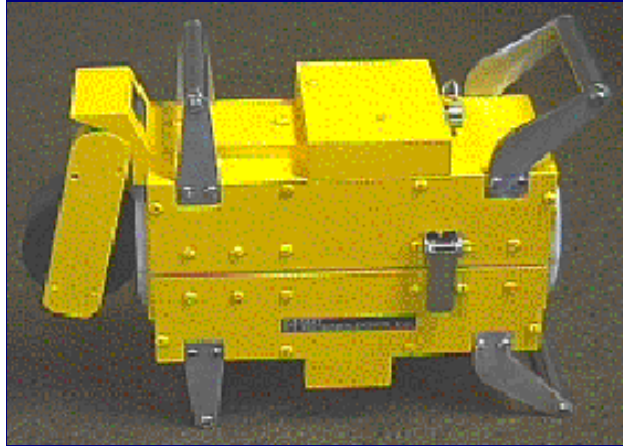


# LMA-300 WIRE ROPE INSPECTION SYSTEM

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## SPECIFICATION SHEETS

### LMA-300 Sense Head



### CC-03, Rev. A Signal Console



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# Features

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- For the Non-destructive inspection of wire ropes with diameters up to 3 in. (76 mm).
- Rope Guide sizes available: 1 in. (25 mm) through 3 in. (76 mm).
- Accurate Speed and Distance wheel assembly. Calibrated for Yards or Meters.
- Ruggedized construction with pit-worthy hardware, connectors and carrying case.

# Specifications

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The LMA-300 Wire Rope Inspection System consists of the following items:

## Sense Head Assembly comprising

- Magnet Assembly
- Sensor Assembly
- Distance Counter Wheel Assembly

## Signal Console CC-03 including

- Signal Conditioning Circuitry
- Integrated Chart Recorder
- Interface Circuitry and Connectors for both an external Chart Recorder and an external Data Acquisition System.

## Accessories

- Connecting Cable, 25 ft. (7.6 m) length-standard (any length up to 1000 ft. (305 m) available)
- Battery Charger (120/240 VAC, 50/60 Hz)
- Customized Carrying Cases
- Operation & Maintenance Manual
- Rope Guides (1 set supplied - any size) Other sizes available (optionally)
- External Chart Recorder (optional)
- Data Acquisition System (optional)

## Sensor Head

Dimensions (LxWxH) (without handles)..... 10" x 5 " x 7" (254 x 127 x 178 mm)  
Weight..... 35 Lbs.(16 kg)

## Signal Console - CC-03

Dimensions (LxWxH)..... 16" x 13" x 7" (405 x 330 x 178 mm)  
Weight..... CC-03, 20 lbs (9 kg).  
Power..... Internal rechargeable batteries and/or 120/240 VAC, 50/60 Hz. Battery operation: 6-8 hours continuous.

## Performance

Rope Sizes..... Up to 3 in. (76 mm).  
Rope Speed..... 0.5 to 600 feet per minute (0.003 to 3 m/sec)  
Test Signals..... LF and LMA signal, amplitudes independent of rope speed.  
Flaw Detection..... Loss of metallic cross-sectional area (LMA): external and internal corrosion, wear, various changes of wire rope structure. Localized flaws (LF): broken wires and corrosion pitting.

## Specifications (continued)

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Flaw Detectability.....	Flaw cross section: 0.1% of rope cross-sectional area. Quantitative flaw identification of loss of metallic cross-sectional area for flaws longer than 2" (50mm), qualitative identification for localized flaws.
Environmental Conditions .....	Dust proof, splash proof (oil and water), humidity to 95%. Sensor Head hermetically sealed with polyurethane coating. Connectors waterproof to 30 m. Operating temperature: 0°C to 55°C. Storage temperature: -40°C to 55°C.

### Readout and Recording

Rope Distance Counter.....	Digital panel readout. Counts and indicates every 1 meter (or 1 yard) of wire rope inspected.
Strip Chart Recorder .....	Integrated two channel thermal/digital recorder. Wire rope flaws indicated by characteristic chart patterns. Signal amplitudes independent of wire rope speed. Distance event marker indicates every 1 meter (or 1 yard), emphasizing every 10 meters (or 10 yards) of wire rope inspected. Localized Flaws are indicated by an additional event marker.
LED Indicator Light .....	Localized Flaws indicated by flashing LED indicator light.

The Signal Console, Battery Charger and other accessories are stored in a rugged, foam-filled Carrying Case, and the LMA-300 Sense Head is stored in a separate customized Carrying Case.

In operation, the Sense Head attaches to the wire rope to detect flaws as the wire rope moves at rates from 5 fpm (.03 m/sec) to high speeds of 600 fpm (3 m/sec). The fault signals are recorded by the integrated chart recorder and/or an external chart recorder. Different wire rope flaws are then identified from their characteristic chart patterns. In addition, localized wire rope flaws are indicated by the flashing of an LED indicator light.

