

Introduction

Welcome to the Larson Davis LxT. This versatile instrument, with graphic display, performs the functions of several instruments. It puts the combined features of a precision sound level meter and a real-time frequency analyzer in the palm of your hand.

About This Manual

This manual has 12 chapters and 5 appendices covering the following topics:

Chapters

- *Chapter 1 - Introduction:* Orients the user to the contents of this user manual and the System 824's features, functions and measurement capabilities. It also includes instructions on unpacking the System 824.
- *Chapter 2 - Overview:* Provides an overview of the instrument's capabilities and a description of each key along with its function and displays. It also includes instructions on working with menus.
- *Chapter 3 - Front Panel Keys; their Functions and Associated Menus:* Explains the functions associated with each key on the 824.
- *Chapter 4 - Quick Start:* Guides users in the immediate use of the System 824 including how to take measurements, understanding the readings, and storing data in the System 824.

- **Chapter 5 - System 824 Instrument Modes:** Provides descriptions of the System 824's standard instrument ID's.
- **Chapter 6 - System 824 Views:** Gives you a detailed description of the different display views available and how to access them.
- **Chapter 7- Using ID Setting Files:** Describes how to recall, customize and save IDs.
- **Chapter 8 - Printing a Report:** Describes how to print a report of the data collected with the System 824.
- **Chapter 9 - Performing a Sound Level Measurement:** Walks the user through the steps necessary to obtain a sound level measurement whose accuracy will be optimal for the measurement conditions.
- **Chapter 10 - Using the 824 Utility Software:** Describes how to connect the 824 to a computer, in order to download, translate and export data.
- **Chapter 11 - RTA (Optional):** Explains how the RTA high speed data gathering option enables you to perform architectural acoustics, impulse event analysis, and passby event analysis.
- **Chapter 12 - FFT (Optional):** Describes the features and functions of the fast fourier analysis option.
- **Chapter 13 - AUD (Optional):** Explains how the AUD option can be used to manually test an audiometer by measuring level, frequency, linearity, THD, pulse, crosstalk, frequency modulation, narrow band, broad band, and speech noise.

Appendices

- **Appendix A - Integrated Level Calculations:** Provides information on TWA Leq, SEL, dose and projected dose calculations.

- **Appendix B - Serial Port Remote Control Interface:** Explains how to use the Serial Port Interface for Remote Control of the System 824.
- **Appendix C - Technical Specifications:** Gives a listing of acoustic, electronic, environmental, and physical characteristics of the System 824
- **Appendix D - Glossary:** Contains Technical Definitions of key acoustical and vibration terms.
- **Appendix E - Memory Usage:** Provides details on the allocation of memory when data are stored. This information is particularly important for applications such as noise monitoring where measurements are performed and stored automatically over a period of days or weeks.
- **Appendix F - SLM Testing to IEC61672-1:** Presents information for testing the sound level meter function of the System 824 according to IEC61672-1.
- **Appendix G - Miscellaneous Information:** Contains additional information about the 824 in the form of questions and answers

Special Features of the Electronic Version

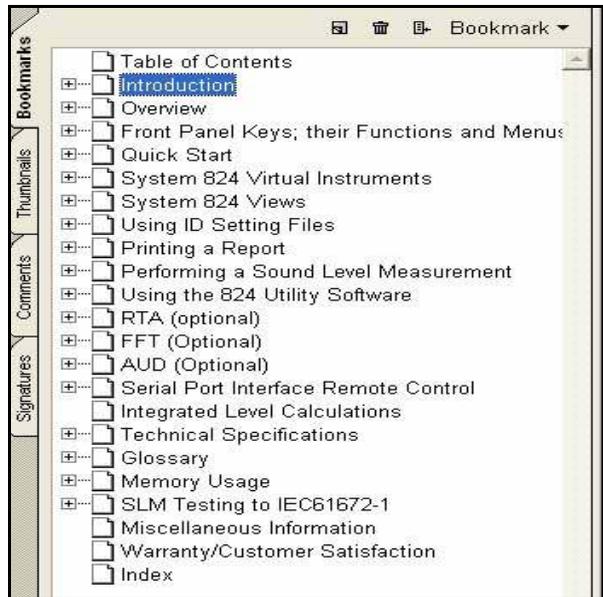
There are a variety of special techniques for navigating through pdf documents which can greatly simplify finding specific items in this manual. Two of these, bookmarks and links, are discussed below.

