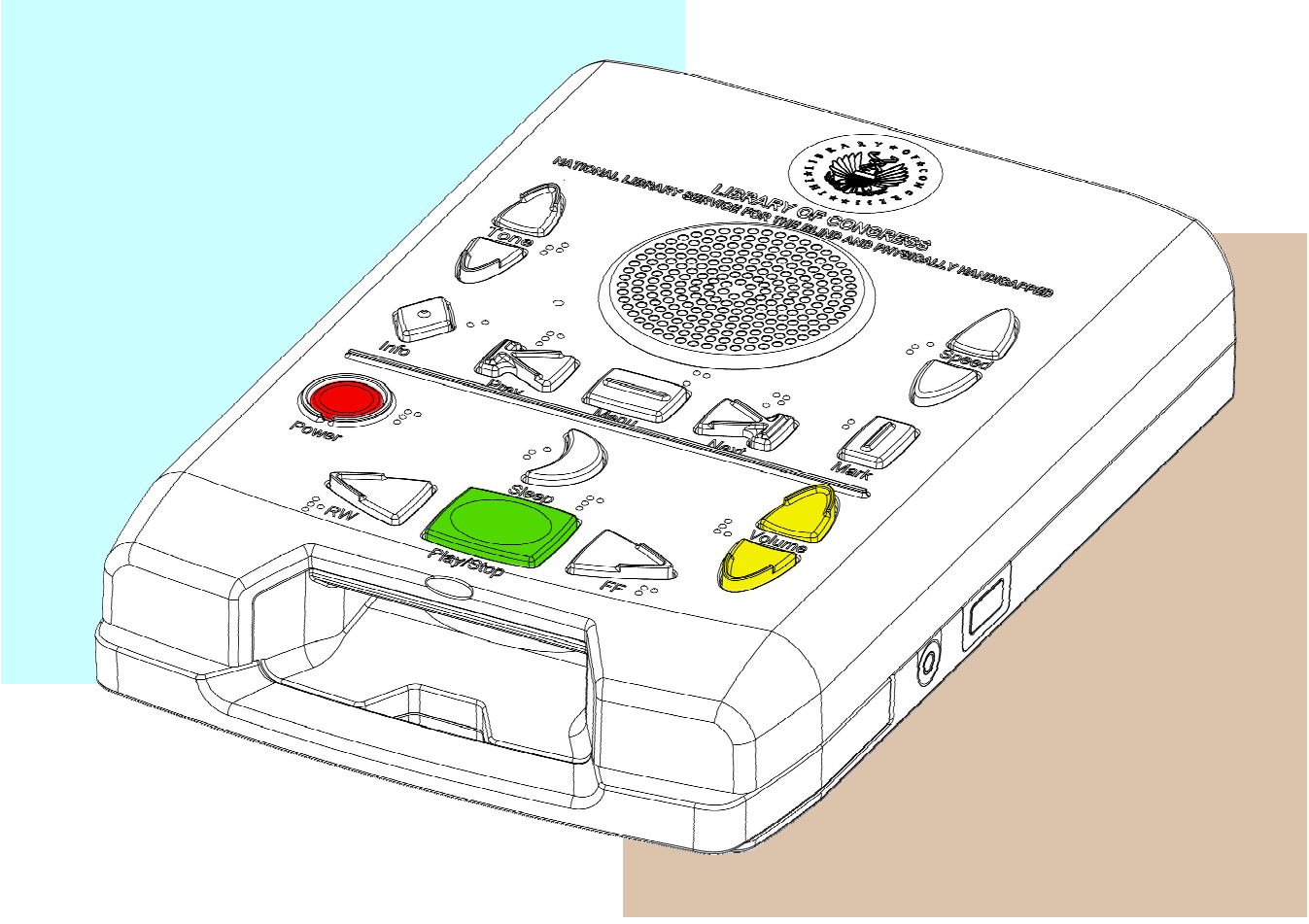
National Library Service
for the Blind and
Physically Handicapped

The Library of Congress

Digital Talking-Book Player
Models DS1 and DA1

Service Manual

Technician Edition



Version 0.993, March 2009

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This document is dedicated to the thousands of volunteer repairers whose skill and commitment have maintained talking-book players for more than forty years.

The design of this digital talking-book player incorporates many of their ideas to improve reliability, speed diagnosis, and streamline repair.

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1 Cautions and Warnings

1.1 Electrical Shock Hazard

WARNING: Hazardous live conductors are exposed if the player is opened for servicing while the unit is connected to utility power through the mains power cord and plug. If the player is not plugged into utility power during servicing, no hazardous live voltages are present; but Safety Extra Low Voltages (SELV) will be present on many conductors inside of the player.

1.2 Electrostatic Discharge Prevention

CAUTION: The circuit board inside the player can be damaged by electrostatic discharge (ESD) when the housing is opened for service.

ESD protective handling must be practiced when the player housing is opened. At a minimum, **technicians must wear grounded wrist straps** and the **work surface must be covered with a grounded mat.**

Guidance for implementation and operation for service facilities is **ANSI/ESD S20.20-19999,** *ESD Association Standard for the Development of an Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies, and Equipment (excluding Electrically Initiated Explosive Devices).*

2 General Information

2.1 General Description

The digital-talking book player is used to play audiobooks stored on USB flash-drive cartridges. These players are supplied to eligible patrons through a network of co-operating libraries under the program administered by the National Library Service for the Blind and Physically Handicapped, Library of Congress in executing United States Public Law 89-522.

The player is able to play digital-talking books (DTBs) structured in ANSI/NISO Z39.86-2002, DAISY 2.02, or CEA-2003 formats. The player can play audio files stored as AMR-WB+, MPEG I/Layer 3 (MP3) and RIFF WAV format, either as part of a talking book or as stand-alone audio files.

The user operates the player using a number of buttons located on the top surface. In addition several player functions occur automatically in response to patron actions or inactions. The player automatically powers on and gives an audible greeting when the patron plugs the power cord into a live AC power outlet. When powered on, the player will start or resume the playing of a DTB automatically when the cartridge is inserted into the player. When operating on battery power and not playing a book, the player will turn off after 30 minutes of inactivity.

There are two models of the digital-talking book player, the Standard Model (DS1) and the Advanced Model (DA1).

Features Common to Both Models

The Rewind, Play/Stop, and Fast Forward controls are centered and located close to the front edge of the player. These primary controls are used to start and stop the book and to move the reading position.

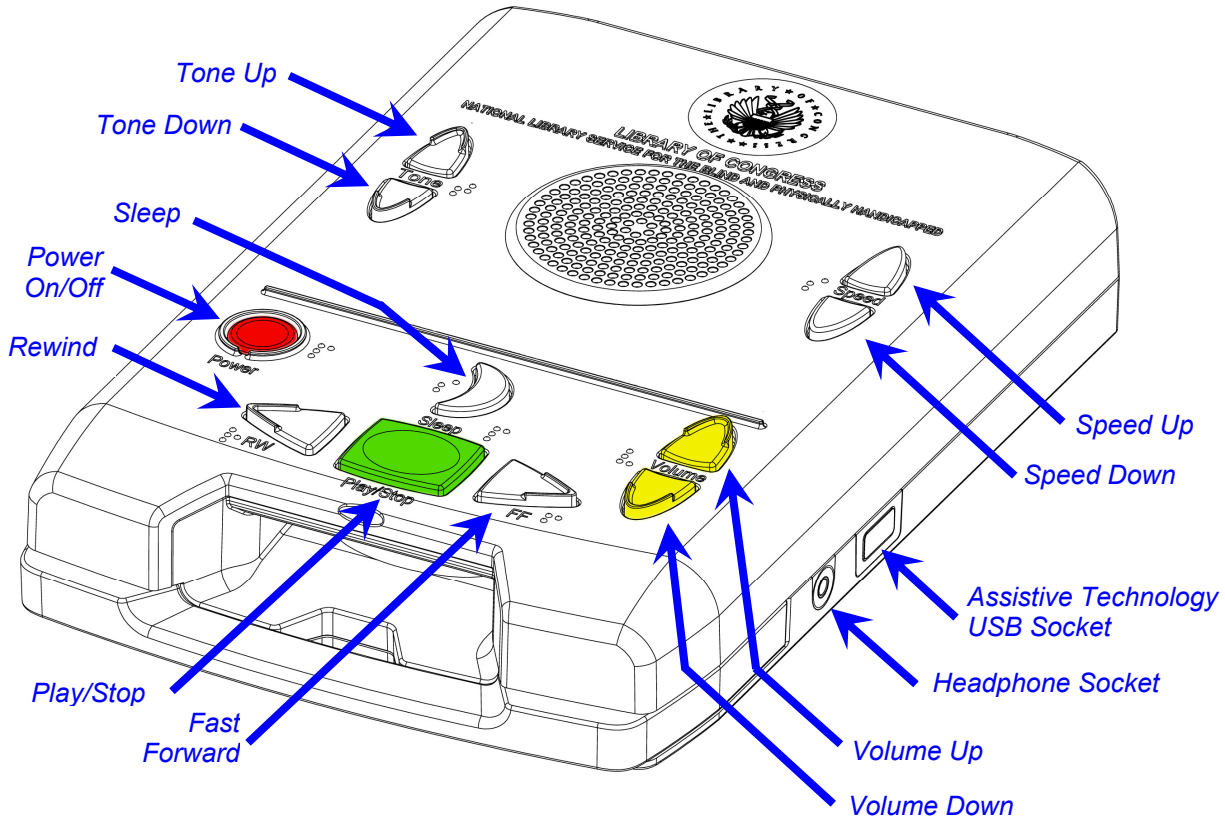


Figure 2-1 Standard Player (DS1)

- ❖ The **square, green Play/Stop button** initiates the playing of a book or stops a book or message already playing. Holding this button down on the Standard Player enters and exits the built-in User Guide.
- ❖ The **white, triangular Rewind** and **Fast Forward buttons** to the left and right of the Play/Stop button move the reading position through the book, further in time and book structure the longer the button is held down. Periodically the amount of book time traversed is announced, while beeps indicate the crossing of chapter boundaries during both Rewind and Fast Forward.

Just behind the Rewind, Play, and Fast Forward controls are the Power, Sleep, and Volume buttons.

- ❖ The **round, red Power button** is pressed to turn the player on and off.[1]
  It is located close to the left edge of the player.
  The Power button can also be used to perform a hardware reset to reboot the player. A hardware reset is accomplished by holding the button down until a beep is heard (more than 7 seconds).
- ❖ The **white Sleep button, shaped like a crescent moon**, is used to start or continue playback for 15, 30, 45 or 60 minutes.
  It is centered just behind the Play/Stop button.
  At the conclusion of the sleep period the player's volume will fade and playback will stop.
- ❖ The **yellow Volume buttons are shaped like arrowheads and point up and down**.
  They are close to the right edge of the player.

Behind the Power, Sleep, and Volume controls is a raised line running from one side of the player to the other. This line divides the six most frequently used controls on the front of the player from the Tone and Speed controls located behind the raised line and on either side of the round speaker.

The Tone and Speed buttons are shaped like up-and-down arrowheads, like the Volume buttons. They are located between the round speaker and the edges of the player.

- The **Tone buttons** are close to the **top left** edge.
- The **Speed buttons** are close to the **top right** edge.

The Volume, Tone, and Speed controls all announce the direction of adjustment with each press of the button (e.g., "Tone up" or "Tone down", with similar announcements for the other controls). When playing a book, the Advanced Model enunciates the adjustments only by simple beeps, with a second beep to represent the normal or middle setting. The Speed control changes the speed of the speech from 50 percent to 300 percent of normal, with no change in pitch.

The player can be powered from a 120 volt AC wall outlet or from an internal battery pack. The battery pack was designed specifically for this player. It is not replaceable by patrons.

The player is designed to resist entry of small liquid spills and insects. The speaker is water-resistant and further protected by a water-resistant speaker grill cloth. The keypad is seated into channels inside the player housing to resist liquid spills entering the player.

The digital talking-book cartridge is inserted into the cartridge dock opening on the front of the player directly below the Play/Stop button. The cartridge plugs into a USB type A receptacle socket at the rear of the cartridge dock. When the player is powered, inserting a cartridge will start playback automatically.

The player has a pull-out handle located below the cartridge dock opening.

A compartment in the back of the player can be used for power cord storage while using battery power or when the player is not in use.

[1] When connected to AC power, turning the player off does not disconnect power from the electronics. Most of the controls are disabled; however, the circuit is still active so that battery charging can occur, if necessary.
When the player is turned off while using batteries, power is completely disconnected from all electronics except the battery monitoring integrated circuit.

The cartridge used with the player is about the size of a common cassette, but with a more complex shape. The end of the cartridge with the round finger hole is beveled, so that when that end of the cartridge is pressed down on a flat surface in front of the player, the other end of the cartridge, with the USB Connector, tilts up and can slide smoothly into the player. The end of the cartridge with the USB connector is also beveled so it will fit into the player only one way.

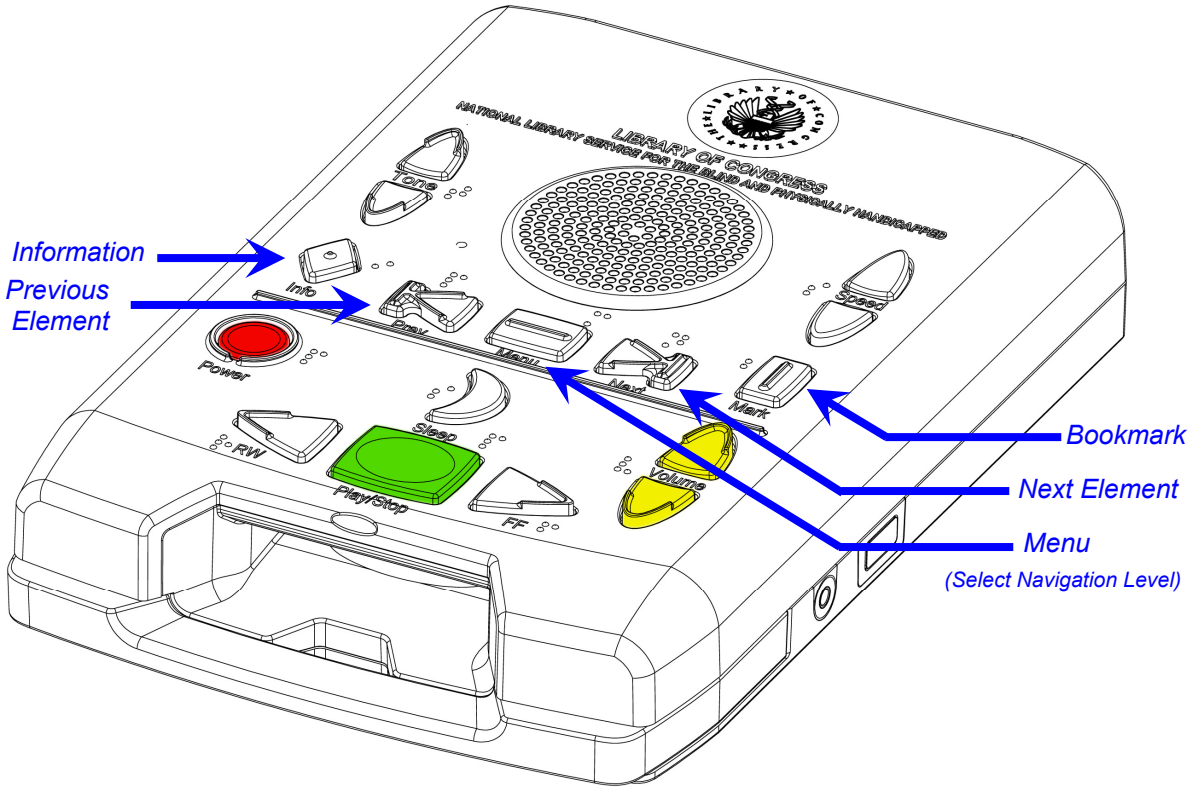


Figure 2-2 Additional Controls on the Advanced Model (DA1)

Advanced Features

The Advanced Model has an **additional row of controls** between the raised line and the round speaker. The advanced controls are for setting and retrieving bookmarks and for navigating through the structured levels of a NISO, Daisy 2.02, or CEA-2003 book.

- The **white, rectangular Menu button** in the center of the player selects the level at which step navigation by the Next and Previous buttons occurs. Pressing this button repeatedly selects progressively finer navigation levels available in a particular book. Navigation by phrase and by bookmark is also selectable.
- The **white, blunt arrow-shaped Previous** and **Next buttons** on the left and right sides of the Menu button respectively move the reading position to the previous or next element in the book. The level at which navigation occurs by the Previous and Next buttons is set by using the Menu button. When set to the bookmark level, the Previous button can be used to go to the beginning and the Next button to move to the end of the book. These are two non-erasable bookmarks.
- The **white, diamond-shaped Information button** near the left edge of the player is used to obtain information about the reading position, the book currently being read, and the power and battery status of the player.
- The **white, rectangular Bookmark button** near the right edge is used to insert and delete bookmarks. Once a bookmark is set, the reading position may be returned to the bookmark by using the Previous and Next

buttons provided the bookmark navigation level has been selected with the Menu button. Pressing this button at a previously set bookmark will remove it.

External Connectors

Headphone

A bright green, circular headphone jack is located on the right side of the player. The player accepts headphones with a 3.5 mm (mini) ring, tip, and sleeve plug. It will also accept a mono 3.5 mm (mini) tip and sleeve connector. The player senses the presence of a connector and disconnects the speaker audio output. This output may be used to drive external amplified speakers or a pillow speaker.

USB host

Behind the headphone jack is a USB port. This USB port can be used for several purposes:

- Patrons may connect Assistive Technology (AT) remote control devices to control the player. (Refer to section 3.2.)
- Patrons can connect commercial off-the-shelf USB flash drives[2] to play books obtained from the NLS Internet library.
- Repair personnel may use this port to access diagnostic information during servicing.

This USB receptacle is provided with a cover to protect it when not in use.

Battery

The battery pack comprises 6 Nickel Metal Hydride (NiMH) cells, a self resetting fuse and a 70°C thermostat for safety, and a thermistor for end of charge detection. The nominal capacity of the battery is 2000mAH which will provide approximately 35 hours of play time (at normal speed and normal volume settings). To preserve the service life of the battery, a charge cycle is initiated only if the remaining capacity is estimated to have fallen to less than 75 percent of full capacity. (*Note: unlike many simple consumer devices, the battery is not recharged on application of AC power*)

The player continually monitors the charge state of the battery pack. The battery's self discharge[3] is estimated and is used to modify the capacity measurement.

The player reports the remaining capacity in number of hours of play time available unless this is greater than 75% of the full capacity in which case the player reports "greater than H hours" (where H is 75% of the number of hours that the player can play on battery). When the player estimates that the capacity is than half an hour, the announcement will be "Battery Low". If the battery pack has been depleted so that the voltage is less than 6 Volts, and the player is powered on using battery power, the message "Battery Low, Powering Off" is played and the player will immediately power off. Due to the uncertainty of the capacity measurement the player underestimates the actual capacity.

It is estimated that the battery pack will have a service life in excess of 600 charge cycles. Under moderate battery usage (4 hours per day for 5 days per week), the battery life should exceed 4 years. At the end of its service life the capacity of the battery pack will be 75 percent of its initial value. A count of the number of charge cycles for the current battery pack is kept by the player. This may be read by library staff through a service function.

[2] Most but not all commercially available USB flash drives will function correctly as a DTB storage medium. NLS maintains a list of known compatible and incompatible drives.

[3] Self discharge is the loss of stored charge due to chemical reactions within the battery. The rate of self discharge doubles for every 10°C rise in temperature.

Digital Talking-Book Player Specifications	
Player size	157 mm (6.2 in.) width; 224 mm (8.8 in.) depth; 43 mm (1.7 in.) height
Player volume	1.51 l (93 in^3)
Player weight	1.15 kg (2.52 lb)
Player box size	317.5 mm (12.5 in.) width; 232 mm (9.1 in.) depth; 97mm (3.8 in.) height
Player overpack (8 players)	480 mm (19 in.) width; 406 mm (16 in.) depth; 330 mm (13 in.) height
Book formats	ANSI/NISO Z39.86-2002, Daisy 2.02, CEA-2003
Audio formats	AMR-WB+ (3GP file format), MPEG 1/layer 3, RIFF WAV
Speaker frequency response	200 Hz to 10 kHz (+/- 6 dB)
Headphone frequency response	20 Hz to 20 kHz (+/- 3 dB)
Speaker power (max)	2 W
Headphone power (max)	60 mW
AT remote protocol	USB HID (keyboard and gamepad devices)
AC voltage	120 VAC nominal, 60 Hz
AC current draw	Maximum 9 mA RMS (when charging the battery pack)
DC current draw (nominal)	55 mA
AC protection	1 Ampere fuse: non-replaceable component of the internal AC/DC power supply
DC power	Battery pack: custom nickel-metal hydride, Part No. 42824591310 (7.2 volt nickel-metal-hydride pack: 6 cells in series with a nominal capacity of 2000 mAh)
DC protection	Within battery pack: 2.5 Amp resetable fuse. Thermal fuse at 70° C.

2.2 USB Flash Cartridge

The player plays DTBs stored on USB flash drive cartridges. These cartridges contain a type of solid state memory that is nonvolatile and can be rewritten thousands of times. They are resistant to damage by extremes of temperature, humidity, and other environmental conditions expected to be encountered by patrons and libraries.

The cartridge has a feature that enables erasing or rewriting of the contents, but only by authorized parties. Thus, it is impossible for patrons to inadvertently or maliciously alter the contents of the book.

Cartridges are manufactured in several sizes. The nominal capacities are 512 MB and 1 GB and 2GB. About 99.5 percent of NLS DTB titles are less than 1GB in size.

Cartridges accommodate a print and braille label in a slightly recessed area to protect the embossed braille. This label contains two 30-point print lines, four large-print (14-point) lines, and five rows of book information in braille. The underside of the cartridge has an area available for a library-specific label or identifier.

The cartridge has mechanical features that assist handling by physically handicapped persons. It can be inserted into the player in only one orientation.

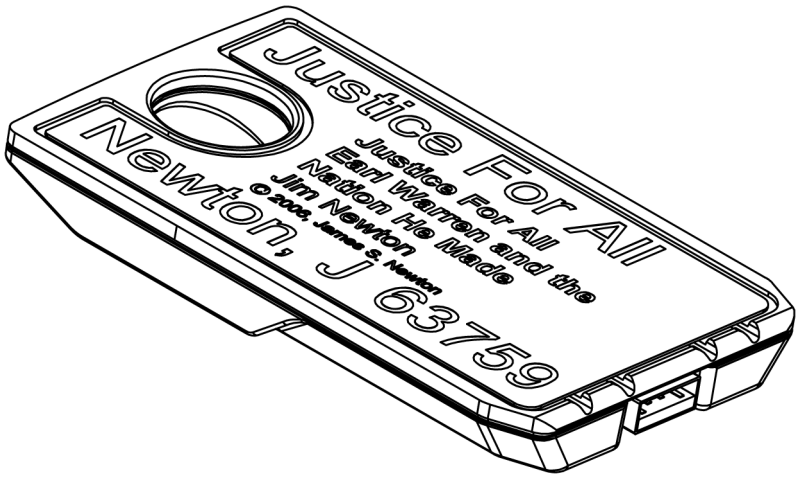


Figure 2-3. USB Flash Drive Cartridge (Top)

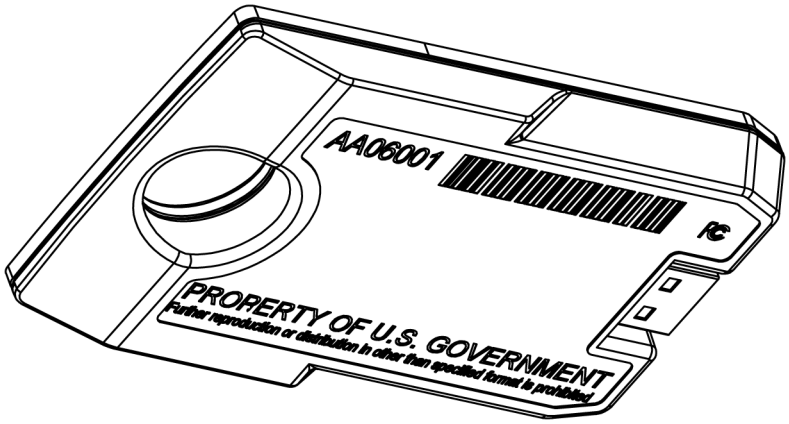


Figure 2-4. USB Flash Drive Cartridge (Underside)

Digital Talking-Book Cartridge Specifications	
Cartridge size	57 mm (2.25 in.) width; 95 mm (3.75 in.) depth; 10 mm (0.39 in.) height
Cartridge weight	37 g (1.3 oz)
Technology	USB high speed mass storage device
Capacity (unformatted)	512 MB, 1 GB, 2GB, 4GB
File system	FAT12, FAT16, FAT32, ext2, ext3
Container size	112 mm (4.4 in.) width; 152 mm (6 in.) depth; 19 mm (0.75 in.) height
Container weight	110 g (3.87 oz)

2.3 Abbreviations, Definitions, and Acronyms

Abbreviations and Acronyms	
AT	Assistive Technology
AMR-WB+	Adaptive MultiRate-WideBand+
ANSI	American National Standards Institute
DAISY	Digital Accessible Information System Consortium
DTB	Digital Talking Book
DTBM	Digital Talking-Book Machine
CRC	Cyclic Redundancy Check (Checksum)
DAC	Digital to Analog Converter
ESD	Electrostatic Discharge
HID	Human Interface Device
IPA	Isopropyl Alcohol
mAh	milliAmpere hour
MLA	Machine Lending Agency
MP3	MPEG-1 Audio Layer 3 Format
NISO	National Information Standards Organization
PC	Personal Computer
PTC	Positive Temperature Coefficient
PDTB	Protected Digital Talking Book (Using DAISY PDTB2)
RMS	Root Mean Square
Service Center	During the warranty period: the manufacturer; post warranty, the contract repair entity specified by NLS
USB	Universal Serial Bus
VAC	Volts Alternating Current
VDC	Volts Direct Current
WAV	Waveform Audio Format (audio file format variant of RIFF bitstream format)
3GP	Multimedia Container Format defined by the Third Generation Partnership Project
3GPP	Third Generation Partnership Project

2.4 Theory of Operation

Basic Description
The Digital Talking-Book Machine (DTBM) is comprised of several main component blocks. The circuit board is the most complex of these and is the heart of the player. Power for the player is obtained from either the AC power supply or the internal battery pack. The battery pack is used to provide the player power when AC power is not available and is recharged, when required, with power from the AC power supply. The user operates the player by using the keypad, a rubber membrane laying on the circuit board. The keypad has conductive pills that, when depressed, contact terminals connected to the microprocessor. The Digital Talking Book (DTB) is a set of computer files stored on a cartridge comprising a custom USB flash drive enclosed in a plastic housing. These files contain digitized and (usually) compressed audio and metadata defining the characteristics of the book structure. The DTB is connected, upon insertion, to the player via a USB interface.

The player's main circuit contains several major circuit blocks:

1. **Microprocessor**
   This integrated circuit is a Freescale Semiconductor ARM9E processor clocked at 266MHz. It operates with 16MB of low voltage SDRAM (in addition to its high speed internal RAM) and 64MB of NAND Flash memory. Upon boot up, the microprocessor copies the operating system (CE Linux) and the DTBM application from the NAND Flash to SDRAM where it is executed. The "user guide" DTB and non-volatile data, including audio messages and prompts, are stored on the NAND flash and are accessed on demand. The keypad is connected directly to the microprocessor, which has a dedicated internal keyboard-scan circuit. A reset integrated circuit will actively reset the microprocessor on power-up from battery or if the On/Off button is held down for longer than 7 seconds.

2. **Power converters**
   The DC power (12.9V) from the AC power supply, or the nominal 7.2V from the battery must be converted to several voltages used throughout the circuit. The input voltage is first converted by a high efficiency switch-mode converter to 5V and then to other voltages (3.3V 1.8V and 1.2V) by either switch-mode or linear regulators. The core voltage of the microprocessor is 1.2V, the SDRAM and NAND flash memory operate from 1.8V and the ADC, USB circuits, and headphone driver require 3.3V. The speaker power amplifier and the power for external USB devices require 5V. The player is switched from battery power to external power by MOSFETS when the presence of external power is sensed.

3. **Audio Circuit**
   The microprocessor converts the audio data retrieved from the files on the book cartridge to 16-bit PCM at a rate of 44.1ksps. This digital data is clocked into the Digital–to-Analog Converter (DAC) where it is converted to an analog voltage (Max 1V RMS). This analog audio signal is amplified by a high efficiency 2W-class-D amplifier when the player is using the internal speaker, or an 80mW linear driver when headphones are used. If headphones are inserted, the microprocessor senses this and enables the headphone amplifier while disabling the speaker amplifier. The headphone driver has a balanced output around 0V (an internal power supply generates a negative voltage supply). It can drive stereo headphones and is protected from short circuits either to ground or between the two outputs.

   The volume control, when used to control the speaker volume, is distributed between the DAC (+6 to -33) and the speaker amplifier (+6dB or +12dB). The distribution of gain is also governed by the setting of the tone control. For the very low tone settings the speaker gain may be set at +18dB or +23.5dB to compensate for the scaling applied to avoid the tone digital signal processing from overflowing. When used with headphones, the volume adjustment is accomplished solely through the built in control of the DAC. The DAC attenuator is adjusted over the range of -38dB to + 6dB (at flat tone).

4. **Battery Management and Charging**
   The battery pack comprises 6 Nickel Metal Hydride (NiMH) cells, a self resetting fuse and a 70°C thermostat for safety, and a thermistor for end of charge detection. The nominal capacity of the battery is 2000mAH. The state of charge is monitored by a circuit measuring the charge into and out of the batteries

and by predicting self discharge. This 'gas gauge' chip is monitored by the microprocessor to determine when a charge cycle should be initiated. To preserve the service life of the battery, a charge cycle is only started if the remaining capacity is estimated to have fallen to 75 percent of full capacity. (*Note: unlike many simple consumer devices, the battery is not recharged on application of AC power*)

Once the microprocessor has determined that a charge should commence it enables the battery-charger chip, which independently handles the charging process. Charging proceeds at a 1A rate and normally terminates when the charger detects a rapid rise in the battery pack's temperature. As a fail-safe, three other termination criteria are monitored in case the temperature rise is not detected. These are a dip in voltage, which occurs when the battery is fully charged, an absolute temperature of greater than 60º C or after charging for more than three hours. A charge time of more than three hours is considered a fault and is recorded. If the battery attempts three charge cycles and they all result in timeout faults, no further charging is attempted.
If the battery pack voltage is below 6.3V, the player will either shut down if operating, or will not power-up if the player is off. This helps protect the battery pack from the effect of over-discharge (cell reversal).

5. **USB Interface**
   The player has two USB interfaces. One is for the main book cartridge, the other for Accessible Technology (AT) devices or for use as a second book port. USB driver chips ensure that the signals conform to the USB standard. The 5V power available from the USB ports is controlled by a chip that detects over-current to protect the player from USB device malfunctions.

Basic Operation

The player is able to play talking books structured in ANSI/NISO Z39.86-2002, DAISY 2.02, or CEA-2003 formats. The player can play audio files stored as AMR-WB+, MPEG II/Layer 3 (MP3) and RIFF WAV format, either as part of a talking book or as stand-alone audio files.

The player is powered on either by pressing the power button, while not connected to AC power, or by the application of AC power.[4] On power up or reset the operating system and player application program are copied from NAND flash to SDRAM and executed. Peripheral devices are initialized and a power-on message is played.

The operating system monitors peripherals such as the keypad, power state and USB ports for a change of state. When a change is detected, such as a key press or USB cartridge insertion, a signal is sent to the player application. Upon receipt, the application decides the appropriate course of action. In the case of cartridge insertion, the application attempts to mount the cartridge's file system and determine the contents of the cartridge. When found on the cartridge or USB flash drive, a DTB or audio file will play.

The player's operation is altered by:

1. The user (by pressing keypad buttons or by changing the AC power state)
2. The contents of the cartridge (the player will follow the structure of the DTB)
3. A change in the battery or AC power conditions (e.g., power off when battery voltage falls below 6V)
4. Time. Power off after thirty minutes when powered from battery, when not playing a book and with no user action.

Note: In this document, power outlet is defined as a 60 Hertz, 120 volts AC outlet.

[4] While connected to an AC power source operating the On/Off does not completely power down the player. The microprocessor and battery monitoring/charge circuit are still operating. Only when powered from battery, will the On/Off button completely power down the player.

