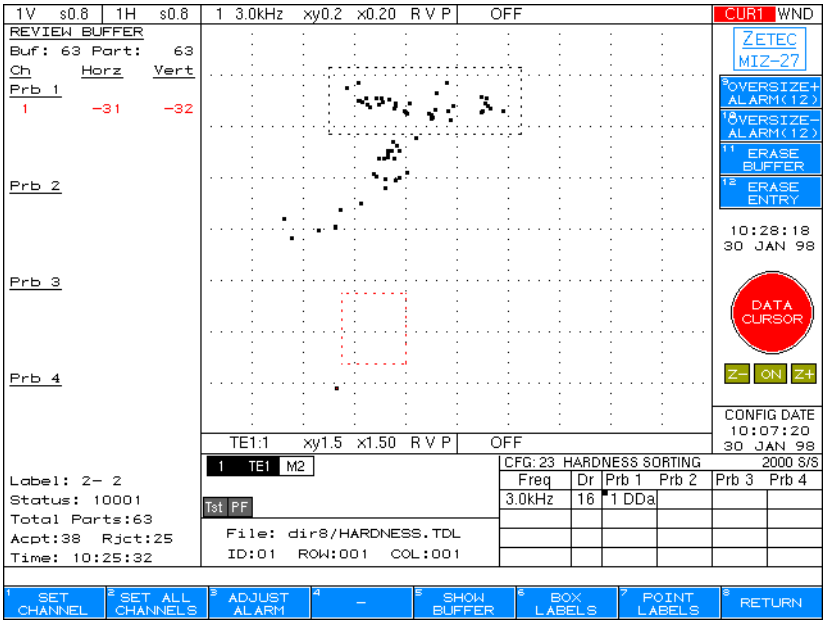
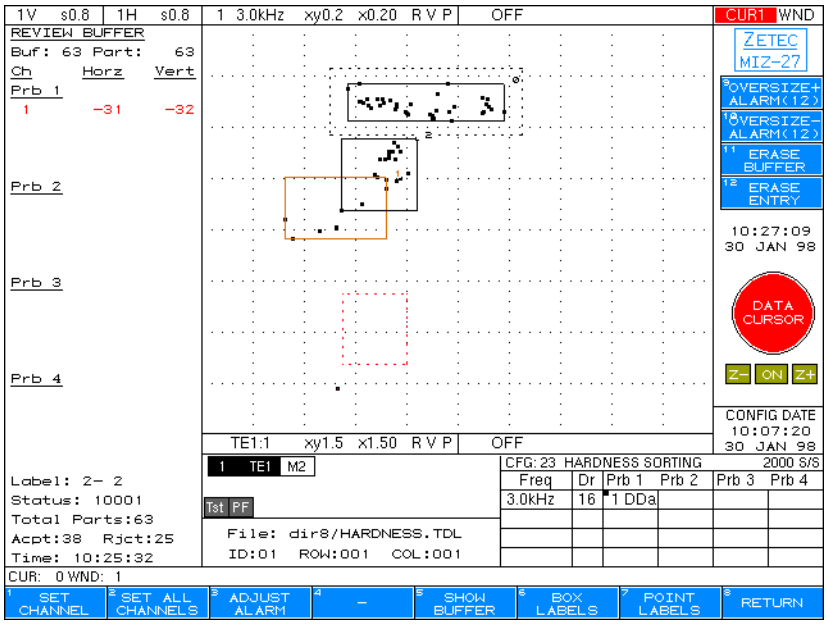


Figure 6-9. Show Buffer Data Points with Box Labels



Label each sample batch with a unique number or color.

Component Crack Detection

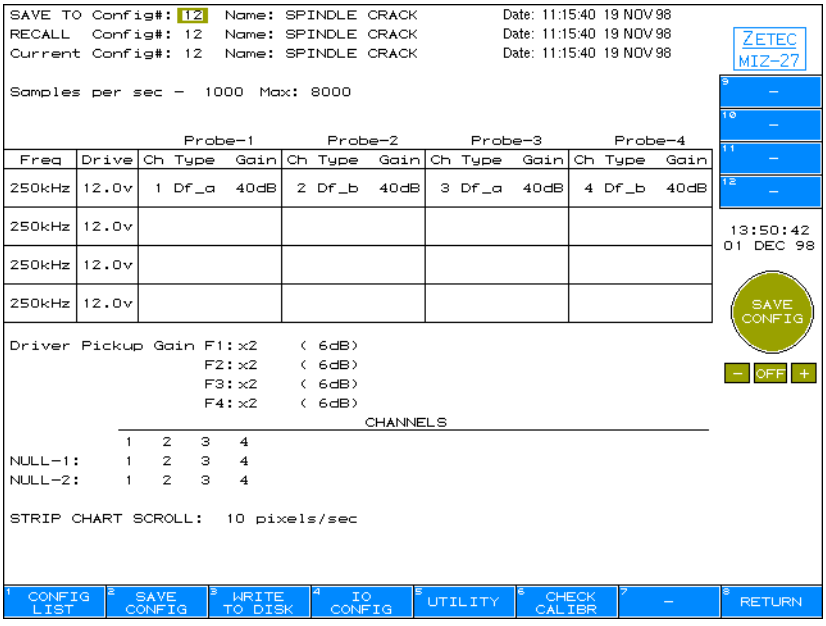
The component crack example uses a differential +Point® coil to test automotive spindles for surface cracks. The spindle in this example is delivered to the coil by an automatic feed device for dynamic testing.

Most component tests are customized according to a wide variety of parts and conditions. As a result, probes, standards, and setup parameters can be as varied as the test parts. The following example is a guideline only to highlight the MIZ-27CT's capabilities.

Setup

Step 1: After power up, select **Hardware Config** and select a test frequency, probe drive, channel type, gain, and samples/second (see figure 6-10).

Figure 6-10. Hardware Configuration



Step 2: Select frequencies which provide good separation between the surface flaws and lift-off (200 to 500 kHz). Typically, only one frequency is enabled for this examination.

To save time in determining which frequency achieves the best response, you can enable four different frequencies. Each frequency should have the same settings to give relative comparisons.

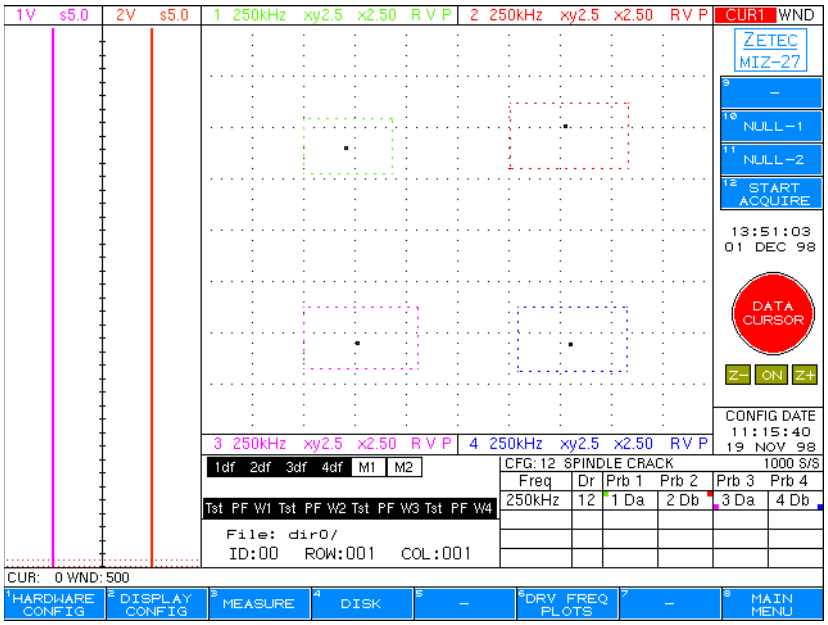
Step 3: Select a starting gain of 40 dB.

Step 4: Press **RETURN** then press **DRV FREQ PLOTS**.

Step 5: Hold probe on standard (away from flaws) and press **DRIVE VOLT PLOT**. This will produce suggested drive settings. Continue to hold the probe on the standard and press **SET MAX DRIVES**. This will enter the suggested probe drives into the configuration. Press **NULL-1.**

Step 6: Press **RETURN** to view the Setup/Review menu as shown in figure 6-11. Select an XY scale of 1.0 and an X scale of 1.0. Adjust the V (volt multiplier) to 4.00. Typically, the instrument software's default V setting is 4.00.

Figure 6-11. Setup/Review Mode



Step 7: Place the test probe on good metal and press **START AQUIRE** and **NULL-1** to balance the instrument. Adjust the **P** (position) of the null point.

Step 8: Rock or shim the probe to produce a lift-off signal as shown in figure 6-12.

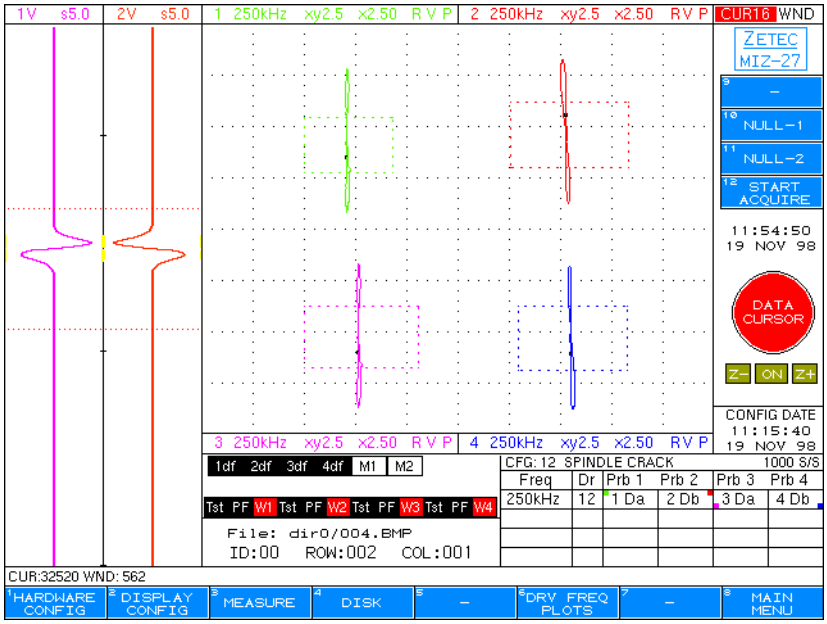
Step 9: Adjust the **R** (rotation) to align the lift-off signal horizontal. This is a convention designed to standardize signal analysis. The information is just as complete if the lift-off signal is vertical.

Step 10: Press **Start Acquire** and null the instrument on a known good sample.

Step 11: Adjust the **V** (volt multiplier) or channel gain to enlarge or reduce the flaw signal size.

Step 12: Further adjustment of the channel gain, XY, X, and V may be used to maximize the flaw separation angle.

Figure 6-12. Lift-Off Signal



Step 13: Press **HARDWARE CONFIG** and then **SAVE CONFIG** to select and store the configuration to a setup number for future retrieval.

Surface Crack

The depth of surface cracks can be estimated by comparing the phase and amplitude of the generated eddy current signal with a test standard. This test corresponds with Configuration #2 on the MIZ-27CT. All requirements for this test are listed in table 6-2.

Table 6-2. Configuration #2 Setup

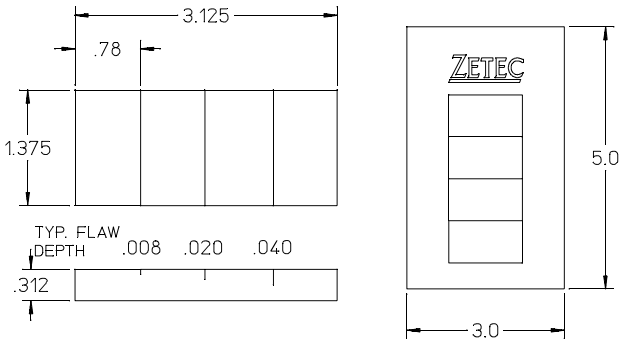
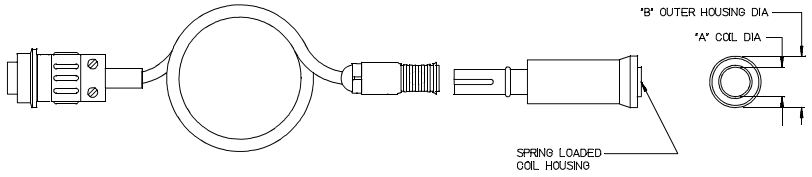
Test Specimen	Catalog Number	950-5100
	Description	Aluminum Surface Crack Standard
	Flaw Type	0.008”, 0.020”, 0.040” depth 0.006” width
		
Analog Board	One analog board is required	
Probe—Detachable Tip Spot Probe with Handle	Part Number—Probe Handle	DT-100-125 DTPH-2
	Catalog Number—Probe Handle	910-4802-000 910-5811-002
	Description	Detachable spring-loaded surface probe with balance coil
	Frequency Range	50-500 kHz
		

Table 6-2. Configuration #2 Setup (Continued)

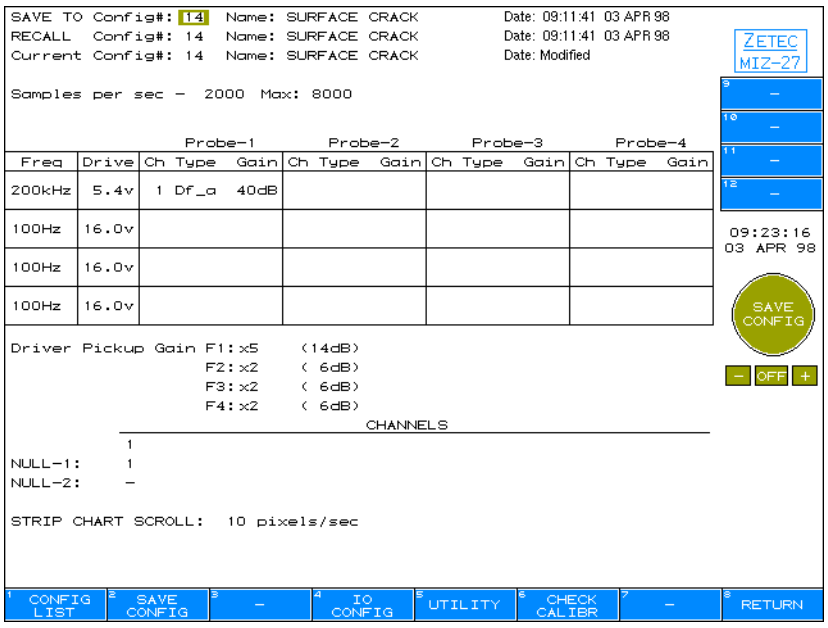
Probe Connections	Probe 1	
Channels/Frequencies	Channel 1	200 kHz
	Channel 2	N/A
	Channel 3	N/A
	Channel 4	N/A
Output Options	Prb 1 Df_a	
Probe Drive	5.4	
Sample Rate	2000 Hz	
Display	User preference	

Setup

Complete the following steps in sequence to setup and perform a surface crack test.

