

MultiMac[®] II

Eddy Current Instrument for Encircling Coil, Sector and Rotary Probe Testing of Tube, Bar, & Wire



MultiMac Screens for Operation and Control

EC Screen

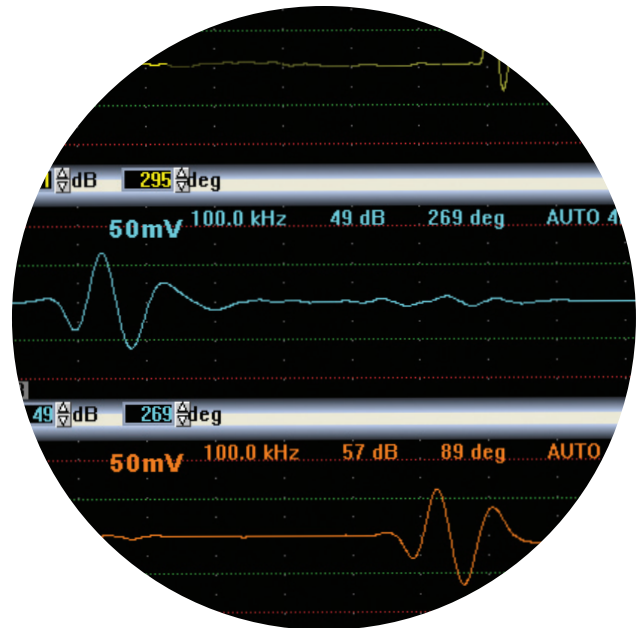
All parameters for testing are set up through the EC Screen. They can be entered through the keyboard or by using a mouse. Each channel is set up independently. A lock out provision is included to prevent changes by unauthorized persons.

Multi Screen

- ❑ Simultaneous test results, including thresholds, for up to eight channels, in polar and linear modes
- ❑ Clearly demonstrates defect signals outside the acceptable threshold levels
- ❑ Displays Rotary speed, piece number, length, and throughput speed

C Scan Screen

- ❑ For rotary probe applications, an intuitive C Scan combines all channels and clearly displays the defect location with respect to its circumferential and longitudinal position.



Linear view in the Multi Screen.
EC Screen also displays linear view



Chart Screen

- ❑ Shows the linear test results for up to 8 channels at a time
- ❑ Each channel can record up to 3 charts, based on the type of threshold (Allphase, Sector and Chord)
- ❑ Time, date, piece number, length and speed of the material under test are also indicated

Track Screen

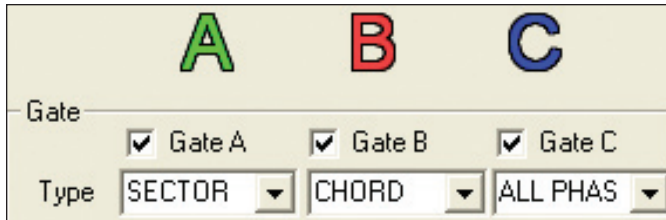
The Track Screen allows for a visual representation of the product, length, line speed, end suppression, flaw tracking, piece count, and output (alarm) routing. Advantages include increased quality control and decreased down time.



Inspection Features

Versatile Threshold Selection

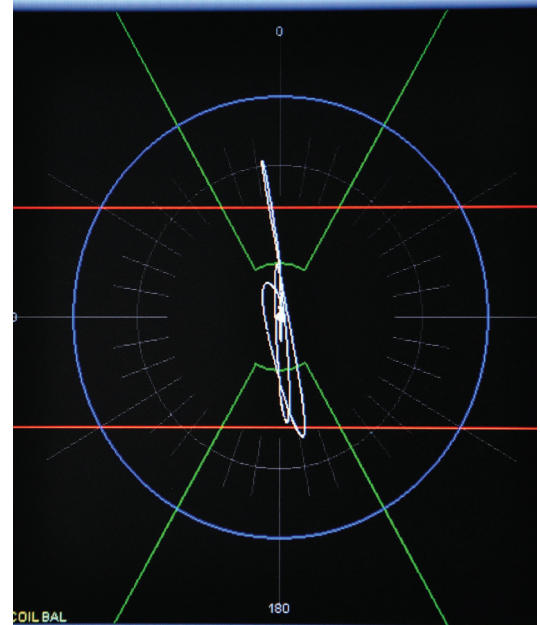
Challenging test conditions are made simple with threshold selections that allow complex gating to detect ID/OD and weld sector defects. 3 gates per channel may be set based on All Phase, Sector, Chord or Half Chord thresholds. (Gates shown at right & below)



