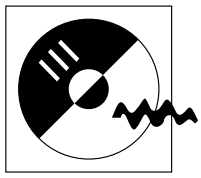


SONIC SOLUTIONS

SonicStudio 5

PQ Editing

(SS-524 and SS-525)

SonicStudio 5, Basic and Expanded PQ Editing (SS-524 and SS-525)

Written and designed at Sonic Solutions, 101 Rowland Blvd., Novato, CA. 94945, USA

Printed in the USA

Sonic Part Number 820011B (12/96)

Contents

1 Basic PQ Editing (SS-524)

The SS-524 Basic PQ Editing option for SonicStudio™ provides the tools to create finished masters for Compact Disc production.

The Basic PQ Editing option provides a simple and intuitive interface for creating and editing the information that defines the placement of Track points on the finished product. PQ Editing supports Write Once Pre-Master CDs.

With additions of the SS-423 8mm Tape Drive and SS-502 8mm Premastering option, you can also generate CD masters in DDP format, accepted increasingly for CD mastering.

Mastering to Sony's 1630/Umatic system requires the Expanded PQ Code Editing / CD Audio (SS-525) package as well as Machine Control (SS-516).

Hardware

For mastering to CD-R, SonicStudio's SCSI bus is connected with a Sony/Start Lab CD recorder. This device shares the SSP-3's SCSI bus with the other Sound Disks.

Creating a CD Master

Cuts or sections of the final CD are prepared in the Edit display with Track Start/End marks. Once all of the Edit Decision Lists are prepared, the Project Manager is used to create a Delivery Log that lists all of the Edit Decision Lists to be included. The cuts (Edit Decision Lists) are listed in sequence, with a specification of the space between each Track.

To create a CD Master on recordable CD:

1. In the edit display, place markers to specify Track Start and End for each cut in the final product.
2. Move to the Project Manager to create a new Project.
3. Open the Delivery Log.
4. Create a Tape to be used for the final master.
   This Tape must of be of type CD.
5. Open the PQ Editing dialog box, and use it to create PQ subcode information from the marks placed in each Edit Decision List.
6. Dump the completed Delivery Log to the recordable CD.

What is PQ Subcode?

The data on a Compact Disc includes PQ subcode information that tells the CD player where each Track is located. The cueing and programming features that the CD format is known for depends on this subcode information.

The Red Book Standard

The “Red Book” standard for audio CD (CD-A) was developed by Sony and Philips to specify the layout of PQ information and musical data on the CD. PQ subcode information is interleaved with musical information, with one complete PQ frame for every 588 audio sample. This translates to 75 PQ frames per second (fps).

The first section on the CD is used for a Table of Contents (TOC) where the PQ information contains a repeated list of all Tracks (not Index points) and their start times on the CD. Program material starts following the Table of Contents.

Timing Formats

During play, the PQ information interleaved with program indicates the numbers of the current Track, as well as two running time counts. These time counts are formatted as “minutes:seconds:CD frames.”

The first time count provides the running time from the beginning of program material. The second time count contains the relative time from the beginning of the current Track. At the end of a Track, the second time count provides a negative time count relative to the beginning of the next Track. At the end of the last Track there are two minutes of lead-out.

Track Information

The Start and End of Tracks are given by specifying a Track number, an Index number, and a time code position. The Red Book standard limits the number of Tracks on a CD to 99.

Start of Track (Index 1)

Index number 1 of any Track marks the start of sound for that Track. Index 1 is where the CD player will start playing when it skips to that Track.

The Red Book standard requires at least four seconds between consecutive Start of Track marks (Index 1), so it is impossible to have a Track shorter than 4.0 seconds.

End of Track (Index 0 or Index 1)

The end of a Track is specified by the first Index of the next Track, which may be Index 0 or 1. If the first Index of the next Track is 1, the program material is “spliced” together without pause (that is, the first Track of music ends just as the second Track starts). If the first Index of the next

Track is 0, then a space or silence occurs between the two Tracks, called the “pause interval.” During the pause interval, most CD players show a negative time counting down.

On some CD players the output mutes during this pause interval so the mastering engineer should make sure that there is nothing important in the area between the Start and End of Tracks.

The SonicStudio PQ Editing Environment

SonicStudio uses the intuitive nature of the waveform display and the text-style editing of the Project Manager to make it as easy and automatic as possible to create PQ subcode information.