2.5 Assembly Diagrams

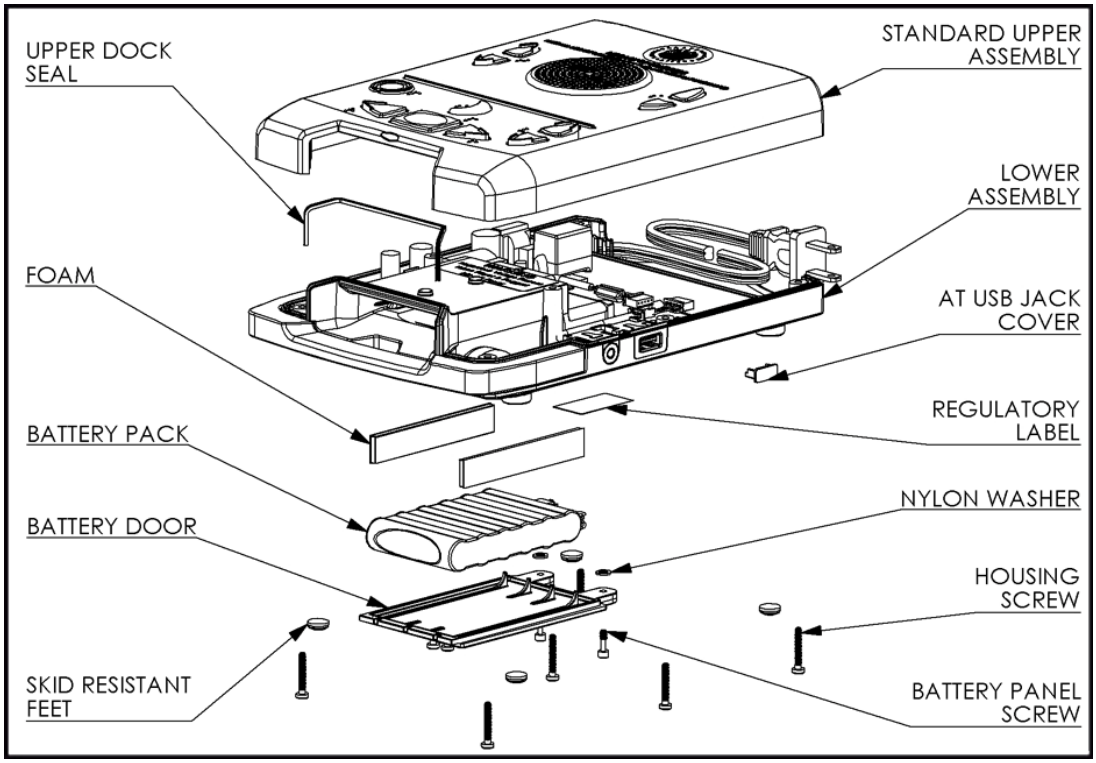


Figure 2-5. Standard Player Assembly

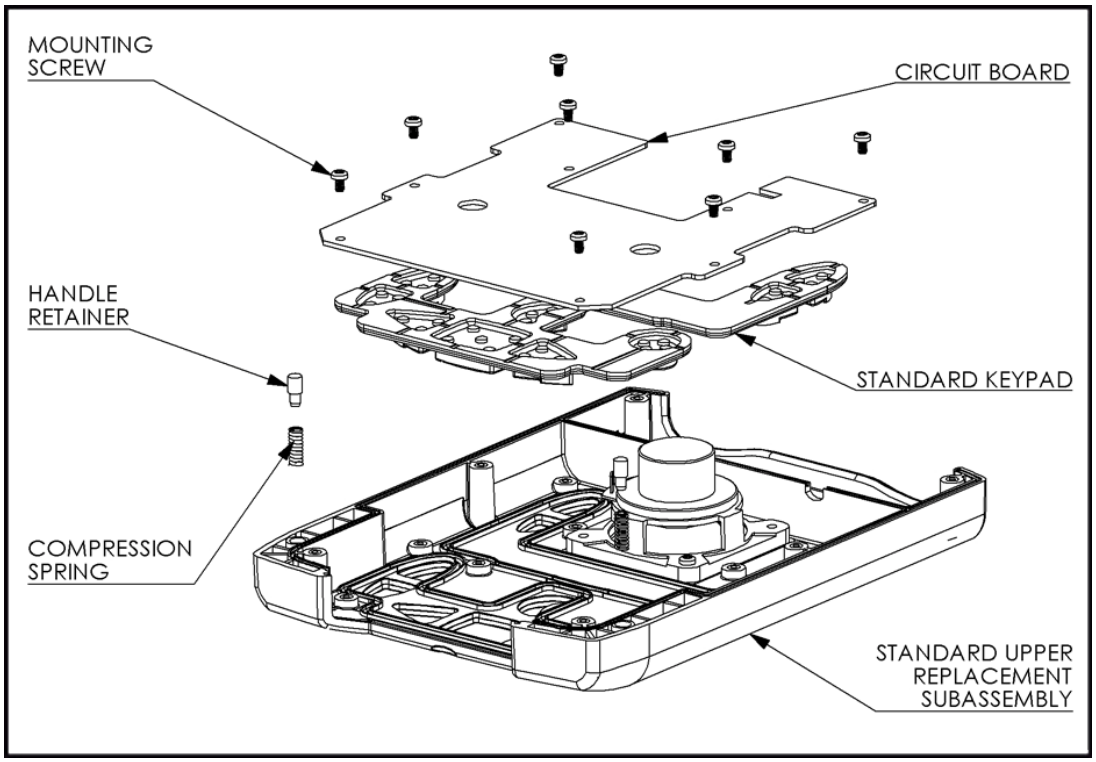


Figure 2-6. Standard Player Upper Subassembly

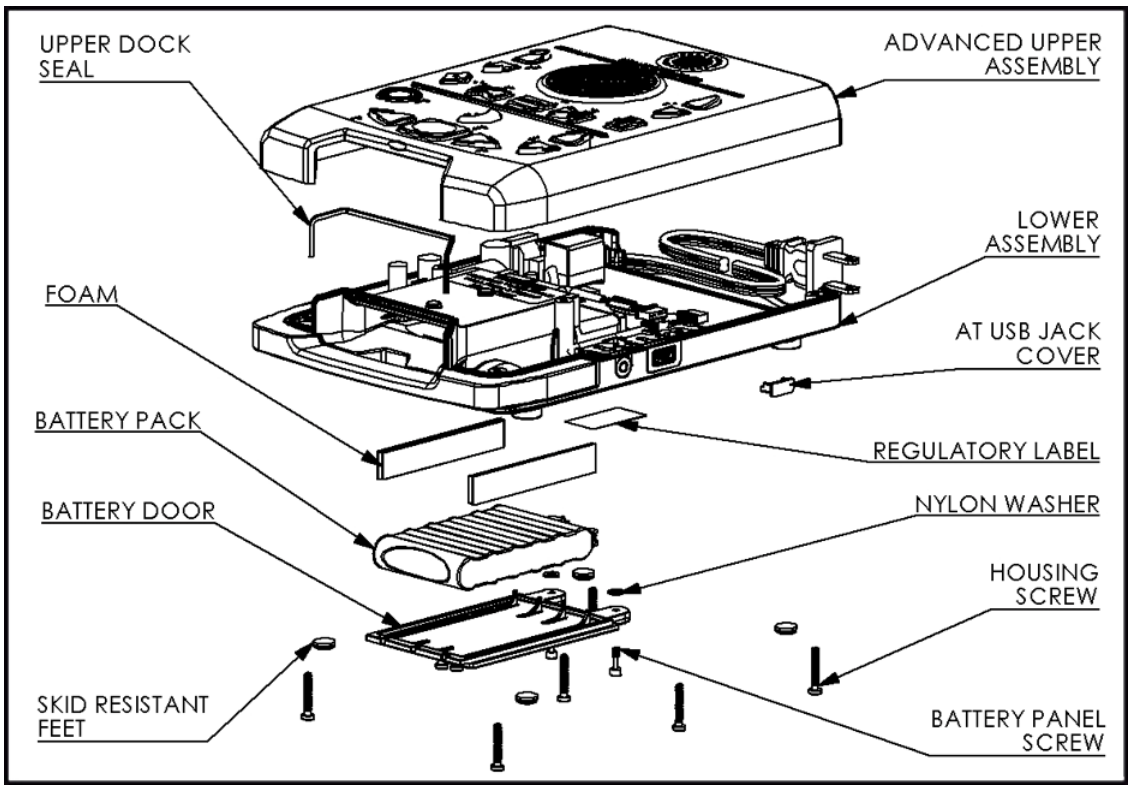


Figure 2-7. Advanced Player Assembly

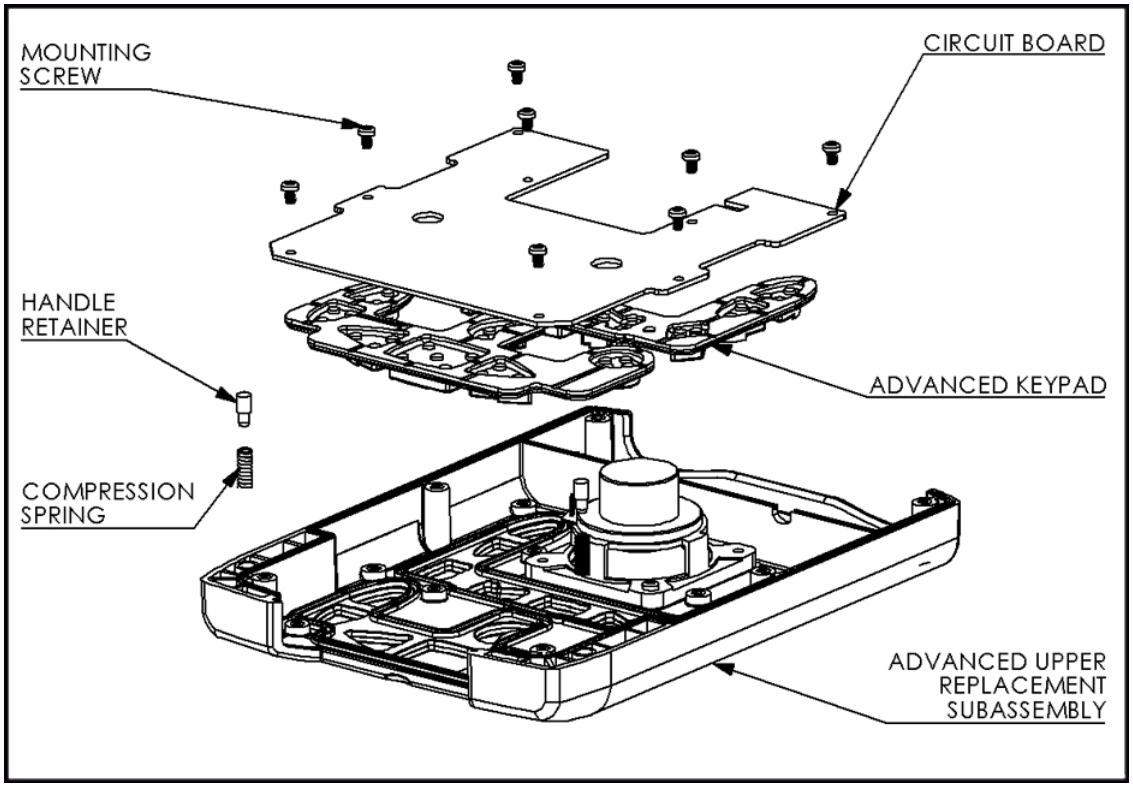


Figure 2-8. Advanced Player Upper Sub-Assembly

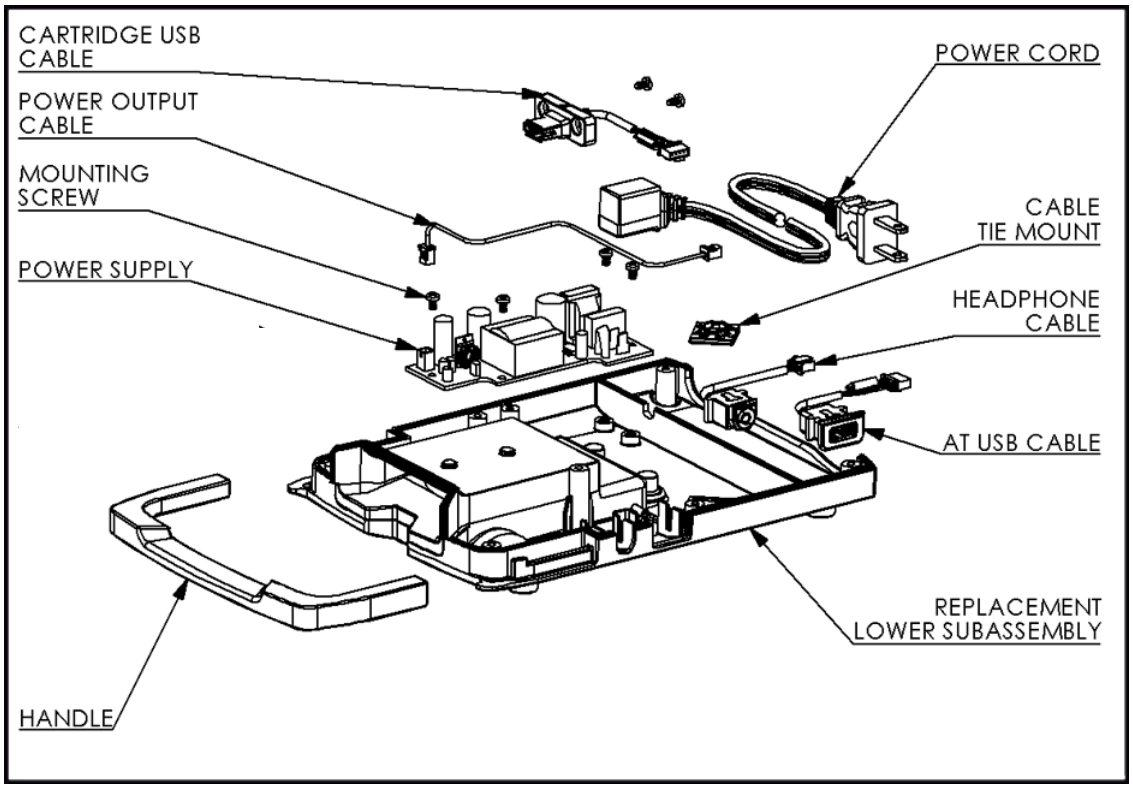


Figure 2-9. Lower Player Assembly (Common to both models)

2.6 Digital Talking Book

A digital talking book is composed of a collection of computer files. These files contain the digitized audio content along with information on the book's structure to permit both random access and linear reading of the material. To play the book, a compatible player requires information on how all the audio files fit together and the location of the book structure elements such as parts, chapters, and optionally page numbers.

Digital talking books created for NLS are built to conform to the ANSI/NISO Z39.86-2002 standard. Using the complete standard, books can be created in many formats such as audio, text, or mixed text and audio. The content of NLS digital talking books contains only human narrated speech. In the following description of the DTB, only those parts of the standard relevant to NLS-produced books are described.

2.6.1 Files That Make Up a Typical DTB

File Name	Purpose	Purpose
db54321.ppf	Protected **Package file (PPF)**	Book structure
db54321.pncx	Protected **Navigation Control file (NCX)**	Book navigation
db54321-01.smil	**Synchronized Multimedia Integration Language (SMIL) files**	Audio clip organization
db54321-02.smil		
db54321-01.3gp	**AMR-WB+ files**	Compressed audio
db54321-02.3gp		
db54321-03.3gp		
db54321-04.3gp		
db54321-05.3gp		
db54321-06.3gp		
db54321-07.3gp		
db54321ann.3gp	**AMR-WB+ announcement file**	
db54321hdgs.3gp	**AMR-WB+ headings file**	
us-nls-db54321.ao	**Authorization object** contains the symmetric keys for the encrypted files encrypted in the NLS public key	Book protection
dtbsmil110.dtd	**Document Type Definition file**	Administrative files for book validation but not required to play the book
ncx110.dtd	**Document Type Definition file**	
oeb1.ent	**Entity file**	
oebpkg101.dtd	**Document Type Definition file**	
pdtb_protected.smil	Façade Book **SMIL presentation**	Façade Book
protected.mp3	Façade Book **announcement**	
db54321.ncx	Façade Book **Navigation Control file (NCX)**	
db54321.opf	Façade Book **Package file (OPF)**	

Figure 2-10. Example DTB files

2.6.1.1 Package File

The Package file contains administrative information about the DTB, the files that compose it, and how these files interrelate.

The major parts of the Package file are as follows:

- **Package Identity** – a unique identifier for the DTB
- **Metadata** – Publication metadata (title, author, publisher, etc.)
- **Manifest** – A list of files that make up the DTB
- **Spine** – An arrangement of files providing a linear reading order

2.6.1.2 Navigation Control File

The Navigation Control file (NCX) exposes the hierarchical structure of a DTB to allow the user to navigate through it. The NCX is similar to a table of contents in that it enables the reader to jump directly to any of the major structural elements of the document, i.e., part, chapter, or section. However, it will often contain more elements of the document than the publisher chooses to include in the original print table of contents. Other elements such as pages can be included in separate, nonhierarchical lists and can be accessed by the user as well. These NCX elements contain pointers to elements in the SMIL file. Each NCX element has an associated audio label (or tag) that the player renders to notify the user (e.g., "Chapter One"). These labels access clips in audio files directly, not through the SMIL files.

It is important to emphasize that these navigation features are intended as a convenience for users who want them, and not as a burden to those who do not. The NCX is used primarily by the Advanced Model. It does not contain information required for linear playback of the book.

2.6.1.3 SMIL Files

The SMIL (Synchronized Multimedia Integration Language) files contain information that weaves together the various parts of the audiobook into a complete presentation. These files define the order, timing, and location of the audio clips that compose the DTB. There will be one or more SMIL files in each DTB. Each SMIL element will identify an audio file that contains the clip. The start and end times of the clips referenced in the SMIL elements are relative to the audio file and not the entire DTB.

2.6.1.4 Audio Files

The digitized audio files are compressed during the production of the DTB to reduce their size. NLS uses AMR-Wideband Plus (WB+), an advanced compression standard specifically designed for high-quality voice compression. The compressed audio is stored on the cartridge in the 3GP file format.

2.6.1.5 Authorization Object File

The audio files and the content of some other files are encrypted to meet the requirements of copyright law. The keys to decrypt the audio and markup files are unique for each book and are themselves encrypted and stored in the Authorization Object file. The player contains a private key that is used to decrypt the Authorization Object file and recover the book keys required to decrypt the book content. Commercial players that have not been enabled to play NLS books do not contain this key and thus are unable to play NLS protected books.

2.6.1.6 Administrative Files

A DTB contains several files that play no role in rendering the book. These files describe the rules that the book content must follow to be valid. They are used in the production and validation of the DTB.

2.6.1.7 Façade Book

All NLS DTBs actually have a second book contained on the cartridge. This so called Façade Book is played only when the encrypted book cannot be played. A Façade Book will never be heard when playing a book on an NLS player, but it may be played on a third party commercial player that has not been authorized to play NLS books. The Façade Book merely informs users that they are not authorized to read the book.

2.6.2 How the Player Uses the Files

To read a book linearly, that is to say from beginning to end, the player opens the **Package File** and uses the "spine" to identify the sequence of one or more **SMIL file** presentations to play. The **SMIL file** contains a series of pointers to audio clips to be played. These clips are located in the compressed **3GP Audio Files**.

If a user wishes to use the features of the Advanced Model to move directly to a place in hierarchical book structure, such as a chapter, the player will use the information contained in the **NCX file** that will point to the position in a

SMIL file where the chapter begins. The **NCX file** will also have a direct pointer to the audio clip that will render the name of the chapter so that the user can quickly locate the navigation point of interest. Both the standard and advanced players use information in the NCX file to report the book title and reading position location.

Before a protected book can be played, the player examines the **Authorization Object** to determine the secret key required to extract the unique book keys from the **Authorization Object**. If the player has the key required, it will decrypt the book keys and use them in turn to decrypt the book's audio and navigation information. If it does not have the secret key that this book was protected with, it will play the Façade Book.

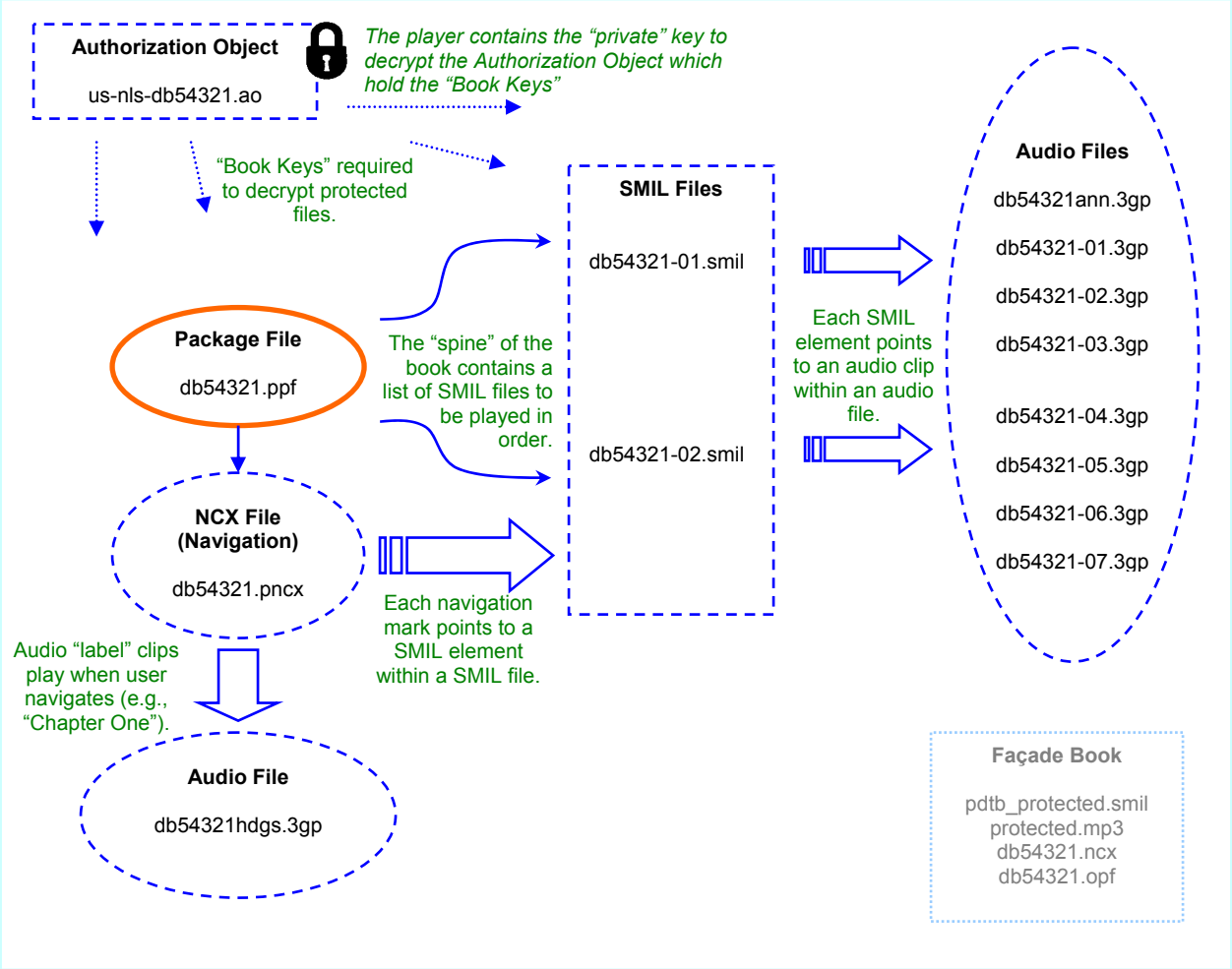


Figure 2-11. Representation of a Typical NLS Digital Talking Book

3 User Operation and Controls

The player responds to user actions by a combination of two processes. The first moves or stops moving the reading position (referred to as navigation) and the second initiates or alters the characteristics (volume, tone, or speed) of the audio rendered by the player.

The reaction of the player to user action is principally affected by

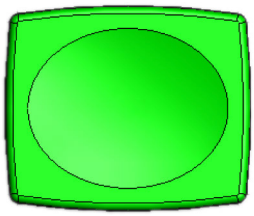
- Whether or not the player is playing a book
- How the book is "marked up," i.e., the type and number of navigation points created when the DTB was produced
- The format of the book on the cartridge (ANSI/NISO Z39.86, DAISY 2.02, CEA2003)
- Whether a cartridge is inserted into the player
- The type of player (Standard Model or Advanced Model) and its verbosity setting
- The sequence and timing of the user actions (e.g., the player may react differently to a press and hold on a control than to a faster press and release)

3.1 Player Controls

The description of player controls in this section refers to several player states:

1. **Primary**
   The usual function for the control. Most controls require a book cartridge with a DTB to be inserted into the player for this function to be available. A simple press and release will always initiate the primary function for the control.
2. **Secondary**
   A control may have several functions depending on how the user operates it. A secondary function will be accessed by an action other than a simple press and release such as holding the button for several seconds.
3. **Key Describer**
   When no book cartridge is inserted in the player, the player is in the Key Describer state. Unless otherwise noted, all buttons will give a brief explanation of their operation when the user presses them in this mode.

Play/Stop



Play/Stop

Primary

Pressing the **Play/Stop** button while the player is stopped starts or resumes playback of the book. Playback resumes from the reading position noted by the player for the current book when playback or navigation last ended.

Pressing the **Play/Stop** button while the player is playing a book or message stops playback and silences the player.

Playback commences automatically upon the insertion of a book cartridge from the last reading position recorded by the player for the particular book on the cartridge or from the beginning if the book has never been played.

When the player is stopped and the reading position is the end of the book, pressing **Play/Stop** once will play a message informing the user of this and that pressing **Play/Stop** again will move the reading position to the beginning of the book.

Secondary (Standard Model only)

Pressing and holding the **Play/Stop** button will switch playback from the DTB on the cartridge, or from the Key Describer, to the built-in **User Guide**. When the User Guide is enabled, it can be read just like a regular DTB. **Pressing and holding** the **Play/Stop** button, when the **User Guide** is enabled will return playback to the cartridge DTB. The User Guide can be entered at any time.

Rewind

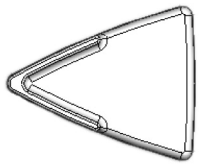
Rewind and Fast Forward are the principal means of book navigation for the Standard Model player. The rewind and fast forward behavior of the Standard and Advanced Models are the same; however, users of the Advanced Model will most likely use its other controls to perform most navigation.

Pressing and releasing the **Rewind (RW)** button moves the reading position back 5 seconds.

Pressing and holding the **Rewind** button moves the reading position back at an accelerating rate.

When a **chapter**[5] **boundary** is crossed, a beep is heard. Releasing the Rewind button immediately following a beep will snap the reading position to the beginning of the chapter.

If a chapter boundary is crossed after moving the reading position back 15 minutes, rewind proceeds by chapter (one chapter for each 2 seconds the RW button is held). Until a chapter boundary is crossed the acceleration will increase to a ceiling of 1 hour steps for each 3 seconds that the RW button is held.



RW

Time Rewind held		Reading position moves	
Initial	Press	5	seconds
2	seconds	20	seconds
4	seconds	1	minute
7	seconds	5	minutes
10	seconds	15	minutes
Until a chapter boundary is crossed:			
13	seconds	30	minutes
16	seconds	1	hour
19	seconds	2	hours
Each 3	seconds	+1	hours
Once a chapter boundary is crossed:			
Each 2	seconds	1	chapter

On release of the Rewind button, the chapter name is announced if the reading position has crossed a chapter boundary.

Playback will continue following release of the Rewind button only if the book was playing prior to pressing Rewind.

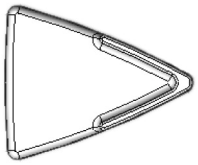
[4] The term "chapter" actually may refer to other navigation levels depending on the particular book. Some books may not be marked with chapter, in which case a navigation level of similar granularity will be chosen.

Fast Forward

Pressing and releasing the Fast Forward (FF) button moves the reading position forward 5 seconds.

Pressing and holding the **Fast Forward** button moves the reading position forward at an accelerating rate.

When a **chapter boundary** is crossed, a beep is heard. Releasing the Fast Forward (FF) button immediately following a beep will snap the reading position to the beginning of the chapter.



FF

If a chapter boundary is crossed after moving the reading position forward 15 minutes, fast forward proceeds by chapter (one chapter for each 2 seconds the FF button is held). Until a chapter boundary is crossed, the acceleration will increase to 1 hour steps for each 3 seconds that the FF button is held.

Time Fast Forward held		Reading position moves	
Initial	Press	5	seconds
2	seconds	20	seconds
4	seconds	1	minute
7	seconds	5	minutes
10	seconds	15	minutes
Until a chapter boundary is crossed:			
13	seconds	30	minutes
16	seconds	1	hour
19	seconds	2	hours
each 3	seconds	+1	hours
Once a chapter boundary is crossed:			
each 2	seconds	1	chapter

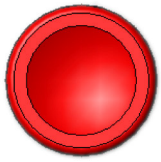
On release of the Fast Forward button, the chapter name is announced if the reading position has crossed a chapter boundary.

Playback will continue following release of the Fast Forward button only if the book was playing prior to pressing Fast forward unless the end of the book is reached.

Power

Primary

Pressing the **Power** button turns the player on and off when it is being powered from the battery. When the player is powered by AC, the **Power** button enables and disables the keypad and USB ports, but part of the circuit is always powered (battery monitoring/charging).



Power

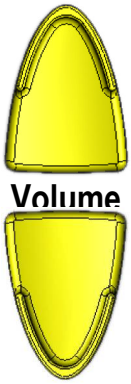
The player turns on automatically when AC power is applied.

Secondary

Pressing and holding the **Power** button for 7 seconds will apply a hardware reset to the microprocessor. This should be necessary only when the player has become unresponsive to other controls. Resetting the player does not erase any stored data or bookmarks.

Key Describer

If the player has no cartridge inserted, **pressing** the **Power** button plays an informative message describing the use of the **Power** control and the remaining battery capacity. Pressing the **Power** button again during this message or shortly thereafter turns the player off.



Volume

Pressing the **Volume Up** or **Volume Down** button adjusts the audio volume. Each press of the control will make one adjustment. There is a total of 45 dB of volume control in 15 steps. Each step is either three or four dB. The lowest volume setting will not mute the audio output.

A distinct double beep sounds when the volume is adjusted to the maximum or minimum to inform the user that no more adjustment is available.

If the volume is adjusted to the lowest setting when the machine is powered off, it will be reset at a slightly higher level when the player is subsequently turned on. This is done to ensure that the user can hear the player power up.

Sleep

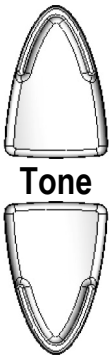
Primary

Pressing the **Sleep** button starts both playback and a timer that will turn the player off after 15 minutes. If the button is pressed again, within 5 seconds, the sleep timer is increased in 15 minute steps up to 1 hour. When the timer expires the audio will fade out over 5 seconds and playback will stop.

Pressing the **Play/Stop** button while the sleep timer is active will disable the sleep function. Pressing any other controls, such as volume, will have no effect on the sleep timer.

Secondary

The player's **serial number** and **software version** can be played by rapidly pressing the **Sleep** button 10 times or more when a cartridge is not inserted. The informational message will repeat until the **Play/Stop** or **Power** button is pressed.

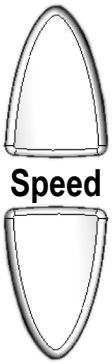


Tone

Pressing the **Tone Up** or **Tone Down** buttons adjusts the tonal quality of the player audio. The treble (high frequencies) can be boosted by up to 10 dB with the **tone up** control, and the bass (low frequencies) can be accentuated by the same amount with the **tone down** control (compared to the mid setting, which is flat). At the extreme **Tone Up** setting, there is a 10 dB boost in treble and a 10 dB cut in bass. An analogous effect occurs at the extreme **Tone Down** setting.

A distinct double beep sounds when the tone is adjusted to maximum or minimum to inform the user no more adjustment is available. A different beep and announcement sound at the neutral tone setting.

The tone adjustment is only active when a book cartridge is inserted. When a book cartridge is inserted for the first time, the player sets the tone level to neutral. The player remembers the setting for each book so that the tone setting for that book is recalled when the book cartridge is reinserted.



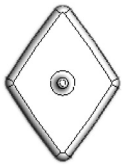
Speed

The speed of playback is adjustable using the **Speed Up** and **Speed Down** buttons. The speed is adjustable from one half to three times normal. That is to say if a book took a narrator 7 hours to narrate, it would take 2 hours and 20 minutes to render at the fastest setting. The pitch of the audio at all speed settings remains the same.

A distinct double beep sounds when the speed is adjusted to maximum or minimum to inform the user no more adjustment is available. A different beep and announcement sound at the normal speed setting.

The speed adjustment is only active when a book cartridge is inserted. When a book cartridge is inserted for the first time, the player sets the speed level to normal. The player remembers the setting for each book so that the speed setting for that book is recalled when the book cartridge is reinserted.

Controls Exclusive to the Advanced Model (DA1)



Info

Information

Primary

Pressing the **Information (Info)** button gives information on the book and on the player state. Information given for an ANSI/NISO book:

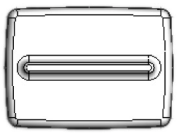
1. Current position in the book (i.e., chapter)
2. Current page number (if pages are marked in the book)
3. Total book time elapsed
   Total book time remaining (at 1x play speed)
   Total book time
4. Book Title
5. AC or battery powered
   Estimated time the player will play a book on battery

Different information plays for Daisy 2.02 or CEA2003 books or for a collection of audio files.

Pressing the **Info** button while a message is being played will interrupt the rendering of the information element and advance to the next information message.

Secondary

Pressing and holding the **Info** button for 1.5 seconds will switch playback from the DTB on the cartridge, or from the Key Describer, to the built-in **User Guide**. When the User Guide is enabled, it can be read just like a regular DTB. Pressing and holding the **Info** button, while the **User Guide** is enabled will return playback to the cartridge DTB.



Menu

Menu

Pressing the **Menu** button selects the navigation level at which the **Previous** element and **Next** element buttons operate. The levels available depend on the particular book. Many books will be marked at the chapter level only, while some will mark parts and chapters or chapters and sections. Recipe books are likely to have recipe and page levels.

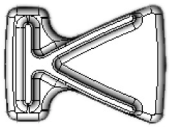
The **Phrase** level actually permits navigation by SMIL segments or one minute intervals, if its length is over one minute. The SMIL file weaves together all the components of the book (audio fragments for NLS books) into a continuous "presentation." Book producers can mark significant points as SMIL segments without explicitly making them navigation points such as chapters or pages. For example, each ingredient of a recipe may be a distinct SMIL segment. Thus, at the phrase level, a recipe can be heard ingredient by ingredient by using the **Next** element button.

The menu button is only active when a book cartridge is inserted. When a book cartridge is inserted for the first time, the player sets the navigation level to the highest (coarsest) available. The player remembers the setting for each book so that the navigation level set for that book is recalled when the book cartridge is reinserted.

Secondary

Pressing and holding the **Menu** button for 2 seconds will set the navigation level to the highest (coarsest) level.

Previous



Prev

Primary

Pressing the **Previous (Prev)** element button moves the reading position to the beginning of the previous navigation element at the hierarchical level selected by the **Menu** button (chapter, section, page, bookmark, etc.)

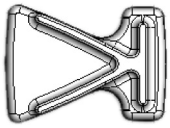
The player reacts differently depending on the current navigation level and whether the player is playing the book prior to the **Previous** element action:

Navigation level (set with Menu)	State	Action
Part, chapter, section, poem, etc.	Playing	1. The reading position moves to the beginning of the previous part, chapter, section, poem, etc. 2. The book will play continuously from the new reading position. NLS books will have the name of the part, chapter, section, poem, etc. recorded at this point.
	Stopped	1. The reading position moves to the beginning of the previous part, chapter, section, poem, etc. 2. The book will play the audio element tag associated with that part, chapter, section, poem, etc. of the book and then stop.
Bookmark	Playing	1. The reading position moves to the first bookmark prior to the current reading position or to the beginning of the book if no bookmark was set. 2. The book will play the lowest navigation level audio element (e.g., the section title if chapter and section is present) and the elapsed book time at the bookmark. Then the book will play from the bookmark.
	Stopped	1. The reading position moves to the first bookmark prior to the current reading position or to the beginning of the book if no bookmark was set. 2. The book will play the lowest navigation level audio element and the elapsed book time at the bookmark. Then at least 5 seconds of audio from the bookmark up to the end of the current SMIL segment or 10 seconds, whichever is shorter.
Phrase	Playing	1. The reading position moves back 1 minute or to the beginning of the SMIL segment prior to the current reading position, whichever is shorter. 2. The book will resume playing at that point.
	Stopped	1. The reading position moves back 1 minute or to the beginning of the SMIL segment prior to the current reading position, whichever is shorter. 2. The book will play at least 5 seconds of audio up to the end of the current SMIL segment or 10 seconds, whichever is shorter.

Secondary

Pressing and holding the **Previous** button moves the reading position back five navigation elements at the hierarchical level selected by the **Menu** button or 10 pages at the page level.

Next



Next

Primary

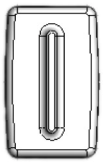
Pressing the **Next** element button moves the reading position to the beginning of the next navigation element at the hierarchical level selected by the **Menu** button (e.g., chapter, section, page, bookmark, etc.)

The player reacts differently depending on the current navigation level and whether the player is playing the book prior to the **Next** element action:

Navigation level (set with Menu)	State	Action
Part, chapter, section, poem, etc.	Playing	1. The reading position moves to the beginning of the next part, chapter, section, poem, etc. 2. The book will play continuously from the new reading position. NLS books will have the name of the part, chapter, section, poem, etc. recorded at this point.
	Stopped	1. The reading position moves to the beginning of the next part, chapter, section, poem, etc. 2. The book will play the audio element tag associated with that part, chapter, section, poem, etc. of the book and then stop.
Bookmark	Playing	1. The reading position moves to the first bookmark following the current reading position or to the end of the book if no bookmark was set. 2. The book will play the lowest navigation level audio element (e.g., the section title if chapter and section are present) and the elapsed book time at the bookmark. Then the book will play from the bookmark or will stop if at the end of the book.
	Stopped	1. The reading position moves to the first bookmark following the current reading position or to the end of the book if none was set. 2. The book will play the lowest navigation level audio element, the elapsed book time at the bookmark, then at least 5 seconds of audio from the bookmark up to the end of the current SMIL segment (or "End of book if appropriate), or 10 seconds, whichever is shorter.
Phrase	Playing	1. The reading position moves forward 1 minute or to the beginning of the SMIL segment following the current reading position, whatever is shorter. 2. The book will resume playing at that point.
	Stopped	1. The reading position moves forward 1 minute or to the beginning of the SMIL segment following the current reading position, whatever is shorter. 2. The book will play at least 5 seconds of audio up to the end of the current SMIL segment or 10 seconds, whichever is shorter.

Secondary

Pressing and holding the **Next** button moves the reading position forward five navigation elements at the hierarchical level selected by the **Menu** button or 10 pages at the page level



Bookmark

Pressing the **Bookmark (Mark)** button will insert a bookmark at the current reading position.

If the book is playing, pressing the **Bookmark** button when the reading position is within 5 seconds of an existing bookmark will remove it. If not playing, the reading position must be exactly at the existing bookmark to remove it.

3.2 Player Controls Using Assistive Technology Devices

The player has a second USB host port that may be used to control the player remotely. Assistive Technology (AT) devices acting as a keyboard or a gamepad can be used to operate the player like the integral keypad. The AT device can be configured to map its keys to each of the player's own keys (with the exception of the Power button). This mapping is performed through a learning mode. The regular controls are still active when an AT device is connected, thus the player can be controlled by either the integral keypad or the AT device.

3.2.1 Default AT Device Assignments

If a control has not been assigned through the learning process then the player controls will be mapped to default buttons on a keyboard or gamepad USB human interface device. These default assignments are shown in the table below.

Player control	Keyboard button (Numeric keypad)	Gamepad button
Play/ Stop	0	1
Sleep	. (decimal point)	2
Volume Up	8	3
Volume Down	2	4
Rewind	4	5
Fast Forward	6	6
Speed Up	9	7
Speed Down	3	8
Tone Up	7	9
Tone Down	1	10
Bookmark	/ (slash)	11
Menu	*	12
Previous	- (minus)	13
Next	+	14
Info	5	15

3.2.2 AT Device Learning Mode

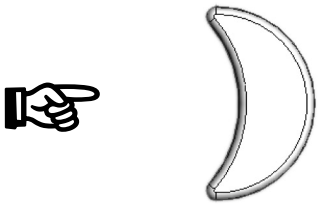
The player can be instructed as to which controls on the AT device are to operate particular player functions. This assignment is performed through a learning process.

Entering AT Device Learning Mode

Connect the AT device to the USB port on the side of the player.

To enter the learning mode press and hold the Sleep button for 5 seconds **while in Key Describer mode** (the player is on but has no cartridge inserted). An **AT device must be connected** to the player in order to enter learning mode. If no AT device is found, the message **"No remote control device found. Ensure your remote control device is connected before entering learning mode"** is played. The player then returns to Key Describer mode.

Press and hold for 5 seconds

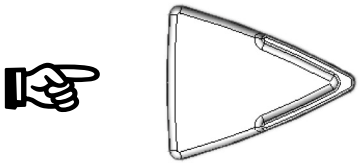


Sleep

Initiating AT Learning Sequence

Audio prompts will lead the user through the learning sequence. The first prompt asks the user to press the **Fast Forward button to start** the learning process or **the Power button to exit**.

then press



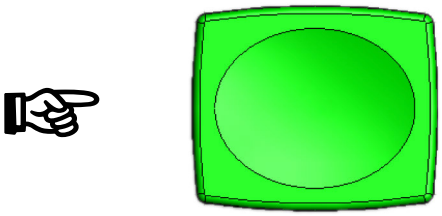
FF

Assigning Player Functions to the AT Device Buttons.

Player controls are assigned by first pressing the button on the player then pressing the control on the AT device that is to be assigned that function.

This is repeated for all controls to be assigned.

Press the player button to be assigned *(example: Play)*



Play

then

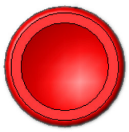
Press the control on the AT device to be assigned

Exit AT Learning Sequence

Press the Power button to exit the learning mode.

If an assignment has been started but not completed, pressing the Power button will cancel the assignment. The player will remain in AT learning mode.

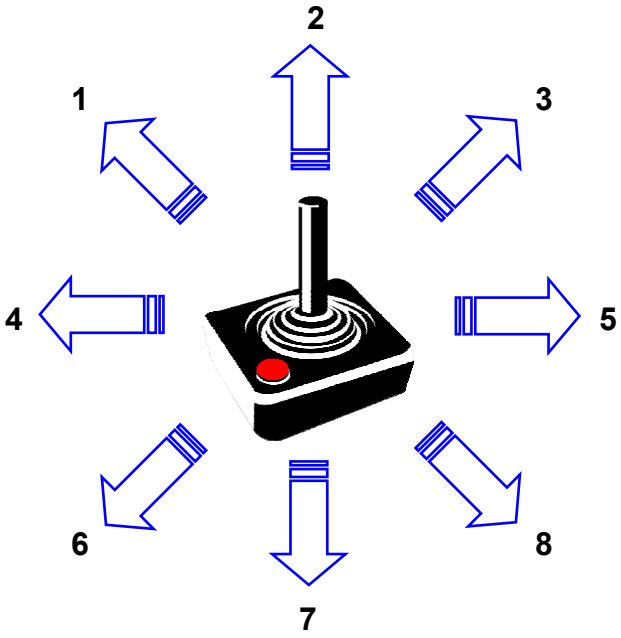
Press to exit



Power

3.2.3 USB Joystick

Patrons with physical disabilities may find it simpler to move a joystick than to press a button. The two-axis (x,y) USB joystick of a gamepad can be used to control the player. Movements of the joystick to the top-left, top-center, top-right, left, right, bottom-left, bottom-center, and bottom-right positions can be assigned to player controls using the learning mode. (Refer to diagram below.) There are no default assignments for these joystick movements.



4 Special Features for Libraries and Technicians

This section describes the different levels of error reporting and diagnostics available to personnel involved in lending and servicing players. There are four service levels available:

- Library level is intended for use by librarians, technicians and service center personnel.
  Control is through the keypad buttons and messages are rendered as audio.
  ***Note:** Patrons may hear Level 1 error announcements when problems occur.*
- Technician level is intended for use by librarians, technicians, and service center personnel.
  Control is through keypad buttons and messages are rendered as audio.
- Technician Plus level is intended for use by technicians and service center personnel.
  Control is through a computer connected through the AT USB port and messages are displayed on the computer screen.
- Developer level is intended for Service Center personnel.
  Control is through a computer connected through the internal serial port and messages are displayed on the computer screen.