Up to 8 Channels

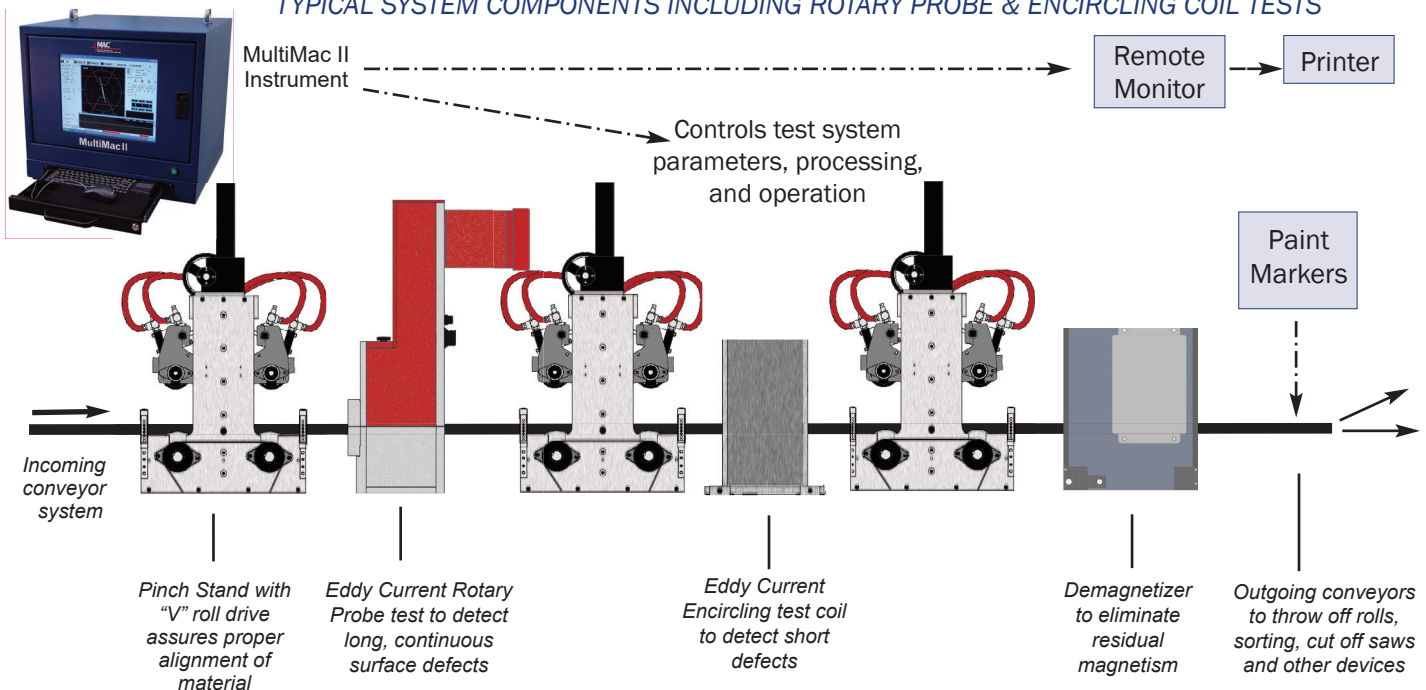
Eight flaw, MID, absolute, or a combination channels are able to operate over the frequency range of 1 KHz to 6 MHz, with appropriate test coils or rotary probes.

One channel can be set as a differential channel with an encircling test coil to detect short weld line defects, for example, while a second channel, using a rotary probe test, simultaneously detects long, continuous surface flaws such as laps and seams.

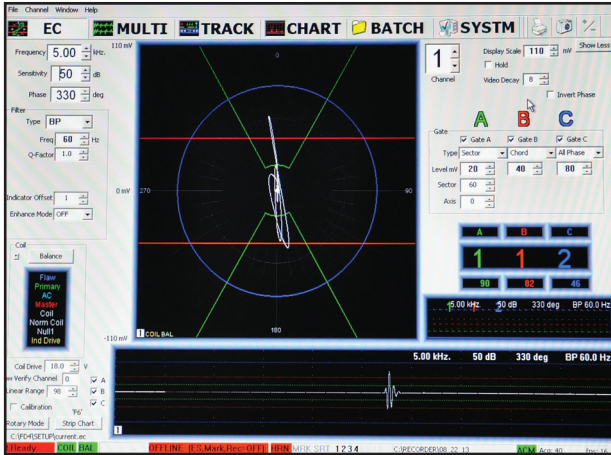


EC Screen Polar view of thresholds with a test signal for a drilled hole in a copper tube.