Step 1: Press **HARDWARE CONFIG** to set frequency, probe drive, channel type, gain, and samples/second as shown in figure 6-13.

Figure 6-13. Hardware Configuration Menu for Surface Crack Test



Typically, only one frequency is enabled for a surface crack test.

Step 2: Select frequencies which provide good separation between the surface flaws and lift-off (200 to 500 kHz). Typically, only one frequency is enabled for this examination.

To save time in determining which frequency achieves the best response, you can enable four different frequencies. Each frequency should have the same settings to give relative comparisons.

Step 3: Select a starting gain of 40 dB.

Step 4: Press **RETURN** then press **DRV FREQ PLOTS**.

Step 5: Hold probe on standard (away from flaws) and press **DRIVE VOLT PLOT**. This will produce suggested drive settings. Continue to hold the probe on the standard and press **SET MAX DRIVES**. This will enter the suggested probe drives into the configuration. Press **NULL-1.**

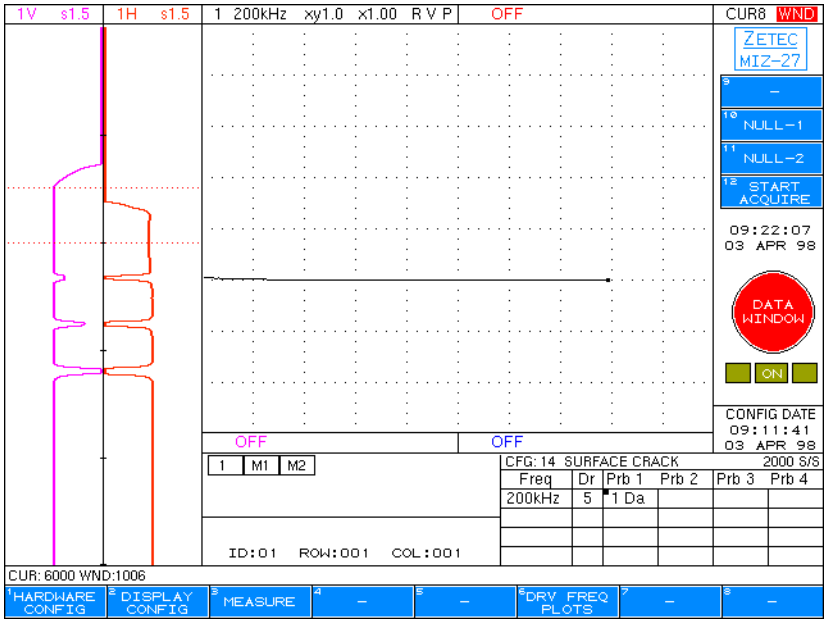
Step 6: Press **RETURN** and select an XY scale of 1.0 and an X scale of 1.0. Adjust the V (volt multiplier) to 3.00.

Step 7: Place the test probe on good metal and press **START AQUIRE** and **NULL-1** to balance the instrument. Adjust the **P** (position) of the null point to approximately X=474 and Y=215.

Step 8: Rock or shim the probe to produce a lift-off signal.

Step 9: Adjust the **R** (rotation) to align the lift-off signal horizontal as shown in figure 6-14. This is a convention designed to standardize signal analysis. The information is just as complete if the lift-off signal is vertical.

Figure 6-14. Probe Lift-Off Signal Horizontal

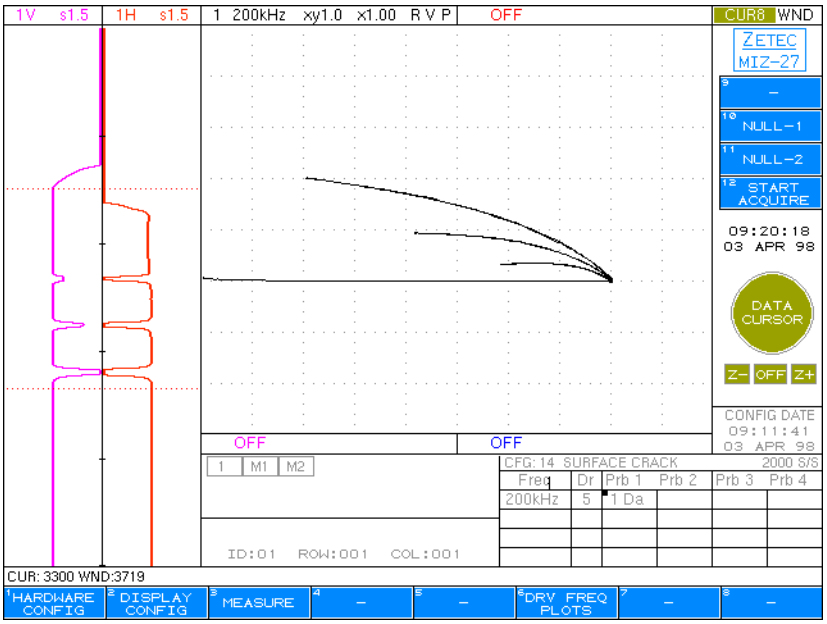


Adjust the phase to rotate the lift-off signal horizontal with the flaw responses going in the vertical direction.

Step 10: Adjust the **V** (volt multiplier) or channel gain to enlarge or reduce the flaw signal size.

Step 11: Further adjustment of the channel gain, XY, X, and V may be used to maximize the flaw separation angle. See figures 6-15 and 6-16.

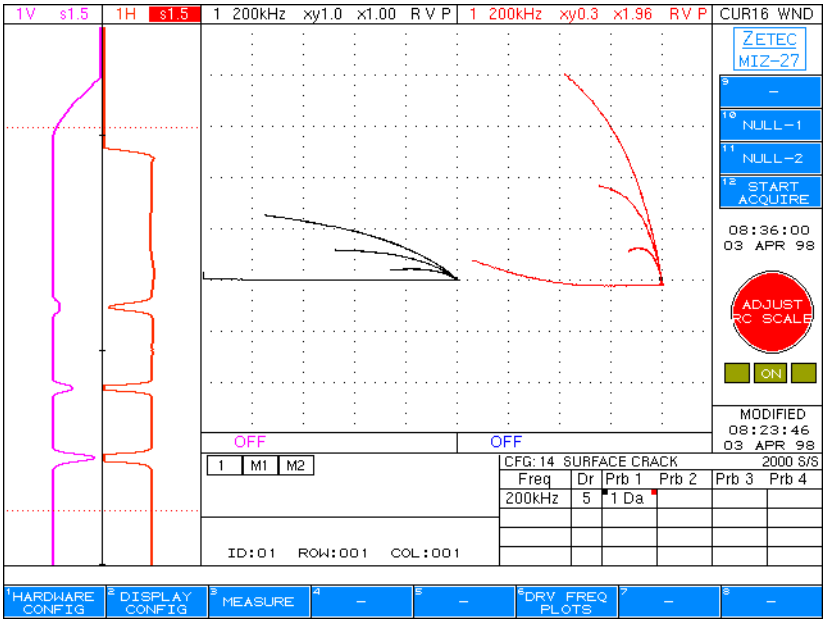
Figure 6-15. Flaw Response



Typical flaw response from three EDM notches on standard (X and Y scales are equal).

Step 12: Press **HARDWARE CONFIG** to select and store the configuration to a setup number for future retrieval.

Figure 6-16. Enhanced Flaw Signal Responses



After adjustment of X and Y scaling, the maximized responses are shown (right) compared to original response (left).

Sub-Surface Crack

Sub-surface cracks in non ferro magnetic materials may be detected using the eddy current inspection method. Material thickness and conductivity will affect the degree of sensitivity. It is a comparative technique dependent on known standards. This test corresponds with Configuration #3 on the MIZ-27CT. The requirements for this test are listed in table 6-3.

Table 6-3. Configuration #3 Setup

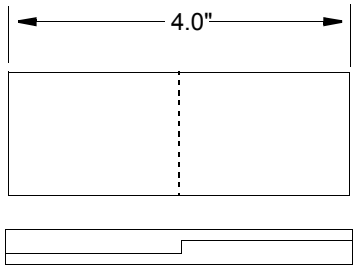
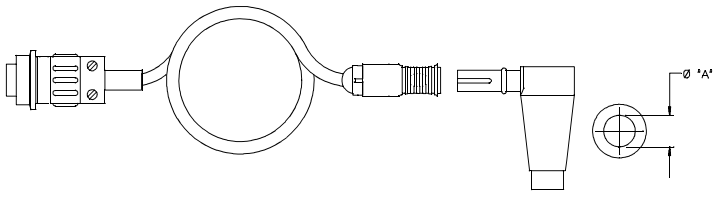
Test Specimen	Catalog Number	950-5150
	Description	Sub-Surface Flaw Standard—two stacked aluminum plates, 0.125” thick
	Flaw Type	top plate—no flaws bottom plate—infinite flaws
		
Analog Board	One analog board is required	
Probe—Detachable Tip Driver-Pickup Spot Probe with Handle	Part Number—Probe Handle	DTDP-750-SP DTPH-2
	Catalog Number—Probe Handle	910-4882-000 910-5811-000
	Description	Detachable driver pickup spot surface probe with separate handle
	Frequency Range	100 Hz-6 kHz
		

Table 6-3. Configuration #3 Setup (Continued)

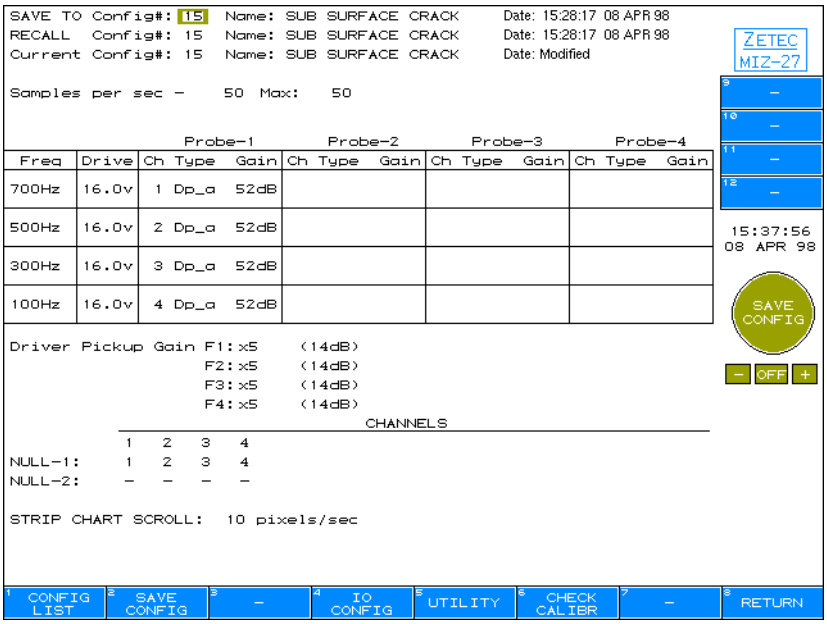
Probe Connections	Probe 1—Test Probe	
Channels/Frequencies	Channel 1	700 Hz
	Channel 2	500 Hz
	Channel 3	300 Hz
	Channel 4	100 Hz
Output Options	Prb 1 DP_A (all channels)	
Probe Drive	16 (all frequencies)	
Driver-Pickup Gain	×5	
Sample Rate	50 (maximum for this configuration)	
Display	As desired	

Setup

Complete the following steps in sequence to setup and perform a corrosion test.

Step 1: Press **HARDWARE CONFIG** to open the submenu that sets frequency, probe drive, channel type, gain and samples/second as shown in figure 6-17.

Figure 6-17. Sub-Surface Crack Hardware Configuration



To save time in determining which frequency achieves the best response, you can enable four different frequencies.