Descriptions of how to access and use each service level are provided in this section.

General Procedures

Hard Reset

If the player stops responding to commands it may be necessary to perform a hard reset to restart the player. To perform a hard reset, press and **hold the Power button** until a beep is heard (more than **7 seconds**).

The player will reboot. A hard reset can be performed whether the player is plugged in or not, or if a cartridge is inserted or not.

A hard reset should not be necessary under normal circumstances.

Note: A hard reset will **not** erase any bookmarks or stored diagnostic information.

Press for more than 7 seconds

Power

Obtaining Player Serial Number and Software Version Number with Keypad

The serial number and the version of software currently installed on a player can be obtained without entering a diagnostic level. Press the **Sleep** key **10 times** or more within 1minute, without the presence of a book cartridge, and the player will announce both the serial number and the installed software version number.

press 10 times

Sleep

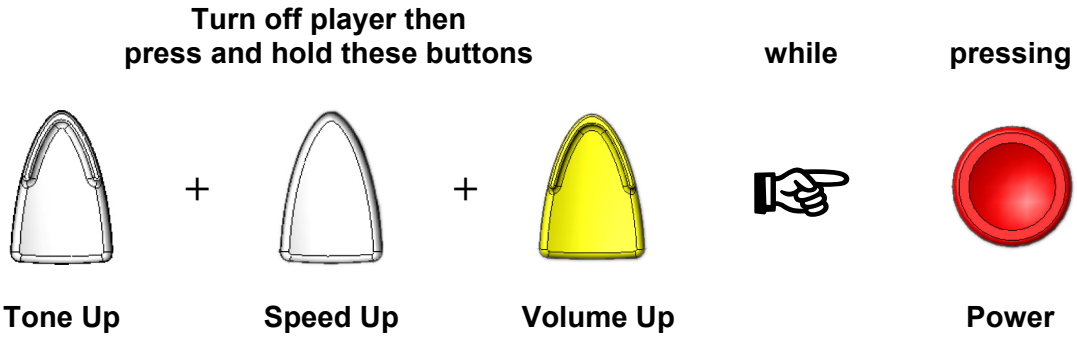
Reset to Factory Default User Settings

Resetting the player to factory default user settings:

- Erases the saved current position of the books history.
- Erases all bookmarks.
- Restores the default values for the volume, tone, and speed settings.
- Sets the machine language to English.
- Erases the history of button presses.

Battery statistics are **not** effected.

To reset the player to factory default user settings is done by turning the player on while the Tone Up, Speed Up and Volume Up buttons are pressed.



The message "Creating new profile" is played to confirm the operation has been performed successfully and the profile data in the volatile memory has been reset. **The player must then be powered off normally to save the newly blanked profile data to non-volatile memory.**

Memory Test

To enter the different service levels described in this section, the player RAM memory needs to be functional. To ensure that the player's memory is functional, a memory test is automatically executed upon entering any service level.

This step will take a several seconds during which time the player will not make any sounds or announcements.

If the memory test succeeds, the player will proceed to the selected service level.

If the memory is nonfunctional, the player will attempt to make a "beep" sound for 5 seconds before shutting down at Library, Technician and Technician Plus levels. At Developer level, a memory test failure will be reported through a text message on the PC display. If the audio is not operational or if the memory is too damaged, users will not receive any feedback. In this event, the player will need to be evaluated for disposition to a service center.

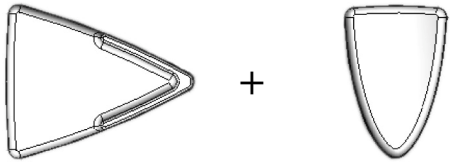
Changing Level of Verbosity

The verbosity of the player's announcements can be modified. In the **reduced verbosity** configuration the following messages are not rendered:

- the initial "forward" or "back" message in response to the user pressing the **Rewind** or **Fast Forward** buttons.
- the tone, volume and speed up/down messages in response to users pressing the controls while the book is playing. *Note: This is the default behavior of the DA; it is only a change in behavior of the DS1.*

To configure the player for **reduced verbosity** press the Rewind and Speed Up buttons simultaneously for three seconds, when the player is in "Key Describer Mode." (no cartridge inserted)

Reduced Verbosity: With no cartridge inserted, press (simultaneously) and hold these buttons for 2 seconds

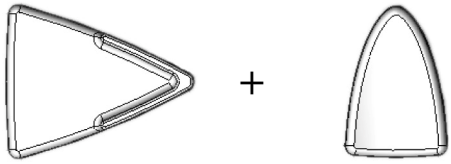


Fast Forward + **Speed Down**

The message "Reduced Verbosity" confirms the operation has been performed successfully.

To return the player to **normal verbosity** press the Fast Forward and Speed Up simultaneously for three seconds, when the player is in "Key Describer Mode" (no cartridge inserted).

Normal Verbosity: With no cartridge inserted, press (simultaneously) and hold these buttons for 2 seconds



Fast Forward + **Speed Up**

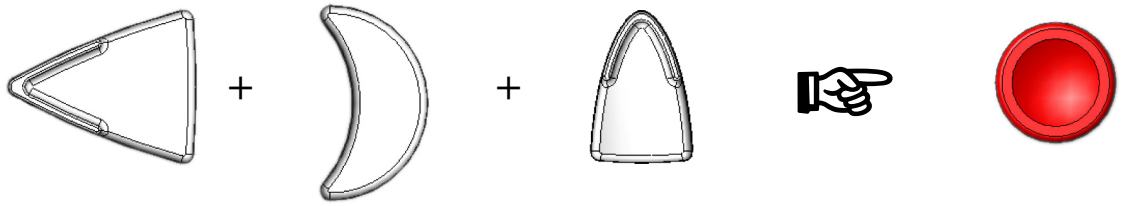
The message "Normal Verbosity" confirms the operation has been performed successfully.

4.1 Library Service Operations *(via Keypad)*

The Library Service level is accessed using only the keypad, with prompts and results rendered as audio announcements. Library-level errors are announced at the time they occur and are recorded for later analysis. Patrons may hear library-level error messages when they occur.

To enter the Library Service level:

Turn off player then press and hold these buttons **while** **pressing**



Rewind **Sleep** **Tone Up** **Power**

To exit the Library Service level:

1. Power off the player, or to exit and erase the errors, hold the Sleep button down for 5 seconds.

Errors may occur in the normal course of operating the player causing a descriptive message to be played regarding the nature of the error detected. Player subsystems generating error messages are:

- **Cartridge**: Problem with the main USB Port (over-current), unreadable cartridge, any cartridge playback problem under normal conditions, or an unsupported USB device at the cartridge USB port.

Note: *Cartridge errors can occur if a cartridge is removed while playing a book. This error is benign and can be ignored.*

- **AT Device**: Problem with AT device port (over-current), unreadable cartridge, any cartridge playback problem under normal conditions, or unsupported USB device at the AT USB port.
- **Power**: Problems related to a bad battery or battery recharge
- **System**: Writing problem related to the internal flash memory during a software upgrade.

These errors will be reported with audio announcement of the type *«components»+status*. It is expected that patrons encountering a recurring and persistent status "error" during use will seek technical support from the appropriate lending institution.

Possible audio announcements indicating a problem are **"Cartridge Error"**, **"AT Device Error"**, **"Power Error,"** and **"System Error."**

The occurrence of an error of each type is recorded in the player's memory and can be retrieved in either Library or Technician Service level (menu item: Player Status).

Depending on the severity of a system error, **the system may not be able to save the information related to the problem in the player's memory**. Minimal information from the internal flash memory must be read to execute this service level. If a system error is announced, the player should be evaluated for disposition.

It should be noted that Cartridge and AT device errors could be caused by a cartridge or device not connected to the player when the status information is given. The information is saved for later analysis when the errors actually occur.

4.1.1 Library-Level Service Message Retrieval

Library service functions enable the playback of error messages that have been recorded in the player's memory. This functionality is expected to be useful for telephone support where librarians may be able to instruct patrons on how to cause error messages to be announced. By holding the telephone microphone near the player speaker, the librarian can hear the error codes and discuss the recent history of the player with the patron to try to establish what caused the error and the appropriate action to take.

The player must be turned off prior to activating the Library service level. To activate the Library service level, press and hold the **Rewind**, **Sleep** and **Tone Up** keys and then press the **Power** key.

When the Library service level is entered, the following steps and announcements occur:

1. **Power On beep:** The player boots, and the memory test is performed. This step may take a few moments.
2. Audio Announcement "**Player Status**"
3. Audio Announcement "**Cartridge OK"** or **"Cartridge Error**"
4. Audio Announcement "**AT Device OK"** or **"AT Device Error**"
5. Audio Announcement "**Power OK"** or **"Power Error"**
6. Audio Announcement "**System OK** or **"System Error**"

The five audio announcements listed above are repeated in a loop until the **Power** key is pressed or the **Sleep** key is pressed and held for 5 seconds.

Pressing the **Sleep** key and holding it for at least 5 seconds will cause the player to exit the Library service level, erase errors from memory, and turn off.

Pressing the **Power** key and holding for at least 2 seconds will cause the player to exit the Library service level and turn off. Errors are NOT erased from memory. The error messages can be replayed at a later time by returning to the Library service level.

Functioning audio on the player is needed for the Library service level to be used. If no sound is audible try the following steps to restore audio:

- Increase the volume level.
- Reset the player by holding the Power button down for 7 seconds (until a beep is heard).
- Try the use of headphones (it is possible that the speaker audio has failed but the headphone audio is functioning normally).

If these efforts fail, the player requires service.

Announcement	What the Announcement Means
Cartridge OK	The player has not recorded any error codes related to book cartridges.
Cartridge Error	An error event occurred related to a cartridge (or other device) plugged into the Cartridge USB socket. The player was unable to read it, but it was able to detect that a USB device had been plugged in. ***Troubleshooting:*** ***Note:*** *Cartridge errors can occur if a cartridge is removed while playing a book. This error is benign and can be ignored. Cartridge errors are significant only if they are persistent and repeatable.* *[first exit the Library service level (hold sleep button for 5 seconds)]* Try another cartridge: • If it works, return the bad cartridge to the library. • If several cartridges fail, the player should be returned to the library for service.

Announcement	What the Announcement Means
AT Device OK	The player has not recorded any error codes related to the AT Device.
AT Device Error	An error event occurred when a USB device was plugged into the AT Device receptacle. The player was unable to recognize it as a supported device, but it was able to detect that a USB device had been plugged in. ***Troubleshooting:*** *[first exit the Library service level (hold sleep button for 5 seconds)]* ***Note:*** *AT Device errors can occur if an AT device or USB flash drive is removed while playing a book. This error is benign and can be ignored.* If the AT device or USB flash drive that caused the error will not work correctly with the player, perform the following steps: **1. Is a detection "beep" heard when plugging a device into the port?** **a) No**, a device was not detected by the player. ⇒ Perform same test with an AT device or USB flash drive that is known to be functional. If detection beep is not heard there is a problem with the AT USB port. The player should be returned to the library for service. **b) Yes**, a USB device has been detected by the player. ⇒ Continue with step 2. **2. Is the device that is plugged into AT device port supported by the player?** **a) No**, not supported or unsure. ⇒ If unsupported, the device cannot be used with the player. ⇒ AT Device or USB flash drive may be faulty: • Test the AT device port with a supported device known to be functional. **b) Yes**, supported devices are USB flash-memory drives or AT devices (implemented as keyboard or gamepad USB human-interface devices). ⇒ Continue with step 3.

Announcement	What the Announcement Means
	3. In the case of a **USB flash memory drive**, files contained must be in main directory. The drive may contain a NISO/DAISY/CEA book or individual audio files. Audio files must be in 3GP, MP3, or WAV format (ex: 57739-0003.3gp, 57833-0004.mp3 or P010.wav). **Is the cartridge content valid?** **a) Yes**, the USB flash drive contents are valid. ⇒ Try a USB flash drive that is known to work correctly. ⇒ Redo tests by erasing all files, reformatting and copying a single 3GP, MP3, or WAV file on the USB flash drive. • If the player is able to read file, the USB flash drive and player are in proper working order. The problem resides with the contents of the cartridge. • If player is unable to read the file, the player should be returned to the library for service. **b) No**, cartridge contents are not valid. ⇒ The player is working correctly but cannot be used to play the material. **4.** In the case of an **AT Device**, redo preceding tests with cartridge or other AT Device supported by the player to validate proper functioning of AT device port.

Announcement	What the Announcement Means
Power OK	The player has not recorded any error codes related to the battery or the battery recharge.
Power Error	Detection of a bad battery. A critical fault occurred when trying to recharge the battery. ***Troubleshooting:*** Battery pack may have faulty cell(s) or the player's battery charger may have a problem. ⇒ The player should be returned to the library for servicing.

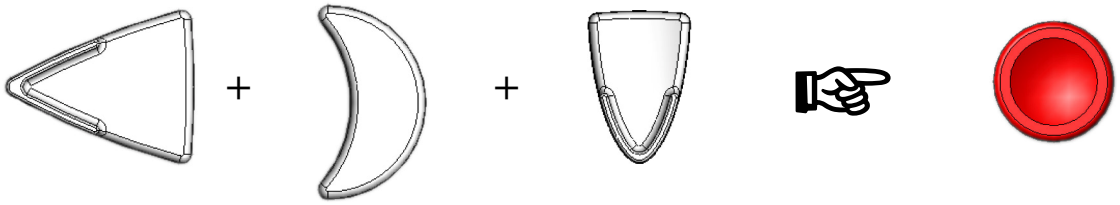
System Announcement	What the Announcement Means
System OK	The player has not recorded any error codes related to the RAM or flash memory.
System Error	The player has detected an internal error. If this error is persistent the player should be forwarded to an NLS service center. This error is generated if a player runs out of memory or when an error writing to the flash memory has been detected during a software upgrade. ***Troubleshooting:*** If the player does not function correctly **and this error is persistent**, it must be returned to an NLS service center for repair.

4.2 Technician Service Operations *(via Keypad)*

The Technician service level is accessed using only the keypad, with prompts and results rendered as audio announcements. There are two methods to enter the Technician service level. The first is by holding the Rewind, Sleep and Tone Down buttons while turning the player on by pressing the Power button. The second method is to use a USB flash cartridge containing a file named options.xml that contains the directive to do this.

To enter the Technician service level:

Turn off player then press and hold these buttons **while** **pressing**



Rewind **Sleep** **Tone Down** **Power**

or

Insert a USB cartridge containing the file 'options.xml' containing:

```
<?xml version="1.0" encoding="utf-8"?>
<dtbm xmlns="http://www.loc.gov/nls/DTBM">
    <directive>
        <InitialMode value="Service2" />
    </directive>
</dtbm>
```

To exit the Technician Service level:

Power off the player.

4.2.1 Introduction

The Technician service level is intended primarily for use by librarians and technicians. At this level, access to an audio interactive menu is provided to check the current condition of the player's systems, read accumulated usage statistics, and adjust various settings.

Functioning audio on the player is needed to use the Technician service level.

A series of functions are available from a menu that it is entered with a special key combination at start-up.

4.2.2 Accessing and Navigating Using the Keypad

Press **FF** or **Rewind** key to cycle through the Main Menu until you reach the submenu of your choice. Press **Play/Stop** to enter a submenu. Use the **FF** or **Rewind** key to cycle through the commands within a submenu. Press the **Play/Stop** to execute a command within the sub-menu.

A graphic illustration of menu navigation is provided in section 4.2.3.

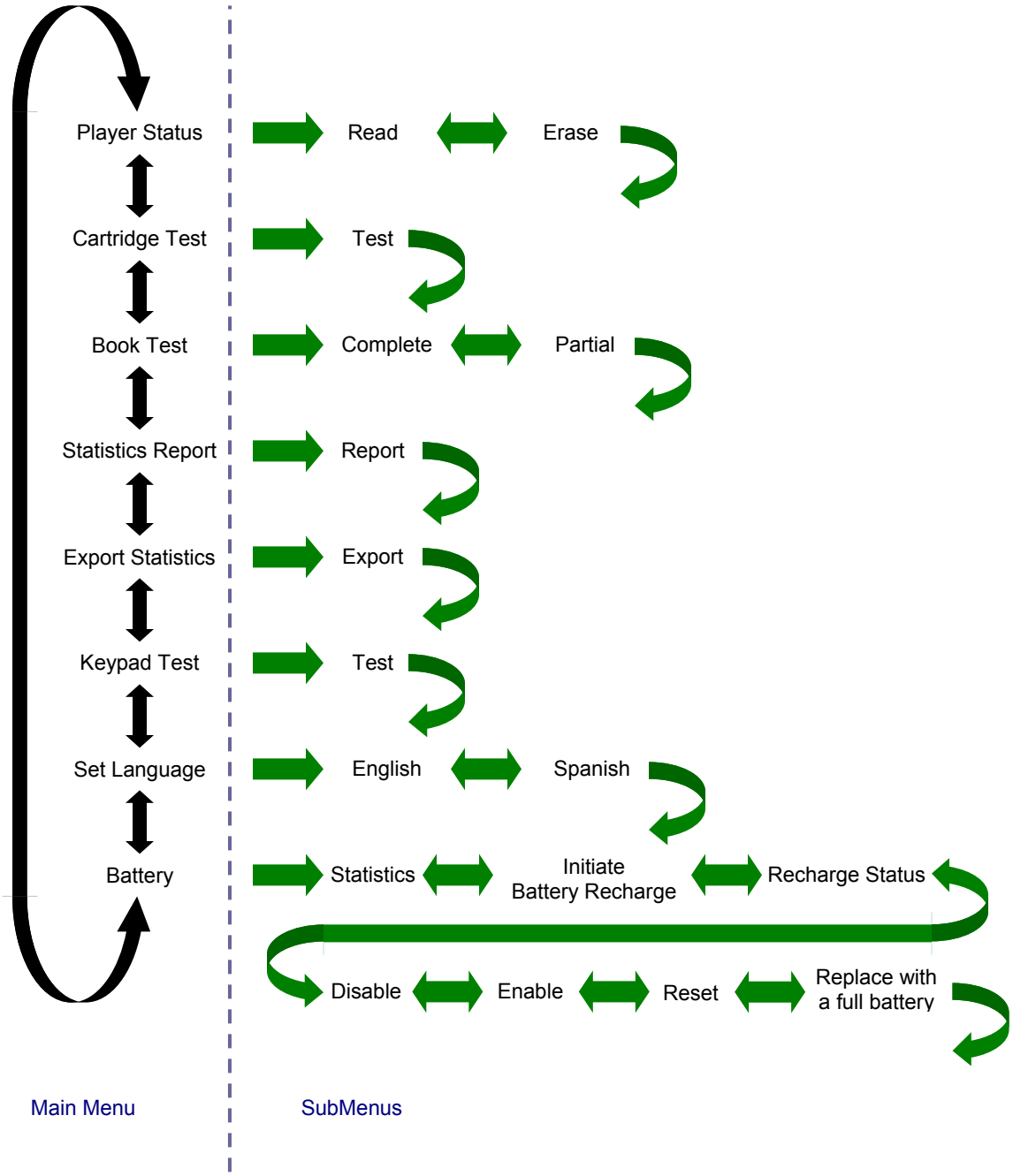
When the Tecnician service level is entered, the player announces the following information:

- **Power On beep**: The player is booting, memory test is performed. This step may take a few moments.
- **Audio Message**: "Player On"
- **Audio Message:** "Player Status"

As noted in section 3, if the player is unable to enter the Technician service level, it should be evaluated for service.

Exit the Technician service level by powering off the player.

4.2.3 Technician Service Level Menu Items



- Use the **RW** and **FF** to select a **Main Menu** item.
  - Press **Play** to enter the **Submenu** for the **Command**.
- Use the **RW** and **FF** to select a **Command** within the **SubMenus**.
  - Press **Play** to execute a **Command**.

Player Status

Player error messages stored in player memory

Commands

Read

The player reports the errors saved in the internal memory of the player. At the end of the report the player returns to the current menu item.

Response

The player reports the errors. See section **4.1.1** for details.

Followed by the current menu item "**Player Status.**"

Erase

Erase the current errors stored in the internal memory of the player.

Response

The player announces "**Press Play/Stop to confirm or any other key to cancel.**"

Pressing Play/Stop:
The player announces "**Player Information has been erased from the internal memory.**"

If any other button is pressed :
The player announces "**Cancel.**"

The player then announces the current menu item "**Player Status**."

Cartridge Test

Verification of cartridge file system integrity (clusters). This test can be done on the cartridge port or the AT device port. If no cartridge is present, the test is stopped. If a cartridge is present, the test is launched. If the cartridge's file system integrity is compromised, the test will return an error announcement. If two cartridges are present (on both the cartridge and AT device ports) when the test is started, only the one found on the cartridge port will be analyzed.

Command

Test

Response

If the test is successful, the player announces **"Cartridge OK."**

If no cartridge is present, the player announces **"No Cartridge."**

If the cartridge's file system integrity is compromised, the player announces **"Cartridge Error."**

The player then announces the current menu item **"Cartridge Test."**

Book Test

Problems with a player may sometimes be due to a faulty book structure. This test can be helpful to validate the structure of a book.

This test will only work with DAISY 2.02 and NISO books. This test includes only the validation of the book information needed to play the book. This is not meant as a complete NISO validation, and some book information not required to play the book is not analyzed.

During the test, progress information is played in the form of **"**Heading X" where "X" is the current SMIL heading.

If an error is encountered, along with the standard error announcement, the heading number will be repeated and the test will abort.

At the end of a book test, the player goes to Key Describer mode (as if no book were inserted in the player) and waits for either the insertion of a new book to test or the press of the Power button to quit the book test.
The only way to exit the book test is to power off the player.

Commands

Complete

The audio files are decoded but audio is not played. This is a long test that can be used to validate a whole book, including format. Audio feedback is provided during the book test in the form of periodic beeps.

Response

If the test is successful, the player announces **"Book OK.**"

If an error occurs, the player announces **"Book Error.**"
"Heading X."

Where:
X = SMIL Heading number

Partial

The structure of the book is tested but audio files are not decoded. This is much faster than the first test but it will only detect book format errors since it will not validate the contents of the audio files.

Response

If the test is successful, the player announces **"Book OK.**"

If an error occurs, the player announces **"Book Error.**"
"Heading X."

Where:

X = Spine Heading Number

Statistics Report

List of different statistics saved by the player.
Refer to the Statistics Table in the Appendix.

Note: Information about the following items is not rendered:
- Number of Key Exchanges Object
- Key Exchange Object name list
- Last Service Date
- Service Comments

Commands	Report
Response	The player announces the **"Item X, Y"** (Repeat for each item in the list). Where: "X" is an assigned number for each statistic. "Y" is the actual value for that statistic. The player then announces the current menu item **"Statistics Report."**

Export Statistics

Export statistics are saved by the player in a text file.

To export statistics, insert a USB memory stick in the player's AT-device port.
Note: No cartridge may be inserted in the cartridge port when exporting statistics.
Statistics will be saved in an ASCII file that can be viewed with text editor on a PC. The file name will be the player's serial number.

Command	Export
Response	If a USB flash memory stick is detected on the AT-device port, the player announces **"Exporting Statistics"**. When the file is transferred, the player announces **"Statistics Exported."** If a writable USB memory stick is not detected on the AT-device port, the player announces "**Unable to export statistics; insert a USB memory stick in the player's AT device port.**" The player then announces the current menu item **"Export Statistics."**

Keypad Test

The Keypad test works like the key describer, except that only short announcements will be reported so the tester doesn't get bored or disturbed by long repetitive messages. This test will terminate if no key is pressed for 5 seconds. Note that it is possible to test all supported Human Interface Devices (HID) (not just Keypad) connected to the AT-device port. However, this device will need to act like a keyboard or gamepad.

Command

Test

Response

Depending on the key press, the player will announce the following messages:

- "**Tone Up**"
- "**Tone Down**"
- "**Speed Up**"
- "**Speed Down**"
- "**Volume Up**"
- "**Volume Down**"
- "**Info**"
- "**Previous**"
- "**Menu**"
- "**Next**"
- "**Power**"
- "**Sleep**"
- "**Rewind**"
- "**Play/Stop**"
- "**Fast Forward**"

After 5 seconds of inactivity, the player exits this option.

The player then announces the current menu item **"Keypad Test."**

Set Language

Switch the default language of the player to English or Spanish.

Commands

English

Switch the default language to English.

Response

The player announces "**Default language, English.**"

The player then announces the current menu item **"Set language."**

Spanish

Switch the default language to Spanish.

Response

The player announces "**Default language, Spanish.**"

The player then announces the current menu item **"Set language."**

Battery

Battery Settings and Statistics

Note: There may be a delay in the proper update of the battery status information, namely after adding, removing, plugging, unplugging or resetting a battery, after plugging or unplugging the player and also after initiating a manual recharge. Some extreme scenarios may require 5 minutes to produce the expected status annoucement. If you get unexpected results, retry another battery status 5 minutes later to confirm the results.

Commands

Statistics

Report the number of battery charge cycles for the current battery and the current software version.

Response

The player announces **"**Number of battery charge cycle X", **"**Version Y."

Where

X is number of battery recharges = number of times the current battery has been recharged (less than 25 percent + between 25 percent and 50 percent + between 50 percent and 75 percent + between 75 percent and 100 percent)

Y is the current software version number of the player.

The player then announces the current menu item **"**Battery."

Initiate Battery Recharge

Initiate a battery recharge. The player launches its recharging mechanism.

Note: It takes at least 5 seconds before the status is updated. If the status is queried before that 5 second delay elapses, the result will be inaccurate.

Response

The player announces **"Recharge initiated."**

The player then announces the current menu item **"Battery."**

Recharge Status

Determine battery state.

Response

If the battery is not detected, the player announces **"Battery not detected."**

If the battery recharge is in progress, the player announces **"Battery recharge in progress."**

If the battery recharge is completed, the player announces **"Battery recharge completed."**

If any other problem is detected the player will announce "**Power Error.**"

The player then announces the current menu item **"Battery."**

Commands

Disable

Set the player to be used without a battery.

If the player is to be used without a battery, and this option is set, error messages related to battery-charge state are not reported to the patron.

Note: Selecting this option, even if a battery is present, will not damage the player. However, the player's volatile memory will be shortened as a result.

Response

The player announces **"Battery disabled."**

The player then announces the current menu item **"Battery."**

Enable

Set the player to be used with a battery. (normal state)

When the player has a battery installed, enabling this option will enable reporting of battery condition to the patron.

Do not unplug the player when operating without battery. Certain parameters could be lost if the player is unplugged without powering off. The player could also report false error announcements (low battery for example).

Response

The player announces **"Battery enabled."**

The player then announces the current menu item **"Battery."**

Reset

This option resets all the battery statistics relative to the current Battery Pack.

Response

The player announces **"Battery statistics for the current battery has been erased from the internal memory."**

The player then announces the current menu item "**Battery.**"

Replace with Full Battery.

This option resets all the battery statistics relative to the current Battery Pack and advises the player that a fully charged battery has been inserted in the player.

Note: It takes at least 5 seconds before the status is updated. If the status is queried before that 5-second delay elapses, the result will be inaccurate.

Response

The player announces "**Battery statistics for the current battery has been erased from the internal memory.**"

The player then announces the current menu item "**Battery.**"

4.3 Player Configuration and Operation with an XML file

It is possible to automate some configuration and service operations of the player by using an XML file containing one or more text instructions. The player will examine this file, called `options.xml`, if present in top most (root) directory of the cartridge or USB drive. The file has two parts. The first is the configuration section which contains the commands that set non–volatile settings such as the language or verbosity. The other section contains one time directives such as clearing the book profile or exporting the statistics to the USB drive.

Example of an 'options.xml' file used to setup a player prior to distribution to a patron

`<?xml version="1.0" encoding="utf-8"?>`	
`<dtbm xmlns="http://www.loc.gov/nls/DTBM">`	
`  <configuration>`	
`  <Language value="spanish" />`	Set the player to Spanish
`  <Verbosity value="normal" />`	Set the verbosity to normal
`  </configuration>`	
`  <directive>`	
`  <ResetProfile value="all" />`	Clear the bookmarks, last marks & keys
`  <BatteryLife />`	Report the battery condition & software version
`  <ExportStatistics />`	Save the accumulated player data to USB drive
`  <Off />`	Turn off the player
`  </directive>`	
`</dtbm>`	

Configuration elements in 'options.xml'

Tag	Value	Effect
`Language`	`English, Spanish, Inglese, Espaniol`	Change the language setting of the player if different from current configuration.
`Verbosity`	`Normal, Reduced`	Change the verbosity setting of the player if different from current configuration.

Directive elements in 'options.xml'

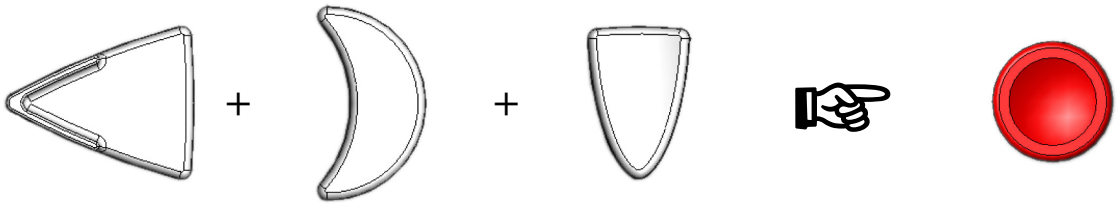
Tag	Value	Effect
`AGC`	`On, Off, Default`	Explicitly enable or disable AGC
`InitialMode`	`Normal, Service2, Service3`	Change the mode to the technician or technician plus service level or leave in normal mode.
`ResetProfile`	`Profile, Keys, All`	Clear the bookmarks/lastmarks and/or the user added PDTB1 and PDTB2 keys.
`BatteryLife`		Announce the current charge state, number of charges for this battery and the software version.
`ExportStatistics`		Save the accumulated statistical data on the player to a file on the USB drive.
`ExportKey`		Save the player's public instance key to the USB drive.
`Off`		Turn the player off after acting on these directives.

4.4 Technician Plus Sevice Operation *(via USB port)*

The Technician Plus service level uses a text based interface from a computer or terminal. The computer is connected to the player's USB AT-device port via a USB to USB null modem cable or a USB to a serial interface cable depending upon the interfaces provided on the computer. There are several methods to access the Technician service level.

1. To enter the Technician Plus service level unconditionally:

Turn off player then press and hold these buttons **while** **pressing**

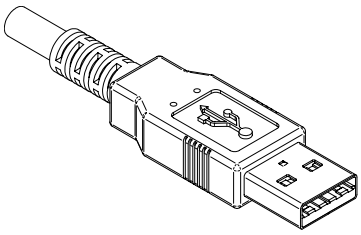


Rewind **Sleep** **Speed Down** **Power**

OR

2. To enter the Technician Plus service level if no cartridge is in the player:

Connect the USB null modem or USB serial cable **then** **press**

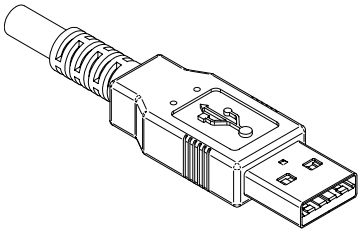


Power

OR

3. To enter the Technician Plus service level if a cartridge in the player:

Connect the USB null modem or USB serial cable **then** **press**



USB cartridge contains the file 'options.xml' **Power**

```
<?xml version="1.0" encoding="utf-8"?>
<dtbm xmlns="http://www.loc.gov/nls/DTBM">
    <configuration >
        <InitialMode value="Service3" />
    </configuration>
</dtbm>
```

To exit the Technician Plus service level:

Type "user" or power off the player.

The Technician Plus service level, accessed by a computer, provides some enhanced functionality over the Library level. Technicians utilizing this level must be familiar with using a terminal emulator program on a computer. The Technician level also includes functionality that is likely to be of use to service center personnel who have more extensive knowledge of the player.

Because USB management occurs at the operating system level, a significant portion of the player needs to be operational to operate at this service level. Commands found in the Technician Plus service level are in fact a subset of those found in the Developer service level.

The Technician Plus service level provides more information about causes of error messages than the Library or Technician levels. A listing of error messages and causes is provided in section 11, Appendix. Also, the Technician Plus service level enables the technician to enter service information into the player's memory and to review previously entered service history notes.

4.4.1 Equipment Needed

To use the Technician Plus service level you require:

- a computer or terminal
- a terminal emulator program (HyperTerminal or ZOC for example)
- either a USB to USB null modem cable or a USB to serial cable together with a null modem adapter. Only cables using the USB to serial device manufactured by Future Technology Devices International (FTDI) are compatible with the DTBM. A list of vendors of USB-Serial adapters with the FTDI chip is provided in Section 11 Appendix.
- installation of the drivers on the computer for the FTDI USB null modem cable or USB to serial cable.

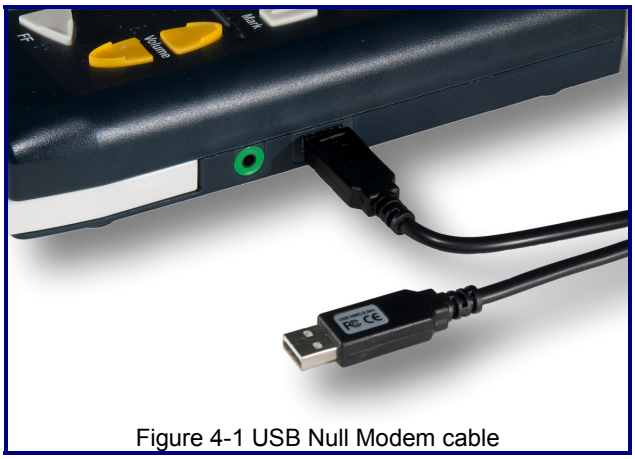


Figure 4-1 USB Null Modem cable

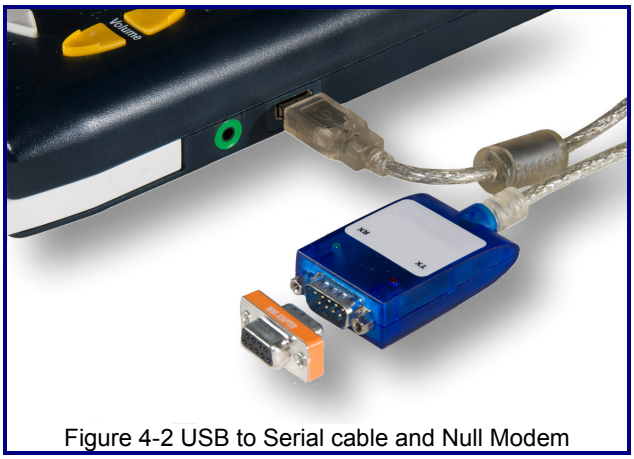


Figure 4-2 USB to Serial cable and Null Modem

4.4.2 Player to PC Interconnection

Once the FTDI drivers are installed on the computer you may connect the DTBM to the computer. To connect the player to your computer:

1. Plug one end of the USB null modem cable to one of the computer's USB ports or if using the USB serial cable, the serial cable with null modem adapter to your computer's serial port.
2. Plug the USB serial connector on the other end of the cable into the DTBM (see Figure 4-1 and Figure 4-2).

4.4.3 Terminal or Terminal Emulator Set Up

After connecting the player to your computer, you will need to configure your terminal application (e.g. hyperterminal) to the following settings:

- The serial port or virtual serial port to which you connected the cable: COM1, COM2, COM3 etc
- Speed: 115200bps (bits per second)
- Data: 8bits, no parity, 1 stop bit
- No handshake (CTS/RTS)

Ensure the player is turned off..

There are three methods that may be used to enter the Technician Plus service level.

1. The simplest method is to remove the cartridge and with the USB cable connected to the player press the **Power** key.
   note: If a cartridge is inserted in the player upon power up, the Technician mode will not be entered and the cartridge will be played as normal. (see below for an exception if "options.xml" is present)

2. The second method is to press and hold **Rewind**, **Sleep**, and **Speed Down** keys, then press the **Power** key. You may have the USB cable connected to the player prior to turning the player on or may insert the cable after the key sequence has been pressed. In either case you will enter the Technician Plus service level.
3. a cartridge containing a file, in the root directory, called "options.xml" can be used to set the player into Technician Plus service level. The directive is in the form `<InitialMode value="Service3">.` With the cartridge containing the file inserted, press the **Power** key. If the USB cable is connected to the player, Technical Plus service level will be entered.

Upon entering the Technician Plus level the following information will appear on screen:

```
Manufactured for the Library of Congress by Shinano-Kenshi Corp., Ueda Japan
Contract: LCNLS08D0172
DTB application software by Humanware, Canada & The Library of Congress NLSBPH
Contract: GS23F0011L

Linux kernel 2.4.21 on Freescale Semiconductor iMX21

    Linux kernel: GNU public license  (http://gnu.org/licenses/gpl-2.0.txt)
         BusyBox: GNU public license
 MAD MP3 decoder: GNU public license
         OpenSSL: Open source license (http://openssl.org/source/license.html)
  AMRWB+ decoder: Licensed from Voiceage Corp.
 Time Scale Mod.: Licensed from Enounce Inc.
 DTB application: FAR 52.227-19 Commercial Computer Software (Restricted Rights)


Software Version: 1.1.69 (Feb 28 2009)
   Board version: 001
  i.MX21 chip ID: 0x600081AACDBC
          Player: DA1-0000560 Advanced
    Power Source: Battery

LoC DTB>
```

Figure 4-3. Level 3 Prompt on Terminal Program

The terminal application prompt will appear as: `LoC DTB>`
It is at this point that you enter the various commands available.

Note: To edit or delete a command, as you type it, you may only use the Backspace key.
You cannot use the mouse or the arrow keys to move the cursor.