A bi-directional wire rope Distance Counter indicates wire rope position, and a Speed Display shows the speed of the wire rope under test. Distance marker signals on the chart recording indicate every 1 meter, (or optionally 1 yard), with emphasis on every 10 meters, (or 10 yards) of the wire rope under test.

# Description

## APPLICATION

Wire rope testers of the LMA-Test™ series are used in the field to test for and measure loss of metallic cross-sectional area (LMA) caused by external and internal corrosion, as well as wear and deformations in steel wire ropes. In addition, a localized-flaw (LF) signal is available which can be used to pinpoint the location of a variety of flaws, such as broken wires and corrosion pitting. LMA-Test™ wire rope testers were developed as an accurate diagnostic tool for thorough wire rope inspections where safety, and hence the detection of anomalies, is of paramount importance.

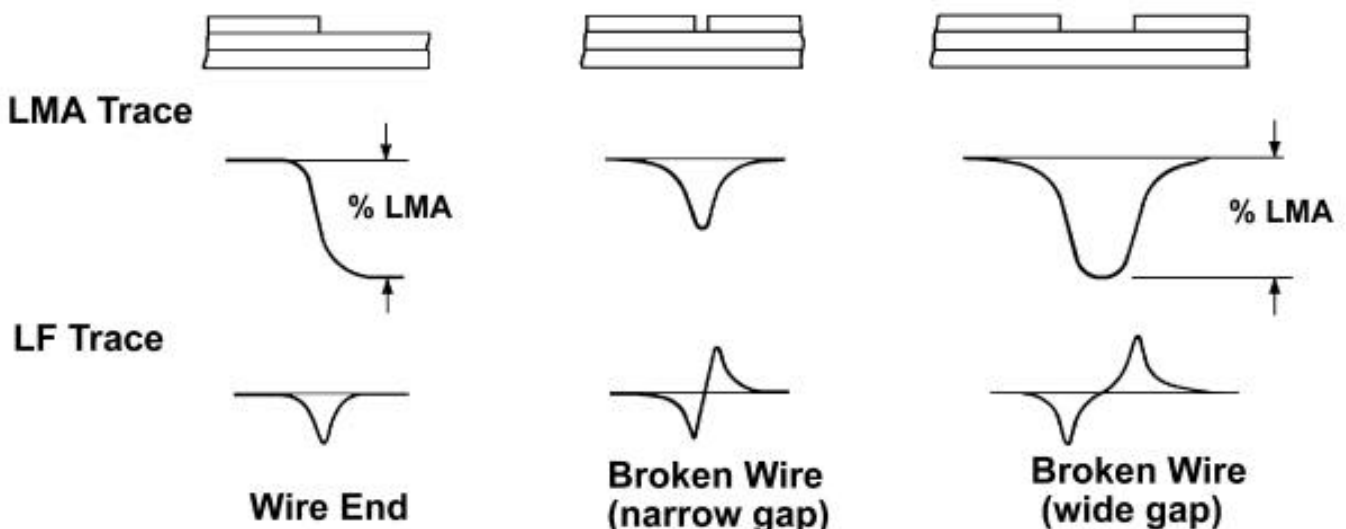
Because it can detect wire rope deterioration in its incipient stage, the LMA-Test™ wire rope testers is a powerful preventive maintenance tool. For example, the early detection of wear and corrosion allows immediate remedial action which can increase the service life of a wire rope.

## PRINCIPLES OF OPERATION

A section of the steel wire rope is magnetically saturated in the longitudinal direction by strong permanent magnets. Discontinuities in the wire rope such as broken wires, corrosion and wear distort the longitudinal magnetic flux, and flux leaks from the wire rope into the surrounding air space. Sensors close to the wire rope sense the leakage flux. The wire rope moves through the sense head which causes the leakage flux to intersect the sensors. The changing intersecting flux induces signals in the sensors. Electronic circuitry conditions and modifies the signals. A strip chart recorder and an indicator light display the signals visually.

