MFD350

Ultrasonic Flaw Detector

Operating Manual

Mitech Inc. Ltd.

1 Introduction

The MFD350 is an advanced digital ultrasonic flaw detector featuring a multi-color TFT LCD and a host of new features to meet challenging inspection requirements. It combines powerful flaw detection and measurement capabilities, extensive data storage, and the ability to transfer detailed inspection data to the PC via its high-speed USB port.
The instrument incorporates many advanced signal processing features including a 10MHz RF bandwidth to permit testing of thin materials, narrowband filters to improve signal to noise in high gain applications and a spike pulser to optimize penetration on thick or highly attenuating materials.
The instrument can be widely used in locating and sizing hidden cracks, voids, disbands, and similar discontinuities in welds, forgings, billets, axles, shafts, tanks and pressure vessels, turbines, and structural components.

1.1 Features of the Instrument

The instrument extends the performance and range of applications that are capable of being satisfied by a portable instrument. The quality, portability, durability, and dependability that you have come to expect from the popular Mitech MFD Series of instruments remain.

Display

Hi-resolution (320 × 240 pixels) multi-color TFT LCD Display with nine user-selectable color display schemes and brightness control provides high contrast viewing of the waveform from bright, direct sunlight to complete darkness.
The hi-resolution color LCD display with fast 60 Hz update gives an “analog look” to the waveform providing detailed information that is critical in many applications including nuclear power plant inspections.

Range

Up to 6000 mm in steel. Suitable for use on large workpieces and in high-resolution measurements.

Pulser

Pulse Energy selectable among Low, Medium and High
Pulse Repetition Frequency adjustable from 10 Hz to 1 KHz in 1 Hz increments.
Damping selectable among 100 Ω、200 Ω and 400 Ω for optimum probe performance
Test Modes include Pulse echo, dual and thru-transmission

Receiver

Sampling：10 digit AD Converter at the sampling speed of 160 MHz
Rectification：Positive Halfwave, Negative Halfwave, Fullwave and RF
Analog Bandwidth: 0.5MHz to 10MHz capability with selectable frequency ranges (automatically set by the instrument) to match probe for optimum performance.
Gain：0 dB to 110 dB adjustable in selectable steps 0.1 dB, 2 dB, 6 dB, and locked.

Gates

Two fully independent gates offer a range of measurement options for signal height or distance using peak triggering.
The echo-to-echo mode allows accurate gate positioning for signals which are extremely close together.
Gate Start: Variable over entire displayed range
Gate Width: Variable from Gate Start to end of displayed range
Gate Height: Variable from 0 to 99% Full Screen Height
Alarms: Threshold positive/negative

Memory

Memory of 100 channel files to store calibration set-ups
Memory of 1000 wave files to store A-Scan patterns and instrument settings.
All the files can be stored, recalled and cleared.

Functions

- Semiautomatic two point calibration: Automated calibration of transducer zero offset and/or material velocity
- Flaw Locating：Live display Sound-path, Projection (surface distance), Depth, Amplitude,
- Flaw sizing: Automatic flaw sizing using AVG/AVG or DAC, speeds reporting of defect acceptance or rejection.
- Digital Readout and Trig. Function: Thickness/Depth can be displayed in digital readout when using a normal probe and Peam path, Surface Distance and Depth are directly displayed when angle probe is in use.
- Both the DAC and the AVG method of amplitude evaluation are available.
- Curved Surface Correction Feature
- Crack Height Measure function
- Magnify gate：spreading of the gate range over the entire screen width
- Video Recording and play
- Auto-gain function
- Envelope: Simultaneous display of live A-scan at 60 Hz update rate and envelope of A-scan display
- Peak Hold: Compare frozen peak waveforms to live A-Scans to easily interpret test results.
- A Scan Freeze：Display freeze holds waveform and soundpath data
- B Scan display feature

Real Time Clock

The instrument clock keeps running tracking the time.

Communication

High speed USB2.0 port.
The optional DataPro software helps manage and format stored inspection data for high-speed transfer to the PC. Data can be printed or easily copied and pasted into word processing files and spreadsheets for further reporting needs. New features include live screen capture mode and database tracking.

Battery

Internal rechargeable Li-ion battery pack rated 7.2V at 6600 mAh
8 hours nominal operating time depending on display brightness
8-10 hours typical recharge time

Knob

Operating adjustments are easily and quickly made using the rotary knob.