- In the waveform display, marks are placed to signify the Start and End of Track.
- Once the marks have been placed in the waveform display, the Project Manager can read them and automatically generate PQ information and the PQ burst.
- The Project Manager can then print out a PQ log and automate the transfer of audio and PQ information to 1630, DAT, or CD Recorder. PQ points may also be typed in from within the Project Manager.

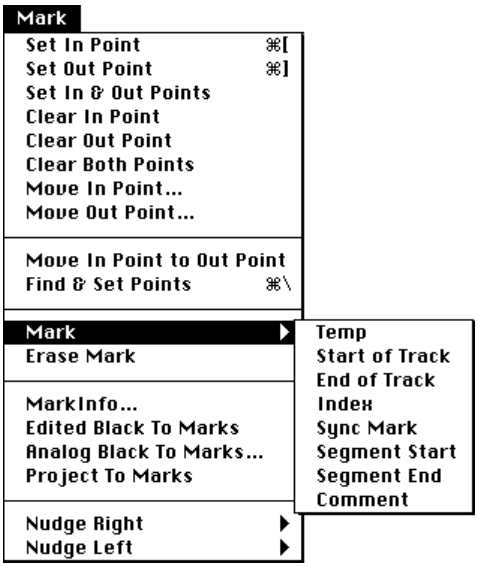
SonicStudio provides a comprehensive environment for entering and editing Track information and transferring that to the subcode data on the final CD.

Placing Track Marks

Marks for Track Start and Track End are placed as part of the process of audio editing. These marks are used to assemble the PQ code information in the Project Manager's Delivery Log.

The Mark command in the Mark menu brings up a submenu that lists the various types of marks that can be set in the Edit Decision List. The marks that are used for PQ points are Start of Track and End of Track.

Index points within each cut are only available in the Expanded PQ option. If they are placed in the EDL they will be ignored in the PQ Info dialog box.

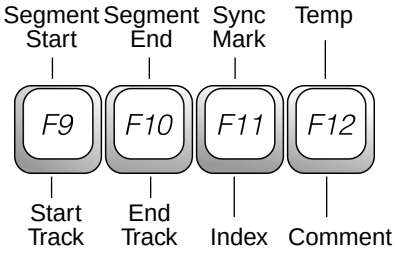


The pull-right menu for the Mark command lists the various types of marks used in the system. Selecting a mark type places it in the selected panel:

- If audio is playing, the mark is placed at the position of the sound pointer when the mark type is selected.
- If audio is not playing, the mark will be placed at the location of the left gate.
- PQ marks must be placed the in top panel of the Edit Decision List and the edit group must be assigned as a Destination group in order for the Project Manager to recognize them.

The QuicKeys equivalents to the Mark commands can be used to place marks quickly and easily.

Note: Hold down Command key



The QuicKeys set for SonicStudio includes assignments to place editing marks using the keyboard Function keys.

Automatic Track Placement

Most of the information required to generate a PQ list already exists upon completing the editing stage of the mastering process. There are two commands that can automatically set Start and End of Track marks on the waveform:

Special commands are available to simplify placement of Track Start and Track End marks.

In digital audio, Black is a term used to indicate silence. Digital recorders such as the Sony 1630 encode digital audio into video form. When viewed on a video monitor, the output of these systems appears as solid black when the audio samples are all zero.

These two commands scan through audio, and place Start and End of Track marks wherever audio starts or stops.

Edited Black to Marks searches throughout the panel and places marks wherever audio adjoins perfect, digital black.

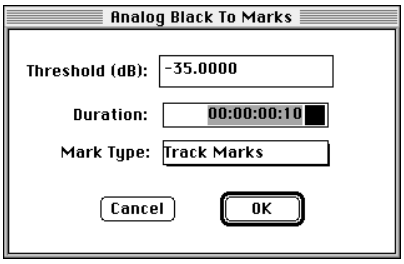
Analog Black To Marks... uses a threshold value to search for sections of relative, or analog, silence. Analog Black To Marks is used when audio to be mastered is transferred directly from a non-digital medium. Edited Black to Marks is best used when cuts have been assembled digitally, so that they are separate by perfect silence (sample values of zero).

To place marks using Edited Black To Marks:

1. Place the Tracks to be marked in the upper two panels of the Edit Decision List.
2. Assign the panels to Edit Group Destination.
3. Select the top panel and place the left and right gates around the area to be marked.
   In this case, the area is the beginning and the end of the entire track.
4. Select Edited Black to Marks... from the Mark menu.
   The marks are placed wherever audio adjoins digital silence.