TYPICAL SYSTEM COMPONENTS INCLUDING ROTARY PROBE & ENCIRCLING COIL TESTS



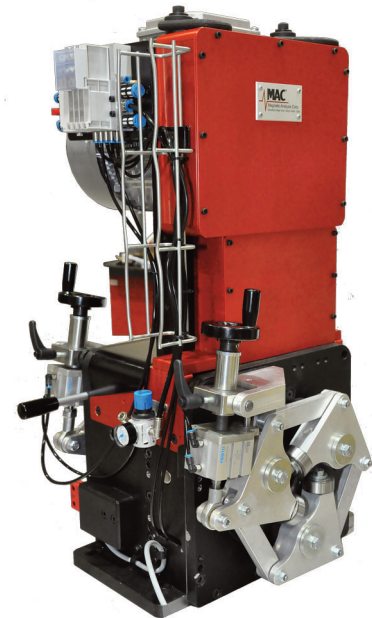
Features of the MultiMac II Electronics



- Simultaneous Coil and/or Rotary Probe operation
- Differential, MID, and/or Absolute Mode operation
- Up to 4 independent Test Channels
- 1 KHz to 6 MHz Test Frequency selection for each even channel
- Store & Recall Setups; Print & Transfer Data
- Simultaneous Polar/Linear Display
- All channel composite C Scan display of defect location, for rotary applications
- Versatile Threshold Selection includes Chord, Half Chord, Sector, All Phase
- Enhanced Signal-to-Noise
- CE Compliant

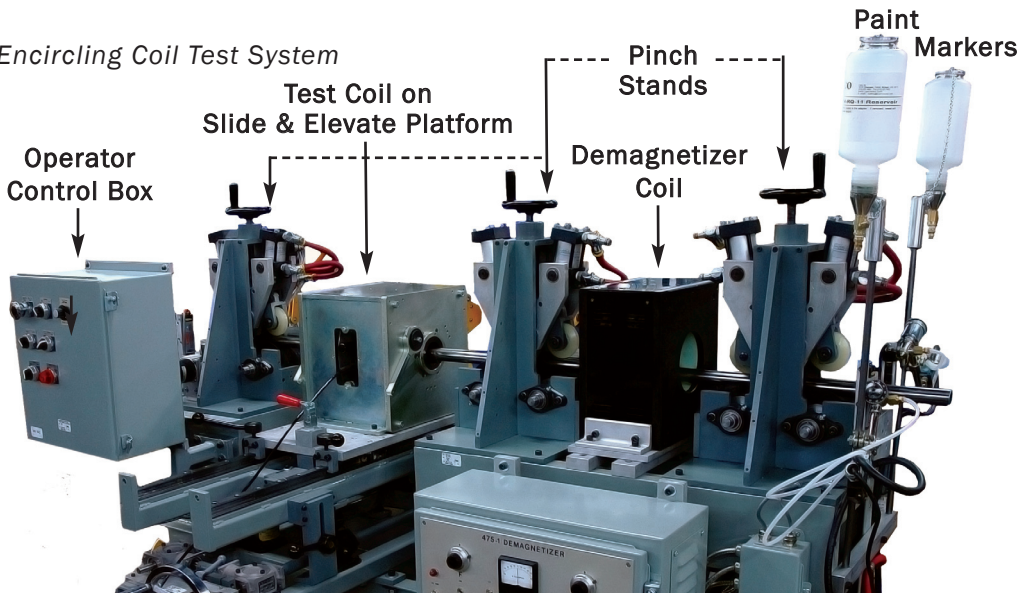
MultiMac II Applications

- Detect short surface and some subsurface defects in tube, bar, and wire.
- Identify seam type surface defects and laps in cold drawn wire or cut length bar stock.
- Test magnetic or non-magnetic wire, bar and tube.
- Inspect welded tube for short ID or OD defects in the weld zone.
- Test uniform cross sectional material, including squares, rectangles, hex and round.
- Check continuity and locate welds in single & multi-conductor insulated wire and cable.
- Built in MID with software-controlled activation.
- Inspect in-line with continuous wire operations.
- Test parts, such as small shafts and bearings for longitudinal surface defects.



Rotary Probe Tester, shown above, used with MultiMac® II electronics to inspect bar or tube from 3mm - 40mm diameter.