Bookmarks

Opening Bookmarks

Bookmarks are clickable navigation tools in pdf files. To open bookmark, left click the upper Tab on the left of the

screen labeled **Bookmarks**. These will appear as shown below.



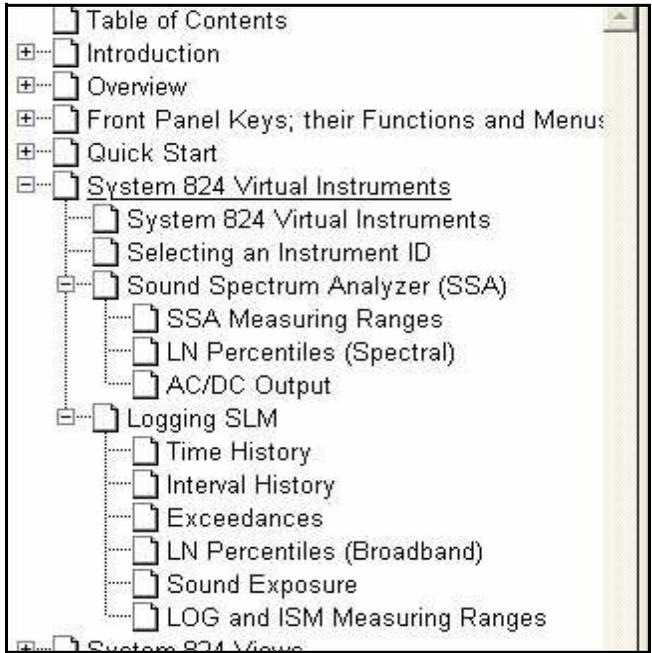
In the unexpanded view, bookmarks lists the names and page numbers of chapters and appendixes in order of appearance, as well as the Table of Contents and the Index.

Closing Bookmarks

To close bookmarks, simply left click the tab once more.

Expanding Bookmarks

For any entry, if there is a + within the rectangle to the left, there are sub entries which can be displayed upon expanding the tree by clicking the rectangle. For example, clicking the + to the left of any chapter will expand it into major headings and, by clicking all the + symbols, the complete tree for that chapter will be shown. In the following figure we can see the entry System 824 Virtual Instruments completely expanded.



Click to Display Page

Left click on any text field (Chapter name, Appendix name, Table of Contents, Index, or any sub heading) and the page displayed on the right will jump to the page associated with that text field.

Return to Previous View

To return to the page which was displayed previous to clicking on a bookmark text line, right click on the display page, then left click on "Go to Previous View".

Links

Click to Display Page

The Table of Contents and the Index have a page number associated with each item. For the Table of Contents, left click on the text line and that page will be displayed. For the Index, left click on the page number itself to display the page associated with that entry. To return to the previous display, follow the procedure described in "Return to

About This Chapter

This introductory chapter covers the following topics:

- *Formatting Conventions*: Provides an explanation of the fonts and other formatting conventions used in this manual.
- *Features*: Gives an overview of the System 824 keypad, functions and measurement capabilities.
- *Getting Started*: Provides instructions for unpacking, inspecting and initially assembling the System 824.

Formatting

This manual uses the following format conventions:

In step-by-step directions, the *process* (what you do) is shown in the right column, and the *rationale* (why you do it) with other cautions and comments are shown in the left column.

Keys to press on the LxT are shown with the icon representing the appropriate key. For example:

Press the  key

Items that appear in various on-screen menus (such as settings) are shown in bold and italicized style. For example:

Detector ***[Slow]***

Features

Hardware Features:

The Larson Davis System 824 has the following features:

- Large backlit bitmapped graphic display
- Soft rubber backlit keys
- Pop-up menus with scroll bars
- Pick and choose setup...just click and run!
- File management system (stores multiple measurements)
- Multiple Instruments

SSA: Sound Spectrum Analyzer combining a sound level meter and real-time spectrum analyzer (optional)

LOG: Logging SLM (optional)

ISM: Integrating SLM (standard)