This service level will allow you to:

- Retrieve information on the player (serial number, software version etc)
- Retrieve information on the battery condition and charging state
- Initiate or halt a battery recharge and configure the battery setup
- Obtain one or all of the stored statistical data.
- Test player's keypad functionality
  (AT-Device keypad cannot be tested with this command in this mode)
- Generate audio simple waveforms (sine, square and triangle) or a stepped sine sweep
- Play audio files from a cartridge at a defined level, tone and speed (without AGC)
- Enter new or read past service notes

4.4.4 List of Technician USB Commands Available

The commands may be entered in full or with shortcuts. In the following section shortcuts are indicated with parentheses. e.g the 'sine' command may optionally be shortened to 'si'.

batt (b)

Description: Obtain and modify battery parameters.
Usage: `batt (b) <command>`

`batt status (s)`:	Battery detection and recharge state (in progress, completed, etc.)
`batt recharge (re)`:	Start a recharge cycle
`Batt stop (sr)`:	Stop recharging
`Batt in (i)`:	Player used with battery
`Batt out (o)`:	Player used without battery
`Batt reset (rs)`:	Erase battery statistics related to current battery
`Batt full (f)`:	Erase battery statistics related to current battery and put in a full battery
`Batt statistics (st)`:	Print battery's statistics
`Batt hardware (hw)`:	Print gas gauge registers, charger hardware and software state

gain (ga)

Description: Used to test speaker amplifier.
Usage: `gain (ga) <X>`

Where X:
0 → 6dB
1 → 12dB
2 → 18dB
3 → 23.5dB

```
iMX21 USB NLS> gain 2
Speaker amplifier gain set to 2

iMX21 USB NLS>
```

Figure 4-4. gain

getser# (gs)

Description: Get the player serial number.
Usage: `getsernum`

```
iMX21 USB NLS> getsernum
Player S/N = DA1-1234567

iMX21 USB NLS>
```

Figure 4-5. GetSerNum

help (?)

Description: Help on Technician Plus level service commands.
Usage: `help (?) [command]`

```
iMX21 USB NLS> help getgernum
    GetSerNum: help
Description: Get the player serial number.
      Usage: GetSerNum
iMX21 USB NLS>
```

Figure 4-6. help

keypad (k)

Description: Keypad test (will exit after 5 seconds of inactivity.)
Usage: `keypad (k)`

maintenance (ma)

Description: Used to manage notes on repair history done on a player.
Usage: `maintenance (ma) <command>`

`maintenance add`:	Add a new note on the note list
`maintenance list`:	Shows the list of notes, title, and dates
`maintenance show <#id>`:	Show the given note item id number
`maintenance delete <#id>`:	Delete the given note item id number
`maintenance erase`:	Delete all notes in players

```
iMX21 USB NLS> maintenance list
                  --- List of Technical Notes ---

ID  DATE         TITLE
-------------------------------------------------------------
1  10-02-2007 Battery replacement.

iMX21 USB NLS>
```

Figure 4-7. maintenance list

nand (n)

Description: Scans flash memory and reports number of good and bad blocks.
(note that it is normal for the nand flash memory to have a small percentage of bad blocks and this does not necessarily indicate a problem)
Usage: `nand (n)`

off (o)

Description: Used to shutdown player when powered from battery. When using AC power, this has no effect.
Usage: `off (o)`

play (p)

Description: Play an audio file from the cartridge.
Usage: `play (p) file [volume (0 to 14) [tone (-4 to 6) [speed (-5 to 10)]`

reboot (re)

Description: Reboot the player. The player exits services mode.
Usage: `reboot (re)`

publickey (pk)

Description: Print the player's public instance key as a key exchange object (KXO).
Usage: `public key (pk)`

```
LoC DTB> pk

<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<!-- Library of Congress NLS/BPH Key Exchange Object -->

<KeyExchange xmlns="http://www.daisy.org/DRM/2005/KeyExchange"
             xmlns:ds="http://www.w3.org/2000/09/xmldsig#"
             xmlns:xe="http://www.w3.org/2001/04/xmldenc#">
  <Issuer uid="DAISY.us-nls">The Library of Congress NLS/BPH</Issuer>
  <ds:KeyInfo>
    <ds:KeyValue>
      <ds:RSAKeyValue>
        <ds:Modulus>AL8aJfbKnezYoG68UyHvWfpvyYwWEQJqCcRJoZfwWJ8YXs3AHTOr
mIiLof3+A5cP9npxC1d8gntIclGr6TF/Cpr4W3H5g2UJ6F3w8FW+
4ZsJxBVze1HKghJen9OinAu+uGJxqI8wvBT84izEPEqWEmwaIE5W
4Xu39mTQZ+21nHR7</ds:Modulus>
        <ds:Exponent>AQAB</ds:Exponent>
      </ds:RSAKeyValue>
    </ds:KeyValue>
    <ds:KeyName>DAISY.us-nls.instance-DA1-0000560</ds:KeyName>
  </ds:KeyInfo>
</KeyExchange>
```

pwbversion (pwb)

Description: Obtain print board version.
Usage: `pwbversion`

```
iMX21 USB NLS> pwb
Board Revision : 001
i.MX21 chip ID : 0x600081AACDBC

iMX21 USB NLS>
```

Figure 4-8. #

repeatcommand (r)

Description: Repeat last command.
Usage: `repeatcommand`

sine (si)

Description: Play a square sound waveform to test audio.
Usage: `sine [<frequency> [<duration> [<amp> (0-255)]]]`

```
iMX21 USB NLS> sine 2000 2 100
Play sine: freq = 2000 Hz, dur = 2 sec, amp = 100

iMX21 USB NLS>
```

Figure 4-9. sine

setser# (ss)

Description: Enter the player's serial number in the form `DA1-0000560`
The instance key corresponding to the serial number must be present on the cartridge inserted in the player. This key is a KXO file in the root directory or in the directory `InstanceKXO/DA1/XXXX000/` where `XXXX` is the serial number / 1000.
The KXO filename is of the form `DAISY.us-nls.instance-DA1-0000560`
The instance key can also be contained in a single CRAMFS file called `instance.kxo` located in the root directory.
Usage: `setser# (ss) <serial number>`

square (sq)

Description: Play a square sound waveform to test audio.
Usage: `square (sq) [<frequency> [<duration> [<amp>]]]`

```
iMX21 USB NLS> square (sq) 2000 2 100
Play square: freq = 2000 Hz, dur = 2 sec, amp = 100

iMX21 USB NLS>
```

Figure 4-10. square

sweep (sw)

Description: play a sine sweep from 100Hz to 10Khz.
Usage: `sweep (sw) [amp(0 - 255) ][repeat(0 (continuous)-n)]`
Default: `amp = 23 (equivalent to -21dB FS)`

statistic (st)

Description: Display the accumulated data.
Usage: `statistic (st) [ number 1-56 ]`

swversion (sv)

Description: Display the version of the software and user guide installed.
Usage: `swversion (sw)`

triangle (t)

Description: Play a triangle sound waveform to test audio.

Usage: `triangle [<frequency> [<duration> [<amp>]]]`

```
iMX21 USB NLS> triangle 2000 2 128
Play triangle: freq = 2000 Hz, dur = 1 sec, amp = 128

iMX21 USB NLS>
```

Figure 4-11. triangle

user (u)

Description: Exit technician plus service level and enter normal DTB operation.

Usage: `user (u)`

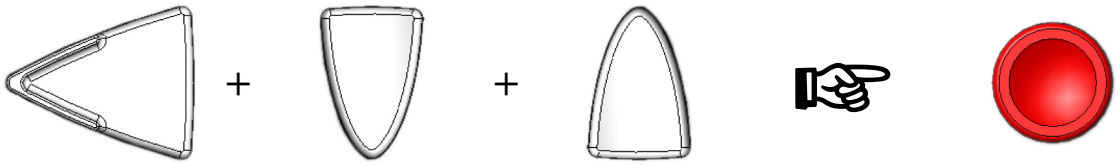
4.5 Developer Service Operations *(via internal serial port)*

The Developer service level is accessed using a computer connected, with a separate interface board and serial cable, to the player's internal serial port (an i.MX21 microprocessor subsystem). The prompts and results rendered as text on the computer terminal screen. This level is included to assist in board level servicing and software development. Minimal system resources and functionality are required for this program to run.

There are two ways to enter the Developer service level:

- If the serial/JTAG interface board has a jumper on pins 2 and 3 you will enter the Developer service level automatically when the player is powered on.
- or:

Turn off player then press and hold these buttons **while** **pressing**



Rewind **Sleep** **Speed Up** **Power**

When dots appear on the terminal screen, press Enter on the terminal keyboard

To exit the Developer service level:

Power off the player.

The Developer service level is intended for trained service center personnel and requires custom cabling and access to a computer. Use of the player serial interface requires direct connection to the circuit board inside the player. This service level will provide the maximum functionality; however, tests on USB ports are not possible as high level USB communication is managed by the kernel which is not executing in this mode.

When the application is running, the serial port will output diagnostic messages. Service center personnel can use these messages to analyze player problems.

The Developer service level is also used for software development. It requires a profound understanding of the design and material components. Commands listed at this level are only briefly described. Technicians and developers will need to refer to components' data sheets and PCB electric schematics in order to use commands.

Refer to the Service Center edition of this Service Manual for details of the Developer service level.

5 Materials

5.1 Tools and Equipment

Tools and Equipment Required for DTB Service
Hand Tools • 2.5 mm size hex wrench (battery access panel screws) • #1 Phillips head (internal fasteners) • T10 Torx driver (housing fasteners) • Small needle-nose pliers • Small diagonal-cutting pliers
Voltmeter (alternating and direct current)
Flashlight basic
Headphones or PC speaker system (with 3.5 mm stereo plug)
USB flash-memory device
Support pads and press tool

Optional Tools and Equipment
Flashlight high-intensity, adjustable light beam (spot to flood)
USB to serial adapter, 9-pin D NULL modem cable (connect PC to player at AT device port using USB to serial adapter) (See Section 4.4.1)
Personal Computer (serial or USB port required)

5.2 Cartridges

Cartridges Required for DTB Service
Test cartridge
Software upgrade cartridge - current software version (optional as required)

5.3 Repair Parts

See Appendix for a list of replacement parts for the digital talking book player.

6 Player Checkout Procedure

Use the following procedure that describes the sequence of inspections and tests required to checkout a player.

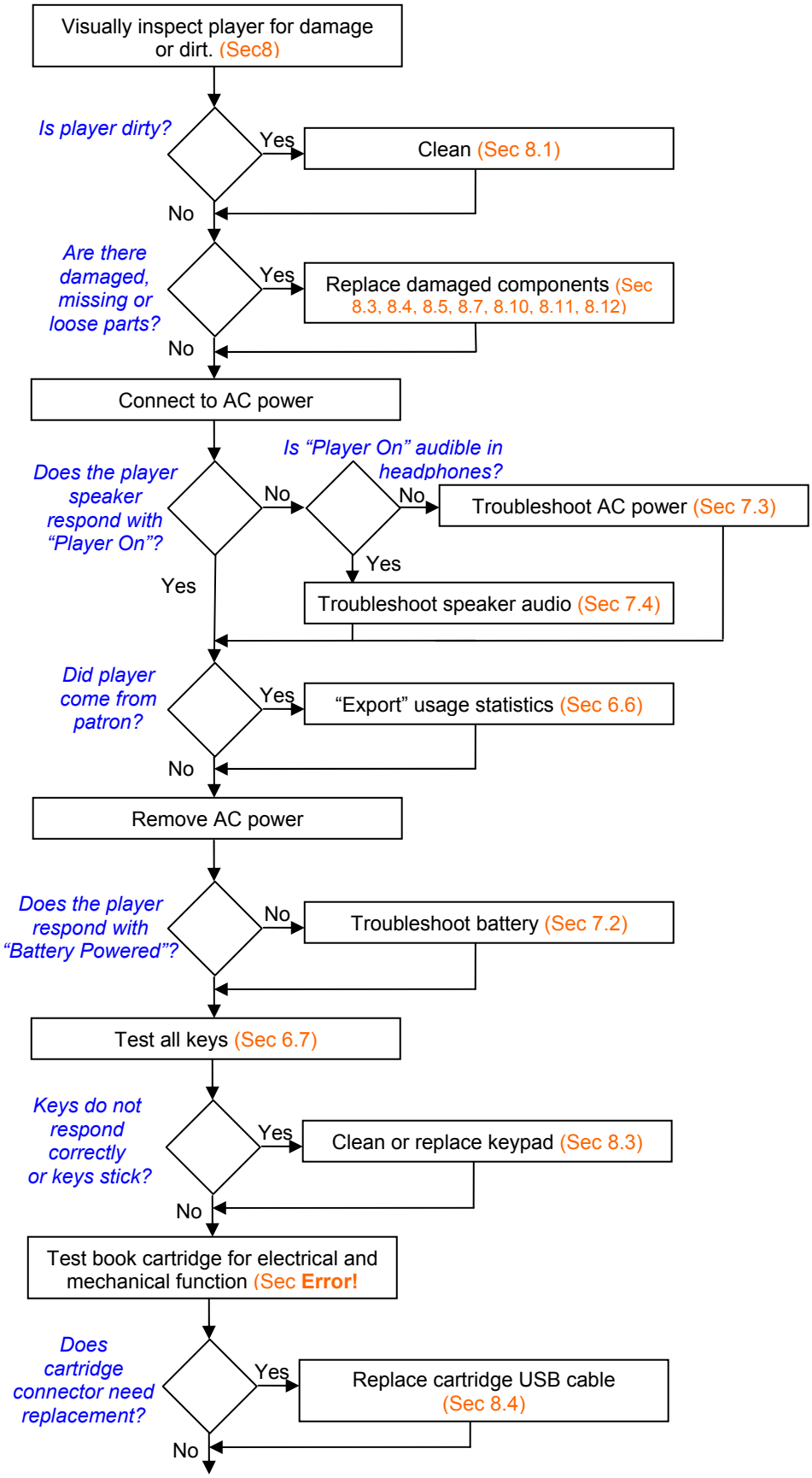
The **player is not opened** during this procedure, but it can be followed by a more detailed examination by a technician.

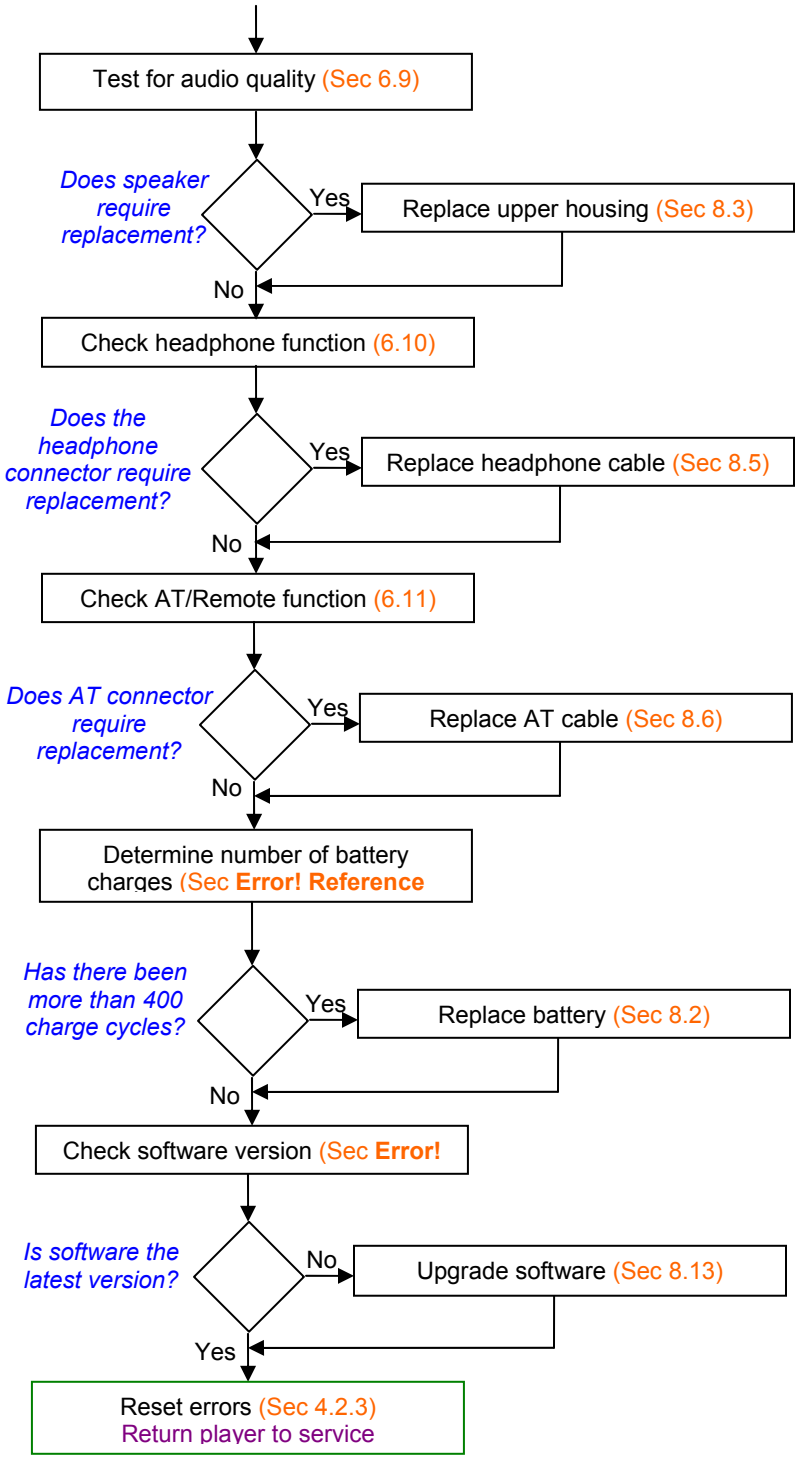
A Player Checkout Worksheet is provided in the Section **Error! Reference source not found.** Appendix.

Tools Needed
Flashlight
USB Flash Memory Device
Headphones or PC speaker system
Test Cartridge
2.5mm hex wrench

The procedure is designed to be completed using Library or Technician service level capabilities described in section 3.

Troubleshooting procedures that require the player to be opened are described in Section 7.1. Repair procedures are described in Section 7.7. References to applicable troubleshooting and repair procedures are provided in the Player Checkout Procedure.


Visually inspect player for damage or dirt. (Sec8)
Is player dirty?
Yes
Clean (Sec 8.1)
No
Are there damaged, missing or loose parts?
Yes
Replace damaged components (Sec 8.3, 8.4, 8.5, 8.7, 8.10, 8.11, 8.12)
No
Connect to AC power
Does the player speaker respond with "Player On"?
No
Is "Player On" audible in headphones?
No
Troubleshoot AC power (Sec 7.3)
Yes
Troubleshoot speaker audio (Sec 7.4)
Yes
Did player come from patron?
Yes
"Export" usage statistics (Sec 6.6)
No
Remove AC power
Does the player respond with "Battery Powered"?
No
Troubleshoot battery (Sec 7.2)
Test all keys (Sec 6.7)
Keys do not respond correctly or keys stick?
Yes
Clean or replace keypad (Sec 8.3)
No
Test book cartridge for electrical and mechanical function (Sec Error!
Does cartridge connector need replacement?
Yes
Replace cartridge USB cable (Sec 8.4)
No


Test for audio quality (Sec 6.9)
Does speaker require replacement?
Yes
Replace upper housing (Sec 8.3)
No
Check headphone function (6.10)
Does the headphone connector require replacement?
Yes
Replace headphone cable (Sec 8.5)
No
Check AT/Remote function (6.11)
Does AT connector require replacement?
Yes
Replace AT cable (Sec 8.6)
No
Determine number of battery charges (Sec Error! Reference
Has there been more than 400 charge cycles?
Yes
Replace battery (Sec 8.2)
No
Check software version (Sec Error!
Is software the latest version?
No
Upgrade software (Sec 8.13)
Yes
Reset errors (Sec 4.2.3)
Return player to service

6.1 General Inspection

Note: *If there are no serial number labels on the housing of the player, remove the book cartridge and press the sleep button 10 times within 1 minute. The player will announce the serial number along with the number of the software version.*

1. Record the serial number on the worksheet (see section **Error! Reference source not found.**).

2. Visually examine the player to identify problems listed below. A flashlight or other light source may be needed to examine the cartridge dock and AT device port. Indicate items for repair on the Player Checkout Worksheet.

Damage or Excessive Contamination:

Keypad	Section 8.3
Speaker Grill	Section 8.3
Cartridge Dock	Section 8.1 Cleaning Section 8.4 Cartridge USB Cable Replacement
Headphone Port	Section 8.5
AT-Device Port	Section 8.6
Power Input Cord	Section 8.7
Upper Housing	Section 8.3
Lower Housing	Section 8.12
Handle	Section 8.10
Battery Access Panel	Section 8.2
Handle Motion (jammed or excessively loose)	Section 8.10

Missing Components

Skid-Resistant Feet	Section 8.11
AT Device Port Cover	replace–no procedure referenced
Battery Access Panel	Section 8.2
Housing Fasteners	Section 7.1

3. Examine the player for loose internal items by listening while gently shaking the player. If noise is heard, indicate on the worksheet that inspection of interior of the player is required (7.1).

6.2 Operation on AC Power

Preconditions:

1. No DTB cartridge is inserted in the player.
2. No AT-device or USB flash drive is inserted in the AT device USB port.
3. The AC power cord is not connected to AC mains power.
4. The player is off.

Methodology:

The player will power on when its cord is plugged into an AC power source and render a **"Player on"** message. Apply AC power and listen for this message. Listen for this message with headphones if it not audible with the speaker, in order to determine if it is the AC subsystem or the speaker audio stage that has failed.

1. Plug the player into a power outlet.

? Did the player announce **"Player on"** without an additional error message?

✓ **Yes:**	The player operates on AC power.	Continue to 6.3
✗ **No:**	There may be a fault with the AC subsystem, speaker audio subsystem, or microprocessor system.	If no message heard go to step 2

? Did the player announce **"Player on"** and **"Power error"**?

✓ **Yes:**	Indicate **Battery Power Troubleshooting** (7.2) on the Player Checkout Worksheet. Keep the player powered on.	Continue to 6.3

? Did the player announce **"Player on"** and **"System error"**?

✓ **Yes:**	This indicates a critical failure of the microprocessor system. No further checkout can be performed. Indicate "forward to be evaluated for disposition" on the Player Checkout Worksheet.	End checkout

2. If the **"Power On" message is not heard** it is necessary to determine if the speaker sub-system is faulty: **Unplug** the player from the power outlet, **plug in headphones** and then **plug** the player back into a power outlet.

? Did the player announce **"Player on"** or **"Power Cord Operated"** in the headphones without an additional error message?

✓ **Yes:**	The player operates on AC power but there is a problem with the speaker sub-system. Indicate **Speaker Audio Failure** on the Player Checkout Worksheet.	Continue to 6.3
✗ **No:**	Indicate **AC Power Troubleshooting** (7.3) on the Player Checkout Worksheet. Note: *If AC power has failed it is likely that the battery power has been depleted and the battery test cannot be performed. If so, repair AC power before proceeding.*	Resume check-out after repair

6.3 Operation on Battery Power

Preconditions:

1. No DTB cartridge is inserted in the player.
2. No AT-device or USB flash drive is inserted in the AT device USB port.
3. The player has a charged (not necessarily fully charged) battery or has been plugged in for a sufficient time to minimally charge the battery.
4. The player has been tested and operates on AC power (see 6.2)

Methodology:

The player will announce "Battery Powered" when detecting the loss of AC power (when powered on). Apply (which will power on the player) and then remove AC power and listen for this message.

1. **Plug** the player (or **keep it plugged**) into a Power Outlet.
   Unplug the player from the Power Outlet.

   ? Did the player announce **the remaining hours of playing time** on Battery (Standard player) **or** "**Battery Power"** (Advanced player) after it is unplugged ?

✓ **Yes:**	The player operates on battery power.	Continue to 6.4
✗ **No:**	Indicate Battery Power Troubleshooting (7.2) on the Player Checkout Worksheet.	Battery recharge cannot be tested. Continue to 6.5

6.4 Battery Recharge

Preconditions:

1. The player has been tested and operates on AC power (see 6.2)
2. The player has been tested and operates on battery power (see 6.3)

Methodology:

Using the service functions we initiate a recharge and determine if it has started.

1. a. **Plug** the player (or **keep it plugged**) into a power outlet.
   b. Enter the "technician" service level **(see section 4.2)**
   c. **Press** the Fast Forward key to step through the menu until "**Battery**" is announced by the player. **Press** the Play/Stop key to select "Battery."
   d. **Press** the FF key to step through options until the player announces the "**Initiate Battery Recharge**" option. **Press** Play/Stop to select "**Initiate Battery Recharge**." The player will announce "**Battery Recharge Initiated**," followed by the current menu item "**Battery**."
   e. **Wait 5 minutes** while the player's battery charging circuit analyses the battery.
   f. **Press** the Play/Stop key to select the "**Battery**" menu item.
   g. **Press** the Fast Forward key to step through options until the player announces the "**Recharge Status**" option. **Press** Play/Stop to select this option.

? Did the player announce **"Battery recharge in progress?"**

✓ **Yes:** The recharge circuitry is operational and the battery is capable of accepting a charge. Continue to 6.5

✗ **No:** There is a fault in the battery or charging circuit.

? Did the player announce **"Power Error?"**

✓ **Yes:** The player has failed three times to charge the battery. Indicate Battery Power Troubleshooting (7.2) on the Player Checkout Worksheet. Continue to 6.5

? Did the player announce **"Battery not detected?"**

✓ **Yes:** The player may not be configured to play on batteries or there is a problem with the battery or battery cable. Indicate Battery Power Troubleshooting (7.2) on the Player Checkout Worksheet. Continue to 6.5

6.5 Battery Condition and Software Version

The player records the number of charge cycles the battery undergoes. The service life of the battery is related to this value.
The player should be programmed to the latest software version.

Preconditions:

None

Methodology:

Battery charge statistics are reported as an audio message using a service operation.
A service function is used to transfer accumulated player statistics to a USB flash drive.

1. a. Enter the "technician" service level (see section 4.2)
   b. Press the Rewind key to step through the main menu until the player announces the **"Battery"** submenu.
   c. Press the Play/Stop key to select the battery submenu.
   d. Press the Rewind key to step through the submenu until the player announces the **"Statistics"** function.
   e. Press Play/Stop to select battery statistics.
   f. The player will then announce the total number of battery recharge cycles and the version number of the software in the player.
   g. **Record** these announced statistics on the Player Checkout Worksheet.

   Note: *To repeat the battery and software version information, press the Play/Stop key. The player will announce **"Statistics."** Press Play/Stop again to select this function.*

? Has this battery had **less than 400** charge cycles?

✓ **Yes:** The battery pack has sufficient remaining service life.

✗ **No:** Indicate battery replacement (section 8.2) on the Player Checkout Worksheet.

? Is the player software the latest version released by the NLS Engineering Section?

✓ **Yes:** The software is up to date. Continue to 6.6

✗ **No:** **Indicate** for Software Upgrade (section 8.13) on the Player Checkout Worksheet. Continue to 6.6

6.6 Player Statistics

The player saves usage statistics in its non-volatile memory that can be recovered and saved.

Preconditions:

(if using "technician service level" to perform this function)

1. No DTB cartridge is inserted in the player.
2. An USB flash drive is inserted in the USB AT device port.

Methodology:

A service function is used to transfer accumulated player statistics to a USB flash drive.

The player collects gross statistics on the usage of various systems (e.g., the number of hours that the player has been used on battery power and on AC power, number of charge cycles, etc.). These data will be used by NLS to better tailor the next version of the player to the needs of the patron.

No personal information is obtained in this procedure nor is any information obtained that identifies the books read.

NLS requests that cooperating agencies obtain these data when players are returned from patrons and send them to NLS engineering (NLSplayerdata@loc.gov). The data exported from the player take the form of a file with the player's serial number as part of the file name. A library should accumulate many such files and at convenient intervals (3 to 6 months) send them together as one or more zip compressed files.

1. a. Press the **Fast Forward** key to step through the battery submenu until the player announces the **"Main menu"** option. Press the **Play/Stop** key to select **"Main menu."**
   b. Press the Fast Forward key to step through submenus until the player announces the **"Statistics"** submenu.
   c. Press **Play/Stop** to select the statistics submenu.
   d. Press the Fast Forward key to step through the statistics submenu until the player announces the **"Export statistics"** function.
   e. With a USB flash drive in the AT device port and no cartridge inserted, press the Play/Stop key to begin the **"Export statistics"** operation.
   f. Save the file for later transmission to NLS engineering.

   or

   a. Insert a cartridge or USB drive with an "options.xml" file containing the "ExportStatistics" directive. (see section 4.3)

```
<?xml version="1.0" encoding="utf-8"?>
<dtbm xmlns="http://www.loc.gov/nls/DTBM">
    <directive>
        <ExportStatistics />
    </directive>
</dtbm>
```

? Did the player report **"Statistics exported"?**

✓ **Yes:** The data were saved to the USB flash drive. Continue to 6.7

✗ **No:** Try again with a different USB flash drive.

6.7 Keypad Operation

Preconditions:

1. No DTB cartridge is inserted in the player.
2. The player is powered on.

Methodology:

The keypad functionality is assessed by pressing each key in Key Describer mode. Each time a key is pressed, a key identifier is announced. When released, the key should return to the full up position.

Note: *It is not necessary to listen to the entire key identifier announcement with each key press. As soon as the key identifier starts, you may press again on a different key.*

1. Press each key in the center, corners, and edges.

? Do all the keys correctly identify themselves and do they move freely without sticking?

✓ **Yes:**	The keypad is operating correctly	Continue to section 6.8
✗ **No:**	Indicate Upper Housing Service (8.3) on the Player Checkout Worksheet. **Describe** specific keys and how they failed on the Player Checkout Worksheet.	Continue to section 6.8

6.8 Cartridge Operation

Preconditions:

1. No DTB cartridge is inserted in the player.
2. The player is powered on.

Methodology:

A cartridge is inserted into the player and it plays a book without error.

This step is intended to confirm that three player functions are operating properly:

- A cartridge can be inserted into the player
- The player can play a cartridge
- The internal connectors are not worn out

1. Insert a DTB cartridge into the player.

   ? Does the player play the test book cartridge automatically?

   ✓ **Yes:** The cartridge USB electrical interface is functional. Continue to step 2

   ✗ **No:** If you hear the message **"Cartridge error,"** restart the player and try the test with a different cartridge.

   Remove the cartridge, and indicate Cartridge USB Cable Replacement (8.4) on the Player Checkout Worksheet. Continue to 6.9

2. With the DTB cartridge playing, pick up the player with the front edge (cartridge end) of the player facing down.

   ? Is the cartridge still firmly in the connector and does the book continue to play?

   ✓ **Yes:** The cartridge USB mechanical interface is functional. Continue to 6.9

   ✗ **No:** **Remove** the cartridge, and indicate Cartridge USB Cable Replacement (8.4) on the Player Checkout Worksheet. Continue to 6.9

6.9 Audio Quality

Preconditions:

None

Methodology:

A cartridge is inserted into the player and the audio is assessed for excessive audio distortion or noise.

1. a) Insert a DTB cartridge into the player.
   b) Set the tone and speed controls to their normal (mid) setting.
   c) With the player reading the DTB cartridge, press the Volume Up button until the player announces **"Maximum Volume."**
   d) Listen for excessive distortion, noise, or buzz.

   ? Does the audio sound good?

✓ **Yes:**	The main amplifier and speaker system is functioning correctly.	
✗ **No:**	There may be a fault with the speaker, amplifier, or upper housing. **Indicate** Upper Housing Service (8.3) repair on the Player Checkout Worksheet.	

2. Return the volume setting to a comfortable level. Continue to 6.10

6.10 Headphone Operation

Preconditions:

None

Methodology:

The plug of a set of headphones is inserted into the headphone jack and its audio is monitored for presence (in both left and right sides) and for quality. The speaker audio is monitored to confirm that the microprocessor has detected the presence of headphones and has deactivated the speaker circuitry.

This test section is intended to inspect three headphone functions:

- Insertion of the headphone plug causes the player to turn off the speaker.
- Both sides of the headphones play with good audio quality.
- The contacts inside the headphone jack are not worn out.

Note: *You can use a PC speaker system that allows left and right channel selection instead of headphones for this test.*

1. Insert the plug of the headphones into the headphone jack while a DTB cartridge is playing.

   ? Does the speaker audio stop?

✓ **Yes:**	The player has detected the headphone correctly.	Continue to step 2.
✗ **No:**	**Indicate** Headphone Cable Replacement (8.5) on the Player Checkout Worksheet.	Repair then return to step2

2. Listen to the audio in both the left and right sides of the headphones.

   ? Is the audio present in both sides and is the audio quality good?

✓ **Yes:**	The player has is operating correctly using headphones.	Continue to step 3.
✗ **No:**	**Indicate** Headphone Cable Replacement (8.5) on the Player Checkout Worksheet. *(The headphone driver is capable of withstanding an indefinite short circuit however it is possible that the headphone driver may be damaged. Replacement of this part is not possible in the field)*	Repair then return to step3

3. Listen to the audio in the headphones while rotating the plug in the headphone jack. Gently pull the plug to ensure that it remains inserted under normal operation.

   ? Is the audio uninterrupted with no scratches or audio distortion perceived?

✓ **Yes:**	The player has is operating correctly using headphones.	Continue to section 6.11.
✗ **No:**	**Indicate** Headphone Cable Replacement (8.5) on the Player Checkout Worksheet.	Repair then continue to 6.11

6.11 AT Device Port Operation

Preconditions:

1. No DTB cartridge is inserted in the cartridge USB port.
2. No device is inserted in the AT device USB port.

Methodology:

A USB flash drive containing a DTB is inserted into the AT device USB port. If the book plays, the port is functional.

1. a. Remove the cover from the AT device USB port by placing a finger nail or small screw driver in the recess on the bottom of the cover and gently prying outward.
   b. Plug a USB flash drive containing a DTB into the AT device USB port.

   ? Does the book play?

✓ **Yes:**	The AT device port is operating correctly.	Checkout complete.
✗ **No:**	If there was no “beep” when the drive was inserted or the player announces **“AT error,”** there may be a fault with the AT USB device port. **Indicate** AT USB Cable Replacement (8.6) on the Player Checkout Worksheet. **Remove** the USB Flash Memory Drive	Commence repair.

2. Replace the cover

6.12 Player Disposition

After completion of the checkout procedure, repair items can be performed as marked.
The marked Player Checkout Worksheet should accompany the player through troubleshooting and repair.

7 Troubleshooting Activities

WARNING: Hazardous live conductors are exposed if the player is opened for servicing while the unit is connected to utility power through the mains power cord and plug. If the player is not plugged into utility power during servicing, no hazardous live voltages are present, but Safety Extra Low Voltages (SELV) will be present on many conductors inside of the player.

CAUTION: The Circuit Board inside the player can be damaged by electrostatic discharge (ESD) when the housing is opened for service.

ESD protective handling must be practiced when a player housing is opened. At a minimum, **technicians must wear grounded wrist straps** and the **work surface must be covered with a grounded mat.**

You must practice ESD protective handling when opening the player housing. Technicians must wear grounded wrist straps, and the work surface must be covered with a grounded mat.

To reduce the risk of electrical shock, the player shall be unplugged whenever the housing is open, except when specific tests are performed that require the player to be plugged in.
Unplug the player after tests are completed.

Figure 7-1 Proper Wiring and Cable Tie Locations

CAUTION:
The connectors used in the player are designed to latch together.

The latch must be released by applying pressure to a tab while separating the connectors.

The socket is surface mounted to the pads on the top surface of the printed circuit board. There is a **danger of pulling the pads and tracks from the printed circuit board** if force is applied to the socket. **Be very careful**.

To remove the plug:

1. Press the latch release tab
2. Pull the plug directly up

Do not pull on the Cable Wires or apply force to the socket.

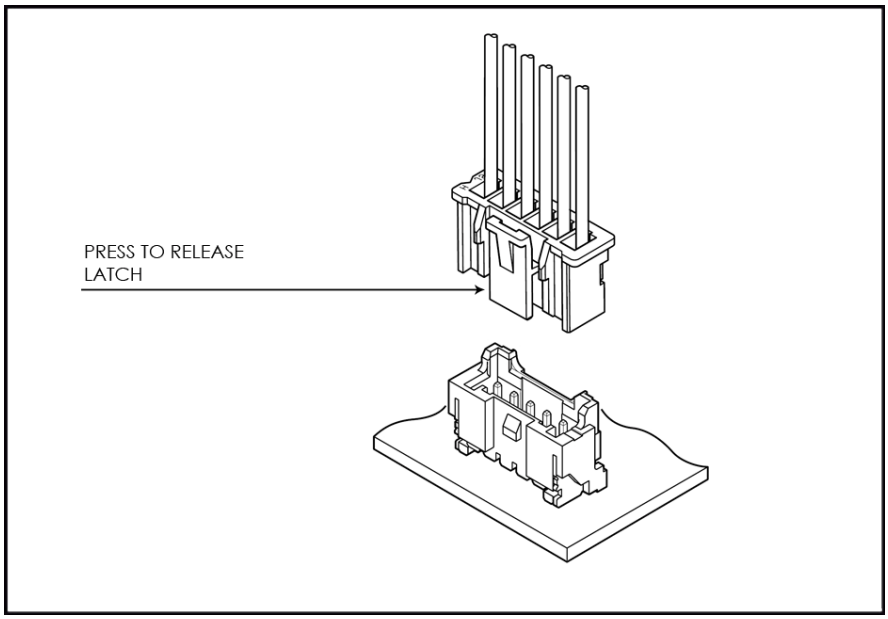


Figure 7-2. Release Latch on Connectors Used in the Player

The cable connectors and circuit board connectors are color coded as shown in Figure 7-3 below.

Note: ***Do Not Plug the White Battery Connector into the Blue Headphone Socket****. If the Battery Cable connector is plugged into the Headphone socket (both have four terminals), the player circuit board will be damaged.*
Be certain the colors match *before plugging the connectors in.*
Always plug the white Battery cable in last.

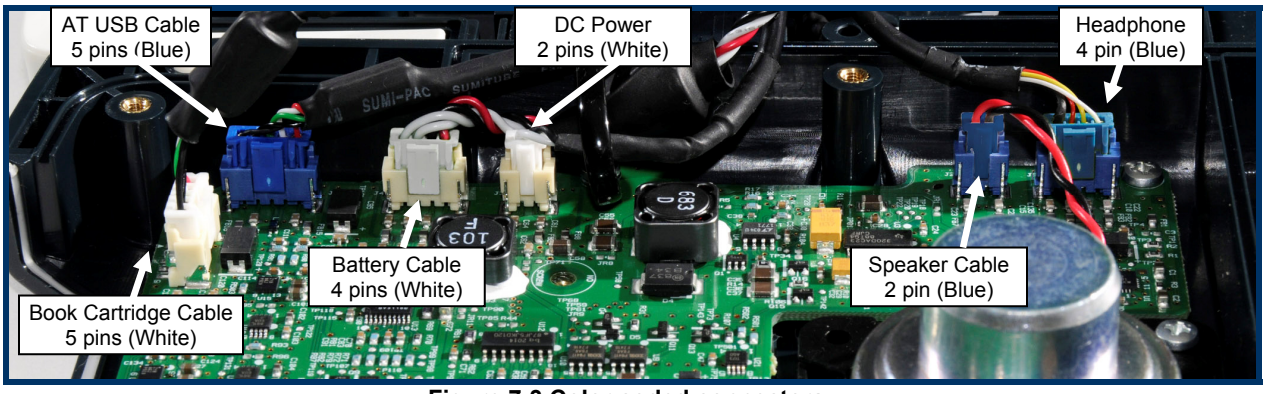


Figure 7-3 Color coded connectors

The machine screws used to assemble the player have a Blue thread-locking patch to make them resistant to vibration. If a machine screw is replaced, it must be the correct type with the Blue patch. Screw part numbers can be found in the parts list provided in the appendix.