Step 2: Select frequencies that provide good separation between sub-surface flaws and lift-off (100 to 700 kHz). Typically, only one frequency is enabled for this examination. To save time in determining which frequency achieves the best response, you can enable four different frequencies. Each frequency should have the same settings to give relative comparisons.

Step 3: Select a starting gain of 52 dB.

Step 4: Select a starting Driver Pickup gain of x5.

Step 5: Press **RETURN**. Select an XY scale of 0.6 and X scale of 0.60. Adjust the **V** (Volt Multiplier) to 3.00.

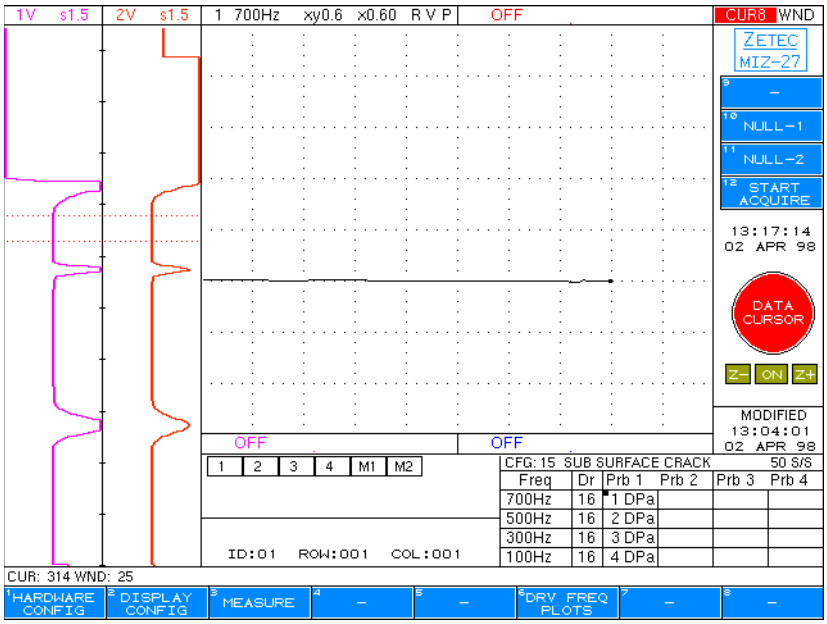
Step 6: Place the test probe on good metal (away from good metal), press **START ACQUIRE**, and **NULL-1** to balance the instrument.

Step 7: Adjust the **P** (Position) of the null point to the right of the screen, X= 474 and Y=215.

Step 8: Rock or shim the probe to provide a lift-off signal.

Step 9: Adjust the **R** (Rotation) to align the lift-off signal horizontal such as shown in figure 6-18. This adjustment is a convention designed to standardize signal analysis. The information is just as complete if the lift-off signal is vertical.

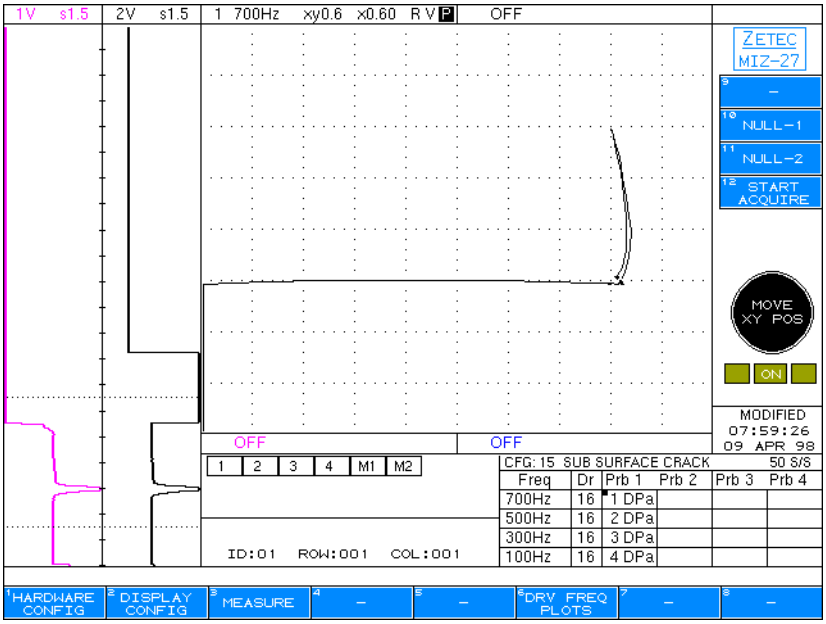
Figure 6-18. Lift-Off Signal Horizontal



Adjust the phase to rotate the lift-off signal horizontal.

Step 10: Slide the probe over the sub-surface crack to observe the flaw signal. It should look similar to figure 6-19.

Figure 6-19. Maximized Flaw Separation



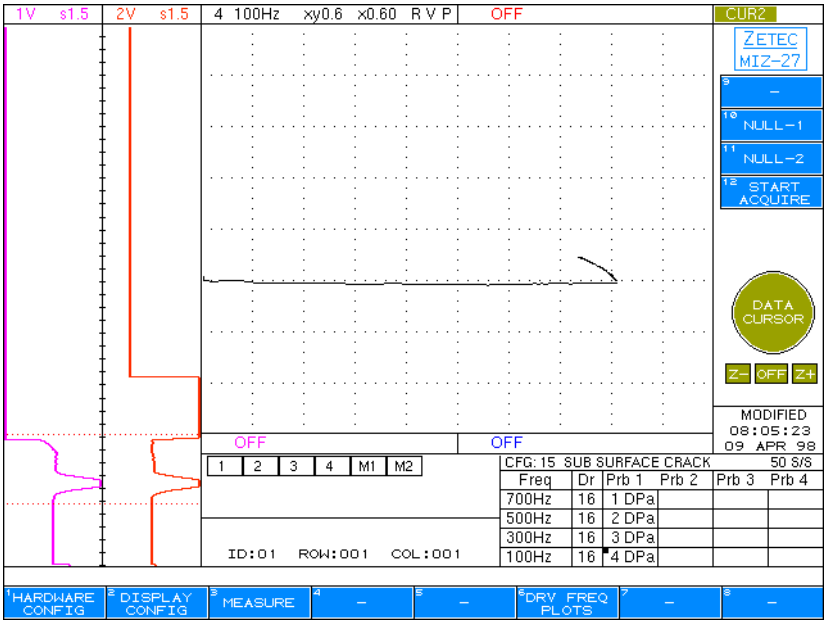
The best flaw separation is seen at 700 Hz.

Step 11: Adjust the **V** (volt multiplier) or channel gain to enlarge or reduce the flaw signal size.

Step 12: Press **HARDWARE CONFIG** to select and store the configuration to a setup number for future retrieval.

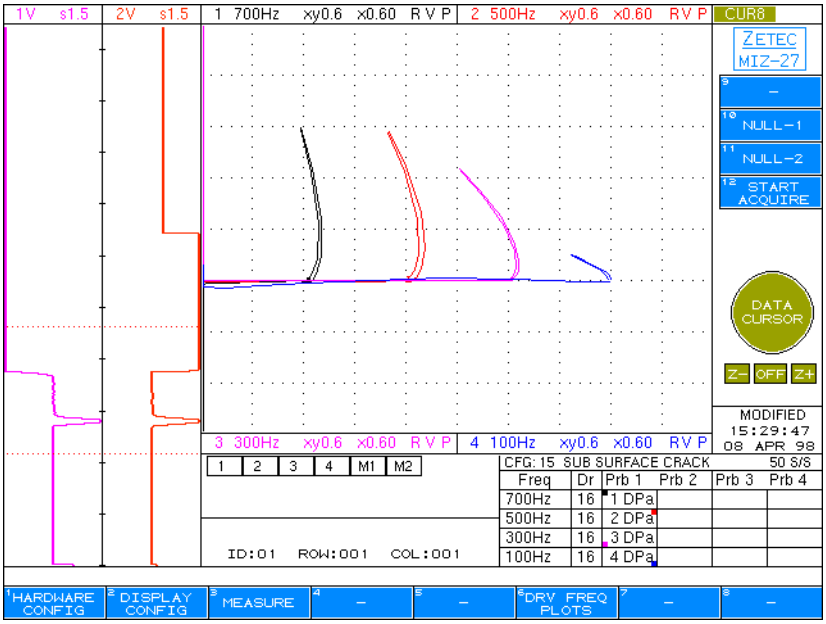
Figure 6-20 shows the same sub-surface flaw tested at 100 Hz with the same gain, scale, and voltage settings. Figure 6-21 shows all four frequencies on the same display. Notice the change in phase angle and amplitude as the frequency is set below optimum of 700 Hz.

Figure 6-20. Loss of Phase Separation and Amplitude



Notice the loss of separation at 100 Hz from the previous example.

Figure 6-21. Display with Four Frequencies



Phase angle and amplitude change as the frequency is set below optimum of 700 Hz.

Conductivity Measurement

The ability of eddy current to detect changes in conductivity makes it ideal for sorting materials. Using the same principles, eddy current can also be used to detect heat-damaged material. This test corresponds with Configuration #4 on the MIZ-27CT. The requirements for this sorting test are listed in table 6-4.

Table 6-4. Configuration #4 Setup

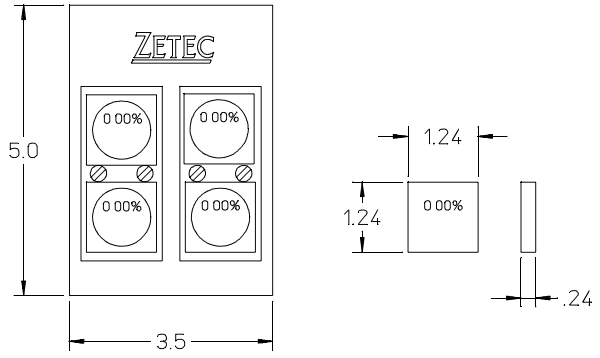
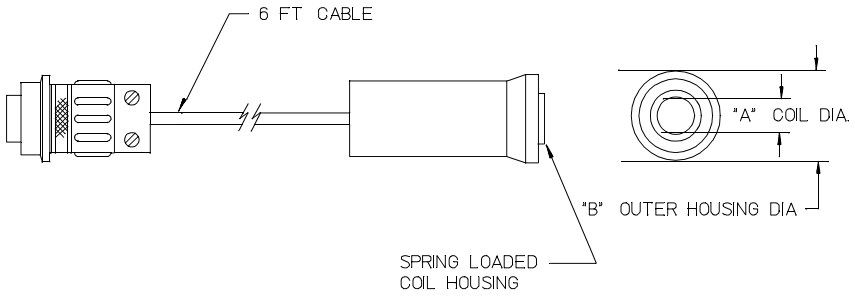
<table>
<tr><td rowspan="3">Test Specimen</td><td>Catalog Number</td><td>950-5200 & 950-5201</td></tr>
<tr><td>Description</td><td>Conductivity standard</td></tr>
<tr><td>Sample Type</td><td>8.4%, 29.0%, 46.0%, and 100% IACS standards</td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td>Analog Board</td><td colspan="2">One analog board is required</td></tr>
<tr><td rowspan="4">Probes</td><td>Part Number</td><td>Z-MIZ-6</td></tr>
<tr><td>Catalog Number</td><td>925-8600-002</td></tr>
<tr><td>Description</td><td>Spring-loaded surface probe</td></tr>
<tr><td>Frequency Range</td><td>50 kHz to 500 kHz</td></tr>
<tr><td colspan="3"> 
</td></tr>
</table>

Table 6-4. Configuration #4 Setup (Continued)

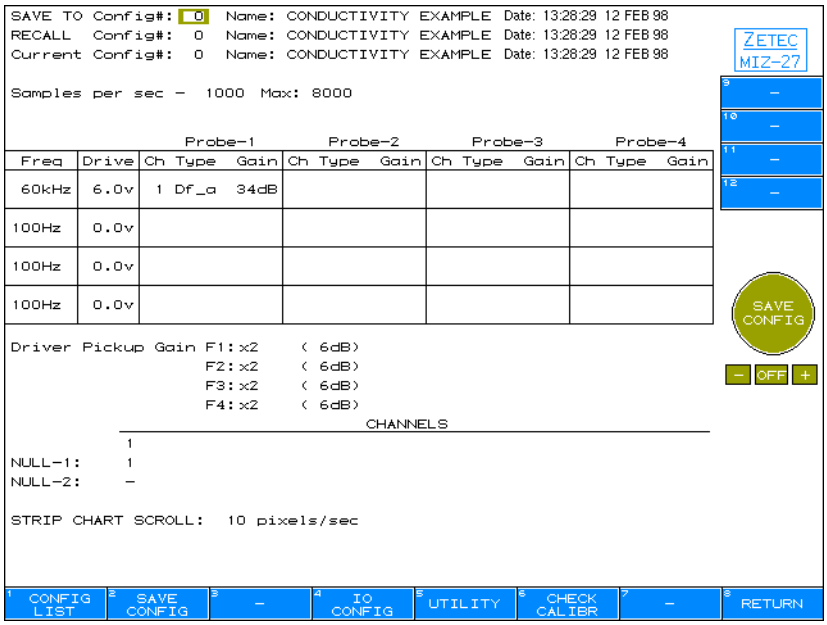
Probe Connections	Probe 1—Test Probe	
Channels/Frequencies	Channel 1	60 kHz
	Channel 2	N/A
	Channel 3	N/A
	Channel 4	N/A
Output Options	Prb 1—Df_a	
Probe Drive	6	
Sample Rate	1000 Hz	
Display	As desired	

Setup

Complete the following steps in sequence to setup and perform a conductivity test.