RTA: Adds high speed spectral data gathering (optional)

FFT: Adds Fast Fourier Analysis to the 824 (optional)

AUD: Gives the 824 the ability to certify audiometers; used in conjunction with the AUDit software (optional)

TAL: Measures tonality according to DIN 45681 and appraisal of low frequencies according to DIN 45680 (optional)

- Type 1 precision integrating sound level meter: satisfies IEC61672-1 (tested with 377B41 microphone only), IEC 60651-1993, IEC 60804-1993, and ANSI S1.4 1985)

- Simultaneous measurement of sound pressure level using Fast, Slow, Impulse, Peak, and Leq detectors with A, C, and Flat weighting (SSA, ISM, LOG, and TAL instruments)
- Exceptionally large dynamic range (> 93 dB for SSA and > 115 dB for ISM and LOG)
- Digital filters with real-time rate to 20 kHz satisfying IEC 1260-1995 Class 1 and ANSI S1.11-1986 Type 1-D meeting linearity specifications over a range of 85dB:
 - 1/1 octave, 16 Hz to 16 kHz (11 filters)
 - 1/3 octave, 12.5 Hz to 20 kHz (33 filters)
- Automatic logging of sound level parameters including Interval data, L_n statistics, noise event detection using exceedance history and exceedance time history (LOG only)

The windspeed (tacho) and wind direction (throttle position) feature requires the firmware option 824-WND, not included with standard System 824 configurations.

- Measurement of windspeed (tacho) and wind direction (throttle position) using external weather transducers with inclusion of data in Views and Data Displays for SSA and LOG instruments.
- Real-time 1/3 octave spectrum analysis with rapid spectrum vs. time autostorage and triggering for sound decay measurement (RTA)
- Simultaneous operation of sound level meter with independent frequency and 1/3 octave analyzer function weighting (SSA)
- Advanced time history feature allows you to store up to 38 different parameters including spectral data with each time history sample
- Narrow band real-time frequency analysis with 400-line FFT and Hanning, Flat-Top or Rectangular window (FFT Mode)
- Standard memory (2 MB) sufficient to store one of the following:
 - 30,000 point 1/3 octave SSA Leq time history
 - 20,000 intervals with 1/3 octave Leq spectrum

- 12,300 SSA intervals with Leq & Max 1/3 octave spectra
- 60,000 LOG intervals without Ln
- 35,000 LOG intervals with Ln
- 1,000,000 point time history
- 70,000 RTA 1/1 octave spectra
- 28,000 RTA 1/3 octave spectra
- 2400 FFT 400 line snapshots
- AC/DC output, unweighted, with gain to 50 dB and attenuation to -20 dB
- Flash memory for in-field firmware upgrades
- Multi-tasking processor: provides simultaneous measuring, viewing, transferring and printing of data
- RS-422 (RS-232 compatible) interface:
Serial bit rate to 115 kbps
- Direct report printouts
- Windows™-based software included for setup, control, and high speed data downloading and translation to ASCII format

System 824 Components



Figure 1-1 *The System 824 is a convenient hand-held sound level meter with a simple user interface.*

The standard System 824 shown in Figure 1-1 includes the following:

- 1/2" diameter condenser microphone
- Backlit graphic 64 x 128 pixel LCD display
- 14-key soft rubber backlit keypad
- AC/DC output, control, serial, and external power connectors (shown in figure Figure 1-2)
- True "hand held" instrument with "sure grip" pads