1.2 Specifications

- Range: 0 to 6000 mm, at steel velocity
- Material Velocity: 1000 to 9999m/s
- Display Delay: -20 to 3400 μs
- Probe Delay/Zero Offset : 0 to 99.99μs
- Sensitivity: 110 dB max in selectable resolution 0.1, 1.0, 2.0, 6.0 dB and locked.
- Test Modes: Pulse echo, dual element and thru-transmission
- Pulse Repetition Frequency ranges from 10 Hz to 1000 Hz
- Pulse Energy: Low, Medium and High
- Damping: 100, 200, 400 ohms
- Bandwidth (amplifier bandpass): 0.5 to 10 MHz
- Gate Monitors: Two independent gates controllable over entire sweep range
- Rectification: Positive halfwave, negative halfwave, fullwave, RF
- System Linearity: Horizontal: +/-0.2% FSW, Vertical: 0.25% FSH, Amplifier Accuracy +/-1 dB.
- Reject (suppression): 0 to 80% full screen height
- Units: Inch or millimeter
- Transducer Connections: BNC
- Power Requirements: AC Mains 100-240 VAC, 50-60 Hz
- Dimensions: 263H×170W×61D mm
- Operating Temperature: -10℃ to 50℃
- Storage Temperature: -30℃ to 50℃

1.3 Base Instrument Package

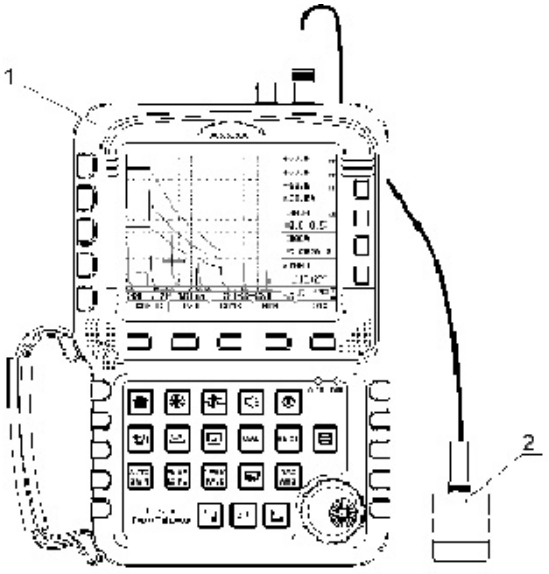
Portable Ultrasonic Flaw Detector with Hi-Resolution Color LCD Display
Straight Beam Transducer (2.5 MHz, Φ20)
Angle Beam Transducer (2.5 MHz, 13 mm×13 mm, 63.5°)
Interconnect Cable for the transducer (Q9-Q9)
Rechargeable Li-Ion Battery Package, 6.6 amp hour
Power supply/charger unit
Supporting pillar
Operating Manual in English