Step 1: Press **HARDWARE CONFIG** to set frequency, probe drive, channel type, gain, and samples/second as shown in figure 6-22.

Figure 6-22. Hardware Configuration for Conductivity Test



Set the frequency, probe drive, channel type, gain, and samples/second in the Hardware Configuration menu.

Step 2: Set the frequency to 60 kHz (standard for most conductivity testing).

Step 3: Select starting gain as 34 dB.

Step 4: Press **RETURN** and **DRV FREQ PLOTS**.

Step 5: Hold the probe on the highest conductivity standard and press **DRIVE VOLT PLOT**. This action displays suggested drive settings.

Step 6: Continue to hold the probe on the standard and press **SET MAX DRIVES**. This function enters the suggested probe drive into the configuration.

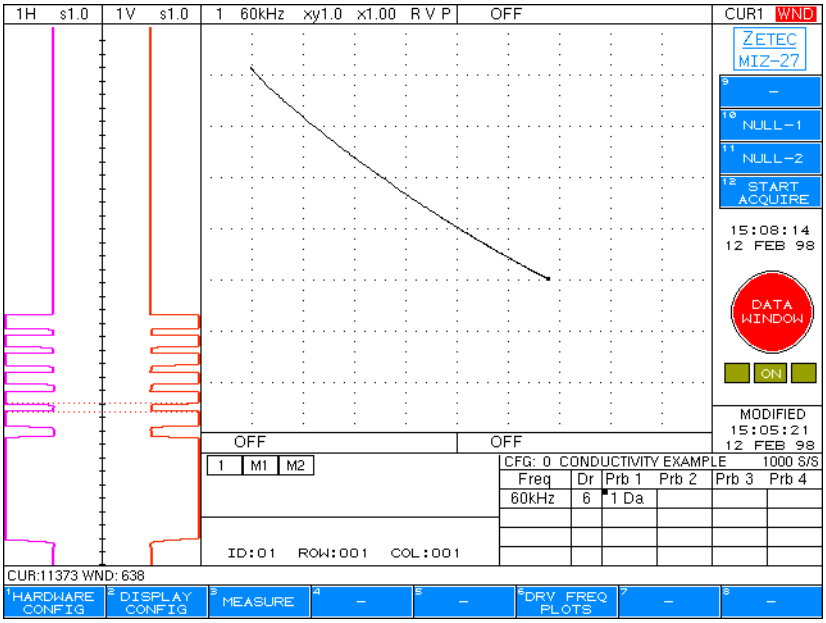
Step 7: Press return and select an XY scale of 1.0 and X scale of 1.0.

Step 8: Adjust the **V** (Volt Multiplier) to 0.73.

Step 9: With the probe in air, press **START ACQUIRE** and **NULL-1** to balance the instrument. Adjust the **P** (Position) of the null point to the upper left corner of the display, X=194 and Y=55.

Step 10: While holding the probe on the 100% sample, adjust the **R** (Rotation) to the approximate position shown in figure 6-23.

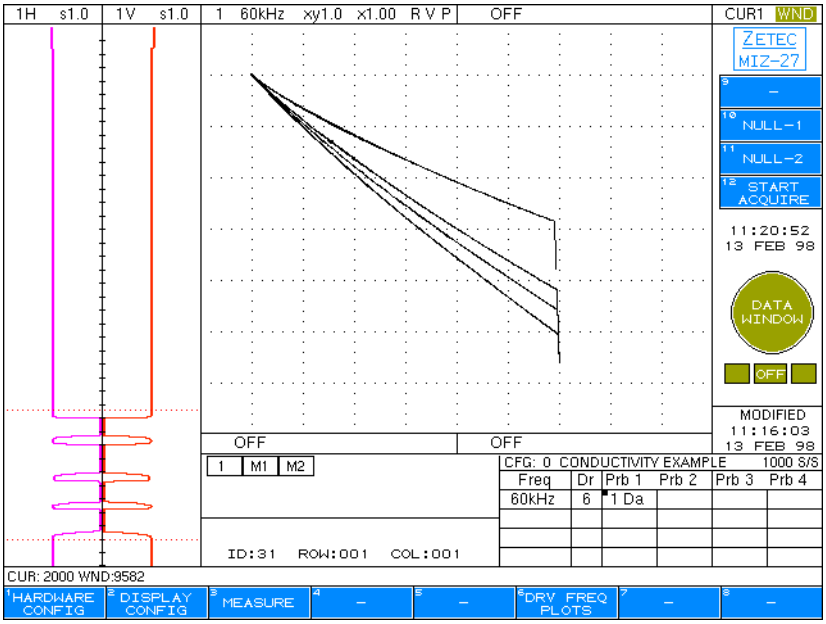
Figure 6-23. Probe Motion Horizontal



Typical response with null position in upper left corner and 100% IACS sample travelling down and towards the right.

The lift-off response for all the conductivity samples should be observed at this point for any abnormal changes to the signal. Figure 6-24 demonstrates the lift-off response from the test coil being over-driven. If a similar response is encountered, reduce the amount of probe drive voltage or channel gain until the lift-off response appears as in figure 6-25.

Figure 6-24. Conductivity Signals with Saturation



Probe saturation caused by excessive channel gain.

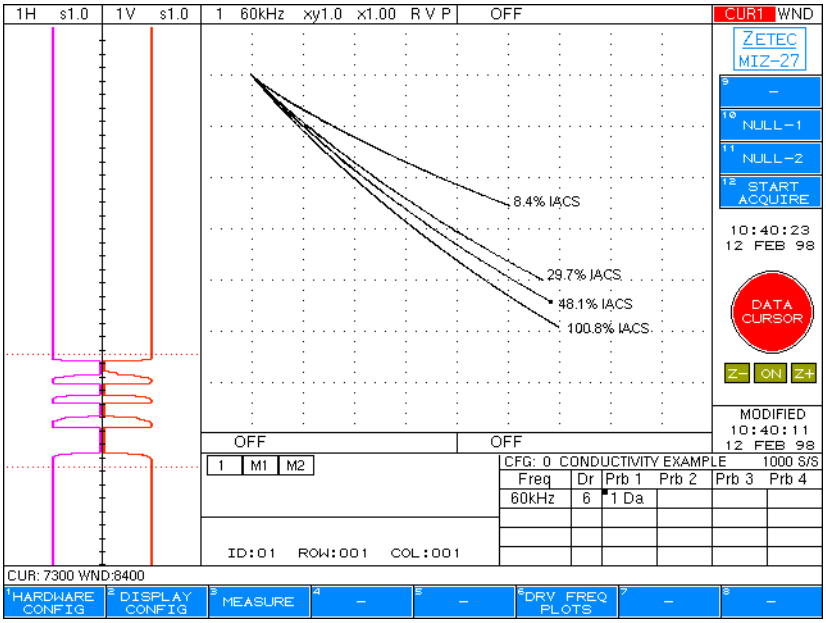
Step 11: Adjust the **V** to enlarge or reduce the displayed signal.

Step 12: Further adjustment of the channel gain, XY, X, and V may also be used to maximize the signal (see figure 6-25).

Step 13: A possible display for an acceptable/unacceptable material test is shown in figure 6-26. It's set so an unacceptable material conductivity response triggers the alarm when it falls inside of the alarm box.

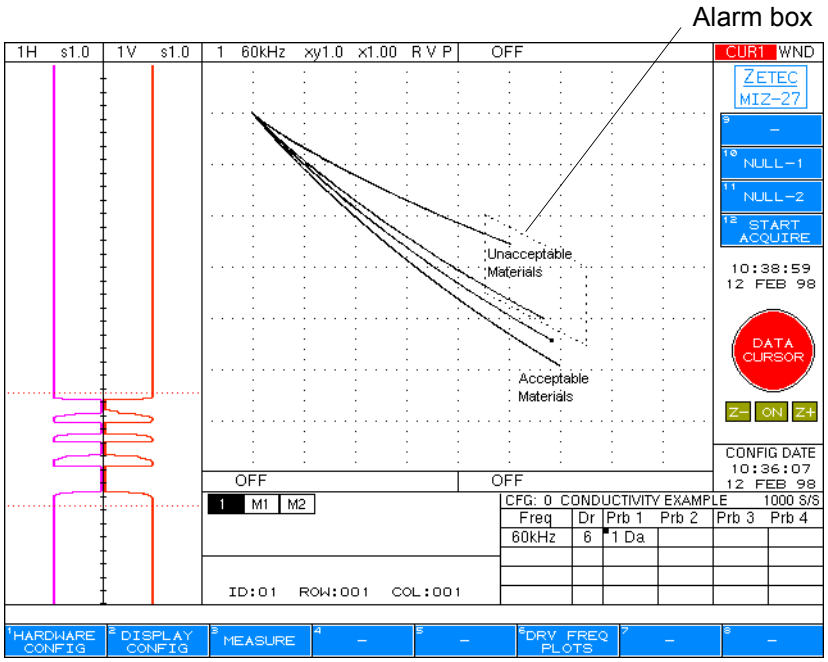
Step 14: Press **HARDWARE CONFIG** to select, name, and store the configuration to a setup number for future retrieval.

Figure 6-25. Comparison of Different Materials



Adjust the phase rotation so that the lift-off response is at the best compromise between each of the test samples.

Figure 6-26. Response with Inside Alarm Enabled



Unacceptable material triggers the alarm when conductivity response falls inside the alarm box.

Bolthole Crack

Special probe shapes and sizes are designed with specific test parameters in mind. In this example, the probe's outside diameter is slightly smaller than the fastener hole it is intended to inspect. This test corresponds with Configuration #5 on the MIZ-27CT. The requirements for this test are listed in table 6-5.

Table 6-5. Configuration #5 Setup

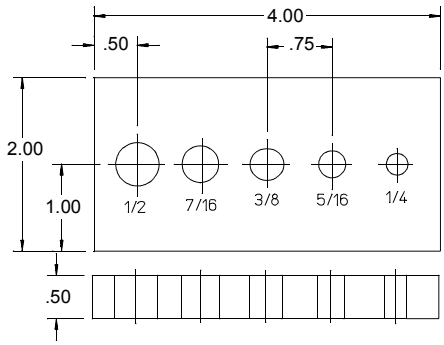
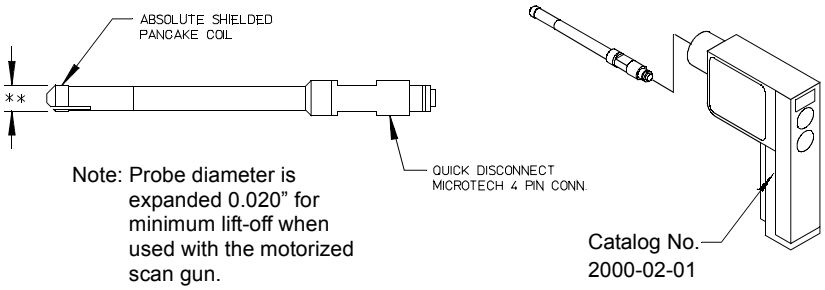
Test Specimen	Catalog Number	950-5300
	Description	Bolthole Standard
	Flaw Type	0.006" EDM Notch in each simulated bolthole
		
Accessories	Rotating Probe Gun C/N 2000-02-01 or 2000-02-05 MIZ-27 to Probe Gun Cable C/N 2700-03-02	
Analog Board	One analog board is required	
Probes	Part Number	MBH/S-125-7/16"
	Catalog Number	921-8400-000
	Description	Rotating Bolthole Probe
	Frequency Range	50 to 400 kHz

Table 6-5. Configuration #5 Setup



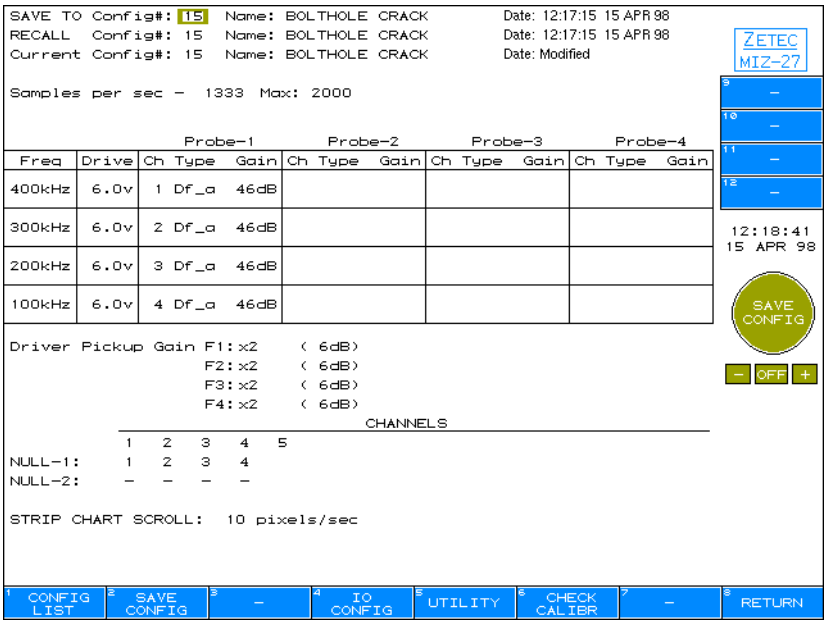
Probe Connections	Probe 1: A & B—Test Probe	
	Remote—Rotating Probe Gun	
Channels/Frequencies	Channel 1—Df_a	400 kHz
	Channel 2—Df_a	300 kHz
	Channel 3—Df_a	200 kHz
	Channel 4—Df_a	100 kHz
	Channel 5—Trigger	100 kHz
Output Options	Prb 1—CH 1-4 Df_a CH 5 Trigger	
Probe Drive	6.0v (all frequencies)	
Sample Rate	approx. 1300 s/s	
Display	Display 1	Channel 1—400 kHz
	Display 2	Channel 2—300 kHz
	Display 3	Channel 3—200 kHz
	Display 4	Channel 4—100 kHz
	Left Strip Chart	Channel 1 vertical
	Right Strip Chart	Channel 1 horizontal
Sweep/C-scan Display	optional	
Persistence	Enabled at 0.5 second intervals	

Setup

Complete the following steps in sequence to setup and perform a fastener hole test.