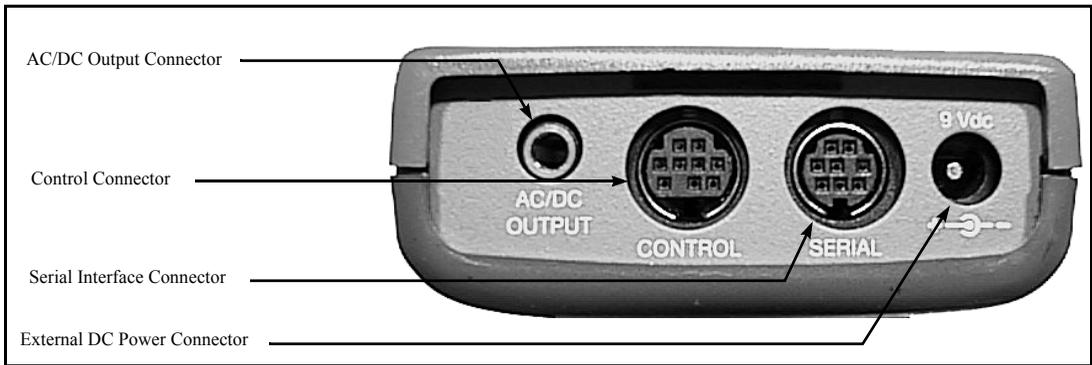


Figure 1-2 *The System 824 has a series of connectors located at the bottom of the device consisting of an AC and DC output connector, control connector, serial interface connector, and external DC power connector.*

The following is a layout of the control connector, which is used to control external devices and receive external wind and control information:

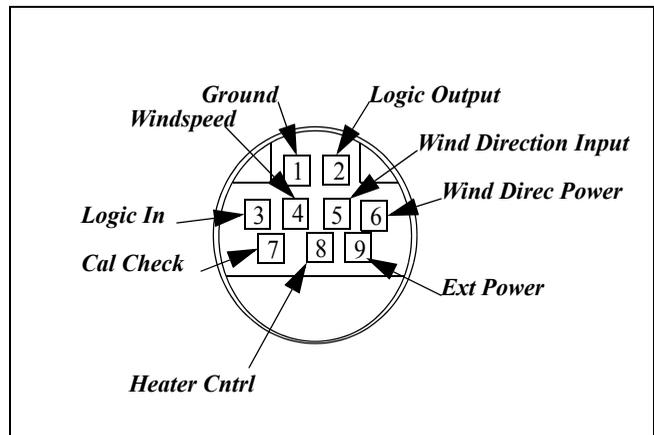


Figure 1-3 *9 pin mini DIN control connector; solder view*

- 1 - Ground
- 2 - Logic output (0 to + 5 volts, active high, through 1 k Ω)
- 3 - Logic input (0 to + 5 volts, active high, 100 k Ω load)
- 4 - Wind speed input (.05 to 10 Vdc peak to peak, 10 k Ω load)
- 5 - Wind direction A:D input (0 to 2.5 Vdc, 100 k Ω load))
- 6 - Wind direction power (+5 Vdc through 250 Ω)

- 7 - Calibration control output (0 to +5 volts, active high, 10 k Ω)
- 8 - Heater control output (open drain, +40 Vdc Max, 100 mA Max)
- 9 - External power input/output (+8 to +15 Vdc)

The serial connector is used for computer, printer and modem communications:

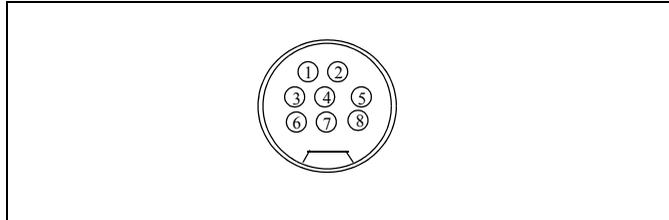


Figure 1-4 *The serial connector is an 8 pin mini DIN connector (AppleTalk™ compatible pinout).*

- 1 - Flow control output (RS-232C levels)
- 2 - Flow control input (RS-232C levels)
- 3 - Transmit data negative output (RS-232C levels)
- 4 - Ground
- 5 - Receive data negative input (RS-422)
- 6 - Transmit data positive output (RS-422)
- 7 - Control input (RS-232C levels)
- 8 - Receive data positive input (RS-422)

Both outputs have a 600 ohm series resistance.

The AC/DC output connector is used to output the signal from the System 824 microphone to external devices such as DAT recorders, real-time analyzers, other sound/vibration measurement equipment, voltmeters, chart recorders, etc.

NOTE: See the section "AC/DC Output" on page 6-5 for more details concerning the AC/DC outputs.