Machine screws should be screwed in until snug. There is no need to over-tighten because the Blue thread locking patch provides resistance to vibration.

The player AT device port cover is provided with the player. If it is missing, obtain and insert a new cover.

Service history can be entered into the player memory using the Technician Plus or Developer service levels as described in Sections 4.4 and 4.5. If these are available, the Maintenance function can be used to enter a brief description of the service performed and the date of service.

7.1 Open and Close the Player

Tools Needed	Parts Needed
Torx T10 driver	Dock Seal, Upper, 4824591314 (Upper Dock Seal) – as needed

Note: The player shall not be plugged into a Power Outlet during this procedure.

1) With the player unplugged, **position it** with the **bottom facing up** and the **Cartridge Dock facing you.**

2) **Remove** the eight (8) housing screws using the Torx driver.

3) **Hold** the housings together and **turn** the player over.

4) **Lift** the upper housing straight up about an inch and **turn it over to the right** (like opening a book).

5) **Set** the upper housing down **to the right** of the lower housing

6) **Check** that the White upper dock seal around the dock opening is **in place**.

7) If the upper dock seal is detached, **press** i**t back** into the channel of the upper housing. (The upper dock seal is important for audio quality and must not be left out of the housing.)

8) **Press** a new upper dock seal into the channel if needed.

Figure 7-4 Open player like a book

To close the player, **lift** the upper housing and **turn it over** to the left above the lower housing (like closing a book).

Use the fingers of your right hand to **gently push** the cable bundle into the housing, so that the cables are not pinched as you **lower** the upper housing.

Lower the upper housing straight **down**. Make sure the tongue on the lower housing **engages** the groove in the upper housing.

Hold the player housings together and **turn the player over**.

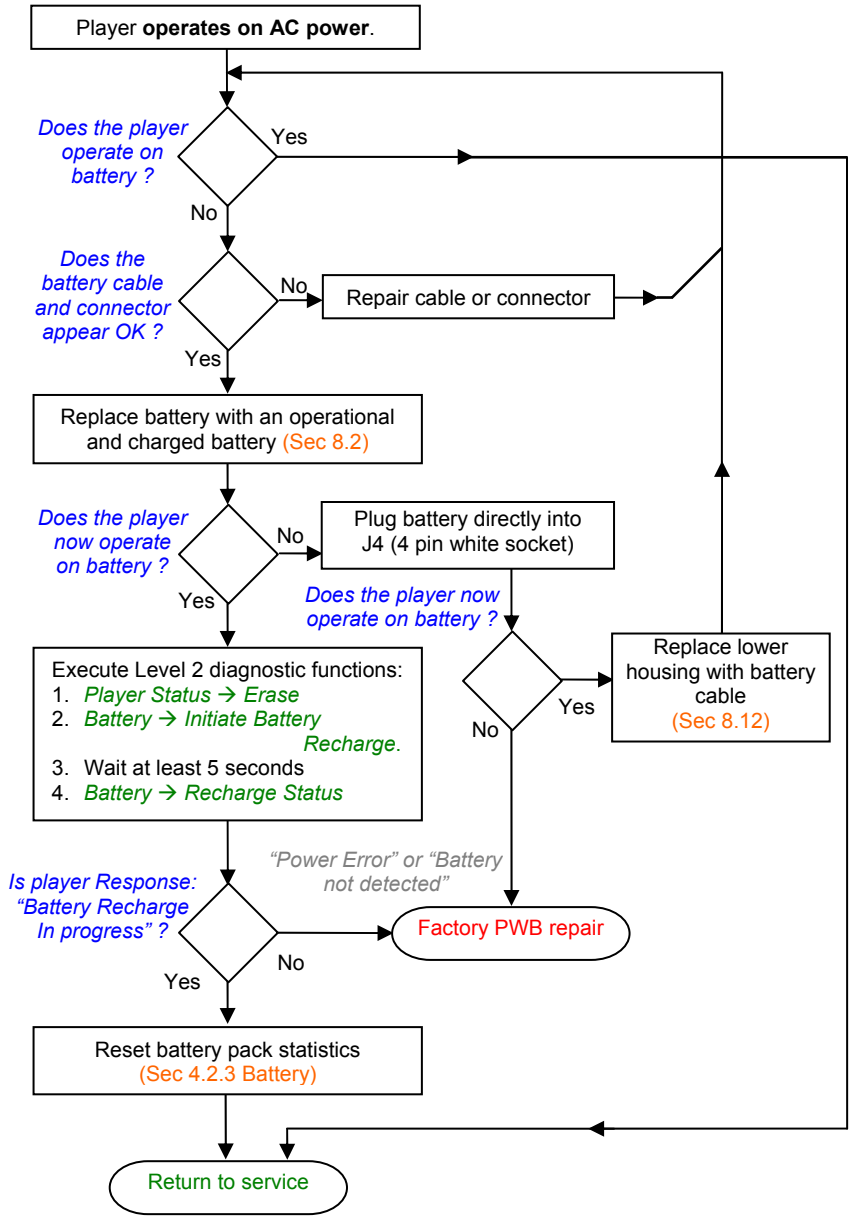
Check that the housings are mated all the way around the player.

Note: If the housing will not mate together, it is likely the cable is being pinched and must be adjusted before tightening the screws to prevent cable damage.

Set the player down. **Insert and tighten** the eight (8) housing screws.

7.2 Player Will Not Play on Battery Power, but Will Play on AC Power

Potential Causes: Battery Pack failure, Battery Cable failure, Circuit Board failure.



Tools Needed
2.5 mm hex wrench

Detailed Procedure:

1) **Check the battery cable and connector**

   a) **Open the Battery Compartment** as described in Section 7.1

   b) **Visually inspect** the Battery Cable for broken wires or wires bent to a sharp angle.

   c) Check that the connector is correctly seated.

   If the connector is not seated or the cable is damaged:

   ❖ **Reseat connector or repair cable** if damaged. Retest.

2) **Replace battery**

   a) **Replace** the Battery with an operational, charged Battery as described in Section 7.2.

   b) **Power on the player** (on battery).

   If the player is now operational on battery proceed to step 4.

3) **Bypass battery cable** (to determine cable fault)

   a) **Open player** as described in Section 7.1

   b) **Disconnect** the 4 pin white battery connector J4 from the PWB

   c) **Plug the battery** directly into the PWB J4

   d) **Power on the player** (on battery).

   If the player still does not function **return the player to NLS for PWB service.**

   If the player now functions on battery, the battery cable is damaged. There is no way to simply replace the battery cable.

   ❖ **Replace the lower housing** (Sec 8.12) assembly, which contains the integral battery cable. Retest and proceed to step 5 to conclude repair.

4) **Test Battery Recharging Circuit**

   a) **Plug** the player into an AC Power Outlet and **initiate** a test of the battery recharge function using the Technician service level as follows:

      i) **power off** the player.

      ii) **Hold down** the REWIND, SLEEP, and TONE DOWN keys, and **then press** the POWER key.
      The player should announce "Player On" followed by "Player Status".
      Note: If only a beep is heard, the player has **failed the memory test. Forward** the player to the designated NLS service center for evaluation.

      iii) **Press** the FF key to step through the Technician service level menu until "Battery" is announced by the player.

iv) **Press** the PLAY/STOP key to select this item.

v) **Press** the FF key to step through options until the player announces the "Initiate Battery Recharge" option.

vi) **Press** PLAY/STOP to select this option.
The player will announce "Battery Recharge Initiated" followed by "Battery".

b) **Check the state of the battery recharge** function using Technician service level functions as follows:

i) Assuming that the player is still in the Technician service level, **Wait** at least 5 seconds, then **press** the PLAY/STOP key to select the "Battery" menu item. The player will announce "Statistics".

ii) **Press** the FF key to step through options until the player announces the "Recharge Status" option.

iii) **Press** PLAY/STOP to select this option: The player will announce one of the following messages followed by "Battery":

(1) "Battery Recharge in Progress"

(2) "Battery Not Detected"

(3) "Power Error"

If the message is "*Battery Recharge in Progress"*, then the player's battery circuitry is now functional:

❖ Proceed to step 5 to conclude to conclude repair.

If either *"Battery Not Detected"* or *"Power Error"* is heard, then the recharge or monitoring circuitry is faulty. The player is not repairable in the field:

❖ **Return the player to NLS for PWB service.**

5) **Reset the battery statistics** (per battery pack)

a) **Reset** the Battery Charge Cycle Counter.

i) **power off** the player.

ii) **Hold down** the REWIND, SLEEP, and TONE DOWN keys, and **then press** the POWER key.
The player should announce "Player On" followed by "Player Status".
Note: If a beep is heard or no announcements are heard, the player has **failed the memory test. Forward** the player for evaluation for disposition.

iii) **Press** the FF key to step through the Technician service level menu until "Battery" is announced by the player.

iv) **Press** the PLAY/STOP key to select this item.

v) **Press** the FF key to step through options until the player announces the "Reset" option.

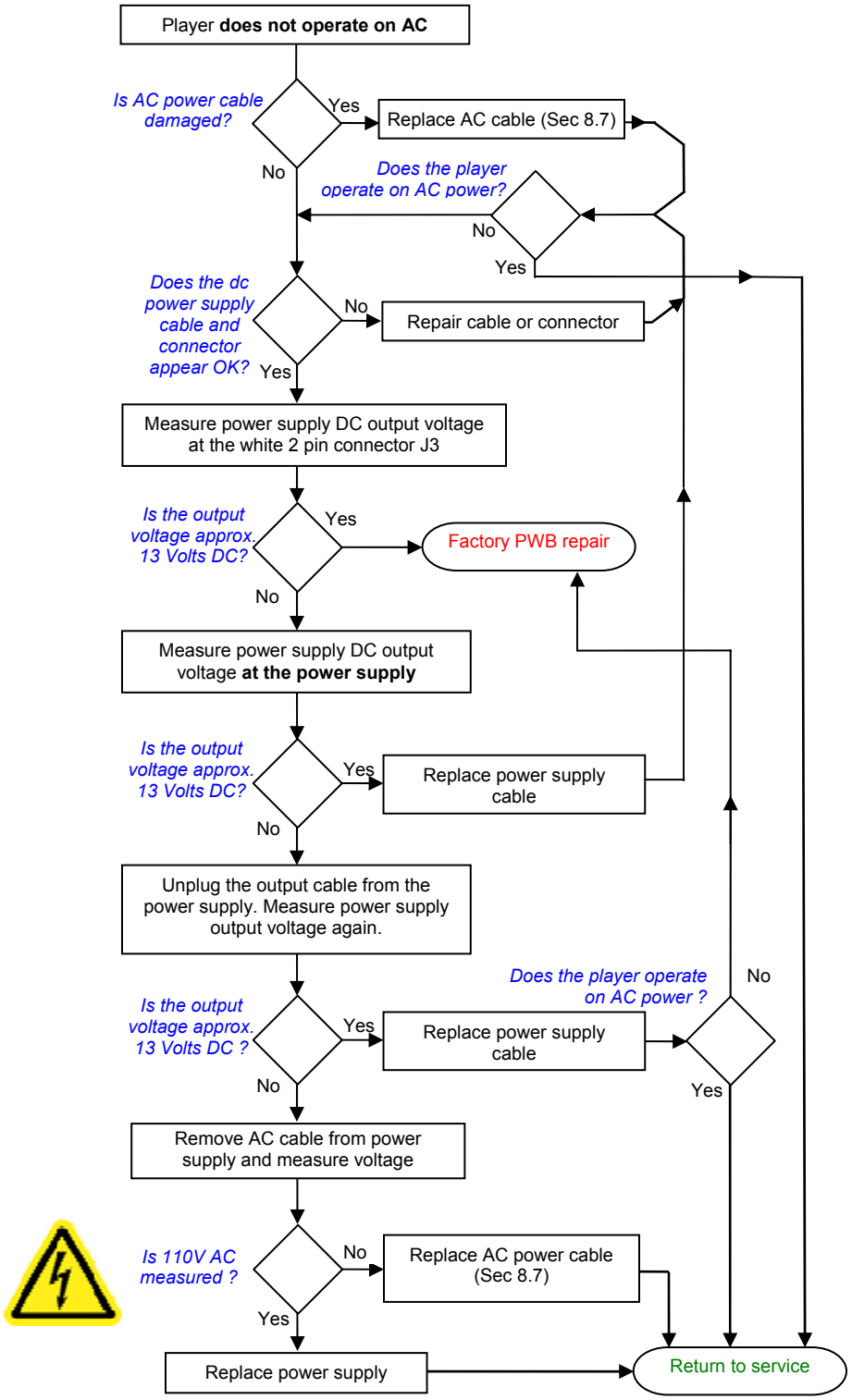
vi) **Press** PLAY/STOP to select this option.
The player will announce "Battery statistics for the current battery have been erased from the internal memory" followed by "Battery".

vii) **power off** the player.

This repair is complete. Consult the Player Checkout Worksheet for additional servicing

7.3 Player Will Not Play on AC Power

Potential Causes: Power Input Cord, Power Supply, Power Supply Cable, Circuit Board.



Tools Needed
T10 Torx driver
Multimeter

Detailed Procedure:

Prerequisite Operation: It is assumed that a hard reset (Sec. 3) has been attempted.

1) **Open player** as described in Section 7.1 **and check AC power cable:**

   a) **Visually inspect** the Power Supply AC wiring for damage.

   If cable or connector is damaged:

   - **Replace AC power cable** (Sec 8.7). Retest.

2) **Verify DC power at PWB (under load)**

   a) **Check** for loose connectors and/or damage on DC power cable and replace if damaged or defective.

   b) **Measure DC voltage** at the PWB with cable connected to board.

   If approximately 13 volts is measured, the Circuit Board is most likely defective:

   - **Close** the player and **return player to NLS for PWB service**

3) **Verify DC power at Power Supply**

   a) **Measure DC voltage** at the Power Supply with cable connected to board.

   If approximately 13 volts is measured at the Power Supply (but not at the PWB) the DC cable is defective (open circuit).

   - Replace the DC cable and retest.

   b) Remove the AC mains power, unplug the DC power cable from Power Supply, reconnect AC mains power then **remeasure the DC voltage** at the power supply**.**

   If approximately 13 volts is detected at the Power Supply the DC power cable may be defective (short circuit) or the PWB may have an excessive load:

   - Replace the DC cable and retest.

   If player is still not operating:

   - **return for PWB service.**

4) **Verify AC power at power supply:**

a) Remove the AC mains power, **disconnect** the AC power female connector from power supply, reconnect the mains plug to the AC power outlet and **measure** AC voltage at female connector.

If approximately AC 110 volts is not measured :

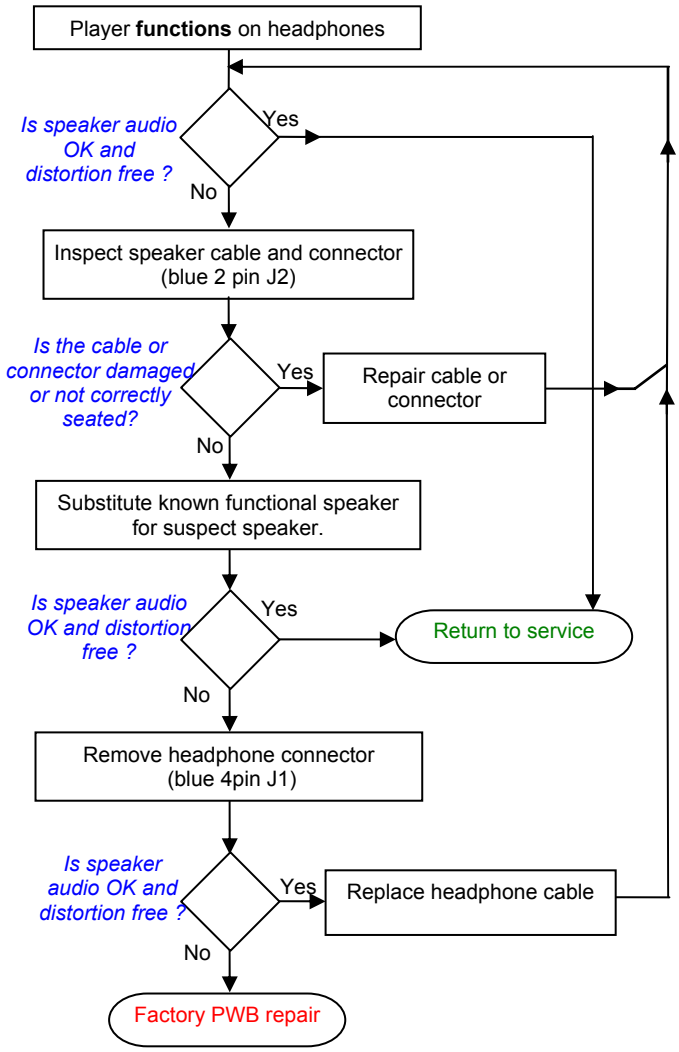
- Replace the AC mains cable and retest.

If the AC voltage is present at the power supply but no DC output voltage is measured:

- Replace the DC power supply and retest.

7.4 No or Distorted Speaker Audio

Potential Causes: Speaker failure, Connector failure, Circuit Board.



Tools Needed
T10 Torx drive
#1 Philips head screw driver
Second speaker with cable and connector

Detailed Procedure:

Prerequisite test: Player produces audio via the headphones.

1) **Visually inspect** the Speaker wiring for damage.

   a) **Separate** the player housings as described in Section 7.1 and **check** for loose connectors and/or damage.

   If speaker cable or connector (blue 2 pin J2) is loose or damage:

   - **Repair cable/reseat connector**. Retest.

2) **Substitute known functional speaker** *(to determine if speaker is faulty)*

   a) **Lift** the speaker cable plug from the white J2 connector labeled "Speaker" on the Circuit Board.

   b) **Plug in** an alternate speaker (or upper housing), which is known to function correctly, into connector J2 on the Circuit Board.

   c) **Plug** the player back into the Power Outlet and **listen** for "Power On" announcement.

   d) **Play** test cartridge and evaluate audio quality.

   If audio is heard and is free of distortion then speaker or cable was faulty.

   - Replace the speaker or upper housing (containing new speaker) (sec 8.3) and retest.

3) **Isolate headphone cable/connector** (isolate speaker/headphone switching)

   The microprocessor determines whether the speaker or headphone is active by monitoring a pin on the headphone connector that changes state when headphones are inserted. A fault in the headphone connector or cable may falsely indicate to the microprocessor that headphones are inserted when they are not.

   a) **Lift** the headphone cable plug from the blue 4 pin J1 connector labeled "Headphone" on the Circuit Board.

   b) **Plug** the player back into the Power Outlet and **listen** for "Power On" announcement.

   If audio is heard and is free of distortion then headphone cable or connector was faulty.

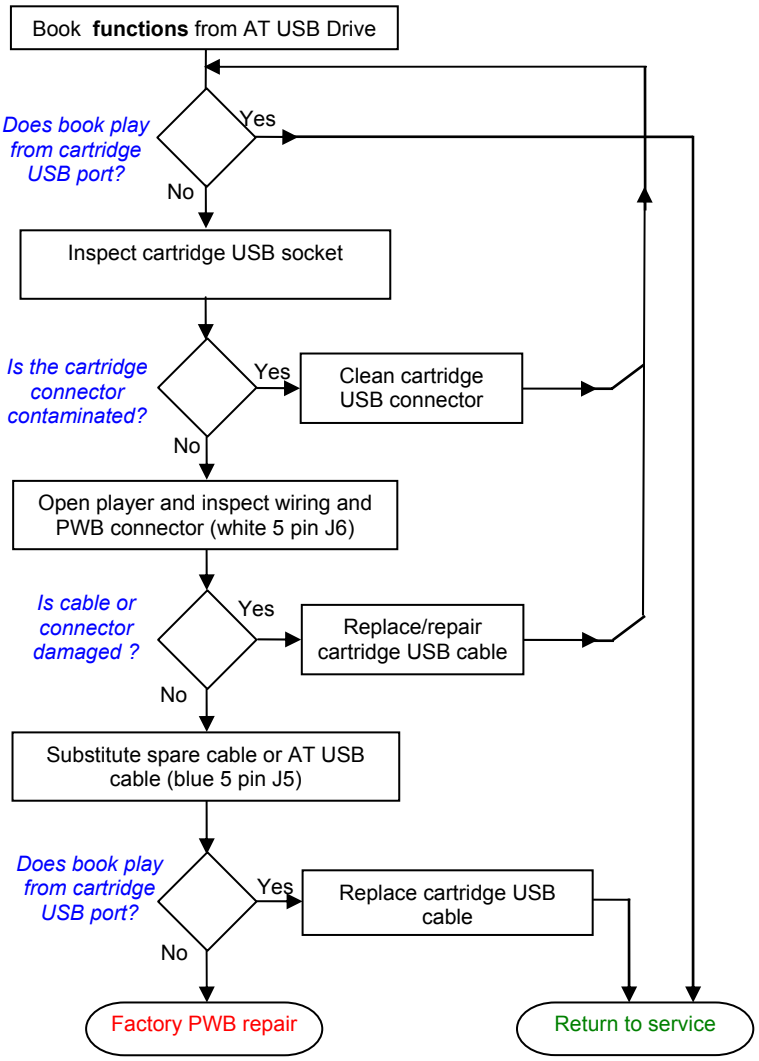
   - Replace the headphone cable (Sec 8.5) and retest.

   If audio is not heard the speaker audio circuitry is faulty. The PWB cannot be serviced in the field.

   - **Close** the player and **return player to NLS for PWB service**

7.5 Cartridge USB failure

Potential Causes: Cartridge USB Cable, Circuit Board.



Tools Needed
T10 Torx driver
Flashlight
Q-tips and connector cleaner
Second Cartridge USB cable

Detailed Procedure:

Prerequisite test: Player plays a book on the AT USB port

Prerequisite Operation: It is assumed that a hard reset (Sec. 3) has been attempted.

1) **Visually inspect** the cartridge USB connector and cable for damage.

The cartridge USB connector is particularly vulnerable to damage by contamination and mechanical stress.

a) Inspect the cartridge USB connector with a flashlight.

If the connector appears contaminated with dirt or debris:

- ❖ **clean** with a Q-tip and connector cleaner.

If the connector appears damaged:

- ❖ **replace** cartridge USB cable and connector (as described in 1.b)

b) **Separate** the player housings as described in Section 7.1 and **check** damage on the cartridge USB cable from the cartridge dock to the white 5 pin PWB connector J6 (Book).

If cartridge USB cable or connector (white 5 pin J6) is loose or damage:

- ❖ **Replace cable/reseat connector**. Retest.

2) **Substitute cartridge USB cable** *(to determine if cable is faulty)*

The AT port USB cable connector (blue J5) is compatible with the cartridge USB connector (white J6). Thus it is possible to use the AT USB cable in lieu of a substitute cartridge USB cable for diagnostic purposes.

Lift the white connector J6 from the PWB (cartridge USB cable)

a) **Either inert** a substitute cartridge USB cable into J6 or to use the AT cable for the test, remove the blue J5 connector and insert it into J6.

b) **Plug** the player back into the Power Outlet or **turn on** the player.

c) **Insert a cartridge** *(containing DTB)* into the cartridge USB port on the substituted cable (or USB drive in the AT port as appropriate).

d) **Listen** for the book title/author message.

If the cartridge plays, then the cable or connector was faulty.

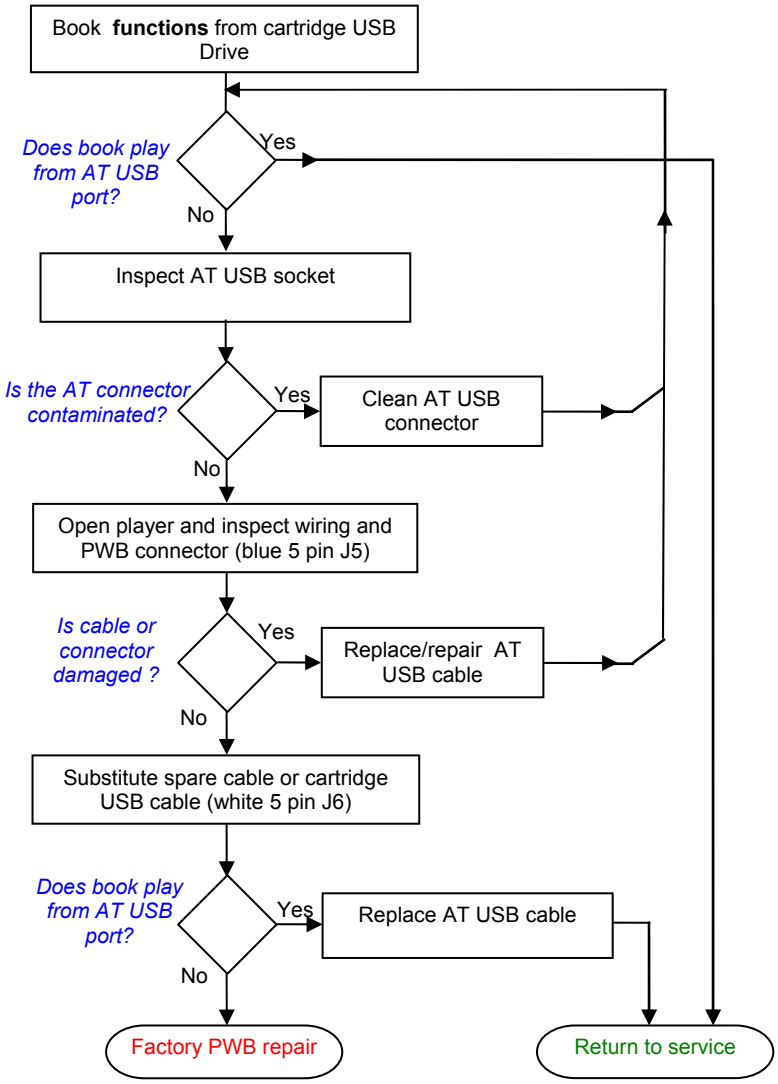
- ❖ Replace the cartridge USB cable (Sec 8.4) and retest.

If the cartridge **does not play,** the USB circuitry is faulty:

- ❖ **Close** the player and **return player to NLS for PWB service**

7.6 AT USB failure

Potential Causes: AT USB Cable, Circuit Board.



Tools Needed
T10 Torx driver
Flashlight
Q-tips and connector cleaner
Second AT USB cable

Detailed Procedure:

Prerequisite test: Player plays a book on the cartridge USB port

Prerequisite Operation: It is assumed that a hard reset (Sec. 3) has been attempted.

3) **Visually inspect** the AT USB connector and cable for damage.

a) Inspect the AT USB connector with a flashlight.

If the connector appears contaminated with dirt or debris:

- **clean** with a Q-tip and connector cleaner.

If the connector appears damaged:

- **replace** the AT USB cable and connector (as described in 1.b)

b) **Separate** the player housings as described in Section 7.1 and **check** damage on the AT USB cable from the cartridge dock to the blue 5 pin PWB connector J5 (Remote).

If cartridge USB cable or connector (blue 5 pin J5) is loose or damage:

- **Replace cable/reseat connector**. Retest.

4) **Substitute AT USB cable** *(to determine if cable is faulty)*

The cartridge port USB cable connector (white 5 pin J6) is compatible with the AT USB connector (blue 5 pin J5). Thus it is possible to use the cartridge USB cable in lieu of a substitute AT USB cable for diagnostic purposes.

a) **Lift** the blue connector J5 from the PWB (AT(remote) USB cable)

b) **Either inert** a substitute AT USB cable into J5 or to use the cartridge cable for the test, remove the white J6 connector and insert it into J5.

c) **Plug** the player back into the Power Outlet or **turn on** the player.

d) **Insert a USB flash drive** *(containing DTB)* into the AT USB port on the substituted cable (or cartridge in the AT port as appropriate).

e) **Listen** for the book title/author message.

If the DTB on the USB flash drive plays, then the cable or connector was faulty.

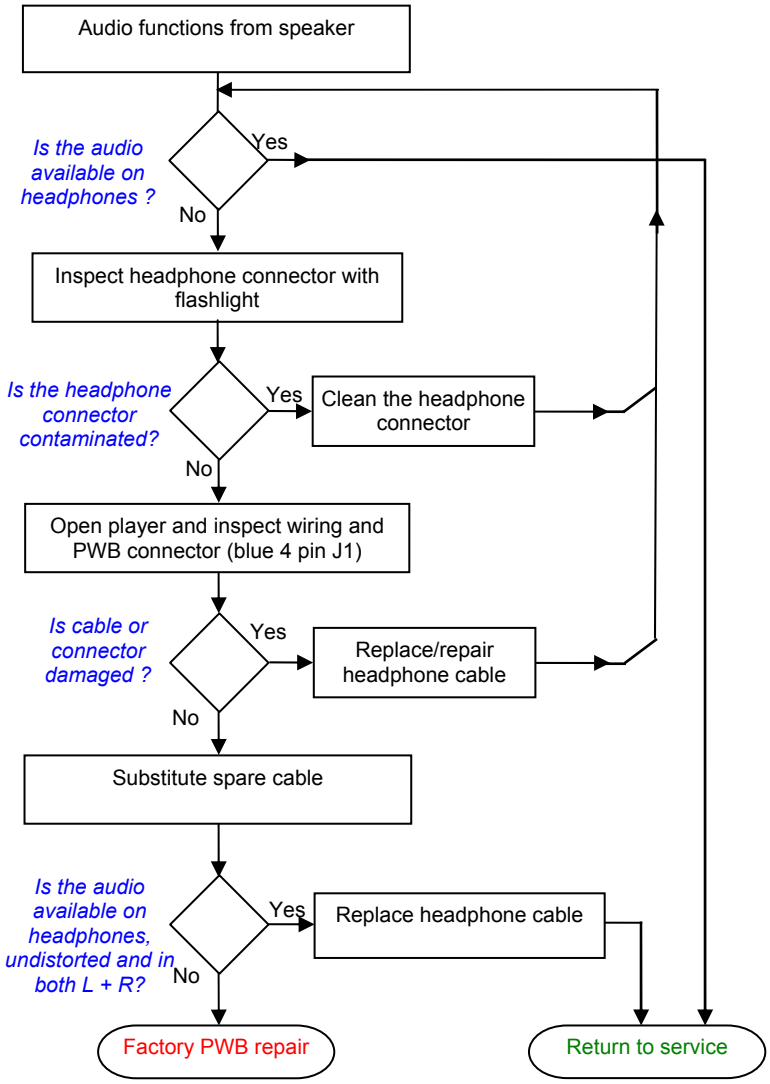
- Replace the AT USB cable (Sec 8.4) and retest.

If the DTB on the USB flash drive **does not play,** the USB circuitry is faulty:

- **Close** the player and **return player to NLS for PWB service**

7.7 Headphone failure

Potential Causes: Headphone Cable or Connector, Circuit Board.



Tools Needed
T10 Torx driver
Flashlight
Q-tips and connector cleaner
Second AT USB cable

Detailed Procedure:

Prerequisite test: Player plays a book on the cartridge USB port

Prerequisite Operation: It is assumed that a hard reset (Sec. 3) has been attempted.

5) **Visually inspect** the headphone connector and cable for damage.

a) Inspect the headphone connector with a flashlight.

If the connector appears contaminated with dirt or debris:

- **clean** with a Q-tip and connector cleaner.

If the connector appears damaged:

- **replace** the headphone cable and connector (as described in 1.b)

b) **Separate** the player housings as described in Section 7.1 and **check** damage on the headphone cable from the cartridge dock to the blue 4 pin PWB connector J1 (Headphone).

If cartridge headphone or connector (blue 4 pin J1) is loose or damaged:

- **Replace cable/reseat connector**. Retest.

6) **Substitute Headphone cable** *(to determine if cable is faulty)*

a) **Lift** the blue 4 pin connector J1 from the PWB (Headphone cable)

b) **Insert** or substitute Headphone cable into J1.

c) **Plug a pair of headphones** into the substituted cable.

d) **Plug** the player back into the Power Outlet or **turn on** the player.

e) **Listen** for the turn on announcement.

If the headphone audio is now **audible** and **free of distortion** in **both left and right** sides:.

- Replace the AT USB cable (Sec 8.4) and retest.

If no audio is heard in one or both left and right sides, or there is distortion circuitry is faulty:

- **Close** the player and **return player to NLS for PWB service**

8 Repair Activities

CAUTION: The Circuit Board inside the player can be damaged by electrostatic discharge (ESD) when the housing is opened for service.

5. ESD protective handling must be practiced when a player housing is opened. At a minimum, **technicians must wear grounded wrist straps** and the **work surface must be covered with a grounded mat.**

8.1 Exterior Cleaning

Materials Needed
Water-based, all-purpose cleaning solutions such as: Simple Green, Johnson Diversey Whistle® 91249 cleaner or 409
Soft cloths, soft brushes, cotton swabs

Note: Never immerse the player in cleaning liquids or water.

Note: Avoid abrasive cleaning solutions or materials that may damage player markings.

1) **Use** a moistened cloth, brush, or cotton swab to clean the player.
Avoid using excess liquid cleaning solution especially near the connectors and the speaker.

2) If the speaker grill is heavily soiled, **hold** the player upside down (so the speaker faces down) and **clean** the grill with a wet soapy cloth

3) If the Cartridge Dock is severely contaminated, it may be necessary to **remove** and **replace** the cartridge USB Cable, as described Section 8.4.

4) **Clean** the Cartridge Dock thoroughly before **replacing** the Connector.

8.2 Battery Replacement

CAUTION: **Do not strain the Battery Cable** when lifting the Battery pack out.

Tools Needed	Parts Needed
2.5 mm hex wrench	Battery Pack, 4824591310
	Foam, Battery Compartment, 4824591316 (as needed)

Note: Battery panel screws are captured in the battery access panel by a nylon washer. **Loosen them,** but **do not pull them out** of the panel.

Note: Grip the Connectors when separating them. **Avoid pulling** on the Battery Cable Wires to prevent possible damage.

1) Turn the player over so the bottom is facing up and loosen two (2) battery panel screws until each spins freely. *Note: The **screws are captive** and should not be removed from the panel.*

2) **Lift** the battery access panel up and away from the player. **Set** panel aside.

3) **Lift** the Battery Pack out of the compartment. **Set** it on the bottom of the housing.

4) **Grasp** the two sides of the Battery Cable Connector.

5) **Press** the Release Latch down while **pulling** the connectors apart to remove the battery.

6) **Check** that two foam strips are secured to the sides of battery compartment. The foam strips prevent the Battery Pack from vibrating during player use. **Replace** missing foam strips as required.

7) **Install** a replacement Battery Pack in the reverse order. The installed Battery Pack is shown in Figure 8-1 below.

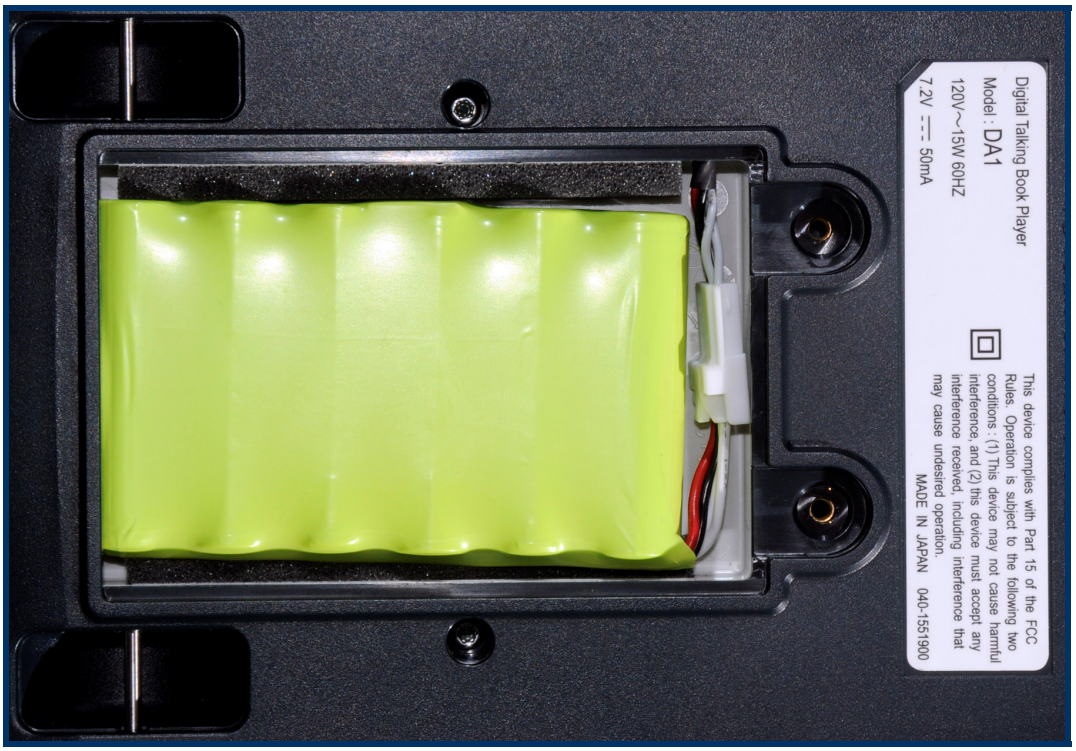


Figure 8-1 Battery Installation

8) **Replace** the battery access panel and **tighten** the battery panel screws.

9) **Turn** the player over.

10) **Power off** the player before **entering** the **Technician service level**.

Reset the per-battery statistics.

1) **Enter** the Technician service level by **holding down** the REWIND, SLEEP, and TONE DOWN keys and then **pressing** the POWER key. The player should announce "**Power On**" followed by "**Player Status**"

2) **Press** the FF key to step through the Technician service level menu until "**Battery**" is announced by the player. **Press** the PLAY/STOP key to select this item.

3) **Press** the FF key to step through options until the player announces the "**Replace with a Full Battery**" option. **Press** the PLAY/STOP to select this option

4) The player will announce "Battery statistics for the current battery has been erased from the internal memory" followed by current menu item "Battery"

5) **Exit** the **Technician service level** by **powering off** the player.

Battery replacement is complete.