Encircling Coil Test System





MultiMac[®] Instrument Technical Data

TEST PARAMETERS	
CHANNELS	Up to 8 test channels. Software configurable as Flaw (Differential), or Absolute for use with Encircling or Sector Coils or Rotary test Probes.
TEST FREQUENCY	1KHz to 5 MHz. 20 pre-selected frequencies, or user selection of any specific frequency.
FLAW BANDWIDTH	Variable up to 5 KHz.
FILTERS	High Pass, Low Pass, Band Pass, BP-Auto and Out. Fixed filter positions adjustable from 0.1 Hz to 5000 Hz flaw frequency. The bandwidth of the BP filter can be selected through a "Q" factor dictating the ratio of high to low pass filters.
AUTO SPEED SHIFT FILTER	Auto speed shift control, used with the optional encoder, adjusts filters to the optimum frequency for the line speed. In rotary test applications, the filter is governed by the RPM and material diameter.
PHASE	0 - 359°, calibrated in 1° steps.
SENSITIVITY	0 - 99 dB, calibrated in 1dB steps.
THRESHOLD SELECTION	selections include All Phase, Sector, Chord, and Half Chord, all assignable with up to three levels. The sector threshold can be rotated to any phase angle. There are counters for active thresholds and each active gate. Only active thresholds display on the screen. The threshold selection feature allows complex gating for challenging test conditions.
ENHANCEMENT CIRCUITS	These circuits may be selected to improve the apparent linear signal-to-noise ratio of signals in any phase. Circuits include A+, V+H- and V++H-. The H- has an adjustable H- factor. V+H- and V++H- are primarily for rotary applications.
AUTO TRACKING BALANCE	All differential channels, are continually tracked to ensure proper balance of the test sensors. MultiMac automatically rebalances if the test system is out of balance, to assure reliable test function, even under adverse conditions. The System Ready Indicator will indicate if the power, coil condition and balance are not adequate.
CALIBRATION	Internally generated signal provides a system check for repeatability of all parameters.
LOCKOUT MODE	Prevents unauthorized changes to instrument settings.
END SUPPRESSION	Optional external switch end sensor and optional encoder to suppress end signals.
SOFTWARE CONTROL	Control of all functions is set through keyboard entry and/or mouse.

OUTPUTS	
EIGHT OUTPUTS	A choice of 3 thresholds per channel, based on All Phase, Sector, Chord or Half Chord, can be mapped to any of 8 outputs. Independently configurable for time or distance delay and normal, reject or latched mode.
CE UNITS	Four 24 VDC output modules are provided, each with a relay and an opto-isolated output. Outputs can be routed to accept any threshold. Combined current draw for all outputs cannot exceed 2 amps.
NON CE UNITS	Four DC and four 120 VAC outputs.

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SCREEN DISPLAY	
BUILT-IN DISPLAY MODEL	Includes built-in 17" TFT display. For cabinetry that does not include the built-in display, a back panel output connector is provided for optional external monitor.
EC SCREEN	All parameters for testing are set up through this screen for each channel, independently.
SIMULTANEOUS POLAR/LINEAR MULTI SCREEN	Provides all the thresholds and test information for up to 8 channels. In the polar display, the amplitude and phase are represented by the length and angle of the signal. The linear display is a strip chart, real-time scrolling portrayal of the vertical channel. Other screens include TRACK , CHART , BATCH , and SYSTEM .
SYSTEM STATUS	System Status section of display includes indicators for Coil, Threshold, System Ready and Balance conditions. Auto tracking provides continuous AC self-balance over the entire frequency range.
C SCAN SCREEN	For Rotary Probe applications only, combines all channels into one composite view that provides a two-dimensional top view of the test piece. The signal for a defect on the test piece surface is presented with respect to its circumferential and longitudinal position.

DATA STORAGE, REPORTING & NETWORKING	
SETTINGS STORE & RECALL	Unlimited settings can be named, annotated, stored and recalled from a library on the internal storage device, or network. When networked, multiple instruments can share the same library for assurance of correct settings in multiple test lines.
DATA STORAGE	Linear strip charts and complete test data are stored.
REPORTING CAPABILITIES & NETWORKING	Through Windows® OS, reports containing customer, product information, defect location, time, amplitude and phase, can be stored locally or on a network server for quick follow up and quality assurance. Test data report is managed in the BATCH screen.

TEST COILS & SENSORS	
COILS & COIL DRIVE	All Standard MAC coil types & sensors. Adjustable/Primary Bridge Drive up to 20 V pp.
COIL CONNECTORS	Standard 7 pin for coil and sector, and 11 pin for rotary probe applications.

STANDARD CABINET SPECIFICATIONS	
CABINET MODEL CAB-002 DIMENSIONS	25" W x 22" H x 26" D (65.5 cm x 55.87 cm x 86.4 cm) for cabinet. Air conditioner adds an additional 8" (20.3 cm) to depth.
WEIGHT	230.5 lbs (104.54 kg) for cabinet. Additional 48 lbs. (21.8 kg) for air conditioner.
POWER REQUIREMENT	120/240 VAC, 50/60 Hz, single phase, 5 amps (not including air conditioner).

CUSTOM CABINET INSTALLATIONS	
MULTI TEST INSTALLATIONS	For many multi test installations with additional test instruments and controls, MultiMac instrumentation is installed in rack mount, environmental cabinets, specified for the application.