Step 1: Press **HARDWARE CONFIG** to set frequency, probe drive, channel type, gain, and samples/second as shown in figure 6-27.

Figure 6-27. Bolthole Probe Hardware Configuration



Set frequency, probe drive, channel type, gain, and samples/second in the Hardware Configuration menu.

Step 2: Select frequencies that provide good detection with low surface noise (100 to 400 kHz). Typically, only one frequency is enabled for this examination.

To save time in determining which frequency achieves the best response, you can enable four different frequencies. Each frequency should have the same settings to give relative comparisons.

Step 3: Connect the rotating gun cables to the **Probe 1** input and the **Remote** connector on the rear panel. Select a starting gain of 46 dB.

Step 4: Press **RETURN** and select an XY scale of 1.00 and an X scale of 1.00. Adjust the V (volt multiplier) to approximately 0.5.

Step 5: Press **DISPLAY CONFIG** and make sure all alarms and filters are off. Turn **PERSIST** to ON ±0.5 seconds.

Step 6: Set left strip chart channel to 1V and scale of approximately 3.3, set right strip chart channel to 1H and scale of approximately 3.3. Press **RETURN**.

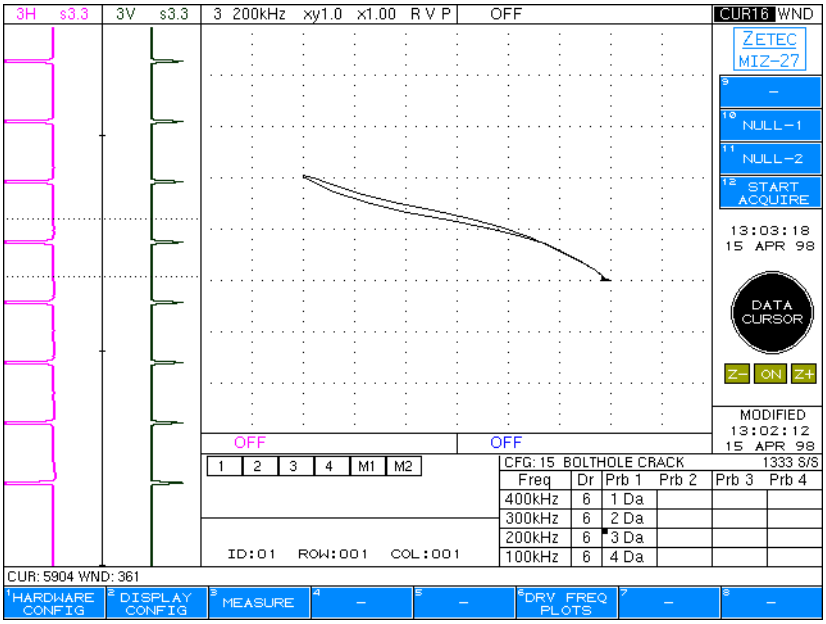
Step 7: Set Display 1 to Channel 3 (200 kHz).

Step 8: Insert the probe into the standard with the coil away from the flaw. With the motor off, press **START ACQUIRE** and **NULL-1** Adjust the **P** (position) of the null point to the center of the screen.

Step 9: Turn the rotating gun on. Adjust the **R** (rotation) to align the lift-off signal to horizontal with the calibration flaw going towards vertical. The screen should look similar to figure 6-28. Adjust the **V** (volt multiplier) or channel gain to enlarge or reduce the flaw signal size. Press **STOP AQUIRE**.

Lift-off adjustment is very important for sweep and C-scan display since only the vertical signal component is displayed. Prevention of any vertical amplitude from the noise component is preferable.

Figure 6-28. Maximized Flaw Response



Adjust the channel gain and the X and Y scale to maximize the flaw response.

Step 10: Press **HARDWARE CONFIG** and set 5 Trig 46 dB under PROBE 2-100 kHz. Press **SAVE CONFIG**.

Step 11: Press **RETURN**. Press **DISPLAY CONFIG**. Adjust displays as follow:

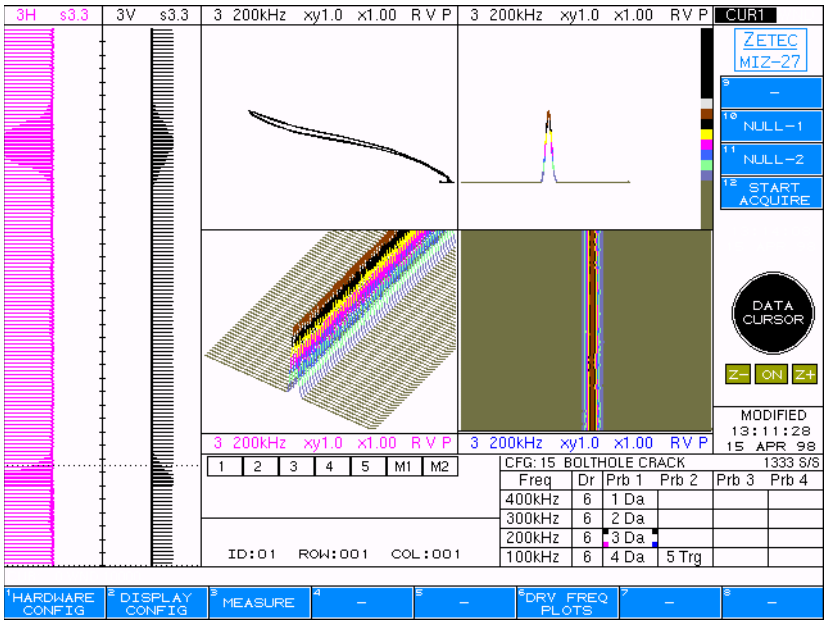
- **1—XY**
- **2—Sweep (SWP)**
- **3—Waterfall (PWF)**
- **4—C-scan (CSN)**

Step 12: Ensure all four displays are set to the same channel (channel 3 in this example). Press **RETURN**.

Step 13: Insert the probe into the standard with the coil away from the flaw. With the motor off, press **START ACQUIRE** and **NULL-1** Adjust the **P** (position) of the null point to the center of Displays 1 and 2.

Step 14: Turn the rotating gun on. Adjust the **V** (volt multiplier) or channel gain to enlarge or reduce the flaw signal size. Press **STOP ACQUIRE**. The screen should look similar to figure 6-29.

Figure 6-29. Absolute Signal Response on 4 Displays



All four displays are set to the same channel to show comparative signals.

Step 15: To turn on differential filter, press **DISPLAY CONFIG**.

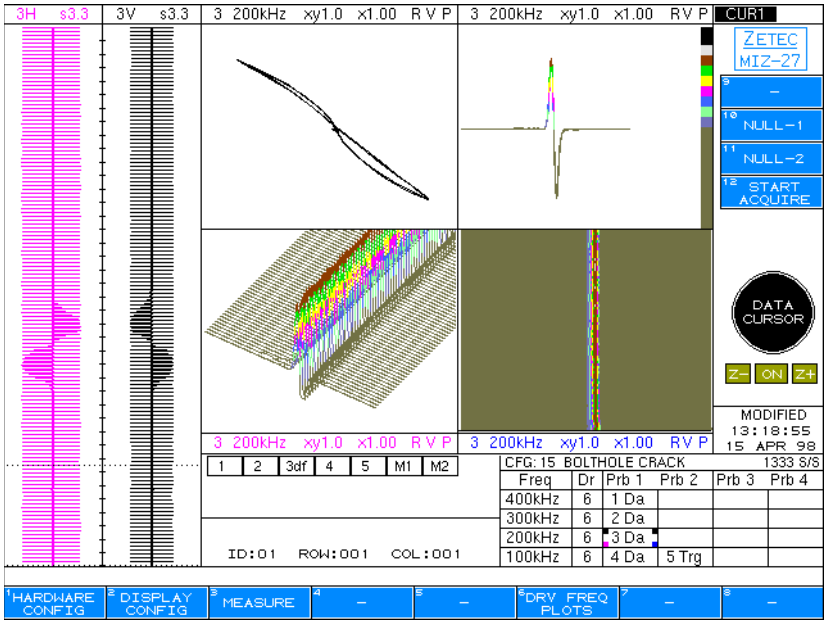
Step 16: Highlight the "FILTERS: Ch 3 OFF DF" field. Turn to ON. Set preferred degree of filtering, for example, 6 pts. Press **RETURN**.

Step 17: Adjust the positions in Displays 1 and 2 again. Changing the rotation in Display 1 will increase or decrease the signal amplitude in all four displays.

Step 18: With proper positioning and sizing (V) of signals the screen should look similar to figure 6-30.

Step 19: Press **HARWARE CONFIG** and **SAVE CONFIG** to a setup number for future retrieval.

Figure 6-30. Signal Response with Differential Filter



Change the rotation in Display 1 to increase or decrease the signal amplitude in all four displays.

Tubing Test

This MIZ-27CT example uses the instrument to detect flaws from the inside diameter of tubing with differential coil bobbin probes. Two probes are used—one for testing and one for reference. The setup corresponds with Configuration #6 of the instrument. The requirements for the test are listed in table 6-18.

Table 6-6. Configuration #6 Setup

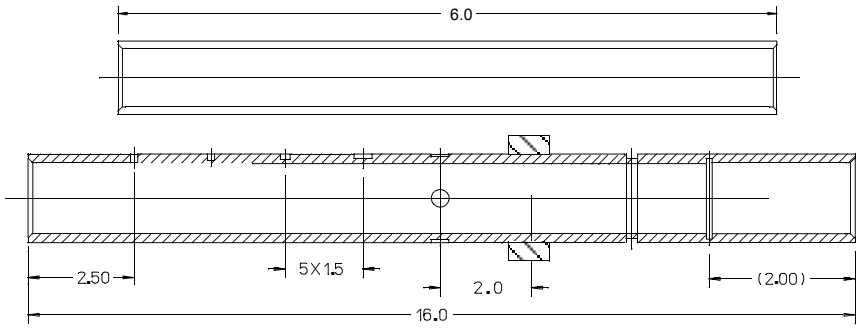
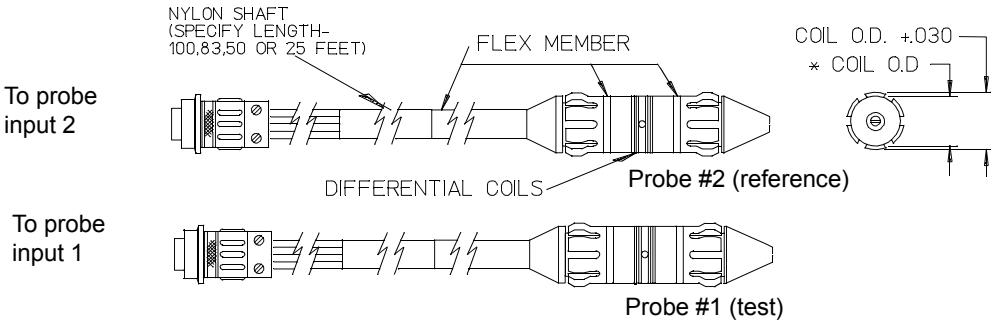
Test Specimen	Part Number	950-0030
	Description	Inconel 600 ASME flat bottom hole standard
	Flaw Type	5 flaws—20%, 40%, 60%, 80%, and 100% thru-wall hole w/carbon steel support ring
		
Analog Board	One analog board is required	
Probes (2 required)	Part Number	A-740-4FLC bobbin probes
	Catalog Number	760-1152-002
	Description	ID self-referencing differential with 0.740" diameter
	Frequency Range	50 kHz to 400 kHz
		

Table 6-6. Configuration #6 Setup (Continued)