To place marks using Analog Black To Marks:

1. Place the Track to be marked in the upper two panels of the Edit Decision List.
2. Assign the panels to Edit Group Destination.
3. Select the top panel and place the left and right gates around the area to be marked.
   In this case, the area is the beginning and the end of the entire track.
4. Select Analog Black to Marks... from the Mark menu.
   A dialog box appears to set the parameters by which the System will search for silences.



The Analog Black to Marks dialog box sets the parameters for searching.

Threshold is the level (in negative dB) that triggers placement of a mark. The default value of -60 dB is appropriate for most purposes. If source material is particularly noisy, a higher value may be used. A lower value could be used for material with very wide dynamic range.

Duration sets the minimum length of time that will be seen as a silence. With the default value of two seconds, for example, any silences shorter than that length of time are ignored.

Editing Track Marks

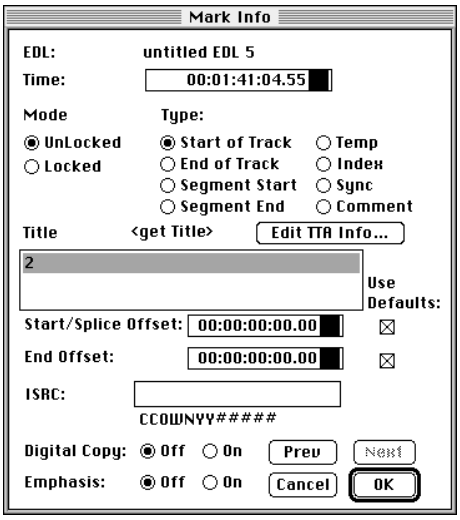
Every mark in the Edit Decision List has an information dialog box for you to alter the information about that mark.

To display the Mark Information dialog box, do one of the following:

1. Hold down the option key and click the mark
   or
2. Place the Left and Right Gates around the mark.
3. Then select the Mark Info command from the Mark menu.

Start of Track

The information window of a Start of Track mark indicates the mark type and mode (locked or unlocked), as well as information that is particular to CD mastering:



Time - Sets the location (in time) of the mark. This may be used to move the mark anywhere in the display panel.

Mode - An *unlocked* mark moves with the audio when ripple edits are performed. A *locked* mark is tied to its time location in the Edit Decision List and will not move from that assigned position.

Type - Any type of mark can be changed to any other type. For mastering, you may sometimes wish to change a Start of Track mark to an Index mark, and vice versa.

Title (Comment) - You can type any title into this Track. The title of a Start of Track mark appears in the formatted PQ Log.

ISRC Code - This is in internationally standardized code for identifying individual CD titles. The information inserted into this box will be included in the subcode are of the final CD.

Start/Splice Offset - Sets a start offset or the splice offset for this particular Track. If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

End Offset - Sets the end offset for this particular Track. If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

Digital Copy - Sets the Digital Copy permit flag for the Track.

Emphasis - Sets the Emphasis flag for the Track.

PQ Code Offsets

To accommodate the cueing times of CD players, offsets are applied to the PQ information entered in the Delivery Log. It takes about 2-10 frames for a CD player to start making sound after it has found the Start of Track location. PQ Start Offset makes sure that the start of music is not clipped. The default value is 10 frames.

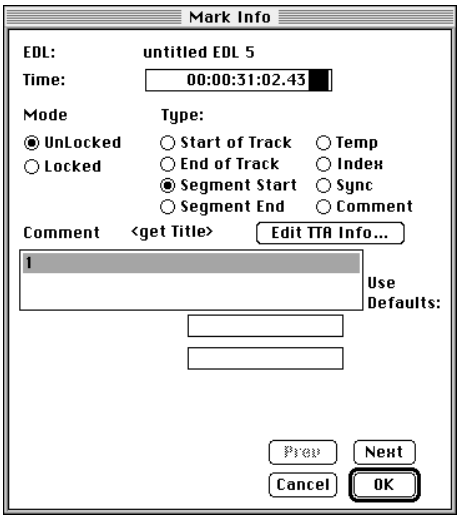
The PQ Splice Offset between Tracks is usually six frames. This is a compromise to make sure that neither the start of music, nor the end of the previous Track are clipped. PQ Splice Offset must always be less than the PQ Start Offset.