2 Understanding the Keypad, Menu System and Display

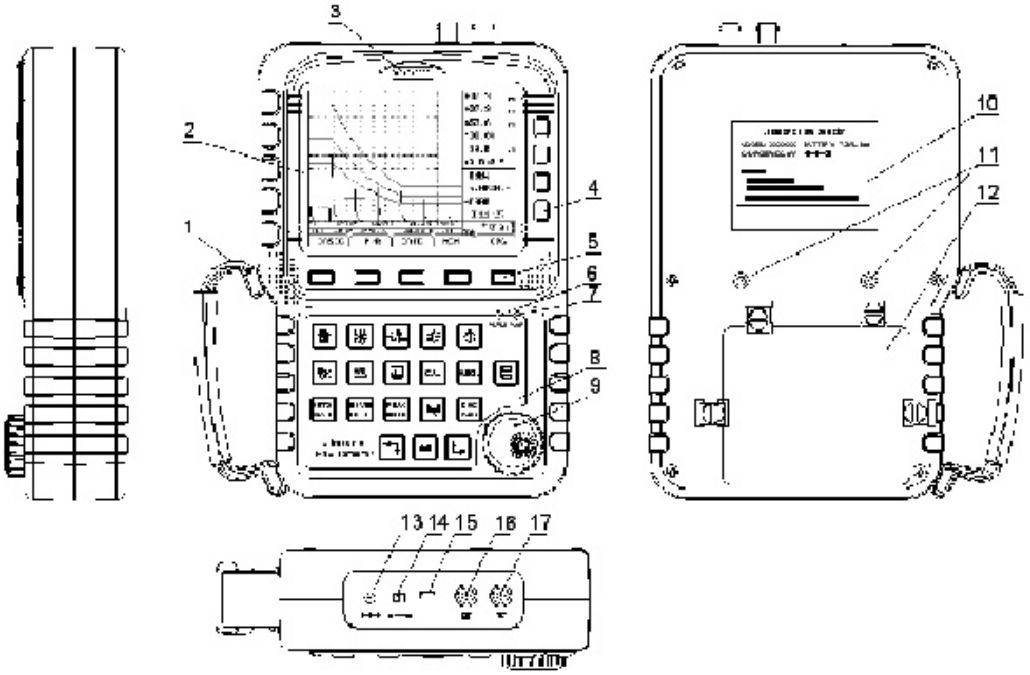
2.1 Structure Feature

The right figure gives an overview of the instrument system.

1、The Main Unit
2、Probe (Transducer)



The Main Unit



1, Belt 2, LCD Display 3, LOGO 4. Function Keys 5 Menu Keys
6, Alarm LED 7, Power LED 8, Keypad 9, Rotary Knob
10, Product Label 11, Support Pillar Screw 12, Battery Case
13, Power adapter port 14, Battery Switch 15, USB Socket
16, Probe Cable Port (Transmit) 17, Probe Cable Port(Receive)

Status	ALRM LED	PWR LED
Gate alarm	Red on	×
Battery charging	×	Flash red/green
Battery charged with external power connected	×	Green on
External power connected No battery installed	×	Green on
No external power	×	off

3 Initial Start-up

3.1 Power Supply

The instrument can be operated with an external power adapter or with batteries.
You can connect the instrument to the mains supply system even if it carries batteries. A discharged battery is charged in this case, viz. parallel to the instrument operation.

Operation Using the Power Supply Unit

Connect the instrument to the mains socket-outlet using the power supply unit. The plug receptacle is at the top left of the instrument. Push the plug of the power supply unit into the plug receptacle until it snaps into place with a clearly audible click. The PWR LED on the keypad of the instrument will light in green color if the connection is properly aligned

Operation Using Batteries

Use a lithium-ion battery pack provided with the instrument for the battery operation.
The battery compartment is situated at the instrument back. The lid is fastened with 4 attachment block. To insert the battery pack

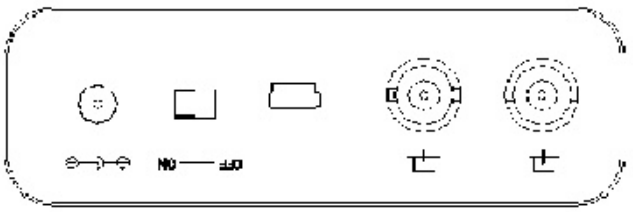
- Move the four attachment block of the battery compartment downward in order to loosen them.
- Lift the lid off upward. At the bottom of the battery compartment, you will see two springs.
- Insert the battery into the battery compartment. Make sure that the two contacts on the back of the battery pack are connected with the springs in the battery compartment.
- Close the battery compartment and fasten the attachment blocks.
- Check the battery switch on the top of the instrument. Make sure to switch it on before internal charging.

Note:

- The battery switch on the top of the instrument must be set to ON when operating with the battery pack or charging it.
- When not using the instrument, set the switch to OFF to save power.

3.2 Connecting a Probe

To prepare the instrument for operation, you have to connect a probe to it. The instrument is available with the probe connectors BNC.
When connecting a probe to the instrument, it's not only important that the probe's physical connection be properly made. It's also important that the instrument is properly configured to work with the installed probe. The Instrument will operate with one or two single-element probes or with a dual-element probe.
To install a single-element probe, connect the probe cable to either of the two ports on the front of the instrument. When two probes, or a dual-element probe is connected to the instrument, the "Receive" probe connector should be installed in the right port and the 'Transmit' probe connector in the left port.



Connect one single element probe to either port.
Connect leads from a Dual Element Probe to both ports.
For through-transmission, connect two single element probes to the transmit (left, labeled as ⊓) and receive (right, labeled as ⊓) ports.

3.3 Starting the Instrument

To start the instrument, press the switch-on key ⏻. If it operates on the internal battery pack, make sure to set the battery switch to ON position before starting.
The start display of the instrument appears; here you will also see the current software version and the serial number of the instrument. The instrument carries out a self-check and then switches over to stand-by mode.
The settings of all function values are the same as before switching-on of the instrument.
The instrument will shut off automatically when the battery capacity level is too low.