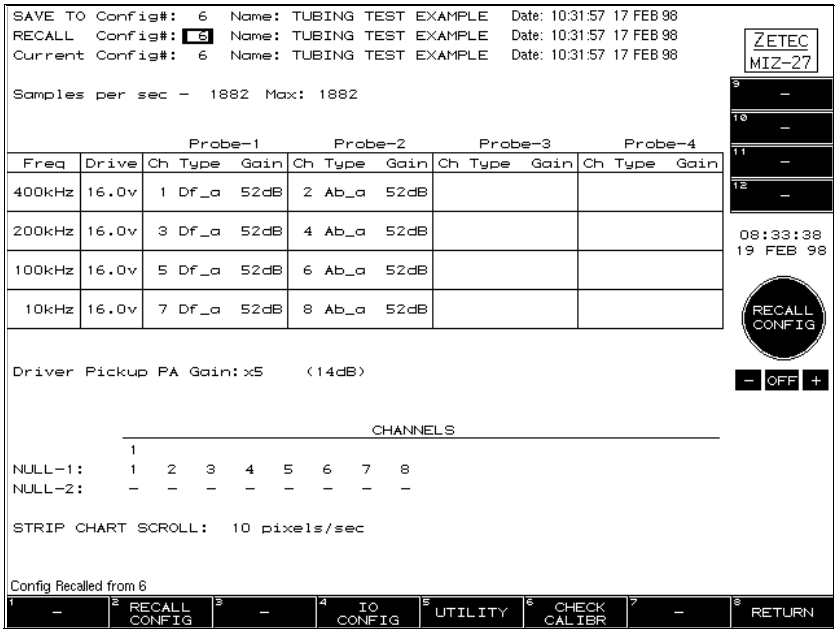
Probe Connections	Probe 1—Test Probe	
	Probe 2—Reference Probe	
Channels/Frequencies	Channel 1	400 kHz Diff—Optimum test frequency (best phase separation between ASME flaws)
	Channel 2	400 kHz Abs—Optimum test frequency (external reference)
	Channel 3	200 kHz Diff—Auxiliary test frequency
	Channel 4	200 kHz Abs—Auxiliary test frequency (external reference)
	Channel 5	100 kHz Diff—Support subtraction data channel (good flaw sensitivity)
	Channel 6	100 kHz Abs—Auxiliary test frequency (provides good phase separation between defects and tube support signals)
	Channel 7	10 kHz Diff—Support locator data channel (insensitive to most flaw conditions)
	Channel 8	10 kHz Abs—Auxiliary support locator frequency
Output Options	Prb 1—A-B (all channels)	
	Prb 2—C-B (all channels)	
Probe Drive	16 (all frequencies)	
Display	Display 1	Channel 1
	Display 2	Channel 4
	Display 3	Channel 3
	Display 4	Channel 6
	Left chart	1V
	Right chart	M1V

Setup

Complete the following steps in sequence to setup and perform a mix that suppresses the signal from a tube support.

Step 1: Press **HARDWARE CONFIG** and set up configuration as shown in figure 6-31.

Figure 6-31. Tubing Test Hardware Configuration



Set frequency, probe drive, channel type, gain, and samples/second in the Hardware Configuration menu.

Step 2: Press **RETURN** and set Display 1 to Channel 1 (400 kHz diff). If preferred, you may set Display 2 to Channel 5 (100 kHz diff) and Display 3 to Channel M1 (1 & 5 diff).

Step 3: Press **DISPLAY CONFIG** and make sure all alarms, filter, and persist are off. Set **MIX 1** to CH1 and CH5.

Step 4: Set the left strip chart channel to 1V and scale of approximately 2.7; set right strip chart channel to M1V and scale of approximately 2.7. Press **RETURN**.

Step 5: Place the reference probe in a flaw-free section of tubing.

Step 6: Place the test probe in a flaw-free section of the standard.

Step 7: Press **START ACQUIRE** and **NULL-1**. Pull the test probe through the standard to display the first five OD defects as well as the support ring.

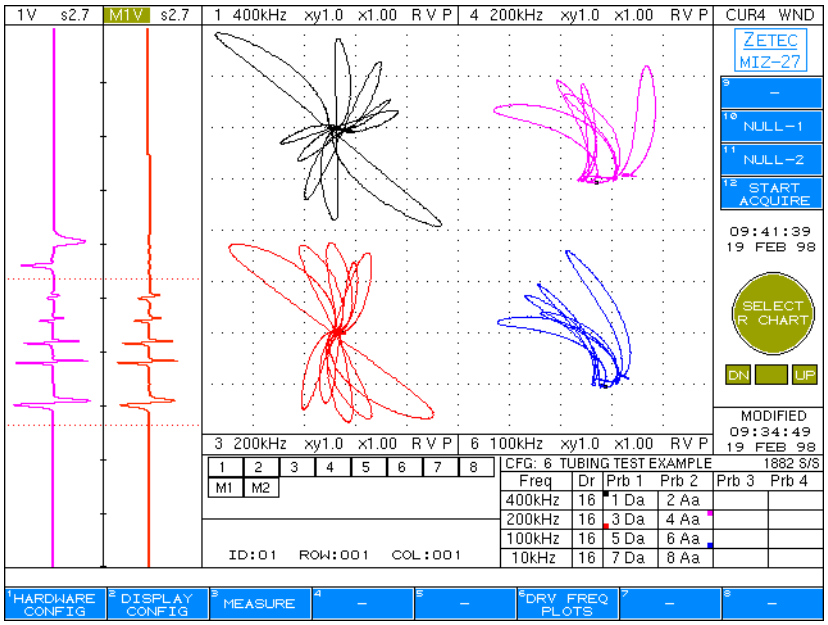
Step 8: Press **Z+** or **Z-** under **DATA CURSOR** to expand or contract the strip chart displays to your size preference.

Step 9: Adjust the **DATA CURSOR (CUR)** and **DATA WINDOW (WND)** to center the information on the strip chart displays.

Step 10: Adjust the **DATA WINDOW** to center the through-wall hole signal (do not overlap onto another signal). Press **MEASURE** and **VOLTS P-P**.

Step 11: Turn **ADJUST ANGLE** to off. Highlight the **R** (Rotation) function and turn on. Adjust phase rotation so that the through-wall drill hole is 40 degrees (see figure 6-32).

Figure 6-32. Response to ASME Flaws



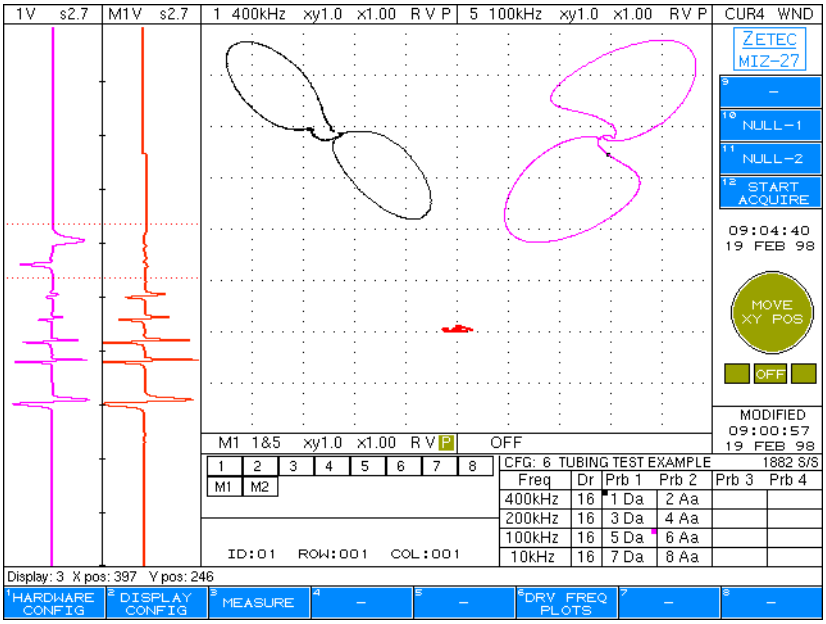
Set the phase rotation so that the through-wall drill hole is 40 degrees.

Step 12: Turn **ADJUST XY ROT** to off.

Step 13: Go to the **DATA CURSOR** and turn it on.

Step 14: Adjust the **DATA WINDOW** as shown in figure 6-33 to center the tube support signal (do not overlap onto another signal). Press **MEASURE** and **VOLTS P-P**.

Figure 6-33. Response to Support Ring



DISP-1 shows response to the tube support ring, while DISP-3 shows the same response with the mix enabled.

Step 15: Turn **ADJUST ANGLE** to off.

Step 16: Highlight **V** (Volt Multiplier) in CH-1, turn **ADJUST VOLTS** to on and adjust the peak-to-peak voltage to approximately five volts.

Step 17: Turn **ADJUST VOLTS** to off and press return.

Step 18: Turn **DATA CURSOR** to off and set Display 1 to Channel 5 (100 kHz).

Step 19: Follow steps 10 through 17 for Channel 5.

Step 20: Turn **DATA CURSOR** to off and select Display 1 to M1 (1 & 5).

Step 21: Press **DISPLAY CONFIG**, **PERFORM MIX**, and **RETURN**.

Step 22: Set Display 1 to Channel 1, Display 2 to Channel 5, and Display 3 to M1.

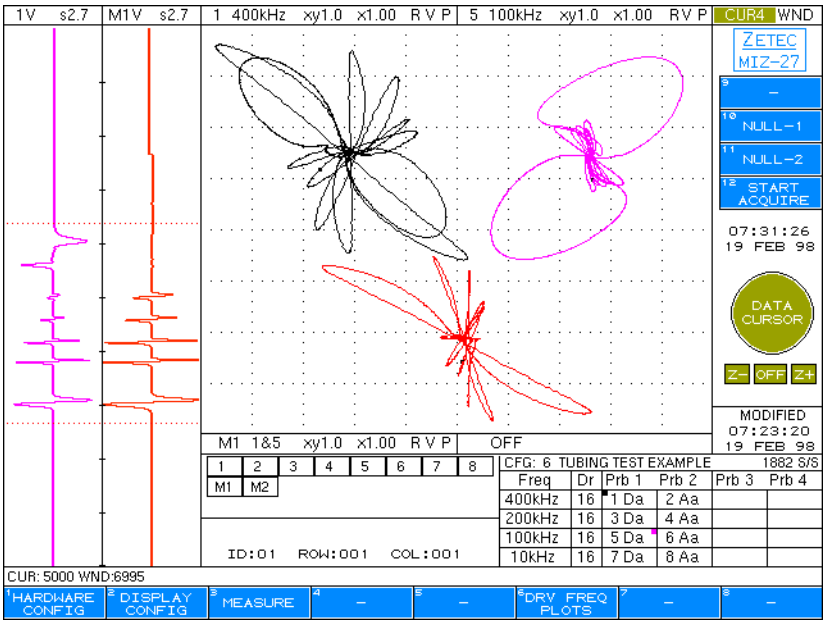
Step 23: Press **START ACQUIRE**, **NULL-1**, and pull the test probe through the standard to display the first five OD defects as well as the support ring.

Step 24: Press **STOP ACQUIRE**.

Step 25: Adjust the Data Window to include all of the signals. With proper positioning and sizing (V) of signals, the screen should look similar to figure 6-34.

Step 26: Select and store the configuration to a set-up number for future retrieval.

Figure 6-34. Mix Enabled



With the mix enabled on Display 3, all the flaws are viewed while the signal from the tube support ring is cancelled.

Finned Tubing with Single Probe

Finned tubing requires a test that is sensitive to circumferential cracking, pitting, and dent type flaws, while being insensitive to bulges, transitions, and supports. Using the MIZ-27CT and an AC3 probe, which is self-referencing, a reliable test can be accomplished. Configuration #7 is setup for the finned copper tubing example. Requirements for this test are listed in table 6-7.

Table 6-7. Configuration #7 Setup

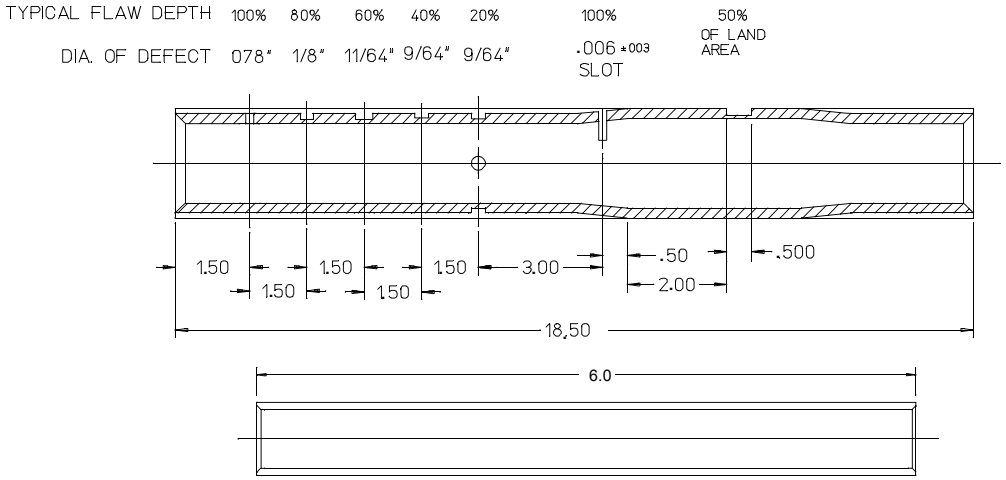
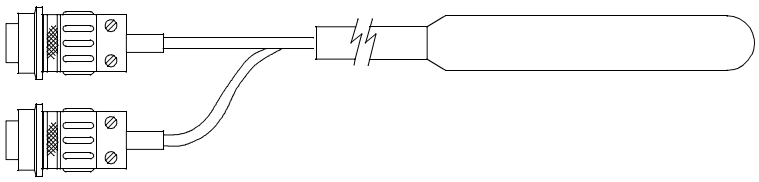
Test Specimen	Catalog Number	950-0080
	Description	Finned air conditioning tubing 0.750" × 0.050"/0.035" wall
	Flaw Type	Flat-bottom holes, 20%, 40%, 60%, 80%, and 100% thru-wall—180°-50% wear scar (fretting) flaw
		