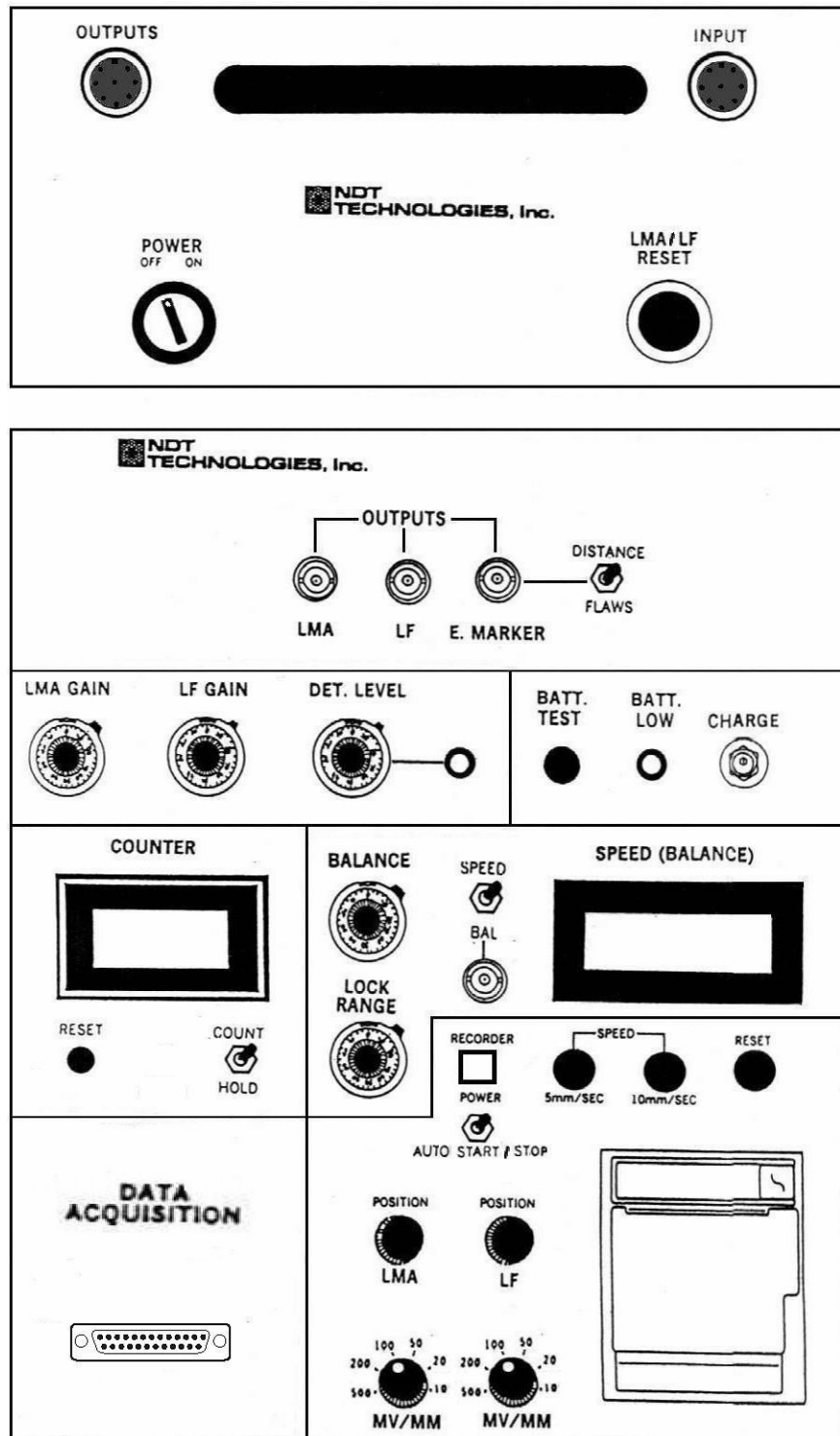
Two different types of signals are available:

- (i) The LOSS-OF-METALLIC-AREA (LMA) SIGNAL gives a quantitative measure of the loss of metallic cross-sectional area of the wire rope caused by corrosion pitting, broken wires, and other anomalies.
- (ii) The LOCALIZED-FLAW (LF) SIGNAL can pinpoint the location of a wide variety of flaws, such as broken wires and corrosion pitting. After flaws have been located by using the LF signal, their actual nature can be ascertained by analyzing the corresponding section of the LMA signal and/or by performing a visual wire rope inspection.



# Operation

## SCHEMATIC OF CONTROL PANELS (CC-03, Rev. A SIGNAL CONSOLE)



# Operation (continued)

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## FUNCTION OF CONTROLS AND CONNECTORS

Controls and Connectors are located on two control panels: The Front Panel and the Top Panel. A schematic of both control panels is shown on the previous page. The functions of the controls and connectors are as follows:

### Power Controls

1. **POWER ON-OFF SWITCH** - The ON-OFF Switch turns on battery power.
2. **BATTERY INDICATOR** - Turn-on of the red LED indicator light indicates discharged batteries. No light indicates adequate battery voltage for operation of the instrument.
3. **BATTERY TEST** - Push Button to check battery condition. If batteries are charged, LED will light up upon pushing of Battery Test Button.
4. **BATTERY CHARGE RECEPTACLE** - This receptacle allows charging of the rechargeable batteries from the separate Battery Charger.