8.3 Upper Housing Service

(Keypad Cleaning/Replacement and Upper Housing/Speaker Replacement)

Tools Needed	Parts Needed
#1 Phillips Screwdriver	Keypad, Standard, 4824591201 (Keypad)–as needed
Keypad Press Tool (or equivalent)	Keypad, Advanced, 4824591251 (Keypad)–as needed
Torx T10 Driver	Standard Upper Replacement Subassembly, 4824591202–as needed
Materials Needed	
Cleaning materials (refer to Section 8.1)	
Isopropyl alcohol and cotton swab	

Upper housing service is performed when the Keypad is not functioning properly or heavily contaminated, the upper housing is damaged, or the speaker has been damaged as determined by the player checkout procedure.

Note: The Keypad must be installed into the upper housing with a Keypad Press Tool (a pill bottle with a flat cap can be used as a substitute) that applies pressure straight down on the Keypad. If this tool is not used, the Keypad may distort during installation. This can cause keys to stick when depressed.

Separate the player housings as described in Section 7.1.

1) **Disconnect** the six (6) cables from their connectors on the Circuit Board located in the Upper housing assembly. (Refer to Section 7 for correct Connector Removal Procedure.)

2) **Remove** the 8 screws that secure the Circuit Board with a #1 Phillips screwdriver.

3) **Lift** the Circuit Board out and **place it** on a grounded ESD-safe mat beside the player.

4) **Inspect** the Keypad contacts on the Circuit Board for contamination. **Clean** with a cotton swab and isopropyl alcohol. **Wipe dry** with a soft cloth.

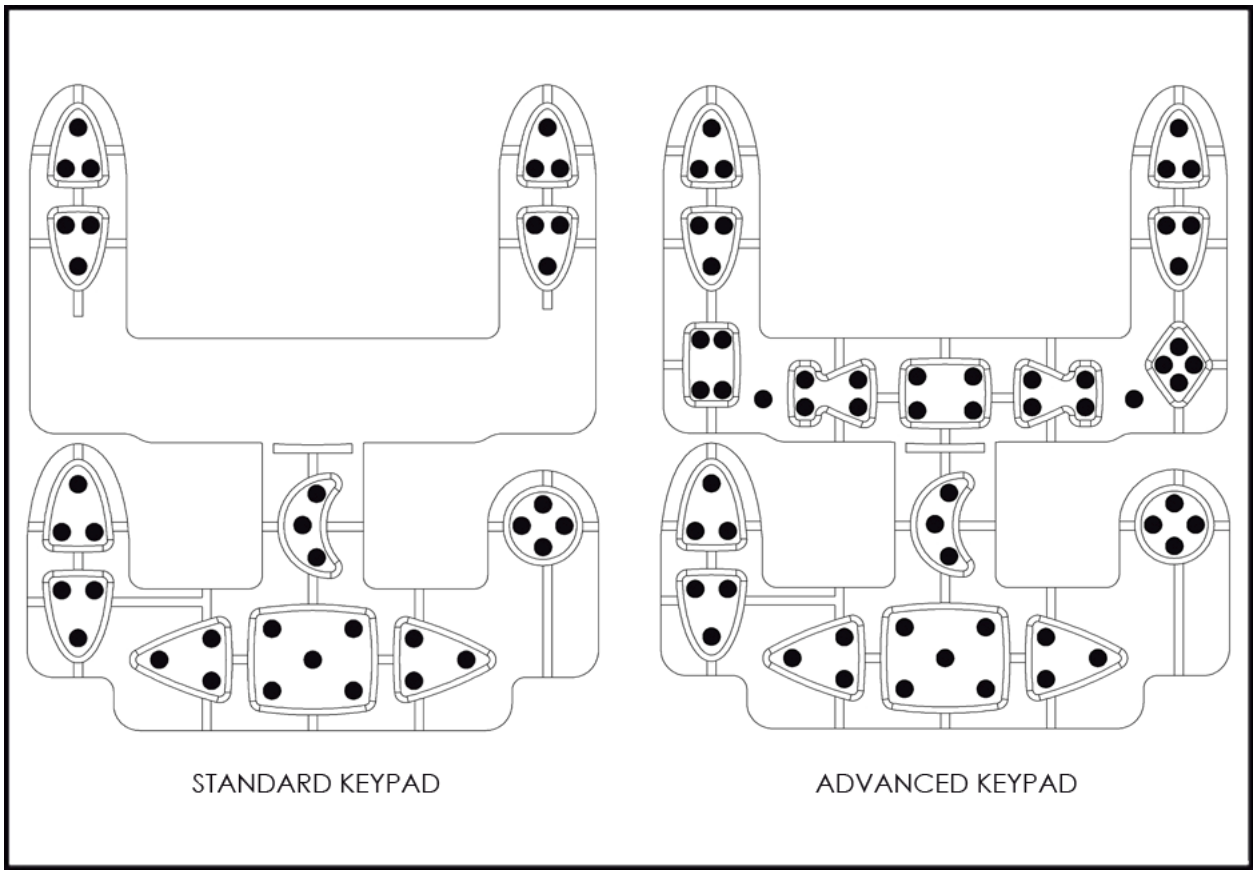


Figure 8-2. Keypad Contact Pill Locations

5) **Inspect** the visible side of the Keypad for missing or contaminated contact pills. **Compare** with Figure 8-2 above. **Note** that the advanced version of the Keypad has additional contact pills. Replace the Keypad if contact pills are missing, if damaged or heavily contaminated.

Note: If a contact pill is missing, **inspect the player** and remove the loose pill.

6) **Remove** the Keypad by lifting it from the edges until it is free of the retaining channels.

7) **Clean** Keypad using a soft brush and cleaning solution. If contaminant is present in the Keypad retaining channels in the Upper housing, **remove** with cleaning solution and a cotton swab.

8) **Dry** with a soft cloth.

9) **Obtain** an Upper Replacement Subassembly if specified by the Player Checkout Worksheet.

10) **Place** the Upper housing upside down on the work surface with support pads so that the protruding keys will not touch the table.

11) **Place** the Keypad over the channels molded into the Upper housing and align them.

12) **Press** the Keypad down into the channels using the Keypad Press Tool or equivalent (pill bottle).

13) **Set** the Circuit Board in place and install 8 Screws.
Do not install screws in two holes marked "No Screw" on the Circuit Board.

14) **Re-attach** six color-coded Cable plugs to the Circuit Board

a) **Connect** the White Cartridge USB Cable Plug to the White J6 Socket marked "Book" on the Circuit Board.

b) **Connect** the Blue AT USB Cable Plug to the Blue J5 Socket marked "Remote" on the Circuit Board.

Note: Do not plug the Green Battery Cable connector into the Red Headphone Cable socket. If the Battery Cable connector is plugged into the Headphone socket (both have four terminals), the player circuit board will be damaged. Make sure the colors match before plugging the connectors in and plug the Headphone cable in first.

c) **Connect** the Red Headphone Cable Plug to Red J1 Socket marked "Headphone" on the Circuit Board.

d) **Connect** the Green Battery Cable Plug to the Green J4 Socket marked "Battery" on the Circuit Board.

e) **Connect** the Yellow Power Supply Cable Plug to Yellow J3 Connector marked "Pwr Supply" on the Circuit Board.

f) **Connect** the White Speaker Cable Plug to the White J2 Socket marked "Speaker" on the Circuit Board

15) **Close** the housing as described in Section 7.1.

8.4 Cartridge USB Cable Replacement

Tools Needed	Parts Needed
#1 Phillips Screwdriver	Assembly, USB Cartridge Dock, 4824591145 (Cartridge USB Cable)
Small Diagonal Cutting Pliers	Cable Ties, 48424591308
Small Needle Nose Pliers	
Torx T10 Driver	

1) **Separate** the player housings as described in Section 7.1.

Note: Examine the installation and routing of the existing Cartridge USB Cable before proceeding. Figure 7-1 in Section 7 shows the cable routing.

2) **Disconnect** the white Cartridge USB Cable Plug from the white 5 pin J6 Socket marked "Book" on the Circuit Board.****

3) Use small, diagonal cutting pliers to **cut** all Cable Ties. **Use caution** not to damage any Cable Insulation.

4) **Remove** and **discard** the cut Cable Ties.

5) **Pull** the Cartridge USB Cable out from the bundle.

6) **Remove** two Mounting Screws that secure the over molded end of the Cartridge USB Cable to the Cartridge Dock.

7) **Pull** the over molded end of the Cable out from the Cartridge Dock and **discard**.

8) **Orient** the over molded end of the replacement **Cartridge** USB Cable with the molded-in "**T**" character **facing up**. **Push it** into the opening in the **back** of the Cartridge Dock.

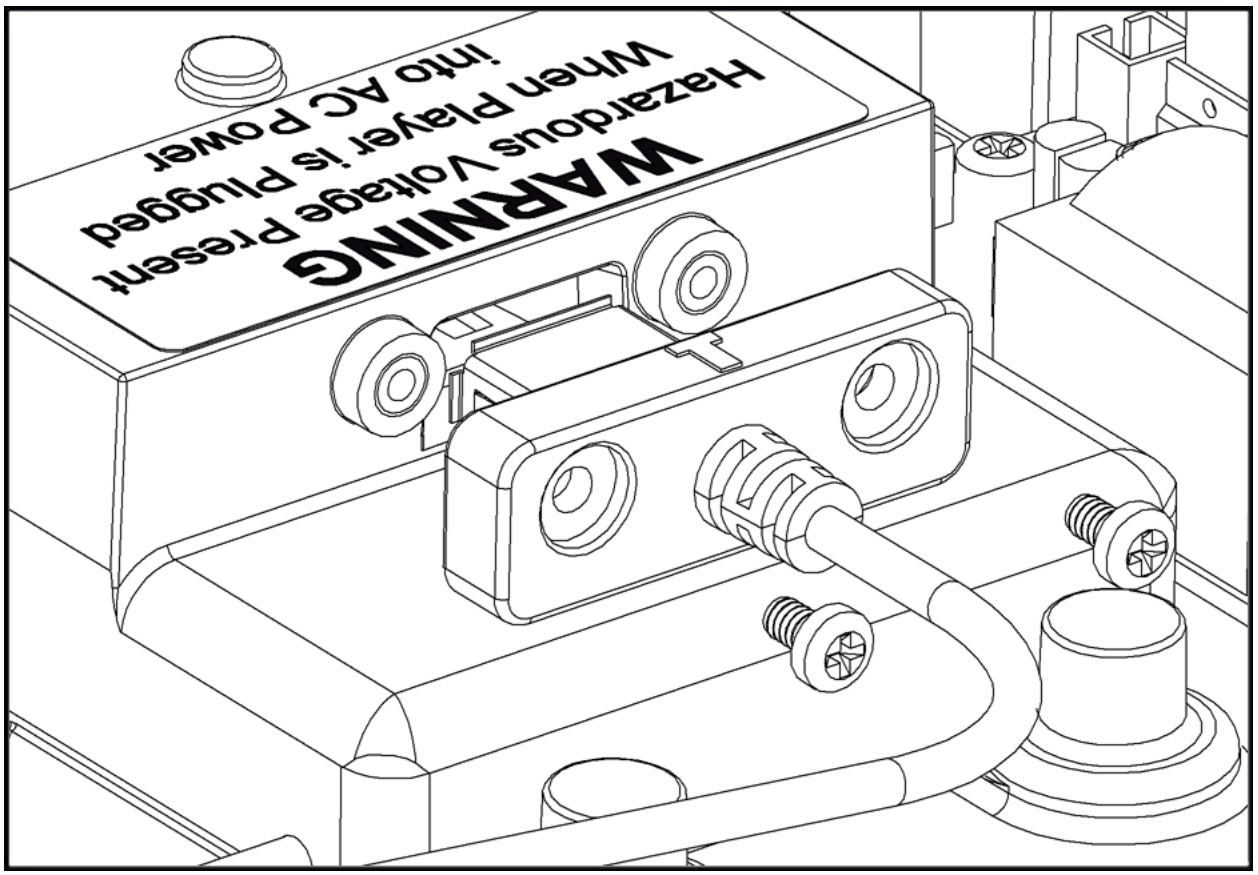


Figure 8-3. Over Mold Orientation for Assembly

9) **Insert** and **tighten** two Mounting Screws.
Important: Ensure that the plastic over-mold is not distorted due to over tightening the screws.

10) **Route** the Cartridge USB Cable along with the bundle of other Cables.

11) **Connect** the White Cartridge USB Cable Plug to the White J6 Socket marked “Book” on the Circuit Board.

12) **Secure** the Cable with Cable Ties as shown in Figure 7-1 in Section 7

13) **Close** the housing as described in Section 7.1.

14) **Power** on the player.

15) **Insert** a test cartridge.

If the test cartridge begins to play, the replacement was successful.

If not, the Circuit Board is most likely defective and the **player should be forwarded to be evaluated for disposition.**

8.5 Headphone Cable Replacement

CAUTION: **Gently** remove the overmolded connectors from the housing to avoid breaking the thin plastic edges.

Tools Needed	Parts Needed
Small Diagonal Cutting Pliers	Assembly, Headphone Jack, 4824591150 (Headphone Cable)
Small Needle Nose Pliers	Cable Ties, 48424591308
Torx T10 Driver	
Headphone	

1) **Separate** the player housings as described in Section 7.1.

   Note: Examine the installation and routing of the existing Headphone Cable before proceeding. Figure 7-1 in Section 7 shows the cable routing.

2) **Disconnect** the Red Headphone Cable Plug from the Red J1 Socket marked "HEADPHONE" on the Circuit Board

3) **Cut** all Cables Ties carefully using the small diagonal Cutting Pliers to avoid damaging any cables. **Remove** and discard the cut Cable Ties.

4) **Pull** the Headphone Cable out from the bundle.

5) **Lift** the over molded end of the Headphone Cable out of the Lower housing and **discard.**

6) To **install** the new cable, **insert** the over molded end of the new Headphone Cable into the Lower housing in the orientation shown in Figure 8-4 below.

7) **Route** the Cable alongside the other cables.

8) **Insert** the Red Headphone Cable Plug into the Red J1 Socket marked "HEADPHONE" on the Circuit Board.

9) **Secure** the Cable with Cable Ties as shown in Figure 7-1 in Section 7.

10) **Close** the housing as described in Section 7.1.

11) **Insert** a Headphone Plug into the Headphone socket.

12) While listening through the headphones, **press** the Power key.

    a) If a "Power On" **announcement was heard** through both channels of the headphones:

       ❖ the replacement was successful.

    b) If a "Power On" **announcement was not heard** through both channels of the headphones:

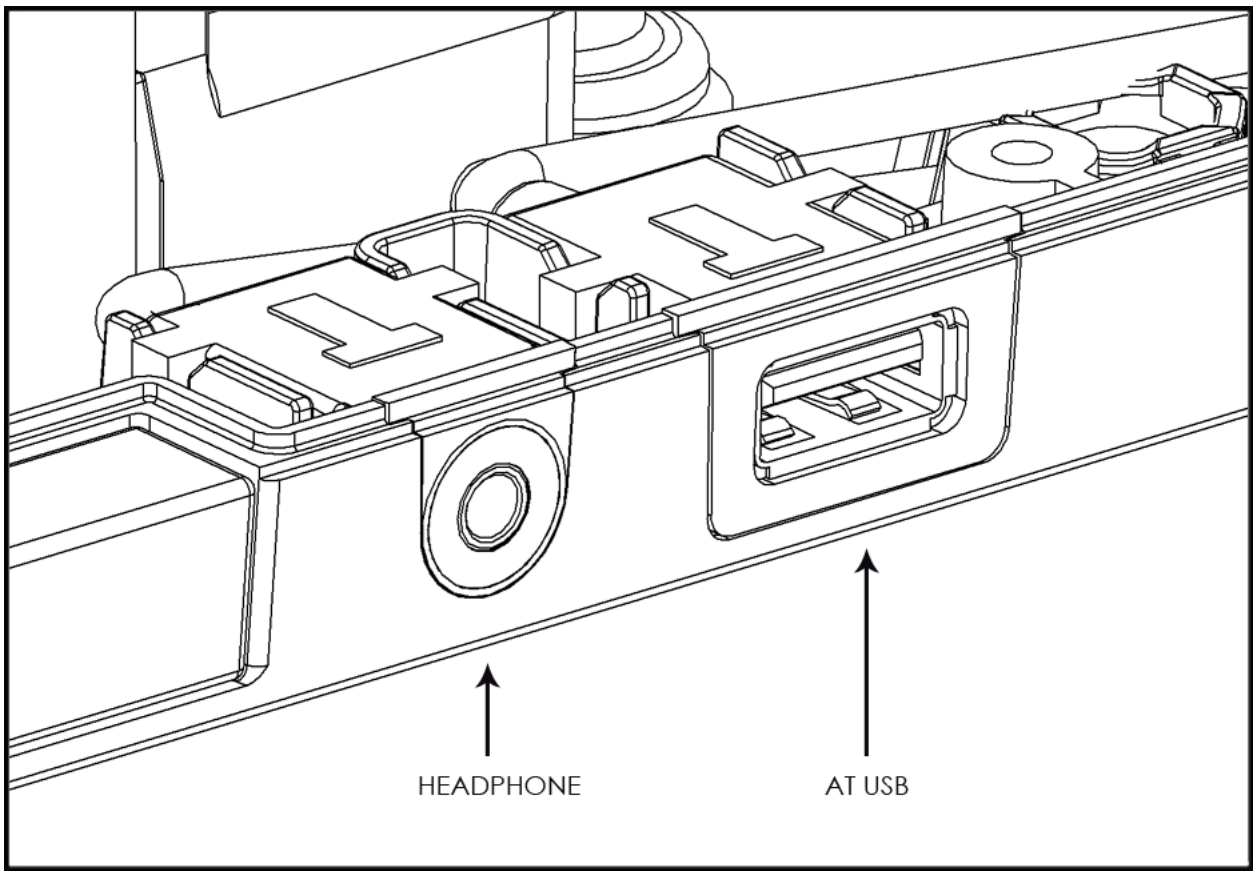


Figure 8-4. Over Mold Orientation During Assembly

8.6 AT USB Cable Replacement

Tools Needed	Parts Needed
Small Diagonal Cutting Pliers	Assembly, AT Jack, 4824591155 (AT USB Cable)
Small Needle Nose Pliers	Cable Ties, 48424591308
Torx T10 Driver	
USB Flash Memory Drive	

This procedure describes how to replace an AT USB Cable.

1) **Separate** the housings as described in Section 7.1.

Note: Examine the installation and routing of the existing AT USB Cable before proceeding. Figure 7-1 in Section 7 shows the cable routing.

2) **Disconnect** the Blue AT USB Cable Plug from the Blue J5 Socket marked "REMOTE" on the Circuit Board

3) **Cut** the Cables Ties carefully with the small diagonal Cutting Pliers to avoid damaging any cables. **Remove** and **discard** the cut Cable Ties.

4) **Pull** the AT USB Cable out from the bundle.

5) **Lift** the over molded end of the AT USB Cable out of the Lower housing and **discard**.

6) To **install** the new Cable, **insert** the over molded end of the new AT USB Cable into the Lower housing in the orientation shown in Figure 8-4.

7) **Route** the Cable alongside the other cables.

8) **Insert** the Blue AT USB Cable Plug into the Blue J5 Socket marked "REMOTE" on the Circuit Board.

9) **Secure** the Cable with Cable Ties as shown in Figure 7-1 in Section 7.

10) **Close** the housing as described in Section 7.1.

11) **Power** on the player and insert a USB Flash Memory Device with book into the Receptacle.

a) If the player begins to play the files on the device:

- ❖ the AT USB Cable was successfully replaced.

b) If the player does not play the files on the device:

- ❖ the Circuit Board is most likely defective and the player should be **forwarded to be evaluated for disposition**.

8.7 Power Input Cord Replacement

Tools Needed	Parts Needed
Torx T10 Driver	Power Input Cord, 4824592020

This procedure describes how to replace a Power Input Cord.

1) **Separate** the housing as described in Section 7.1.

Note: Examine the installation of the existing Power Input Cord before proceeding. Note how the molded strain relief fits in the Lower housing wall.

2) **Lift** over molded strain relief end of the Power Input Cord up and away from the Power Supply and Lower housing. A slight side-to-side wiggling motion of the Plug will ease removal.

3) **Install** the new Power Input Cord by pressing down onto the Power Supply tab contacts as shown in Figure 8-5.

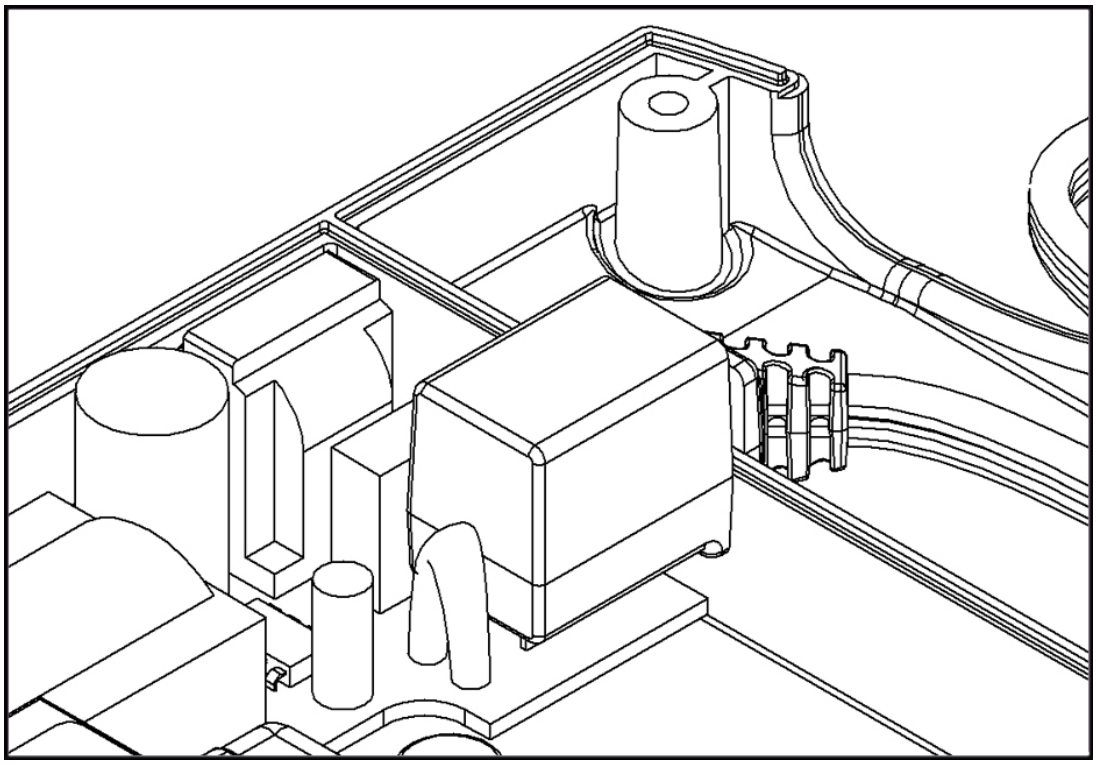


Figure 8-5. Installed Power Input Cord

4) **Plug** the player into Power Outlet.

a) If the player announces "Power On":

- ❖ the Power Input Cord replacement was successful.

5) **Unplug** the player.

6) **Close** the housing as described in Section 7.1.

8.8 Power Supply Cable Replacement

Tools Needed	Parts Needed
Small Needle Nose Pliers	Cable, Power Supply, 4824591320, (Power Supply Cable)
Small Diagonal Cutting Pliers	Cable Ties, 48424591308
Torx T10 Driver	

This procedure describes how to replace a Power Supply Cable.

1) **Separate** the housing as described in Section 7.1.

Note: Examine the installation and routing of the existing Power Supply Cable before proceeding. Figure 7-1 in Section 7 shows the cable routing.

2) **Cut** the Cables Ties carefully with the small diagonal Cutting Pliers to avoid damaging any cables.

3) **Remove** and **discard** the cut Cable Ties.

4) **Disconnect** the Yellow Power Supply Cable Plug from the Yellow J3 Socket marked "PWR SUPPLY" on the Circuit Board.

5) **Disconnect** the White Power Supply Cable Plug from the White Socket on the Power Supply.

6) **Lift** the Power Supply Cable out of the Cable Bundle and out of the two (2) Retaining Slots located behind the Cartridge Dock and **discard**.

7) To **install** the new Power Supply Cable, **insert** the Yellow Plug into the Yellow J3 Socket marked "PWR SUPPLY" on the Circuit Board.

8) **Insert** the White Plug into the White Socket on the power supply.

9) **Route** the Cable through the Retaining Slots behind the Cartridge Dock.

10) **Secure** the Cable with Cable Ties as shown in Figure 7-1 in Section 7.

11) **Plug** the player into Power Outlet.

    a) If the player announces "Power On":

    - ❖ the Power Supply Cable replacement was successful.

12) **Unplug** the player.

13) **Close** the housing as described in Section 7.1.

8.9 Power Supply Replacement

Tools Needed	Parts Needed
#1 Phillips Screwdriver	Power Supply, 4824591071
Torx T10 Driver	

This procedure describes the replacement of a power supply.

1) **Separate** the housing as described in Section 7.1.

Note: Examine the installation and routing of the Power Input Cord and Power Supply Cable before proceeding. Figure 7-1 in Section 7 shows the cable routing.

2) **Lift** the Power Input Cord away from the housing and the Power Supply as described in Section 8.8 and set aside.

3) **Disconnect** the White Power Supply Cable plug from the White Socket on the Power Supply.

4) **Remove** four mounting screws from the Power Supply.

5) **Lift** the Power Supply out of the Lower housing.

6) **Install** the new Power Supply.

7) **Insert** and **tighten** four mounting screws.

8) **Re-install** the Power Input Cord as described in Section 8.7.

9) **Insert** the White Plug of the Power Supply Cable into the White Socket on the Power Supply.

10) **Plug** the player into a Power Outlet.

    a) If the player announces “Power On”:

    ❖ the Power Supply replacement was successful.

11) **Unplug** the player.

12) **Close** the housing as described in Section 7.1.

8.10 Handle and Retainer Spring Replacement

Tools Needed	Parts Needed
Small Needle Nose Pliers	Spring, Compression 4824591319 (Compression Spring)–as needed
Torx T10 Driver	Handle Retainer, 4824591303–as needed
Cleaning Materials (refer to Section 8.1)	Handle, 4824591101–as needed

This procedure is performed for broken handles, handles that will not slide properly, or handles that are too loose.

1) **Separate** the housing as described in Section 7.1.

2) **Lift** the Handle away from the Lower housing.

3) **Remove** the Compression Spring and Retainer from its well in the Upper housing with the Needle Nose Pliers.

Note: One end of the Compression Spring has the wire formed to a larger diameter to keep the spring in the Upper housing after insertion. This end is referred to as the Large End. The opposite end is referred to as the Small End.

4) **Press** the new Handle Retainer into the Small End of the Compression Spring in the orientation shown in Figure 8-6.

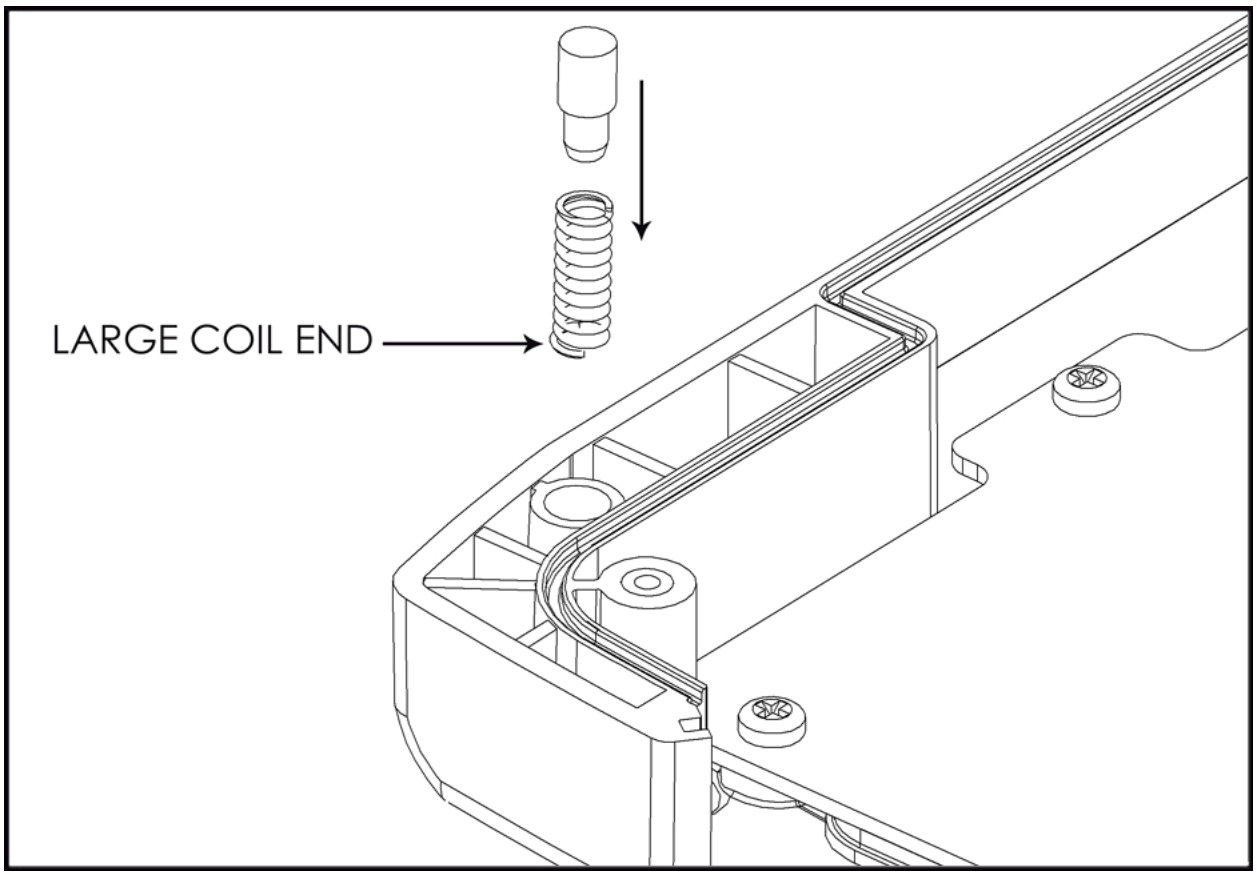


Figure 8-6. Handle Retainer and Compression Spring Orientation for Assembly

5) **Press** the assembled into the well with the Large End of the Compression Spring inserted first.

6) **Clean** the handle as needed.

7) **Place** Handle onto the Lower housing.

8) **Close** the housing as described in 7.1.

9) **Open** and **close** the Handle several times to **confirm correct operation.**

8.11 Skid Resistant Feet Replacement

Parts Needed
Feet, Skid Resistant, 4824591313 (Skid-Resistant Feet)
Materials Needed
Cotton Swabs
Isopropyl Alcohol (IPA)

This procedure describes how to install replacement Skid-Resistant Feet on the bottom of the player.

Note: The feet are mounted in round, shallow wells at each corner of the Lower housing.

1) **Clean** the empty well with a cotton swab and IPA. Use a second dry swab to wipe up residual IPA.
2) **Peel** Skid-Resistant Feet away from the release paper.
3) **Press** the Feet into the wells with the **adhesive side facing the player housing.**

8.12 Lower Housing Replacement

Tools Needed	Parts Needed
#1 Phillips Driver	Lower Replacement Subassembly, 4824591102
Small diagonal cutting pliers	Cable Ties, 4824591308
Torx T10 Driver	**Material**
	White adhesive label

This procedure describes replacement of a damaged Lower housing or a damaged Battery Cable.

Note: Players with replacement Lower housings will not have a bar code label.

Note: If there is no Serial Number label on the Upper housing (because it has been replaced at least once already), the Serial Number should be written on a white adhesive label that has been trimmed to approximately ¼ inch by 1½ inch. The Serial Number should be printed on a label with a laser printer, prior to trimming or written with a fine-point black permanent marker.

1) **Place** the player on the bench with the bottom facing up.

2) **Remove** the Battery Pack as described Section 8.2.

3) **Set** the Battery Access Panel and Battery Pack aside.

4) **Open** the player as described in Section 7.1.

5) **Lift** the handle from the Lower housing and set aside.

6) **Cut** the Cable Tie securing the Cable to the Cable Tie Mount. **Remove** the Cable Tie and discard.

7) **Remove** the two (2) Screws securing the Cartridge Connector.

8) **Pull away** from the Cartridge Dock opening.

9) **Lift** the AT Connector and Headphone Connectors **away** from the Lower housing.

10) **Lift** the Power Input Cord **away** from the Power Supply and set aside.

11) **Lift** the Power Supply Cable **out** of the retaining features at the rear of the Cartridge Dock.

12) **Remove** four (4) screws from the power supply.

13) **Lift** the Power Supply with Power Output Cable still connected **out** of the Lower Housing and **set aside**.

14) The Lower Housing is now separate from the Upper Housing at this point.

15) **Position** a Lower Replacement Subassembly **beside** the Upper Housing.

16) **Install** the Power Supply with four (4) screws.

17) **Route** the Power Output Cable into the Capture Slots **behind** the Cartridge Dock.

18) **Install** the Power Input Cord.

19) **Install** the over molded end of the Cartridge USB Cable to the Cartridge Dock with two (2) screws.

20) **Press** the over molded end of the Headphone Cable into the Lower Housing.

21) **Press** the **over molded** end of the AT USB Cable into the Lower Housing.

22) **Secure** the Cable Bundle to the Cable Tie Mount with a new Cable Tie.

23) **Place** Handle onto the Lower Housing.

24) **Close** the Housing as described in Section 7.1.

25) **Install** the Battery Pack as described in Section 8.2.

26) **Install** four (4) skid-resistant feet.

8.13 Software Upgrade

The NLS Engineering Section will provide software updates for the player periodically or when necessary. The updates will be used to correct problems, enhance usability and to add functionality. The new software is applied to a player using a cartridge or USB flash drive and occurs automatically upon insertion.

The software update files may be present on, and distributed with, regular book cartridges provided by NLS or may be downloaded by the library or patrons and explicitly applied to the player. The player will only update the software if the version on the cartridge is later than that already stored in the player. If the version on the cartridge is the same, or earlier, the software files are ignored.

The duration of the software update process can be up to 30 seconds but is usually shorter. A message is announced and a "ping-pong" tone is repeated during the upgrade. When complete, the player will reboot and play any book coexisting with the update files on the cartridge.

The software, if retrieved from the NLS via the Internet, will be a single zip file of approximately 30 MB in size. This file must be unziped onto a cartridge or USB drive preserving the file structure. The root directory of the update software tree is called "upgrade" and must be located in the top most directory of the drive when unzipped.

Tools Needed
Software upgrade cartridge (current software version)

This procedure describes how to load the current version of software to a player that is received with an older software version.

Note: *To determine what version of software is currently in the player, without a cartridge inserted in the player, press the Sleep button 10 or more times within 1 minute. The player will announce the serial number followed by the software version. Press the Power button to end the announcement.*

Note: *If a software upgrade cartridge containing an older version of software is inserted into the player, the player will not load the older software. It will announce* ***"No book available on cartridge."*** *If the cartridge contains both a software upgrade and a book recording, the player will play only the book.*

1. Insert the software upgrade cartridge into the player.
2. When the software upgrade is complete, the player will announce **"Software upgrade completed; stand-by while your player is restarted."**
3. Remove the software upgrade cartridge.

9 Prepare to Ship

Refer to the parts list in the Appendix for materials needed for shipping players.

Note: Battery Packs must be connected prior to shipment to patrons.

Note: Players and Shipping Containers shall be kept together so the serial number label on the container matches the player serial number.

1) **Place** the player in the Shipping Bag.
2) **Fold** the excess flap under the player.
3) **Press** Foam Inserts onto each end of the player.
4) With buttons facing up, **lower** the player into the Shipping Container.
5) **Place** instructional material in the Shipping Container
6) **Close** the Container Lid.
7) **Secure** with Packaging Tape.

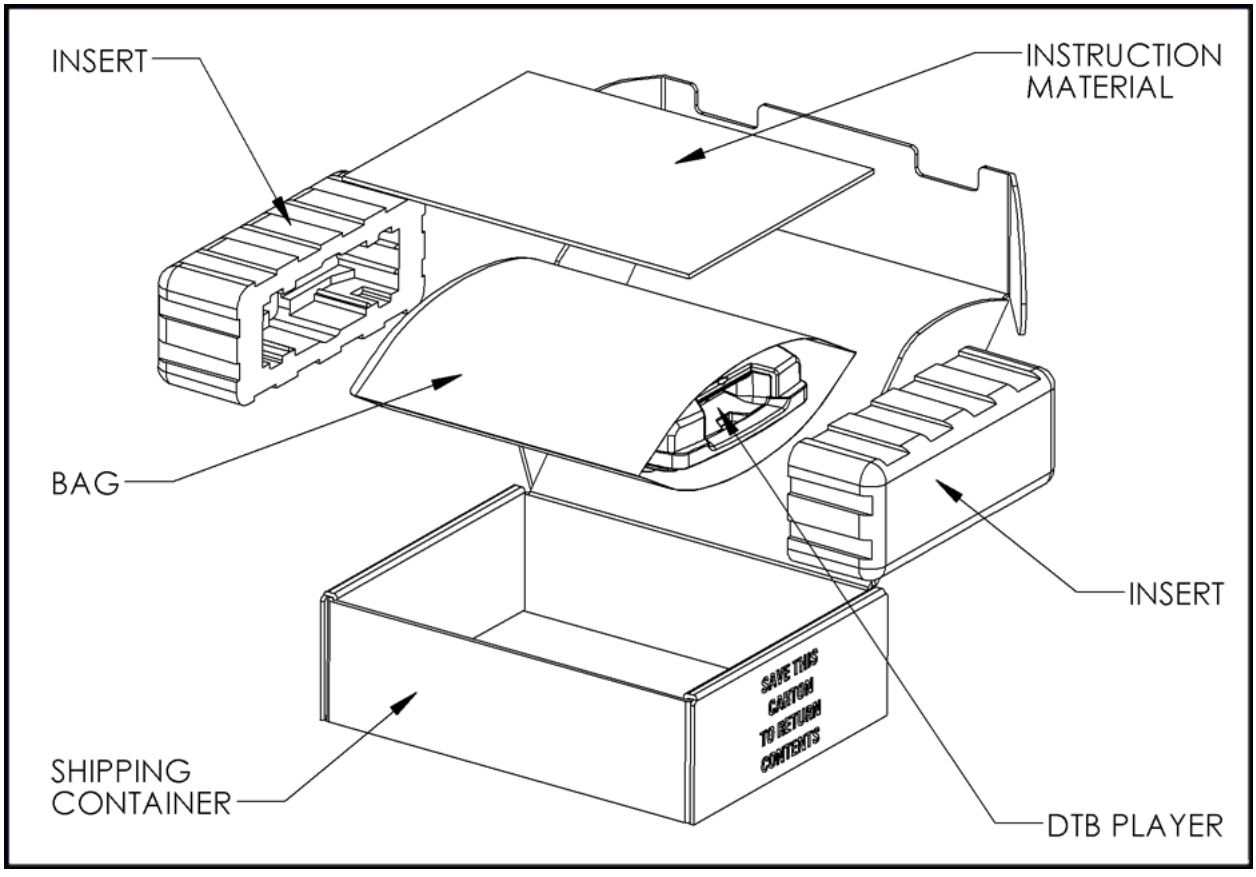


Figure 9-1. Player Package Exploded Diagram

10 Long-Term Player Storage

Players that will be stored for longer than 3 months shall be stored with the Battery Pack disconnected.