Analog Board	One analog board is required. (For maximum probe performance, an additional analog board may be used.)	
Probes	Part Number	AC3-520
	Catalog Number	782-2100-000
	Description	Air Conditioning Probe ID self-referencing, 0.520" diameter
	Frequency Range	2 to 35 kHz

Table 6-7. Configuration #7 Setup (Continued)

		
Probe Connections Using 1 analog board & 1 test probe assembly	Probe 1- Differential bobbin coil	
	Probe 2- Axially wound coil set	
Channels/Frequencies	Channel 1	9 kHz Diff - Optimum frequency for finned area of tubing (best phase separation between ASME flat bottom holes)
	Channel 2	3 kHz Diff - Optimum frequency for the non-finned “land” areas of the tubing
	Channel 3	3 kHz Diff - Frequency used for detection of circumferential cracking
Output Options	Prb 1—Df_a	
	Prb 2—Df_b	
Probe Drive	16 (all frequencies)	
Sample Rate	Maximum as selected by the tester	
Display	Display 1	Channel 1
	Display 2	Channel 3
	Left Chart	Channel 1-Vert
	Right Chart	Channel 3-Vert

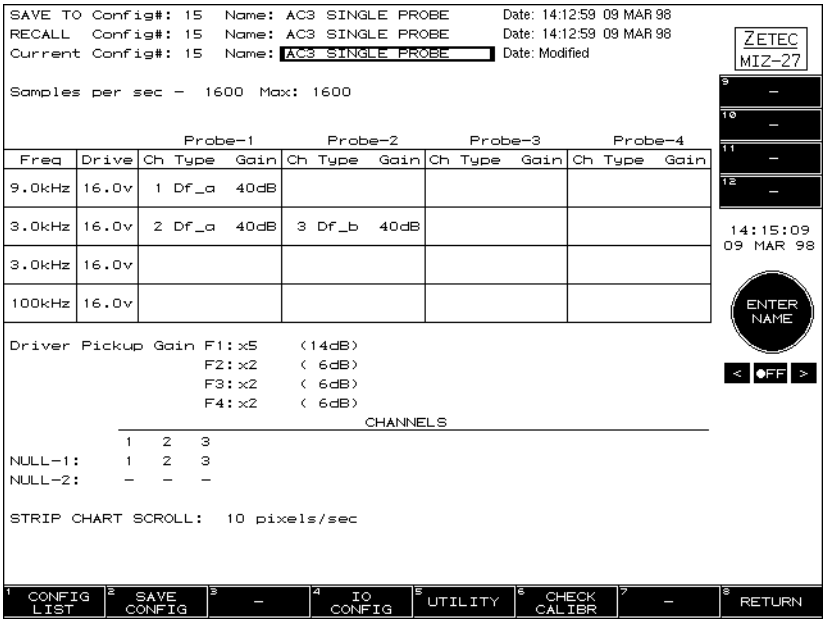
Setup

Complete the following steps to perform the finned tubing test.

Step 1: Press **HARDWARE CONFIG** and set up the MIZ-27 configuration as shown in figure 6-35.

The AC-3 probe contains a low frequency bobbin coil along with a special axially wound coil set combined into one test probe assembly. This arrangement allows the user to perform three types of examinations: 1) self-referencing bobbin exam; 2) externally referenced bobbin exam; and 3) self-referencing axial coil exam. If you need to perform all three exams simultaneously, an additional test probe is required.

Figure 6-35. Single AC3 Probe Hardware Configuration

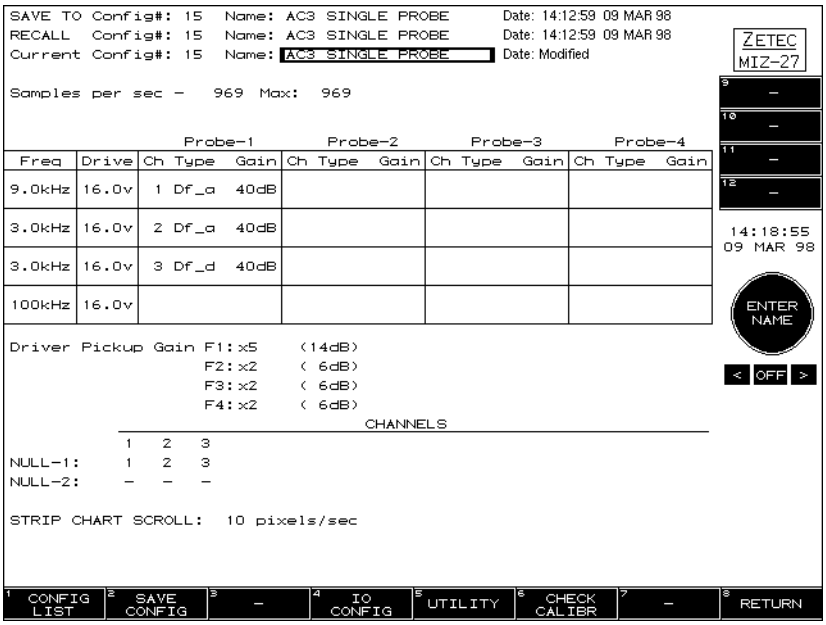


Set frequency, probe drive, channel type, gain, and samples/second in the Hardware Configuration menu.

Step 2: Select a configuration number and press **SAVE CONFIG**.

You may also use the configuration shown in figure 6-36. This will require the 12-pin to two 4-pin adapter (C/N 940-1950). Note that the sample rate will be compromised with this configuration as compared to the configuration in figure 6-35.

Figure 6-36. Alternate Single AC3 Probe Hardware Configuration



Set frequency, probe drive, channel type, gain, and samples/second in the Hardware Configuration menu.

Step 3: Press **RETURN**.

Step 4: Set the following channels:

- **Display 1 to Channel 1 (9.0 kHz diff for pitting and freeze bulge sensitivity)**
- **Display 2 to Channel 2 (3.0 kHz abs for wear scar detection and measurement)**
- **Display 3 to Channel 3 (3.0 kHz axial for circumferentially oriented flaws)**

Step 5: Press **DISPLAY CONFIG** and ensure that all alarms, filters, and persist are off.

Step 6: Set left strip chart channel to 2V and scale to approximately 1.8.

Step 7: Press **RETURN**.

Step 8: Place the test probe in a flaw-free section of the standard.

Step 9: Press **START ACQUIRE**, **NULL-1**, and pull the probe through the standard past the 20, 40, 60, 80, and 100 percent flaws.

Step 10: Press **STOP ACQUIRE**.

Step 11: Press **Z+** or **Z-** under data cursor to expand or contract the strip chart displays to the preferred size.

Step 12: Adjust the **DATA CURSOR (CUR)** and **DATA WINDOW (WND)** to center the signals of interest on the strip chart displays.

Step 13: Adjust the data window to center the through-wall hole signal (do not overlap onto an adjacent signal). Press **MEASURE** and **VOLTS P-P**.

Step 14: Turn **ADJUST ANGLE** to off then highlight the **R** (Rotation) and turn it on. Adjust signal to 40 degrees.

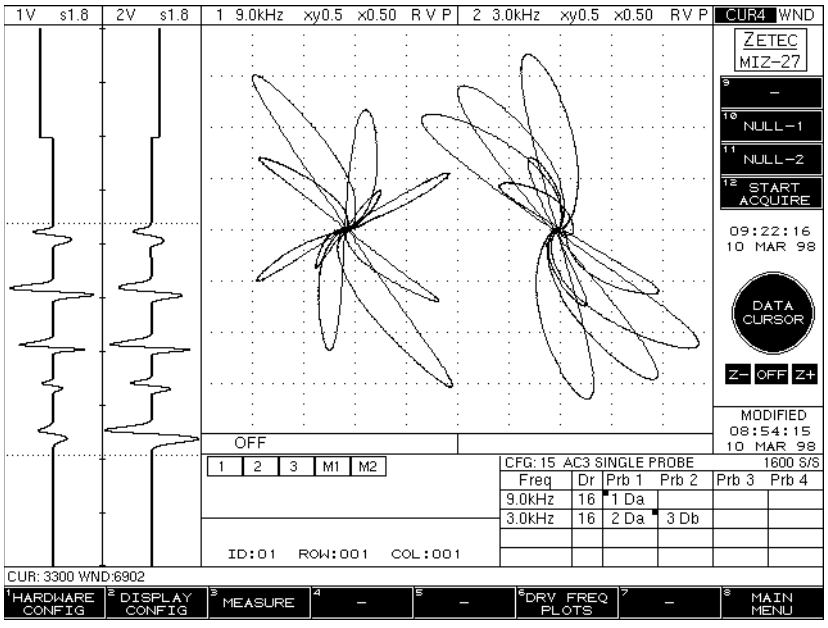
Step 15: Turn **ADJUST XY ROT** to off and turn the **DATA CURSOR** to on.

Step 16: Adjust the data window to include all of the signals.

Step 17: Turn Display 3 off.

With proper positioning and sizing (V) of signals, the screen should look similar to figure 6-37.

Figure 6-37. Single Self-Referencing AC3 Probe Setup



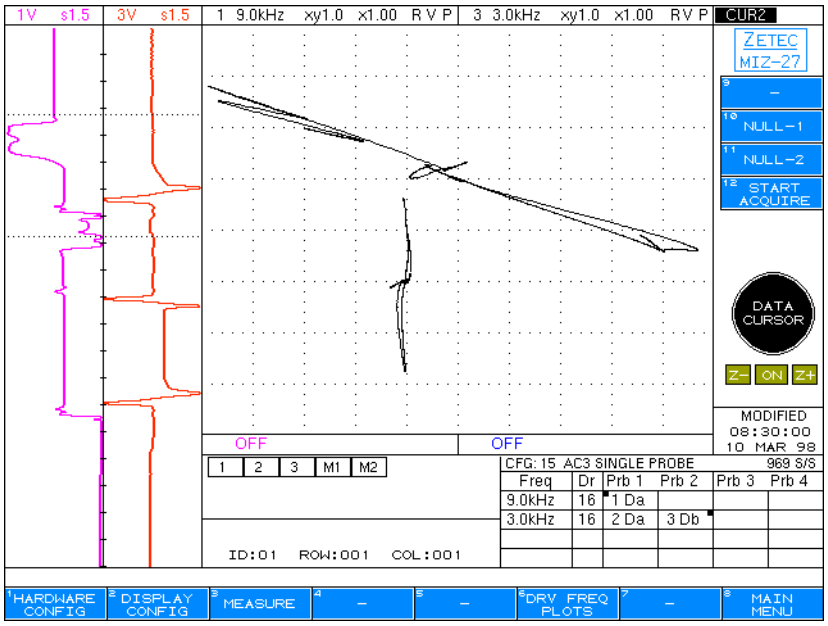
A 9.0 kHz and 3.0 kHz differential response to the ASME-type flat bottom hole flaws in the standard.

Step 18: Change Display 2 from Channel 2 to Channel 3.

Step 19: Pull the probe past the land area and saw cut on the standard.

Again, with proper positioning and sizing (V) of signals, the screen should look similar to figure 6-38.

Figure 6-38. Single Self-Referencing AC3 Probe Setup



Response to 90° circumferential saw cut in free span finned (bottom signal) area of the tubing with bobbin response to the ID change at the same area (top signal).

Step 20: If needed, establish the proper mix channels and rotate the standard flaws for the preferred output.

Finned Tubing with Two Probes

Finned tubing requires a test that is sensitive to circumferential cracking, pitting, wastage, and dent type flaws, while being insensitive to bulges, transitions, and supports.This example requires two AC3 probes—one as the test probe and one as the external reference probe. Using the MIZ-27CT and AC3 probes, a reliable test can be accomplished. Configuration #8 is setup for this finned copper tubing example. Requirements for this test are listed in table 6-8.