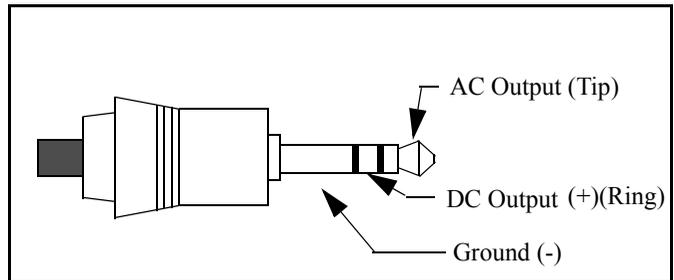
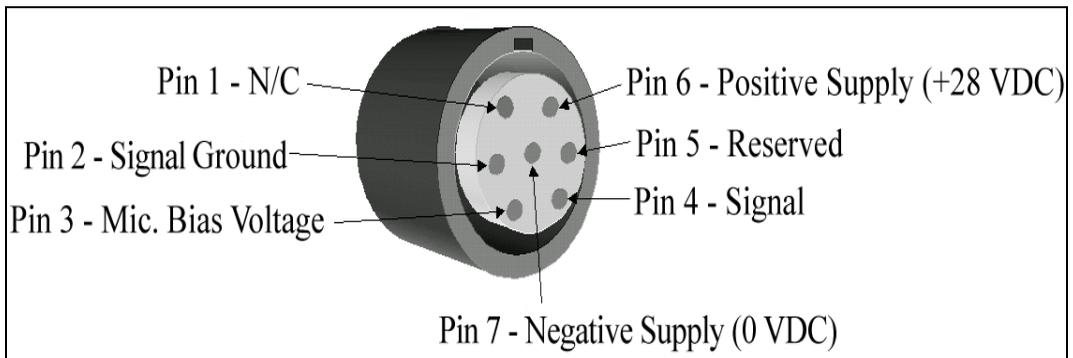


Figure 1-5 *AC/DC output connector*

Preamplifier Input Connector



The preamplifier input connector accepts the PRM902 preamp.

System Diagram

Figure 1-6, illustrates the acoustic-to-digital signal path in the System 824. As you can see, incoming sound is first converted to an electrical signal by the microphone. This electrical signal is amplified, filtered and then sampled by an analog-to-digital converter (ADC). The processor then

calculates all of the desired data based on the sampled data (sample rate of 48-51.2 kHz).

Getting Started

This section outlines the steps to unpack the System 824. The following topics are covered:

- Unpacking and Inspection
- Accessories and Optional Equipment
- Connecting Internal or External Power
- Environmental Considerations

You will then be ready to use the System 824 for actual measurements.

Unpacking and Inspection

Your System 824 has been shipped in protective packaging. Please verify the package contains the items listed below. Retain the packaging for safe shipment for calibration service. Report any damage or shortage immediately to Larson Davis, Inc. at (801) 375-0177.

If you have not already done so, please record the purchase date, the model and serial numbers for your instrument, pre-amplifier and microphone in the spaces provided on the copyright page near the beginning of this manual. You will find the instrument's Model/Serial numbers printed on the label on the instrument's back panel. The microphone's Model/Serial numbers are located on the inside ring of the microphone. The pre-amplifier's Model/Serial numbers are engraved the outside surface. You may be asked to provide this information during any future communications with Larson Davis, Inc.