The offset applied to End of Track (PQ End Offset) prevents the CD player from muting too early and clipping the music. The default value is two frames.

If no offset values are entered in Mark Info, the system uses the default offsets included in the PQ Log, described later in this section.

End of Track Mark

The information window for an End of Track mark includes only the standard information associated with any editing mark on SonicStudio.



Since the End of Track translates into an Index point (0 or 1) in the final PQ codes, there are no offsets associated with it, as there are for the Start of Track.

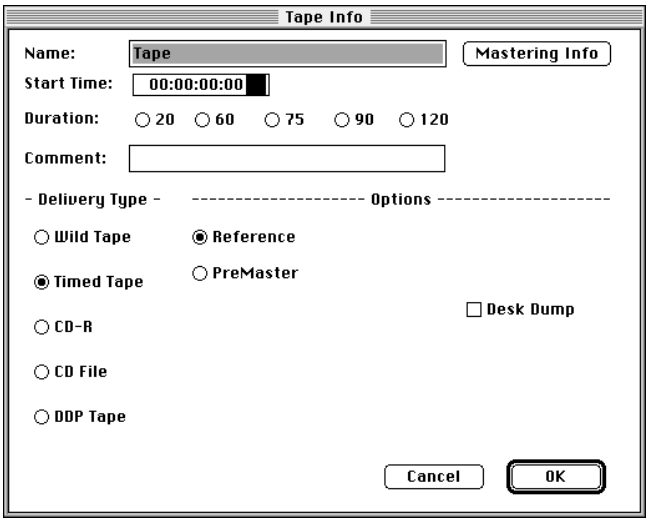
Creating Delivery and PQ Logs

The Project Manager Delivery Log is used to define the contents and timing of information to be included in the final master.

The Delivery Log

To prepare the Delivery Log, create a new Project (or open an existing Project) using the File menu commands. In the Project dialog box, click the Delivery button to open the Delivery Log.

When the Delivery Log is first opened, the system prompts you to define the first Tape in the Log. The Delivery Log can include multiple tapes (which can be used for multi-CD sets, for example), but more commonly the Delivery Log will have only a single tape, for the master itself.



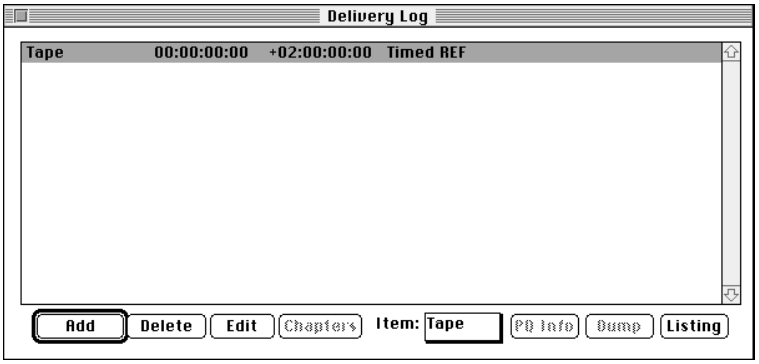
The Project Manager's Tape Info dialog box includes information that defines whether the output can be used as a master for Compact Disc, whether the dump is Double Speed (CD-R only), and if there is a Mixing Desk Session Desk Dump associated with the Edit Decision List.

The Tape Info dialog box includes buttons to specify the Type and Format of final output. For CD Mastering, the output must CD.

The PreMaster CD format includes the PQ Burst information required by the cutting equipment at a CD pressing plant. The PreMaster CD is accepted by a growing number of CD plants as a direct master for mass replication.

Note – If a Double-Speed dump is specified (CD-R only), the ability to add a Desk Dump mixing desk session is eliminated. Also, if a Desk Dump is selected, the ability to do a Double Speed dump is eliminated.

Once the Tape is specified, close the Tape Info dialog box. The Delivery Log dialog box then appears immediately underneath the Project dialog box.