Table 6-8. Configuration #8 Setup

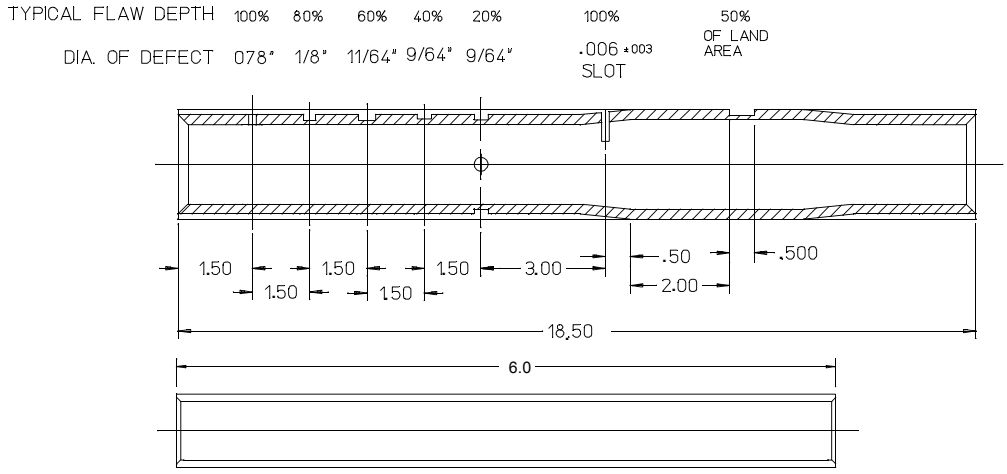
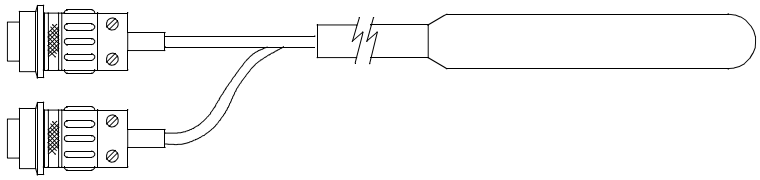
<table>
<tr><td rowspan="3">Test Specimen
(2 required)</td><td>Catalog Number</td><td>950-0080</td></tr>
<tr><td>Description</td><td>Finned air conditioning tubing 0.750" × 0.050"/0.035" wall</td></tr>
<tr><td>Flaw Type</td><td>Flat-bottom holes, 20%, 40%, 60%, 80%, and 100% thru-wall—180°-50% wear scar (fretting) flaw</td></tr>
<tr><td colspan="3"> 
</td></tr>
<tr><td>Analog Board</td><td colspan="2">One analog board is required. (For maximum probe performance, an additional analog board may be used.)</td></tr>
<tr><td rowspan="3">Probes
(2 required)</td><td>Part Number</td><td>AC3-520</td></tr>
<tr><td>Catalog Number</td><td>782-2100-000</td></tr>
<tr><td>Description</td><td>Air Conditioning Probe ID self-referencing, 0.520" diameter</td></tr>
<tr><td></td><td>Frequency Range</td><td>2 to 35 kHz</td></tr>
</table>

Table 6-8. Configuration #8 Setup (Continued)

		
Probe Adapters (2 required)	Catalog Number	940-1950
	Description	12-pin to two 4-pin
Probe Connections using 1 analog board & 2 test probes	Probe 1: A & B - Differential bobbin coil	
	Probe 1: C & D - Axially wound coil set	
	Probe 2: A & B - External reference absolute bobbin coil	
Channels/Frequencies	Channel 1 (Df_a)	9 kHz Diff - Optimum frequency for finned area of tubing (best phase separation between ASME flat bottom holes)
	Channel 2 (Ab_a)	9 kHz Abs - Channel used for external referencing and absolute signal generation
	Channel 3 (Df_a)	3 kHz Diff - Optimum frequency for the non-finned “land” areas of the tubing
	Channel 4 (Ab_a)	3 kHz Abs - Channel used for external referencing and absolute signal generation
	Channel 5 (Df_d)	3 kHz Axial- Frequency used for detection of circumferential cracking
Probe Drive	16 (all frequencies)	
Sample Rate	Maximum as selected by the tester	
Display	Display 1	Channel 1
	Display 2	Channel 2
	Display 3	Channel 3
	Display 4	Channel 5
	Left Chart	Channel 1-Vert
	Right Chart	Channel 5-Vert

Setup

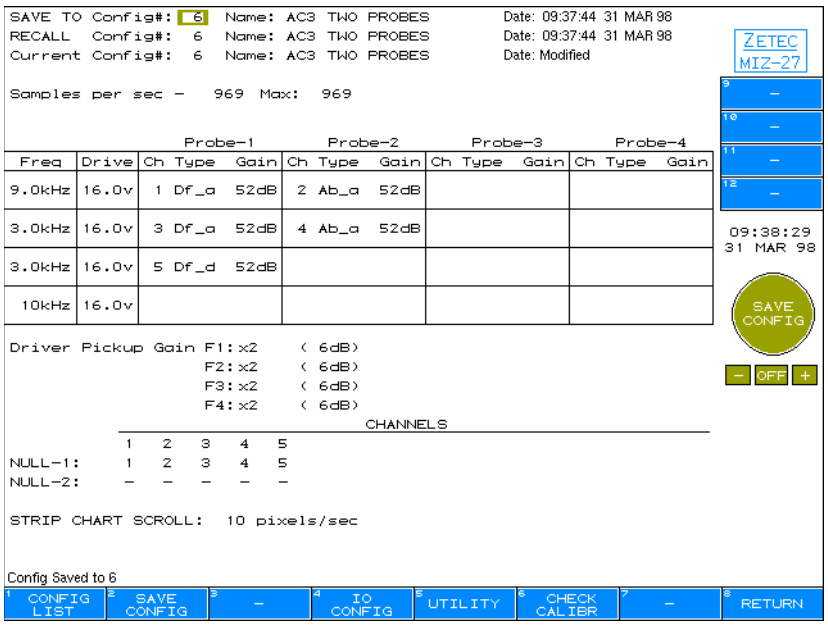
This configuration will require a quantity of two 12-pin to two 4-pin adapters (C/N 940-1950). Complete the following steps to perform the finned tubing test with two probes.

Step 1: Ensure the probe is properly connected to the back of the instrument (see Probe Connections in table 6-8).

The AC-3 probe contains a low frequency bobbin coil along with a special axially wound coil set combined into one test probe assembly. This arrangement allows the user to perform three types of examinations: 1) self-referencing bobbin exam; 2) externally referenced bobbin exam; and 3) self-referencing axial coil exam. You can perform all three exams simultaneously on a single analog board.

Step 2: Press **HARDWARE CONFIG** and set up configuration as shown on figure 6-39. Remember that these gain settings are approximate, and that the values necessary for the sensitivity in the materials you are testing may vary from those given.

Figure 6-39. Hardware Configuration Menu for Two AC3 Probes



MIZ-27 hardware configuration using two AC3 probes and one analog board.

Step 3: Select a configuration number and press **SAVE CONFIG**.

Step 4: Set the following channels:

- **Display 1 to Channel 1 (9.0 kHz diff for pitting and freeze bulge sensitivity)**
- **Display 2 to Channel 2 (9.0 kHz abs for wear scar detection and measurement)**
- **Display 3 to Channel 3 (3.0 kHz diff for pitting and freeze bulge sensitivity)**
- **Display 4 to Channel 5 (3.0 kHz axial for circumferentially oriented flaws)**

Step 5: Press **DISPLAY CONFIG** and ensure that all alarms, filters, and persist are off.

Step 6: Set left strip chart channel to 1V and scale to approximately 2.7.

Step 7: Set right strip chart channel to 5V and scale to approximately 2.7.

Step 8: Press **RETURN**.

Step 9: Place the test probe in a flaw-free section of the standard.

Step 10: Press **START ACQUIRE**, **NULL-1**, and pull the probe through the standard past the 20, 40, 60, 80, and 100 percent flaws and the tube support ring if present.

Step 11: Press **STOP ACQUIRE**.

Step 12: If necessary, establish the proper mix channels and rotate the standard flaws for the best output.

Step 13: Press **Z+** or **Z-** under **DATA CURSOR** to expand or contract the strip chart displays to the preferred size.

Step 14: Adjust the **DATA CURSOR (CUR)** and **DATA WINDOW (WND)** to center the signals of interest on the strip chart displays.

Step 15: Adjust the data window to center the through-wall hole signal (do not overlap onto an adjacent signal). Press **MEASURE** and **VOLTS P-P**.

Step 16: Turn **ADJUST ANGLE** off, highlight the **XY R** (Rotation), and turn it on. Adjust signal to 40 degrees.

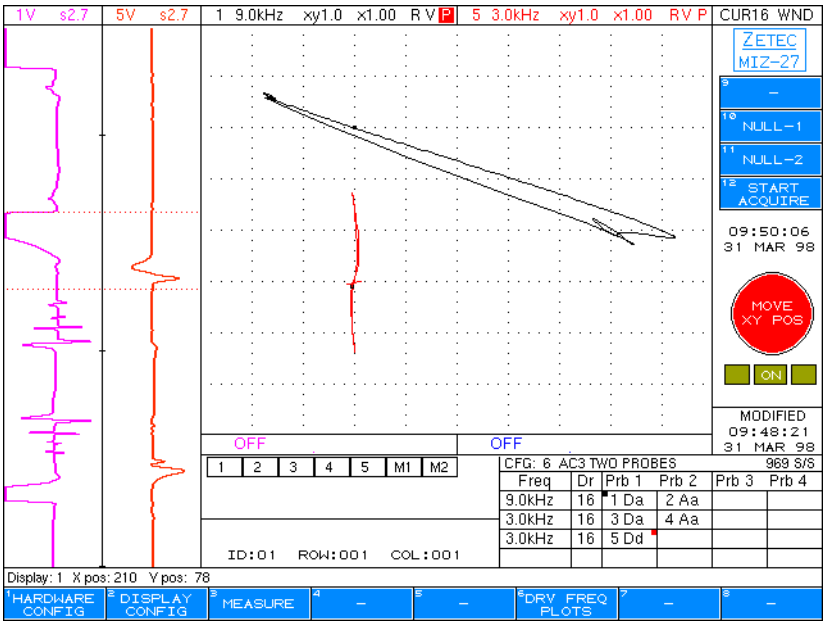
Step 17: Turn adjust **XY ROT** to off and turn the data cursor to on.

Step 18: Adjust the data window to include all of the signals.

With proper positioning and sizing (V) of signals, the screen should look similar to figure 6-41.

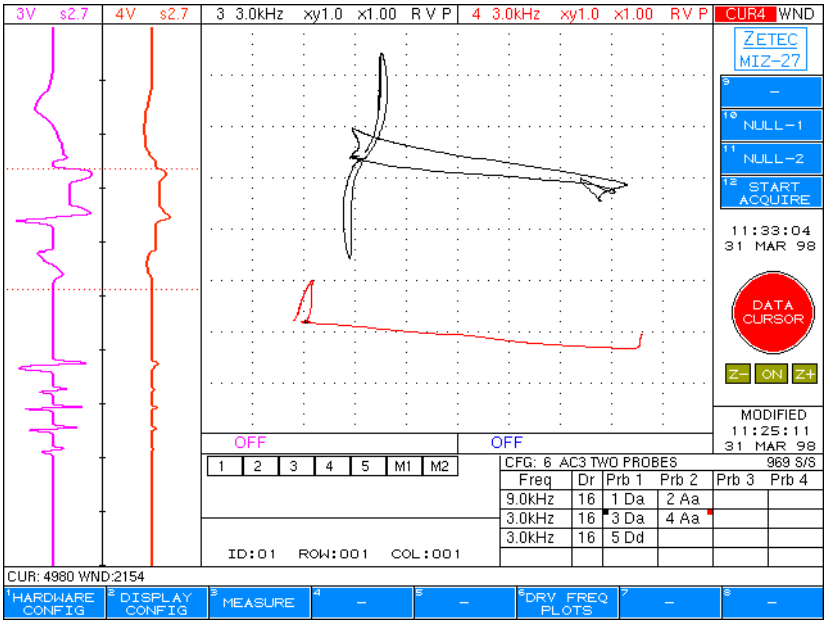
Step 19: Select and store the configuration to a setup number for future retrieval.

Figure 6-40. Two External-Referencing AC3 Probes Setup



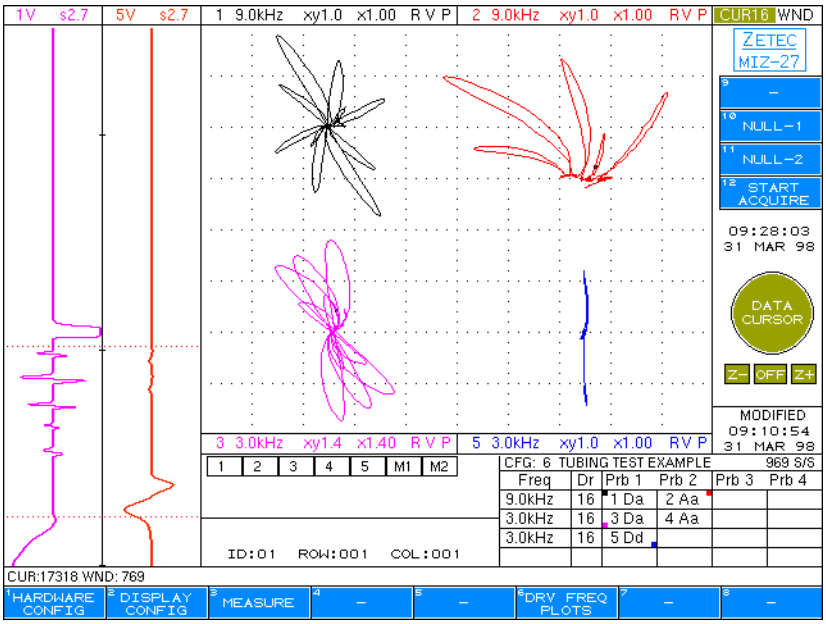
A differential bobbin coil response (top signal—9.0 kHz differential) and an axial coil response (bottom signal—3.0 kHz differential) to the circumferential saw cut and transition. The axial coil detects the sawcut but ignores the transition.

Figure 6-41. Two External-Referencing AC3 Probes Setup



Differential (top) and absolute (bottom) response to the 50% wear scar (fretting) flaw in the land area.

Figure 6-42. Two External-Referencing AC3 Probes Setup



Responses from the ASME-type flaws on the standard using two differential, one absolute, and one axial differential.

This concludes the *MIZ-27CT Eddy Current Instrument Operating Guide.*

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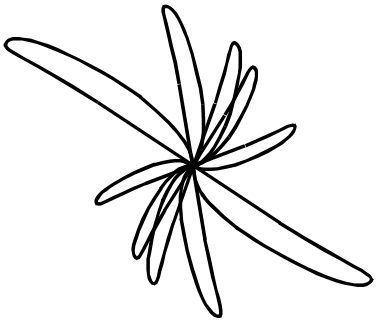

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