This is because the Battery Pack is always (even when the machine is off) powering a “gas gauge” integrated circuit which is used to determine the state of battery charge. This IC consumes approximately 150uA. Typical self discharge of the NiMH battery is approximately 20% per month (at room temperature (20C) and higher at elevated temperatures).

To disconnect the Battery Pack:

1) **Turn** the player over so the **bottom is facing up** and **loosen** two (2) battery panel screws until each spins freely.

2) **Lift** the battery access panel up and away from the player. **Set** panel **aside**.

3) **Lift** the Battery Pack out of the compartment. **Set** it on the bottom of the Housing.

4) **Grasp** the two sides of the Battery Cable Connector.

5) **Press** the Release Latch down while **pulling** the connectors apart.

6) **Place** the Battery Pack back in the compartment with the **connectors positioned** as shown in Figure 10-1.

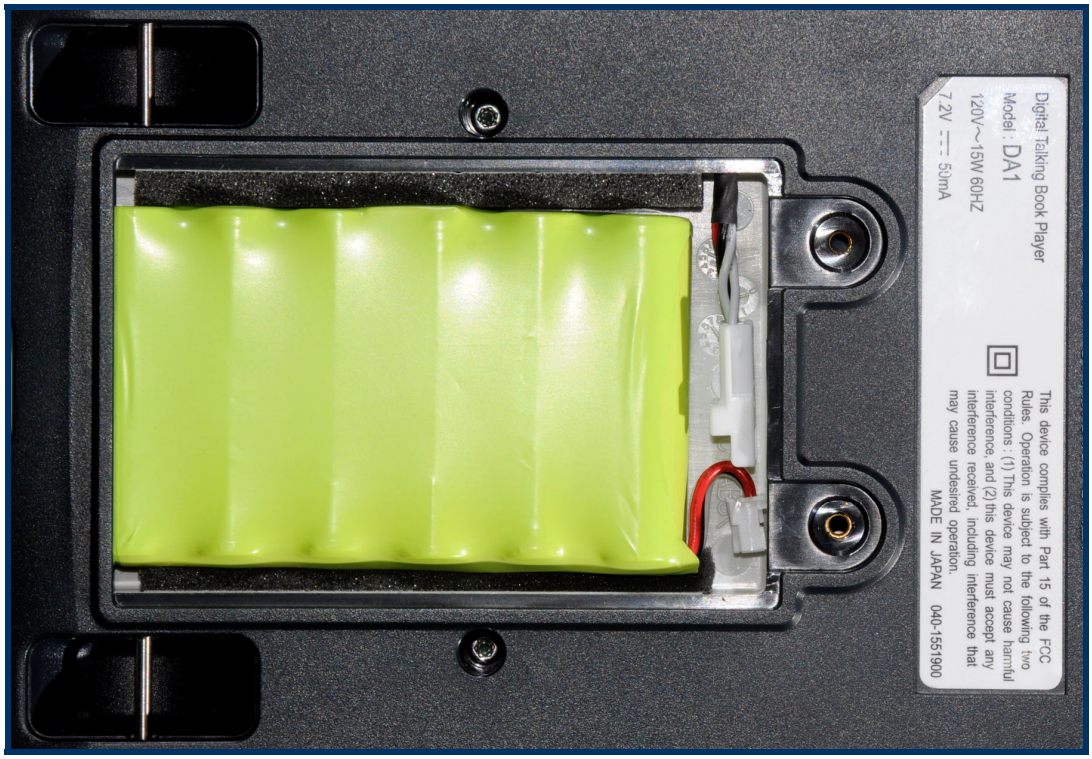


Figure 10-1 Disconnected Battery

11 Appendix

11.1 Post-Service Acceptance Test Procedures

Post-Service Acceptance Test Procedures	
Test	**Procedure Steps**
Equipment Needed:	Book Cartridge, Commercial headphones with 3.5 mm Plug, Commercial USB PC Keyboard
Visual Examination	1. Visually check the player for missing components, misaligned components, or other damage/defects. 2. Pass if no defects observed. 3. Record any observations.
Loose Components	1. Pick up the player and gently shake while listening for sound that may indicate loose material inside the player. 2. Pass if there is no indication of loose material inside. 3. Record any observations.
Power On	1. Plug the player into an electrical outlet. 2. Pass if the announcement **"Player On"** is heard. 3. Record any observations.
Battery Power	1. Unplug the player while powered on. 2. Pass if an announcement regarding remaining battery life is announced. 3. Plug the player back into the electrical outlet. 4. Record any observations.
Battery Charging	1. Press the Power key and hold down until the player announces **"Player Off"**. 2. Press and hold down the RW (rewind), Sleep, and Tone Down keys and then press the Power key. 3. Within a few seconds the player should announce **"Player On"** followed by **"Player Status",** **Note:** If a beep is heard or no announcements are heard, the player has **failed the internal memory test** and player is non-conforming. 4. Press the FF key to step through the menu until **"Battery"** is announced by the player. 5. Press the PLAY/STOP key to select this item. 6. Press the FF key until the player announces the **"Initiate Battery Recharge"** option and press PLAY/STOP to select this option. 7. The player will announce **"Battery Recharge Initiated"** followed by **"Battery".** 8. After at least 5 seconds, press the PLAY/STOP key to select the **"Battery"** menu item. 9. Press the FF key until the player announces the **"Recharge Status"** option and press PLAY/STOP to select this option. 10. The player will announce one of the following messages followed by **"Battery":** 11. **"Battery Recharge in Progress"** Pass if this announcement is heard. 12. **"Power Error"** or **"Battery Not Detected"**: Fail if any of these announcements are heard. 13. Power Off the player

Post-Service Acceptance Test Procedures	
Key Identifier Announced	1. Press the Power key to power on the player. 2. Press the center of each key and verify that each key is announced. 3. Pass if every key press causes a key identifier announcement. 4. Record any observations of keys that do not cause an identifier announcement.
Keys Travel Freely	1. Power Off the player. 2. Saving the power key for last, press the corners or edges of every key. 3. Verify that no keys hang up. 4. Pass if each key returns to its up state. 5. Record any observations of keys that do not return to up state.

Post-Service Acceptance Test Procedures	
Test	**Procedure Steps**
Tone and Player/ Cartridge USB Interface	1. Insert a book cartridge into the player. 2. Increase volume to maximum. 3. Listen for buzzing or humming that may indicate unintended vibration of player components. 4. Pass if the cartridge is successfully inserted and there is no audible indication of player component vibration. 5. Lower the volume to comfortable level. 6. Remove the stepped tone cartridge. 7. Record any observations.
Headphone	1. Press the play/stop button to hear the key identifier. 2. Plug in head phones 3. Press the play/stop button again. 4. Pass if the speaker does not announce the key identifier indicating the speaker is turned off. 5. While listening through headphones press at least 2 keys and listen to key identifier. 6. Pass if sound is transmitted through both sides of the head phones. 7. Record any observations.
AT Device Port	1. Remove the AT device port jack cover. 2. Plug a USB Flash Memory Drive into the port. 3. Pass if the player announces “No book available on cartridge” or begins playing a file on the device. The AT device port is functioning properly. 4. Fail if “AT Error” is announced. 5. Record any observations. 6. Unplug the USB Flash Memory Drive and replace the cover.
Serial Number and Software Version	1. Playback the Serial Number and software version number by pressing the crescent-shaped Sleep key 10 times. 2. Record the announced Serial Number. 3. Record the announced software version. 4. Pass if announced Serial Number is the same as the Serial Number on the player label. 5. Pass if the announced software version number is the current software version. 6. Record any observations.

11.2 Post-Service Acceptance Test Record

Post-Service Acceptance Test Record			
Serial Number of Player:			
Acceptance Tests		**Record Result**	**Initial and Date**
Visual Examination	Record Pass or Fail. If the player fails, describe the reason in the notes below.		
Loose Components	Record Pass or Fail. If the player fails, describe the reason in the notes below.		
Power On	Record Pass if **"Power On"** is heard. Fail if otherwise.		
Battery Power	Record Pass if a remaining battery message life is heard. Fail if otherwise.		
Battery Charging	Record Pass if the player announces **"Battery Recharge in Progress**". Fail if otherwise.		
Key Identifier	Record Pass if the key identifier was heard for every key. Fail if otherwise and record failing keys as observations.		
Keys Travel Freely	Record Pass if all keys travel freely. Fail if otherwise and record failing keys as observations.		
Tone and Player/Cartridge Interface	Record Pass if cartridge is inserted and there is no indication of unintended vibration of components. Fail if otherwise and record observations.		
Headphone	Record Pass if the speaker turns off when the Headphone Plug is inserted. Fail if otherwise.		
	Record Pass if both earphones are functional. Fail otherwise and record observations.		
AT Device Port	Record Pass if the player announcement is correct. Fail if otherwise and record observation below.		
Serial Number and Software Version	Pass if the announced player Serial Number matches the player label. Fail if otherwise.		
	Record the announced software version number: Pass if the software version is the current version.		
Acceptance Test Notes:			

11.3 DTB Player Repair Parts List

DTB Player Repair Parts List			
Description	**Part Number**	**Quantity**	**Note**
Player Components			
Standard Upper Replacement Subassembly	4824591202	1	With speaker and dock seal installed
Advanced Upper Replacement Subassembly	4824591252	1	With speaker and dock seal installed
Keypad, Standard	4824591201	1	
Keypad, Advanced	4824591251	1	
Speaker	4824591302	1	
Adhesive, Speaker	4824591315	1	
Screw, Mounting	4824591304	14	
Screw, Housing	4824591305	8	
Battery Pack	4824591310	1	
Panel, Battery Access	4824591311	1	
Screw, Battery Panel	4824591312	2	
Nylon Washer	4824591309	2	
Cover, AT USB Jack	4824591159	1	
Dock Seal, Upper	4824591314	1	
Foam, Battery Compartment	4824591316	2	
Feet, Skid Resistant	4824591313	4	
Lower Replacement Subassembly	4824591102	1	With labels, cable tie mount, battery foam
Power Supply	4824591071	1	
Cable, Power Supply	4824591320	1	
Power Input Cord	4824592020	1	
Assembly, Headphone Jack	4824591150	1	
Assembly, AT Jack	4824591155	1	
Assembly, USB, Cartridge Dock	4824591145	1	
Cable Tie Mount	4824591307	1	
Cable Tie	48244591308	4	

DTB Player Repair Parts List			
Handle	4824591101	1	
Spring, Compression	4824591319	2	
Handle Retainer	4824591303	2	
Packaging Material			
DTBM Shipping Container Carton	4824591451	1	
Insert, Player Shipping Container	4824591452	2	
Label, Serial # and Barcode	4824591457	1	
Bag, Player Shipping	4824591454	1	
Player Instructional Material	4824591460	1	
DTBM Shipping Container Overpack	4824591455	1	8 players/box

11.4 Player Checkout Worksheet

Player S/N:	D 1-		
Date:	/ /	Inspected by:	

Check for service	Description	Comment	Manual Ref.
	6.1 Inspection		
	Damage or Excessive Contamination		
☐	Key Pad		**8.3**
☐	Speaker Grill		**8.3**
☐	Cartridge Dock		**8.1**
☐	Cartridge USB connector		**8.4**
☐	Headphone connector		**8.5**
☐	AT USB connector		**8.6**
☐	AC Power cord		**8.7**
☐	Upper Housing		**8.3**
☐	Lower Housing		**8.12**
☐	Handle		**8.10**
☐	Battery access panel		**8.2**
☐	Battery pack & cable		**8.2**
☐	Loose internal parts		**7.1**
	Missing Components		
☐	Rubber feet		**8.11**
☐	AT USB cover		**6.11**
☐	Battery access panel		**8.2**
☐	Housing Fasteners		**7.1**
	6.2 AC power evaluation		
☐	*"Power Error"* announcement (battery problem)		**7.2**
☐	*"System Error"* announcement (circuit board failure)		**8.3**
☐	No *"Power On"* announcement (AC power problem)		**7.3**
☐	*"Power On"* announcement in headphones only. (Speaker audio problem)		**7.4**
	6.3 Battery power evaluation		
☐	Player does not remain operating (on battery) when AC power removed		**7.2**

Check for service	Description	Comment	Manual Ref.
	6.4 Battery recharge		
☐	No "Battery recharge in progress" response from status inquiry after initiating recharge		**7.2**
	6.5 Battery condition & software version		
☐	More than 400 charge cycles ☞ *replace battery*		**8.2**
☐	Software requires upgrade ☞ *upgrade software*		**8.13**
	6.7 Keypad operation		
☐	Keys do not respond reliably ☞ *clean or replace keypad*		**8.3**
	6.8 Cartridge operation		
☐	Persistent cartridge error message ☞ *troubleshoot cartridge USB cable*		**8.4**
☐	Poor cartridge mechanical fit ☞ *troubleshoot cartridge USB cable*		**8.4**
	6.9 Audio Quality		
☐	Audio distorted or noisy ☞ *troubleshoot upper housing*		**8.3**
	6.10 Headphone operation		
☐	Speaker audio does not stop on coonector insertion ☞ *replace headphone cable*		**8.5**
☐	Poor quality audio or one side missing. ☞ *troubleshoot headphone cable*		**8.5**
☐	Poor headphone connection. ☞ *troubleshoot headphone cable*		**8.5**
	6.10 AT USB device port operation		
☐	AT port failure ☞ *troubleshoot AT port cable*		**8.6**

Notes:

11.5 Statistics Table

Type	No.	Elements	Description
General	1	Statistics Table Revision	Statistics Table (this table) revision
	2	Player Serial Number	Serial number
	3	Player Type	Standard or Advanced Model
	4	Battery in player	Player is set to expect that a battery is installed.
	5	Number of Key Exchange Object	Number of PTDB1 and PDTB2 keys in the player
	6	Key Exchange Object Name List	Names list of the keys in the player
	7	Last Service Date	Entered manually by a technician
	8	Service Comments	Service code/comments
User Interface	9	Verbosity	Verbosity (normal/reduced)
Software	10	Software version	Current software version number
	11	User Guide	Current User Guide version
	12	Software Errors	Number of times, from the birth of the player, that the watchdog timer has been used to reset the player when the software was unable to execute parts of the code
Statistics	13	Play Time	Total playtime of the player **on AC power**
	14		Total play time of the player **on battery for the current battery pack**
	15		Total play time of the player **on battery since the birth of the player**
	16	Total Time	Total time the player has been powered **on AC power**
	17		Total time the player has been powered **on battery for the current battery pack**
	18		Total time the player has been powered **on battery since the birth of the player**
	19		Total idle time while the player is powered by AC. Three conditions must be met to be idle: no button pressed, no audio played, and power is coming from AC power source.
	20		Total idle time while the player is powered by battery for the current battery pack. Three conditions must be met to be idle: no button pressed, no audio played, and power is coming from batteries.
	21		Total idle time while the player is powered by battery since the birth of the player.

Type	No.	Elements	Description
	22		Total battery play time /Total play time
	23	Battery usage data	1 min < # of battery usages < 30 min
	24		30 min < # of battery usages < 1 hr
	25		1hr < # of battery usages < 3 hrs
	26		3hrs < # of battery usages < 10 hrs
	27		10 hrs < # of battery usage
	28	Number of cartridges inserted	Total number of times a USB drive was plugged in
	29	Number of Battery Errors	Total communication errors from the "gas gauge" device **since the birth of the player**
	30		Total communication errors from the "gas gauge" device **for the current battery pack**.
	31	Number of Power On	Number of times the player was turned on
	32	Charge data (with current battery)	full < # of battery charges < 75% full
	33		75% full < # of battery charges < 50% full
	34		50% full < # of battery charges < 25% full
	35		25% full < # of battery charges < empty
	36	Charge data (since birth of player)	full < # of battery charges < 75% full
	37		75% full < # of battery charges < 50% full
	38		50% full < # of battery charges < 25% full
	39		25% full < # of battery charges < empty
	40	AC Cord	Number of times plugged in
	41	Button Presses	Play/Stop
	42		Rewind
	43		Fast Forward
	44		Volume Up
	45		Volume Down
	46		Speed Up
	47		Speed Down
	48		Tone Up
	49		Tone Down
	50		Sleep
	51		Bookmark
	52		Info

Type	No.	Elements	Description
	53		Menu
	54		Previous
	55		Next
	56	Books	Number of different books (for current profile)

11.6 List of Error Announcements

Error Message **Audio Announcement:** Library, Technician **Text Message:** Technician Plus, Developer	**Level**	**Error types**
"Cartridge Error"	L,T	At this level, all cartridge errors will be reported as: "Cartridge Error"
"Cartridge Unreadable"	TP,D	Unreadable (read)
"Cartridge Content Error"		Unable to decode book content (Player was unable to understand book structure OR player was unable to decode audio data)
"Cartridge, Driver Error "		Driver problem (Operating System drivers) (Player was unable to open, close, mount, un-mount the files/directory on the cartridge)
"AT Device Error"	L,T	At this level, all AT device errors will be reported as: "AT device Error"
"AT Device unreadable"	TP,D	Unreadable (read)
"AT Device Content Error"		Unable to decode book content (Player was unable to understand book structure OR player was unable to decode audio data)
"AT Device, Driver Error"		Driver problem (Operating System drivers) (Player was unable to open, close, mount, un-mount the files/directory on the cartridge OR player was unable to mount, unmount an AT device)
"Power Error"	L,T	At this level, all AT device errors will be reported as: "AT device Error"
"Battery setup is wrong"	TP,D	Battery detection (Player is configured to operate without battery but a battery has been detected OR player is configured to operate with a battery but no battery has been detected)
"Battery fault"		Battery recharge (Battery voltage too low OR Battery voltage too high OR Charge time too long OR Too many failed charge attempts (recharge does not initiate) OR Too many invalid charge attempts (charge terminates normally with a low voltage))
"System Error"	L,T	Unable to write in the internal Flash memory during a software upgrade OR player has run out of memory.

Error Message **Audio Announcement:** Library, Technician **Text Message:** Technician Plus, Developer	**Level**	**Error types**
		Note: Due to the severity of this error, the player may not be able to save and report this information. The unit needs to be fixed.
"System Upgrade Error"	TP,D	Unable to write in the internal Flash memory during a software upgrade
"System Memory Error"		Player has run out of memory.

11.7 List of USB-Serial Adapter Vendors

The vendors listed below offer USB to serial adapters that utilize the FTDI USB-to-serial chip required. A cable of this type is required to interconnect a PC serial or USB port to the player AT device port. This is not intended to be an all inclusive list.

FTDI Chip
http://www.ftdichip.com/
http://apple.clickandbuild.com/cnb/shop/ftdichip?op=catalogue-products-null&prodCategoryID=73&title=USB+NMC-2.5m
http://www.ftdichip.com/Products/EvaluationKits/USB-Serial.htm

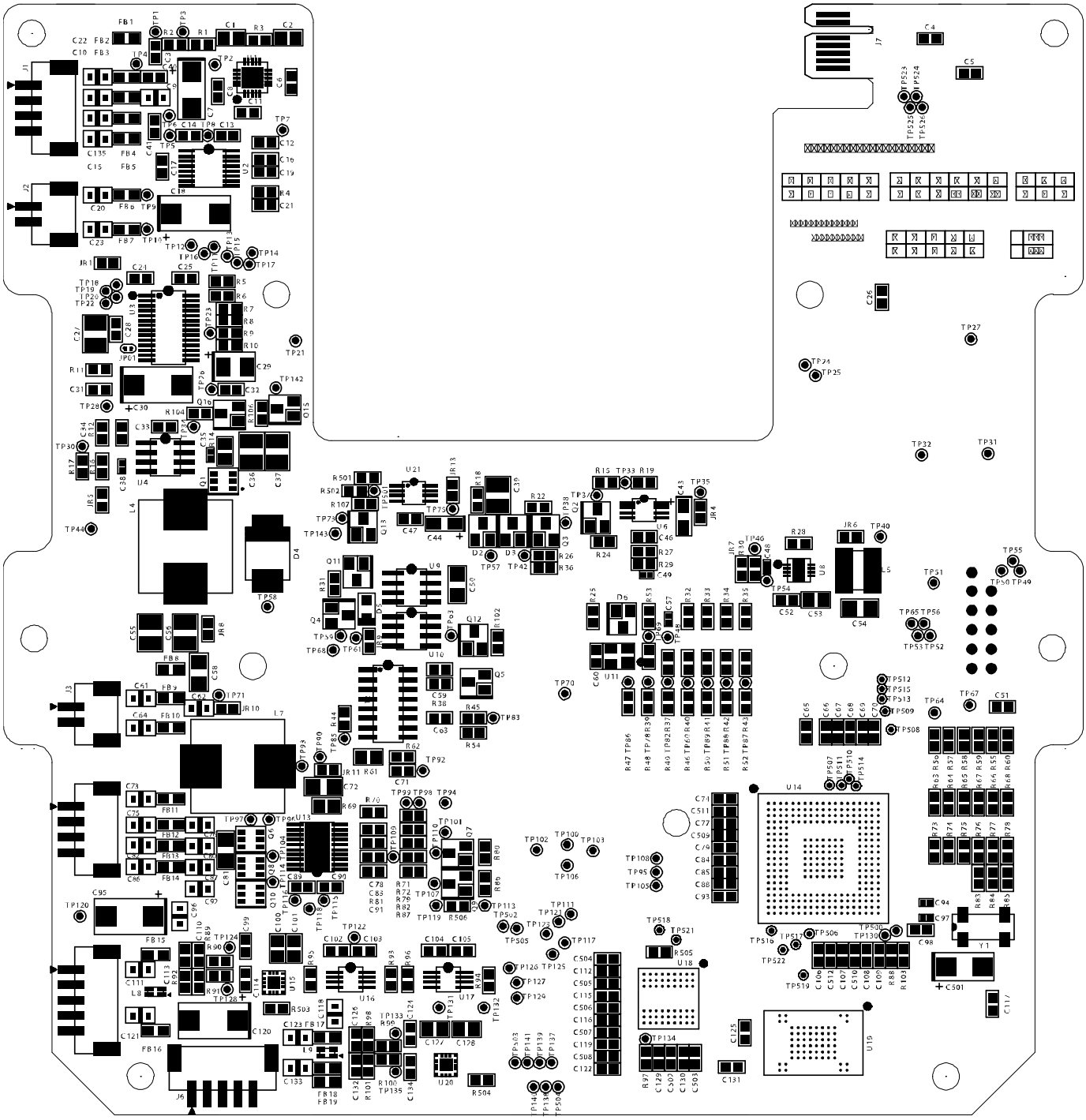
Byterunner Technologies
http://www.byterunner.com/byterunner/product_name=USB-COM-CBL/user-id=/password=/exchange=/exact_match=exact

Cablemax
http://www.usbgear.com/computer_cable_details.cfm?sku=765288&cats=199&catid=199%2C601%2C461
http://www.usbgear.com/computer_cable_details.cfm?sku=USBG-US-2326FT&cats=199&catid=199

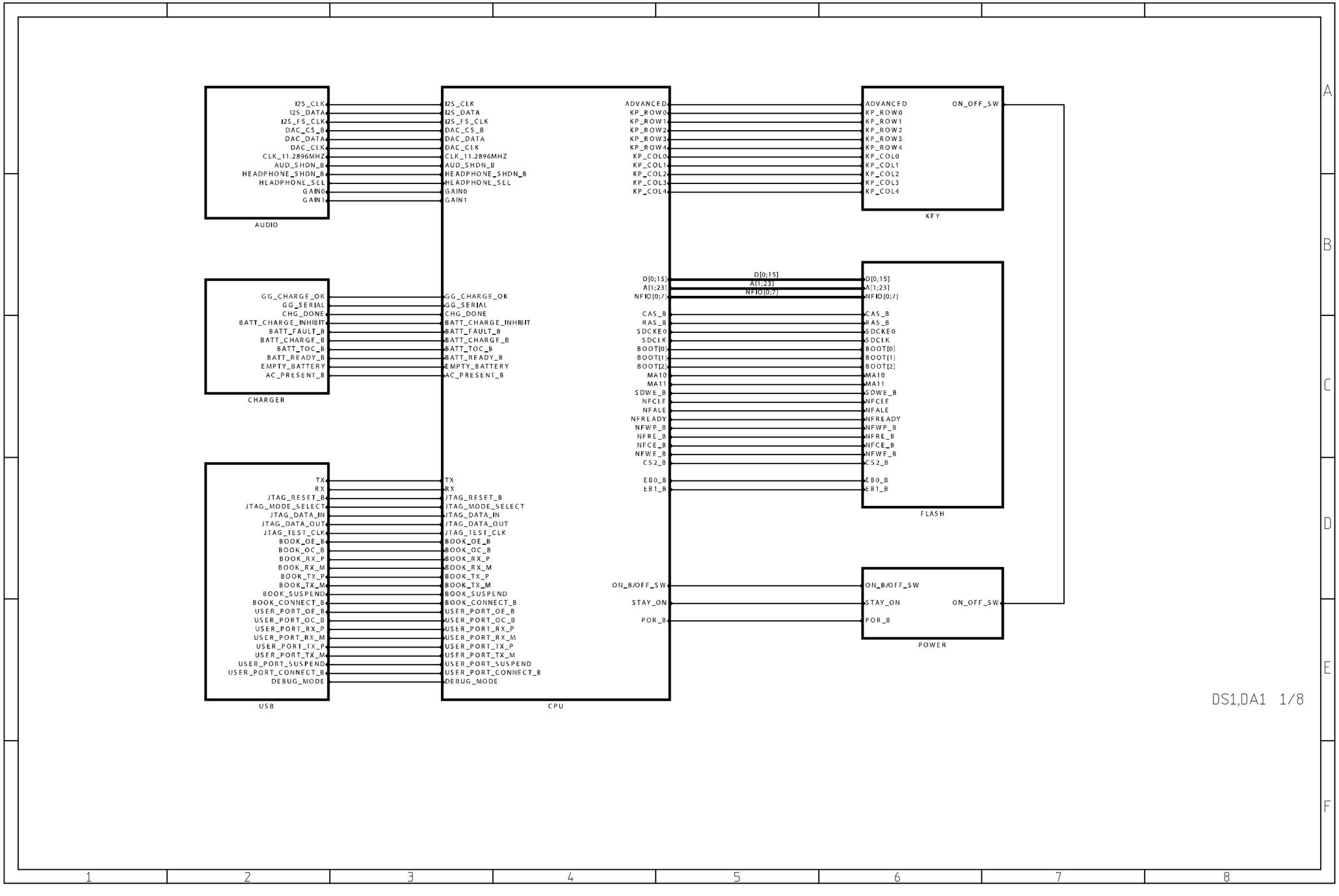
DLP Design
http://www.dlpdesign.com/usb/us232cable.shtml
http://www.dlpdesign.com/usb/

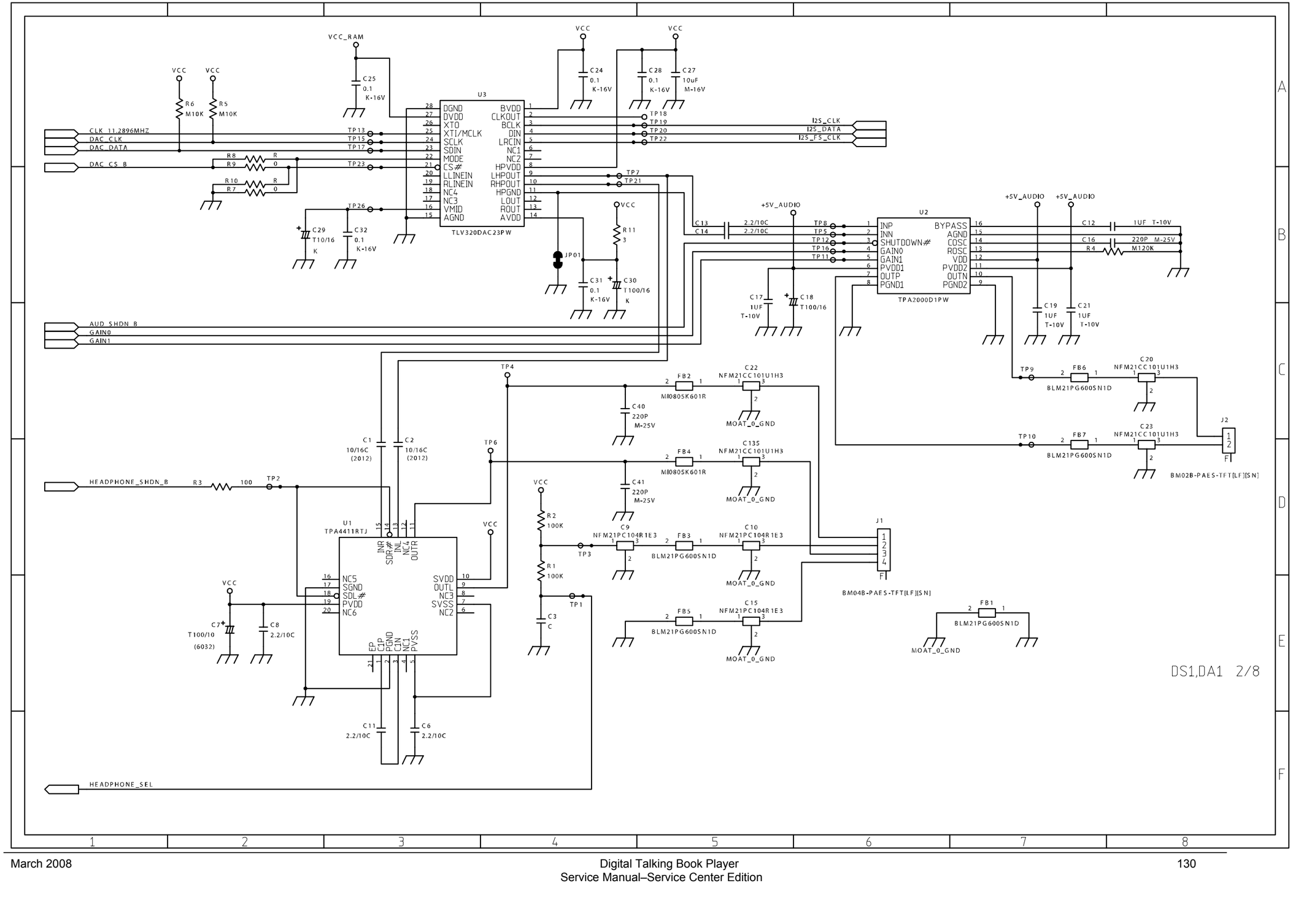
Dontronics
http://www.dontronics-shop.com/EasySync-Premium-GOLD-USB-RS232-Adapter-cable-10cm-cable-p-16139.html