824 System diagram

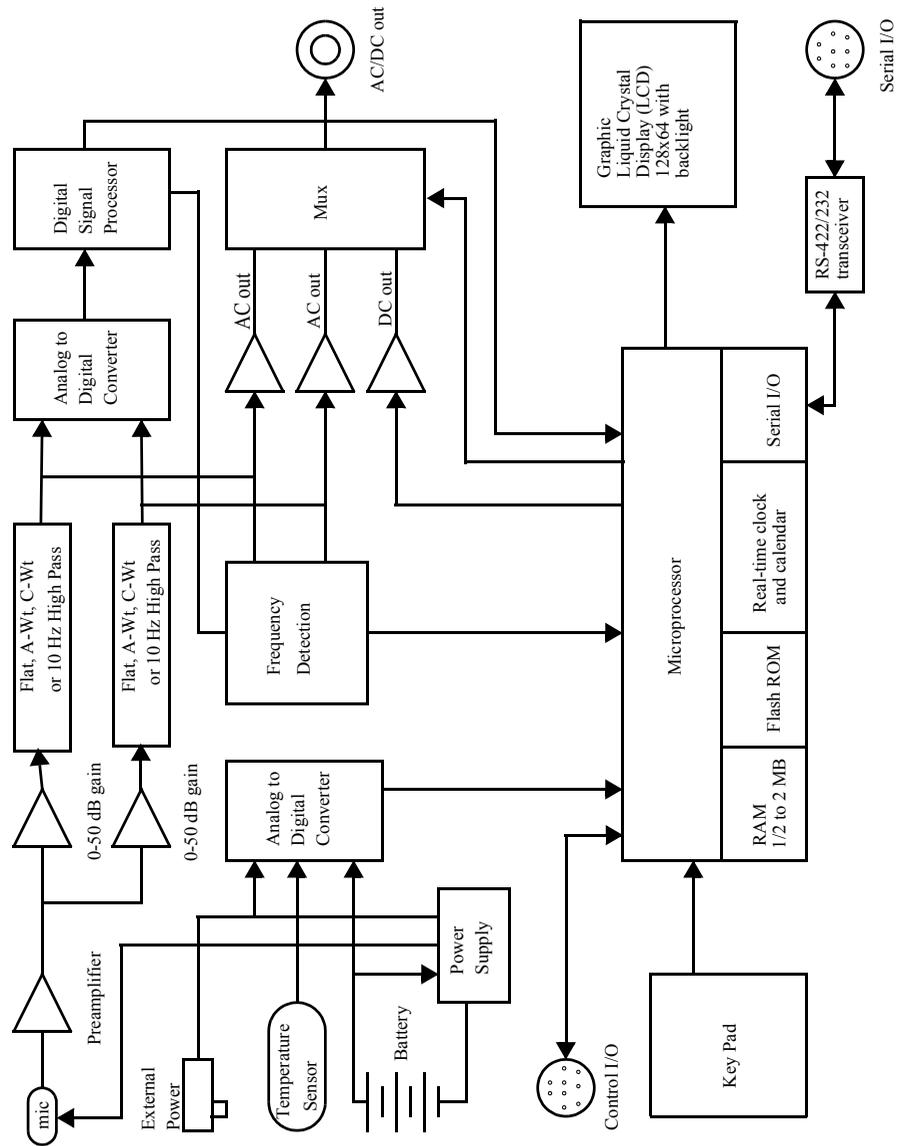


Figure 1-6 System Diagram

Comments concerning the Digital Signal Processor

Although the System 824 does have analog Flat, A-weight, C-weight and 10 Hz high pass filters ahead of the Analog to Digital Converter, most of the measurements use digital weighting filters created by the Digital Signal Processor. The Digital Signal Processor implements the following in order to provide measured data for a wide range of weightings, filters and detectors.

- A, C and Flat broadband filters
- Real-time FFT and 1/1 and 1/3 octave band filters
- Slow, Fast and Leq true RMS detectors
- Impulse and Peak detectors

If the System 824 is not being used for long periods of time (1 month or more), it is recommended that the batteries be removed to avoid damage to the instrument.

Accessories and Optional Equipment

The System 824, 824S, 824L and 824A can be purchased with or without a microphone; they all include the Model PRM902 microphone preamplifier.

The System 824, 824L and 824A are delivered with the following *standard* accessories (824-ACC Pack):

- Battery pack, NiMH, 3.6 V, 1.2 AH (BAT010)
- Reference Manual (I824.01)
- Serial cable, DB9S to DIN08 (CBL006)
- AC/DC output cable, 1/8" mini phone plug to dual phono or BNC (CBL042)
- Universal AC power adapter. (90 to 264 Vac, 50 to 60 Hz, 12 volt output) (PSA027)
- Alkaline battery terminal assembly (AM814.06) *Connects individual alkaline batteries when NiMH battery pack is not used.*

NOTE: Two Terminal assemblies are provided though only one is used. The second one is a spare. To avoid losing them, keep them in the accessory kit in the carrying case provided.