### Test Signal Connectors

5. **INPUT CONNECTORS** - These connectors, on the Sense Head and the Top Panel of the Signal Console, allow signal transmission between Sense Head and Signal Console.
6. **OUTPUT JACK (Top Panel)** - The combined LMA, LF and Event Marker Signals are available at this jack. This jack can be used to connect an external strip chart recorder to the Signal Console allowing discrete and/or simultaneous recordings to be made.
7. **LMA OUTPUT JACK (Front Panel)** - The LMA signal is available at this alternate jack for recording by a strip chart recorder or the Data Acquisition System.
8. **LF OUTPUT JACK (Front Panel)** - The LF signal is available at this alternate jack for recording by a strip chart recorder or the Data Acquisition System.
9. **EVENT MARKER OUTPUT JACK (Front Panel)** - This alternate jack provides a signal for operating the event marker of an external strip chart recorder at the rate of one pulse per 1 meter (or 1 yard) of wire rope traveled, with an emphasized pulse every 10 meters (or 10 yards) of wire rope traveled. Alternatively, controlled by the EVENT MARKER DISTANCE/FLAWS SWITCH, this signal can be used to mark flaws or distance on the external chart recordings.
10. **EVENT MARKER DISTANCE/FLAWS SWITCH (Front Panel)** - This switch selects either the distance or flaw indicator mode of the event marker signal sent to an external chart recorder.

### Test Signal Controls

11. **LMA GAIN POTENTIOMETER (Front Panel)** - This potentiometer sets the gain of the LMA signal and allows calibration of the LMA signal.
12. **LMA / LF RESET BUTTON (Top Panel)** - The LMA and LF signals are reset to their reference (zero) level by pushing this button.
13. **LF GAIN POTENTIOMETER (Front Panel)** - This potentiometer sets the gain of the LF signal and allows calibration of the LF signal.
14. **DETECTION LEVEL POTENTIOMETER (Front Panel)** - This potentiometer controls the LF signal level at which fault signals are indicated by the LED Indicator Light, and marked by the flaw event marker of the strip chart recorder.
15. **VISUAL LF INDICATOR (Front Panel)** - Localized flaws are indicated by blinking of the LED Indicator Light.

# Operation (continued)

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## Counter Controls

16. **DIGITAL DISPLAY** (Front Panel) - Indicates wire rope distance traveled in meters (or yards).
17. **COUNT-HOLD SWITCH** (Front Panel) - Controls operation of Digital Readout.
18. **RESET BUTTON** (Front Panel) - Resets the wire rope distance count to zero.

## Speed and LMA Balance Controls

19. **SPEED (BALANCE) DISPLAY** (Front Panel) - Displays wire rope Speed in meters per second (or feet per minute). Alternatively, this display can be used as an indicator for balancing the LMA amplifier circuit.
20. **SPEED-BALANCE SWITCH** (Front Panel) - Selects speed or balance mode for the display.
21. **BALANCE POTENTIOMETER** (Front Panel) - Balances the LMA signal amplifier.
22. **LOCK-RANGE POTENTIOMETER** (Front Panel) - Sets the lock range of the LMA signal amplifier.
23. **BALANCE JACK** (Front Panel) - The balance sensor signal is available at this BNC jack.

**Note:** Occasional LMA balancing is required at very long intervals.

## Controls for Integrated Chart Recorder

24. **CHART RECORDER PUSH BUTTON POWER SWITCH** (Front Panel) - Switches power (ON/OFF) for integrated chart recorder.
25. **CHART SPEED CONTROL PUSH BUTTONS** (Front Panel) - Start chart recorder at indicated chart speed (5 or 10mm/sec).
26. **RESET PUSH BUTTON** (Front Panel) - Stops chart recorder.
27. **LMA AND LF POSITION CONTROLS** (Front Panel) - Set position of LMA and LF traces on the chart.
28. **LMA AND LF GAIN SWITCHES** (Front Panel) - Set gains of LMA and LF signals on the chart.
29. **AUTO START/STOP SWITCH** (Front Panel) - When left in the ON position, the chart recorder will begin to operate automatically, at 5mm/sec, when the distance counter wheel begins to turn (as the wire rope is passed through the Sense Head). When the wheel (wire rope) stops, the chart recorder will stop after 3 seconds. When left in the OFF position, operation of the chart recorder is manual.

**Note:** The integrated Chart Recorder displays the distance counter signal on the upper margin, and, simultaneously, the flaw indicator signal on the lower margin.

## Data Acquisition System Interface

30. **DATA ACQUISITION SYSTEM JACK** (Front Panel) - Connects all data acquisition system signals from the signal console via a 37 pin D- type connector.