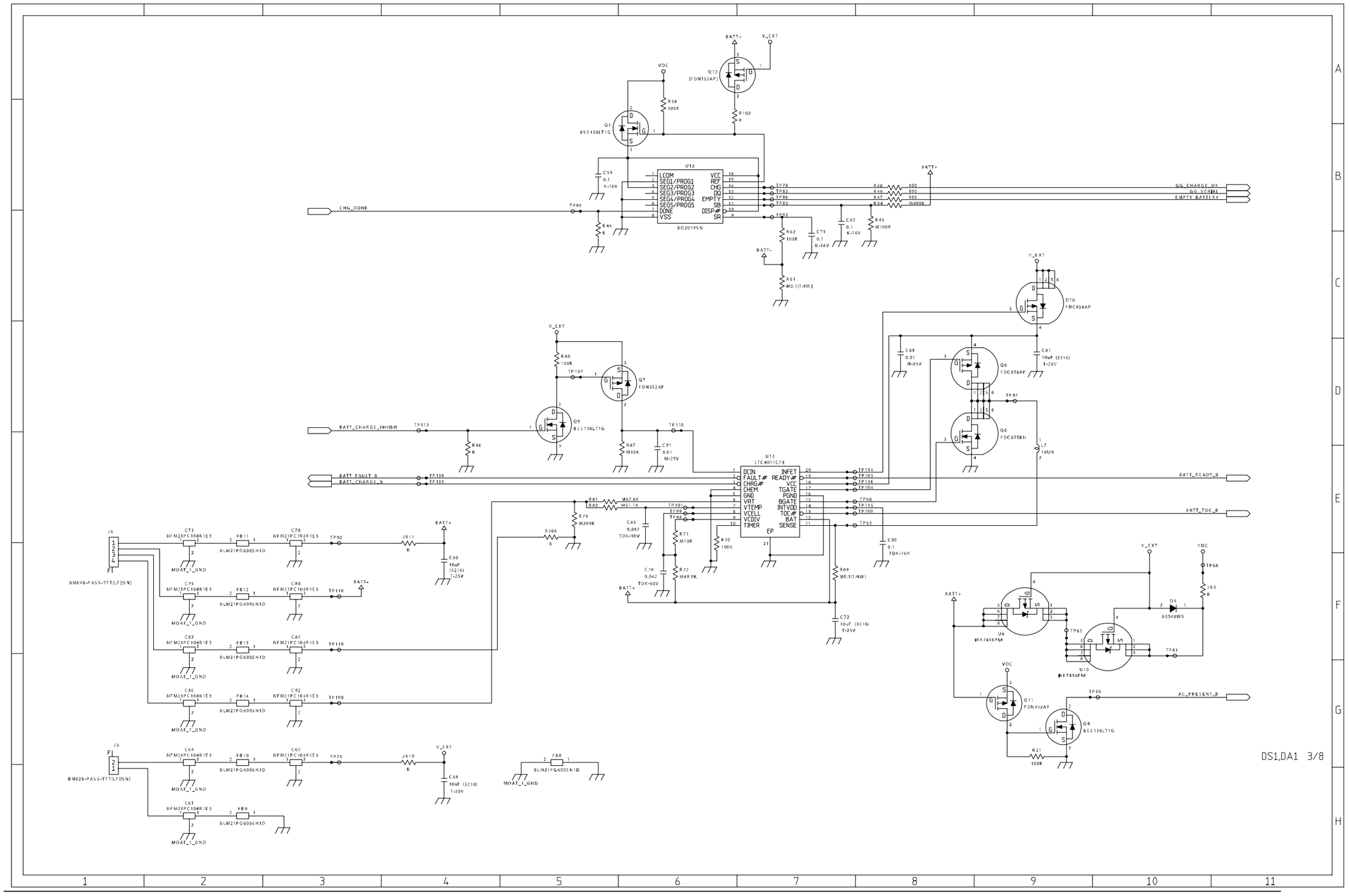
11.8 Component Layout

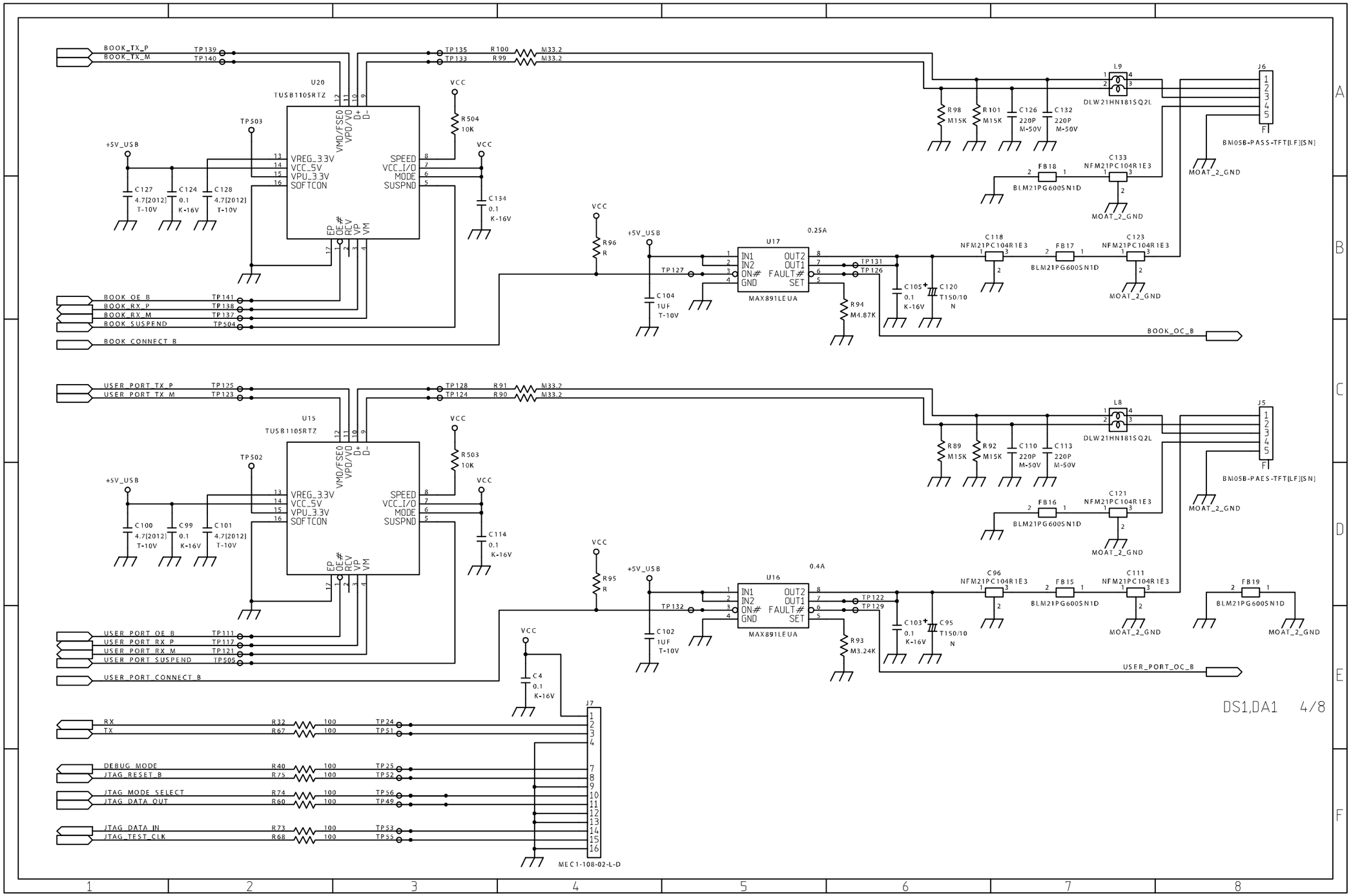


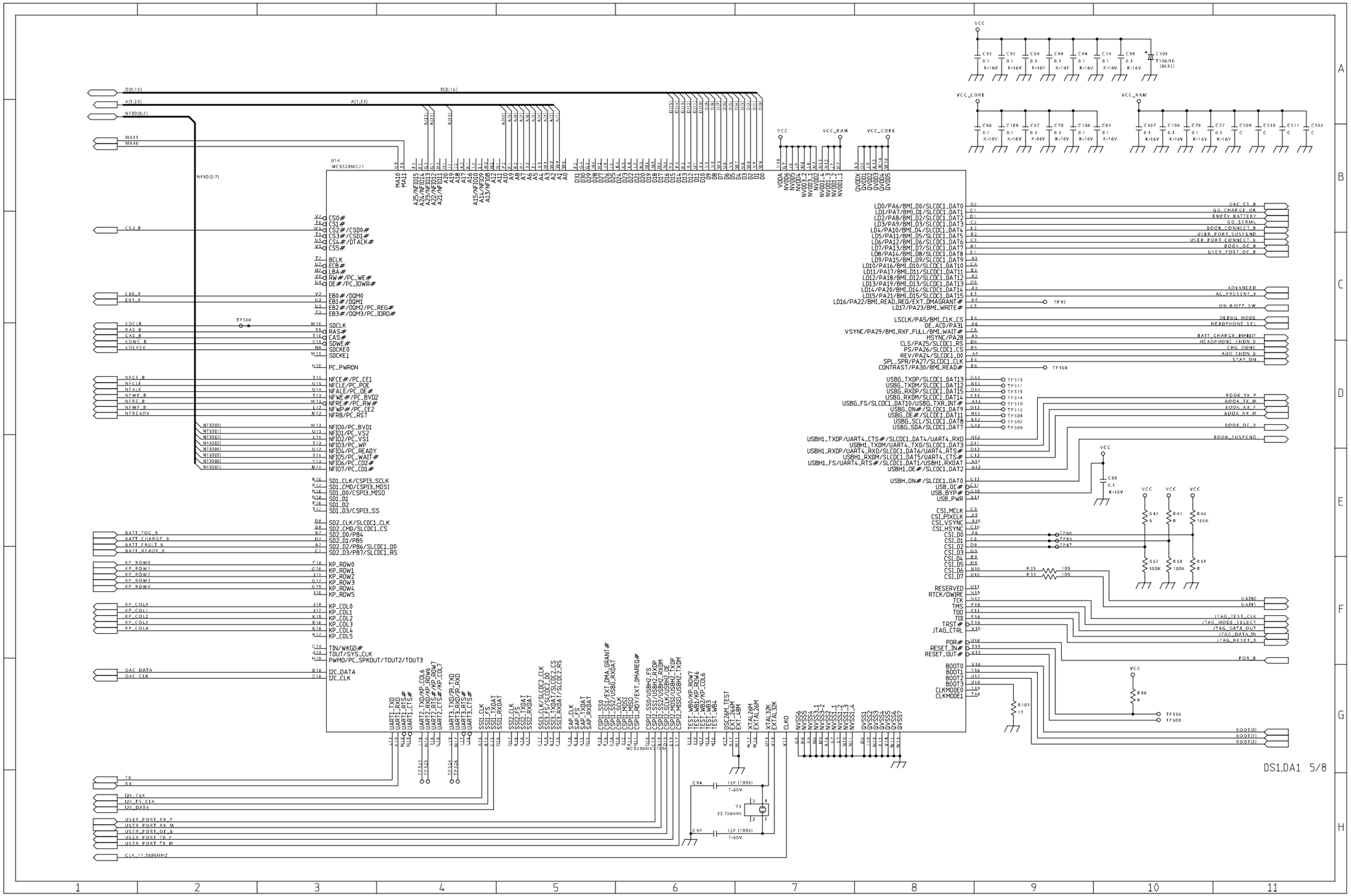
11.9 Player Schematic

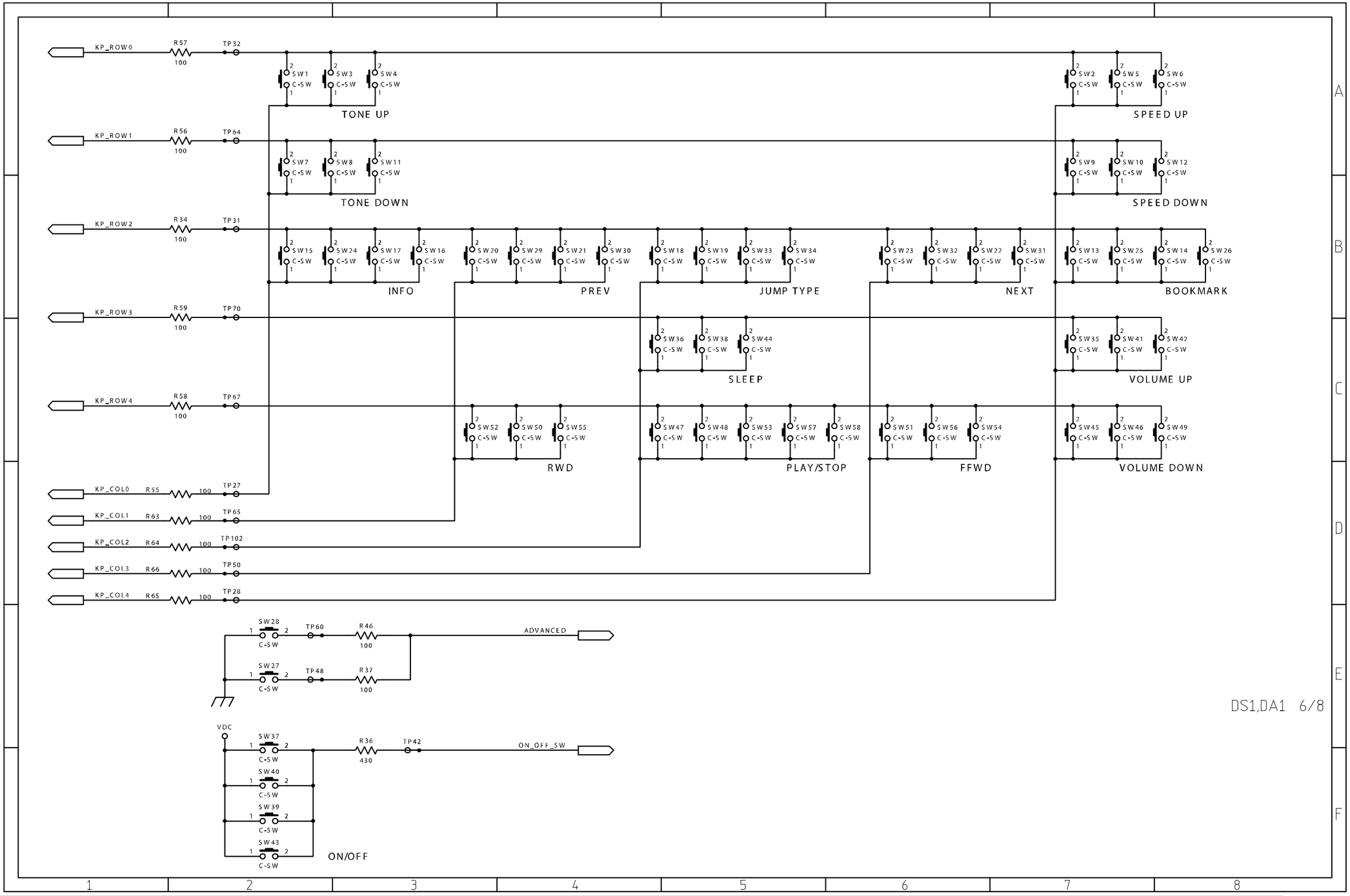

AUDIO
I2S_CLK
I2S_DATA
I2S_FS_CLK
DAC_CS_B
DAC_DATA
DAC_CLK
CLK_11.2896MHZ
AUD_SHDN_B
HEADPHONE_SHDN_B
HEADPHONE_SEL
GAIN0
GAIN1
KEY
ADVANCED
KP_ROW0
KP_ROW1
KP_ROW2
KP_ROW3
KP_ROW4
KP_COL0
KP_COL1
KP_COL2
KP_COL3
KP_COL4
ON_OFF_SW
CHARGER
GG_CHARGE_OK
GG_SERIAL
CHG_DONE
BATT_CHARGE_INHIBIT
BATT_FAULT_B
BATT_CHARGE_B
BATT_TOC_B
BATT_READY_B
EMPTY_BATTERY
AC_PRESENT_B
FLASH
D[0;15]
A[1;23]
NFIO[0;7]
CAS_B
RAS_B
SDCKE0
SDCLK
BOOT[0]
BOOT[1]
BOOT[2]
MA10
MA11
SDWE_B
NFCLE
NFALE
NFREADY
NFWP_B
NFRE_B
NFCE_B
NFWE_B
CS2_B
EB0_B
EB1_B
USB
TX
RX
JTAG_RESET_B
JTAG_MODE_SELECT
JTAG_DATA_IN
JTAG_DATA_OUT
JTAG_TEST_CLK
BOOK_OE_B
BOOK_OC_B
BOOK_RX_P
BOOK_RX_M
BOOK_TX_P
BOOK_TX_M
BOOK_SUSPEND
BOOK_CONNECT_B
USER_PORT_OE_B
USER_PORT_OC_B
USER_PORT_RX_P
USER_PORT_RX_M
USER_PORT_TX_P
USER_PORT_TX_M
USER_PORT_SUSPEND
USER_PORT_CONNECT_B
DEBUG_MODE
CPU
ON_B/OFF_SW
STAY_ON
POR_B
POWER
DS1,DA1 1/8
A
B
C
D
E
F
1
2
3
4
5
6
7
8

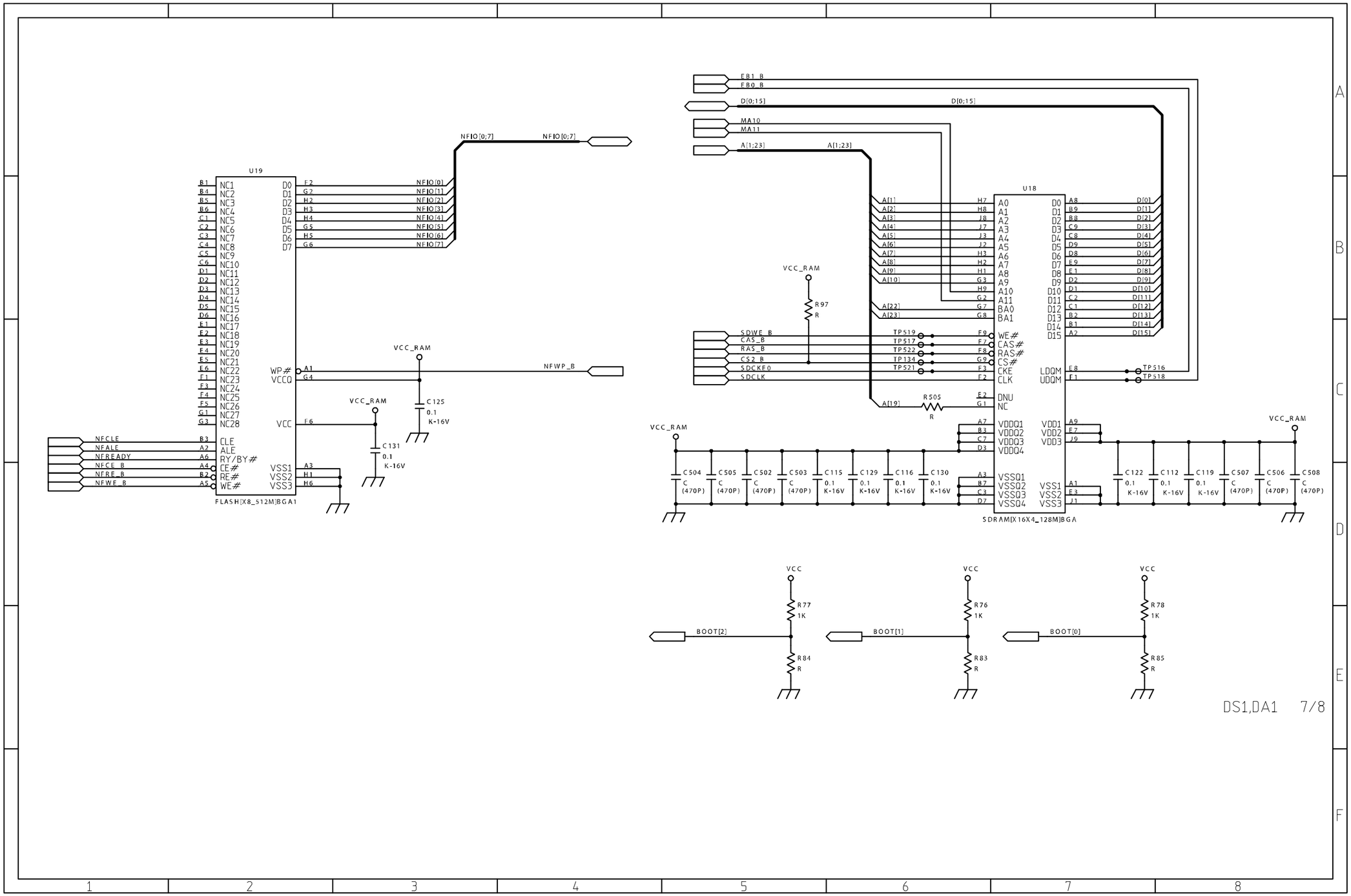

VCC_RAM
VCC
VCC
VCC
VCC
C25 0.1 K-16V
C24 0.1 K-16V
C28 0.1 K-16V
C27 10uF M-16V
R6 M10K
R5 M10K
U3
TLV320DAC23PW
DGND
DVDD
XTO
XTI/MCLK
SCLK
SDIN
MODE
CS#
LLINEIN
RLINEIN
NC4
NC3
VMID
AGND
BVDD
CLKOUT
BCLK
DIN
LRCIN
NC1
NC2
HPVDD
LHPOUT
RHPOUT
HPGND
LOUT
ROUT
AVDD
CLK_11.2896MHZ
DAC_CLK
DAC_DATA
DAC_CS_B
TP13
TP15
TP17
TP23
TP18
TP19
TP20
TP22
I2S_CLK
I2S_DATA
I2S_FS_CLK
R8 R 0
R9
R10 R 0
R7
TP26
C29 T10/16 K
C32 0.1 K-16V
TP7
TP21
JP01
R11 3
C31 0.1 K-16V
C30 T100/16 K
+5V_AUDIO
C13 2.2/10C
C14 2.2/10C
TP8
TP5
TP12
TP16
TP11
U2
TPA2000D1PW
INP
INN
SHUTDOWN#
GAIN0
GAIN1
PVDD1
OUTP
PGND1
BYPASS
AGND
COSC
ROSC
VDD
PVDD2
OUTN
PGND2
+5V_AUDIO
+5V_AUDIO
C12 1UF T-10V
C16 220P M-25V
R4 M120K
C17 1UF T-10V
C18 T100/16
C19 1UF T-10V
C21 1UF T-10V
AUD_SHDN_B
GAIN0
GAIN1
TP4
FB2 MI0805K601R
C22 NFM21CC101U1H3
C40 220P M-25V
MOAT_0_GND
TP9
FB6 BLM21PG600SN1D
C20 NFM21CC101U1H3
J2
C1 10/16C (2012)
C2 10/16C (2012)
TP6
TP10
FB7 BLM21PG600SN1D
C23 NFM21CC101U1H3
BM02B-PAES-TFT[LF][SN]
HEADPHONE_SHDN_B
R3 100
TP2
U1
TPA4411RTJ
INR
SDR#
INL
NC4
OUTR
NC5
SGND
SDL#
PVDD
NC6
SVDD
OUTL
NC3
SVSS
NC2
EP
C1P
PGND
C1N
NC1
PVSS
VCC
C7 T100/10 (6032)
C8 2.2/10C
C11 2.2/10C
C6 2.2/10C
R2 100K
R1 100K
C3 C
TP1
C135 NFM21CC101U1H3
C41 220P M-25V
FB4 MI0805K601R
TP3
C9 NFM21PC104R1E3
FB3 BLM21PG600SN1D
C10 NFM21PC104R1E3
J1
BM04B-PAES-TFT[LF][SN]
FB5 BLM21PG600SN1D
C15 NFM21PC104R1E3
FB1 BLM21PG600SN1D
HEADPHONE_SEL
DS1,DA1 2/8

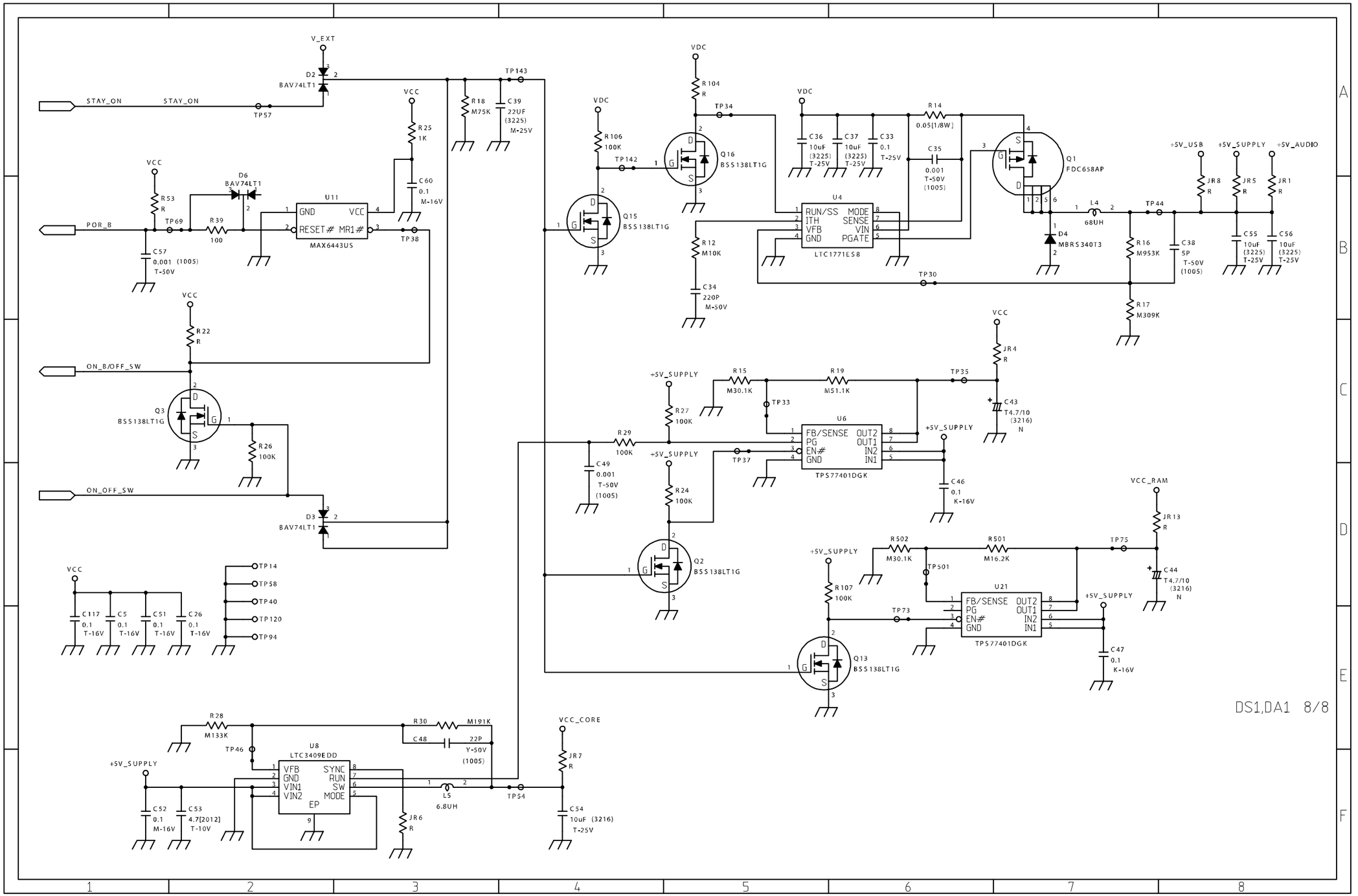

BATT+
V_EXT
VDC
Q12
FDN352AP
R38
300K
R102
R
Q1
BSS138LT1G
U12
LCOM
SEG1/PROG1
SEG2/PROG2
SEG3/PROG3
SEG4/PROG4
SEG5/PROG5
DONE
VSS
VCC
REF
CHG
DQ
EMPTY
SB
DISP#
SR
BQ20145N
C59
0.1
K-16V
CHG_DONE
TP86
R44
R
TP78
TP82
TP86
TP83
TP92
R48
R49
R47
R54
100
100
100
M465K
GG_CHARGE_OK
GG_SERIAL
EMPTY_BATTERY
C63
0.1
K-16V
R45
M100K
R62
100K
C71
0.1
K-16V
BATT-
R61
M0.1[1/4W]
V_EXT
Q10
FDC658AP
C89
0.01
M-25V
C81
10uF (3216)
T-25V
Q8
FDC658AP
TP97
Q6
FDC655BN
L7
10UH
V_EXT
R80
100K
TP107
Q7
FDN352AP
Q9
BSS138LT1G
BATT_CHARGE_INHIBIT
TP113
R86
R
R87
M10K
TP110
C91
0.01
M-25V
U13
LTC4011CFE
DCIN
FAULT#
CHRG#
CHEM
GND
VRT
VTEMP
VCELL
VCDIV
TIMER
INFET
READY#
VCC
TGATE
PGND
BGATE
INTVDD
TOC#
BAT
SENSE
EP
TP114
TP103
TP116
TP104
TP96
TP115
TP100
TP93
BATT_READY_B
BATT_TOC_B
BATT_FAULT_B
BATT_CHARGE_B
TP108
TP105
R81
R82
M97.6K
M511K
TP101
TP99
TP98
R79
M249K
R506
R
C83
0.047
TDK-50V
R71
M10K
R70
100K
C78
0.047
TDK-50V
R72
M49.9K
BATT+
R69
M0.1[1/4W]
C72
10uF (3216)
T-25V
C90
0.1
TDK-16V
J4
F
BM04B-PASS-TFT[LF][SN]
C73
NFM21PC104R1E3
FB11
BLM21PG600SN1D
TP90
JR11
R
BATT+
C59
10uF
(3216)
T-25V
C75
FB12
TP118
BATT-
C82
FB13
TP119
C86
FB14
TP109
C92
MOAT_1_GND
J3
BM02B-PASS-TFT[LF][SN]
C64
FB10
TP71
JR10
V_EXT
C58
10uF (3216)
T-25V
C61
FB9
FB8
BLM21PG600SN1D
BATT+
VDC
TP68
JR9
R
DS
B0540WS
U9
IRF7416PbF
TP63
U10
IRF7416PbF
TP61
Q11
FDN352AP
Q4
BSS138LT1G
TP59
AC_PRESENT_B
R31
100K
DS1,DA1 3/8


BOOK_TX_P
BOOK_TX_M
TP139
TP140
U20
TUSB1105RTZ
TP503
+5V_USB
C127 4.7[2012] T-10V
C124 0.1 K-16V
C128 4.7[2012] T-10V
VREG_3.3V
VCC_5V
VPU_3.3V
SOFTCON
VMO/FSEO
VPO/VO
D+
D-
SPEED
VCC_I/O
MODE
SUSPND
FP
OE#
RCV
VP
VM
R504 10K
VCC
C134 0.1 K-16V
TP135
TP133
R100 M33.2
R99 M33.2
L9
DLW21HN181SQ2L
R98 M15K
R101 M15K
C126 220P M-50V
C132 220P M-50V
J6
BM05B-PASS-TFT[LF][SN]
MOAT_2_GND
FB18
BLM21PG600SN1D
C133 NFM21PC104R1E3
MOAT_2_GND
BOOK_OE_B
BOOK_RX_P
BOOK_RX_M
BOOK_SUSPEND
BOOK_CONNECT_B
TP141
TP138
TP137
TP504
R96 R
TP127
C104 1UF T-10V
U17
MAX891LEUA
IN1
IN2
ON#
GND
OUT2
OUT1
FAULT#
SET
0.25A
TP131
TP126
R94 M4.87K
C105 0.1 K-16V
C120 T150/10 N
C118 NFM21PC104R1E3
FB17
BLM21PG600SN1D
C123 NFM21PC104R1E3
MOAT_2_GND
BOOK_OC_B
USER_PORT_TX_P
USER_PORT_TX_M
TP125
TP123
U15
TUSB1105RTZ
TP502
+5V_USB
C100 4.7[2012] T-10V
C99 0.1 K-16V
C101 4.7[2012] T-10V
R503 10K
C114 0.1 K-16V
TP128
TP124
R91 M33.2
R90 M33.2
L8
DLW21HN181SQ2L
R89 M15K
R92 M15K
C110 220P M-50V
C113 220P M-50V
J5
BM05B-PAES-TFT[LF][SN]
C121 NFM21PC104R1E3
FB16
BLM21PG600SN1D
MOAT_2_GND
USER_PORT_QE_B
USER_PORT_RX_P
USER_PORT_RX_M
USER_PORT_SUSPEND
USER_PORT_CONNECT_B
TP111
TP117
TP121
TP505
R95 R
TP132
C102 1UF T-10V
U16
MAX891LEUA
0.4A
TP122
TP129
R93 M3.24K
C103 0.1 K-16V
C95 T150/10 N
C96 NFM21PC104R1E3
FB15
BLM21PG600SN1D
C111 NFM21PC104R1E3
FB19
BLM21PG600SN1D
MOAT_2_GND
USER_PORT_OC_B
C4 0.1 K-16V
J7
MEC1-108-02-L-D
RX
TX
R32 100
R67 100
TP24
TP51
DEBUG_MODE
JTAG_RESET_B
R40 100
R75 100
TP25
TP52
JTAG_MODE_SELECT
JTAG_DATA_OUT
R74 100
R60 100
TP56
TP49
JTAG_DATA_IN
JTAG_TEST_CLK
R73 100
R68 100
TP53
TP55
DS1,DA1 4/8


VCC
VCC_CORE
VCC_RAM
U14
MC9328MX21
D[0:15]
A[1:23]
NFIO[0:7]
MA11
MA10
CS2_B
EB0_B
EB1_B
SDCLK
RAS_B
CAS_B
SDWE_B
SDCKE0
NFCE_B
NFCLE
NFALE
NFWE_B
NFRE_B
NFWP_B
NFREADY
SD1_CLK/CSPI3_SCLK
SD1_CMD/CSPI3_MOSI
SD1_D0/CSPI3_MISO
SD1_D1
SD1_D2
SD1_D3/CSPI3_SS
SD2_CLK/SLCDC1_CLK
SD2_CMD/SLCDC1_CS
SD2_D0/PB4
SD2_D1/PB5
SD2_D2/PB6/SLCDC1_D0
SD2_D3/PB7/SLCDC1_RS
BATT_TOC_B
BATT_CHARGE_B
BATT_FAULT_B
BATT_READY_B
KP_ROW0
KP_ROW1
KP_ROW2
KP_ROW3
KP_ROW4
KP_COL0
KP_COL1
KP_COL2
KP_COL3
KP_COL4
KP_COL5
TIN/WKGD#
TOUT/SYS_CLK
PWM0/PC_SPKOUT/TOUT2/TOUT3
I2C_DATA
I2C_CLK
DAC_DATA
DAC_CLK
TX
RX
I2S_CLK
I2S_FS_CLK
I2S_DATA
USER_PORT_RX_P
USER_PORT_RX_M
USER_PORT_OE_B
USER_PORT_TX_P
USER_PORT_TX_M
CLK_11.2896MHZ
TP506
LD0/PA6/BMI_D0/SLCDC1_DAT0
LD1/PA7/BMI_D1/SLCDC1_DAT1
LD2/PA8/BMI_D2/SLCDC1_DAT2
LD3/PA9/BMI_D3/SLCDC1_DAT3
LD4/PA10/BMI_D4/SLCDC1_DAT4
LD5/PA11/BMI_D5/SLCDC1_DAT5
LD6/PA12/BMI_D6/SLCDC1_DAT6
LD7/PA13/BMI_D7/SLCDC1_DAT7
LD8/PA14/BMI_D8/SLCDC1_DAT8
LD9/PA15/BMI_D9/SLCDC1_DAT9
LD10/PA16/BMI_D10/SLCDC1_DAT10
LD11/PA17/BMI_D11/SLCDC1_DAT11
LD12/PA18/BMI_D12/SLCDC1_DAT12
LD13/PA19/BMI_D13/SLCDC1_DAT13
LD14/PA20/BMI_D14/SLCDC1_DAT14
LD15/PA21/BMI_D15/SLCDC1_DAT15
LD16/PA22/BMI_READ_REQ/EXT_DMAGRANT#
LD17/PA23/BMI_WRITE#
LSCLK/PA5/BMI_CLK_CS
OE_ACD/PA31
VSYNC/PA29/BMI_RXF_FULL/BMI_WAIT#
HSYNC/PA28
CLS/PA25/SLCDC1_RS
PS/PA26/SLCDC1_CS
REV/PA24/SLCDC1_D0
SPL_SPR/PA27/SLCDC1_CLK
CONTRAST/PA30/BMI_READ#
USBG_TXDP/SLCDC1_DAT13
USBG_TXDM/SLCDC1_DAT12
USBG_RXDP/SLCDC1_DAT15
USBG_RXDM/SLCDC1_DAT14
USBG_FS/SLCDC1_DAT10/USBG_TXR_INT#
USBG_ON#/SLCDC1_DAT9
USBG_OE#/SLCDC1_DAT11
USBG_SCL/SLCDC1_DAT8
USBG_SDA/SLCDC1_DAT7
USBH1_TXDP/UART4_CTS#/SLCDC1_DAT4/UART4_RXD
USBH1_TXDM/UART4_TXD/SLCDC1_DAT3
USBH1_RXDP/UART4_RXD/SLCDC1_DAT6/UART4_RTS#
USBH1_RXDM/SLCDC1_DAT5/UART4_CTS#
USBH1_FS/UART4_RTS#/SLCDC1_DAT1/USBH1_RXDAT
USBH1_OE#/SLCDC1_DAT2
USBH_ON#/SLCDC1_DAT0
USB_OE#
USB_BYP#
USB_PWR
CSI_MCLK
CSI_PIXCLK
CSI_VSYNC
CSI_HSYNC
CSI_D0
CSI_D1
CSI_D2
CSI_D3
CSI_D4
CSI_D5
CSI_D6
CSI_D7
RESERVED
RTCK/DWIRE
TCK
TMS
TDO
TDI
TRST#
JTAG_CTRL
POR#
RESET_IN#
RESET_OUT#
BOOT0
BOOT1
BOOT2
BOOT3
CLKMODE0
CLKMODE1
DAC_CS_B
GG_CHARGE_OK
EMPTY_BATTERY
GG_SERIAL
BOOK_CONNECT_B
USER_PORT_SUSPEND
USER_PORT_CONNECT_B
BOOK_OC_B
USER_PORT_OC_B
ADVANCED
AC_PRESENT_B
ON_B/OFF_SW
DEBUG_MODE
HEADPHONE_SEL
BATT_CHARGE_INHIBIT
HEADPHONE_SHDN_B
CHG_DONE
AUD_SHDN_B
STAY_ON
BOOK_TX_P
BOOK_TX_M
BOOK_RX_P
BOOK_RX_M
BOOK_OE_B
BOOK_SUSPEND
GAIN0
GAIN1
JTAG_TEST_CLK
JTAG_MODE_SELECT
JTAG_DATA_OUT
JTAG_DATA_IN
JTAG_RESET_B
POR_B
BOOT[0]
BOOT[1]
BOOT[2]
DS1,DA1 5/8


KP_ROW0
R57
100
TP32
SW1 C-SW
SW3 C-SW
SW4 C-SW
TONE UP
SW2 C-SW
SW5 C-SW
SW6 C-SW
SPEED UP
KP_ROW1
R56
100
TP64
SW7 C-SW
SW8 C-SW
SW11 C-SW
TONE DOWN
SW9 C-SW
SW10 C-SW
SW12 C-SW
SPEED DOWN
KP_ROW2
R34
100
TP31
SW15 C-SW
SW24 C-SW
SW17 C-SW
SW16 C-SW
INFO
SW20 C-SW
SW29 C-SW
SW21 C-SW
SW30 C-SW
PREV
SW18 C-SW
SW19 C-SW
SW33 C-SW
SW34 C-SW
JUMP TYPE
SW23 C-SW
SW32 C-SW
SW22 C-SW
SW31 C-SW
NEXT
SW13 C-SW
SW25 C-SW
SW14 C-SW
SW26 C-SW
BOOKMARK
KP_ROW3
R59
100
TP70
SW36 C-SW
SW38 C-SW
SW44 C-SW
SLEEP
SW35 C-SW
SW41 C-SW
SW42 C-SW
VOLUME UP
KP_ROW4
R58
100
TP67
SW52 C-SW
SW50 C-SW
SW55 C-SW
RWD
SW47 C-SW
SW48 C-SW
SW53 C-SW
SW57 C-SW
SW58 C-SW
PLAY/STOP
SW51 C-SW
SW56 C-SW
SW54 C-SW
FFWD
SW45 C-SW
SW46 C-SW
SW49 C-SW
VOLUME DOWN
KP_COL0 R55 100 TP27
KP_COL1 R63 100 TP65
KP_COL2 R64 100 TP102
KP_COL3 R66 100 TP50
KP_COL4 R65 100 TP28
SW28 C-SW
TP60
R46 100
ADVANCED
SW27 C-SW
TP48
R37 100
VDC
SW37 C-SW
R36 430
TP42
ON_OFF_SW
SW40 C-SW
SW39 C-SW
SW43 C-SW
ON/OFF
DS1,DA1 6/8
A
B
C
D
E
F
1
2
3
4
5
6
7
8


U19
NC1 NC2 NC3 NC4 NC5 NC6 NC7 NC8 NC9 NC10 NC11 NC12 NC13 NC14 NC15 NC16 NC17 NC18 NC19 NC20 NC21 NC22 NC23 NC24 NC25 NC26 NC27 NC28
D0 D1 D2 D3 D4 D5 D6 D7
NFIO[0] NFIO[1] NFIO[2] NFIO[3] NFIO[4] NFIO[5] NFIO[6] NFIO[7]
NFIO[0;7]
WP# VCCQ VCC VSS1 VSS2 VSS3
NFWP_B
VCC_RAM
C125 0.1 K-16V
C131 0.1 K-16V
NFCLE NFALE NFREADY NFCE_B NFRE_B NFWE_B
CLE ALE RY/BY# CE# RE# WE#
FLASH[X8_512M]BGA1
EB1_B EB0_B D[0;15] MA10 MA11 A[1;23]
U18
A0 A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 BA0 BA1
SDWE_B CAS_B RAS_B CS2_B SDCKE0 SDCLK
TP519 TP517 TP522 TP134 TP521
WE# CAS# RAS# CS# CKE CLK
R97 R
R505 R
DNU NC
LDQM UDQM
TP516 TP518
VDDQ1 VDDQ2 VDDQ3 VDDQ4 VSSQ1 VSSQ2 VSSQ3 VSSQ4
VDD1 VDD2 VDD3 VSS1 VSS2 VSS3
C504 C505 C502 C503 C115 C129 C116 C130 C122 C112 C119 C507 C506 C508
C (470P) 0.1 K-16V
SDRAM[X16X4_128M]BGA
BOOT[2] BOOT[1] BOOT[0]
R77 R76 R78 1K
R84 R83 R85 R
DS1,DA1 7/8


V_EXT
D2
BAV74LT1
STAY_ON
STAY_ON
TP57
TP143
R18
M75K
C39
22UF
(3225)
M-25V
VCC
R25
1K
C60
0.1
M-16V
VCC
R53
R
D6
BAV74LT1
POR_B
TP69
R39
100
U11
GND
VCC
RESET#
MR1#
MAX6443US
TP38
C57
0.001 (1005)
T-50V
VCC
R22
R
ON_B/OFF_SW
Q3
BSS138LT1G
R26
100K
ON_OFF_SW
D3
BAV74LT1
VCC
C117
0.1
T-16V
C5
0.1
T-16V
C51
0.1
T-16V
C26
0.1
T-16V
TP14
TP58
TP40
TP120
TP94
VDC
R104
R
TP34
Q16
BSS138LT1G
VDC
R106
100K
TP142
Q15
BSS138LT1G
R12
M10K
C34
220P
M-50V
VDC
C36
10uF
(3225)
T-25V
C37
10uF
(3225)
T-25V
C33
0.1
T-25V
R14
0.05[1/8W]
C35
0.001
T-50V
(1005)
U4
RUN/SS
ITH
VFB
GND
MODE
SENSE
VIN
PGATE
LTC1771ES8
TP30
Q1
FDC658AP
L4
68UH
D4
MBRS340T3
TP44
R16
M953K
R17
M309K
C38
5P
T-50V
(1005)
+5V_USB
+5V_SUPPLY
+5V_AUDIO
JR8
R
JR5
R
JR1
R
C55
10uF
(3225)
T-25V
C56
10uF
(3225)
T-25V
VCC
JR4
R
+5V_SUPPLY
R15
M30.1K
R19
M51.1K
TP35
TP33
C43
T4.7/10
(3216)
N
U6
FB/SENSE
PG
EN#
GND
OUT2
OUT1
IN2
IN1
TPS77401DGK
+5V_SUPPLY
R29
100K
+5V_SUPPLY
R27
100K
TP37
C49
0.001
T-50V
(1005)
R24
100K
C46
0.1
K-16V
VCC_RAM
JR13
R
Q2
BSS138LT1G
+5V_SUPPLY
R502
M30.1K
R501
M16.2K
TP75
TP501
C44
T4.7/10
(3216)
N
R107
100K
U21
FB/SENSE
PG
EN#
GND
OUT2
OUT1
IN2
IN1
TPS77401DGK
TP73
+5V_SUPPLY
Q13
BSS138LT1G
C47
0.1
K-16V
DS1,DA1 8/8
R28
M133K
R30
M191K
C48
22P
Y-50V
(1005)
TP46
U8
LTC3409EDD
VFB
GND
VIN1
VIN2
SYNC
RUN
SW
MODE
EP
+5V_SUPPLY
L5
6.8UH
TP54
VCC_CORE
JR7
R
JR6
R
C52
0.1
M-16V
C53
4.7[2012]
T-10V
C54
10uF (3216)
T-25V