- Hard case 15"x19"x7" (CCS001) with foam insert (0860.0077)
- Windows™ utility software (SWW_824_UTIL)
- 10 foot microphone extension cable (EXA010)
- 3 1/2" diameter windscreen (WS001)

The 824S is delivered with the following *standard* accessories (824S Pack):

- 3 x 1.5 V "AA" alkaline batteries
- Alkaline battery terminal assembly (AM814.06) *Connects individual alkaline batteries when NiMH battery pack is not used.*
- 3 1/2" diameter windscreen (WS001)

The following *optional* equipment is also available:

- CAL200 Sound Level Calibrator, 1000 Hz @ 94 or 114 dB (IEC 942-1988 Class 1)
- CAL250 Sound Level Calibrator, 250 Hz @ 114 dB (IEC 942-1988 Class 1)
- Microphone extension cables are available in 1.5, 6, 10, 20, 25, 35, 50, 66, 100, and 200 foot lengths or custom lengths up to 328 feet.
- Direct BNC microphone input adapter (ADP005)
- External Battery Charger (PSA024) (Used to quick charge the BAT010)
- Accelerometer preamplifier for ICP accelerometers (PRA951-4 provides 4 mA DC current)

Connecting Internal or External Power

The 824 is shipped with a NiMH battery pack installed.

The System 824 can be powered using a 3.6 V NiMH battery pack, individual alkaline or NiMH cells, or an AC power supply adapter. For specifications on operating time under battery power, see “Battery Operating Time (full capacity, continuous operation, reference environmental conditions, individual cells may vary in performance)” on page -C-6. Below we will discuss how to install and use each.

Using the NiMH Battery Pack

For additional battery information, refer to the section  Power key on page 3-3. For detailed information on charging NiMH batteries, refer to the section "Power Settings" on page 3-6

If power is supplied with the AC Power adapter, the NiMH or alkaline batteries do not require removal and will power the unit if the AC power adapter fails. Without AC power or batteries installed, memory loss will occur.

To use a NiMH battery pack (BAT010) with the System 824, unscrew the battery cover at the back of the System 824 by hand or using a flat blade screwdriver. If individual cell batteries were previously used, remove the Terminal Assembly (Figure 1-8). Insert the battery pack so that the positive terminal is oriented down and to the right, as shown in Figure 1-7.



Figure 1-7 Battery compartment and cover with NiMH battery pack installed. (Note location of positive terminal.)

Using Alkaline Batteries or Individual NiMH rechargeable cells.

Use Duracell MN 1500 (1.5 volt, 2,850 mAH) alkaline battery or equivalent. You may also use the Duracell Ultra™ or Energizer Titanium™ next generation batteries which may provide up to 40% more run time.

Note: It is important to set the battery type to NiMH if individual NiMH cells are being used to power the instrument; otherwise there will not be sufficient battery reserve to preserve the memory once the batteries are drained. Also, the proper setting is important in terms of the ability of the instrument to accurately estimate the remaining battery life

Note: The System 824's "smart" charging system is designed to detect alkaline batteries and prevents accidental charging.

To use alkaline batteries or individual NiMH cells, remove the battery cover, and if installed, remove depleted batteries (or NiMH battery pack). If not already installed, insert a battery Terminal Assembly (AM814.06) so that it is positioned as shown in Figure 1-8. Insert three AA batteries so that polarities match those indicated in the battery compartment and secure the battery cover.

Indicate the battery type being used as follows;

- Step 1** Press the  key.
- Step 2** Press the  key
- Step 3** Use the  key to highlight "Type"
- Step 4** Press  key to activate the "Battery Type" menu.
- Step 5** Press  or  keys to select the appropriate battery type; alkaline or NiMH.
- Step 6** Press the  key to enter the selection, followed by the  key to close the Power menu.

If the rechargeable LD BAT010 battery pack is used, the setting is overridden and assumed to be NiMH. The 824 will automatically detect the presence of the pack, so the setting can be left to what would most likely be used if individual cells were to be used instead of the battery pack.

If alkaline cells are installed but erroneously declared as NiMH, the charger will start for several seconds, then will detect that they are not NiMH. Charging will be terminated and the battery type changed to alkaline. This safety measure will prevent primary cells from being charged and damaging the instrument due to leakage or explosion. Nevertheless, it is inadvisable to ever attempt to charge primary or non-rechargeable batteries.

Rechargeable individual NiMH cells can also be charged in an external rapid charger.