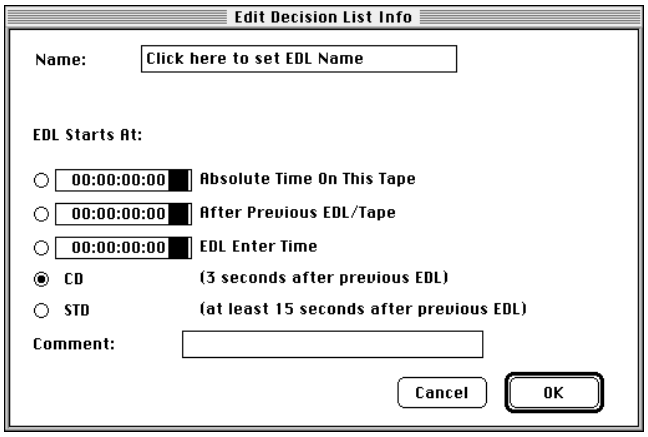


The Delivery Log dialog box lists all elements to be included in the final CD master.

When the dialog box first opens, the tape is the only item listed. Edit Decision Lists to be dumped to CD are entered into this dialog box.

To open the Tape:

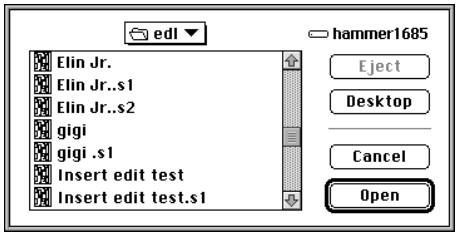
1. Click the line in the Log dialog box where the name of the Tape is shown.
   The Add Tape button then changes its name to Add EDL.
2. Click the name of the tape, as displayed at the top of the main field of the Delivery Log.
   The Add Tape button changes its name to read Add EDL/Sound.
3. Click the Add EDL/Sound button.
   The Edit Decision List Info dialog box displays to allow you to select an Edit Decision List (EDL) or Sound File.



The Edit Decision List Info dialog box is used to enter the names of Edit Decision Lists to be dumped to CD. The important items in this dialog box at this time are the Name and the Timing Information fields.

4. Click the Name field in the Edit Decision List Info dialog box. This opens a regular Macintosh File Select dialog box to locate and open the Edit Decision List to be added to the Delivery Log.

5. Use the Macintosh File Select dialog box to locate and select the Edit Decision List to be dumped to CD.

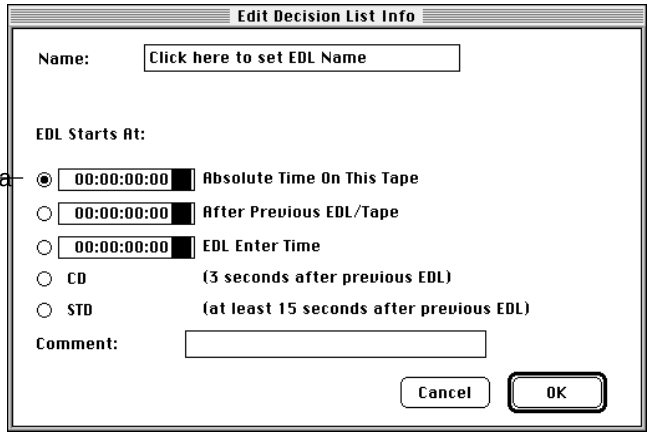


A standard Macintosh File Select dialog box is used to locate and select the Edit Decision List or Sound File desired. If you selected Desk Dump in the Tape Info dialog box, the Edit Decision List Info dialog box will also contain a field for selecting the appropriate Desk Session.

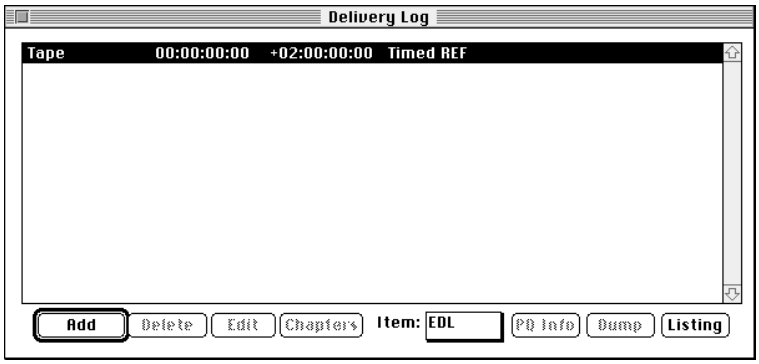
6. To open a session, click this field and locate the session using the standard Macintosh File Select dialog box which appears.

7. After selecting an Edit Decision List, specify its Start Time.

For the first Edit Decision List in a Delivery Log, set the absolute Time to 1 minute



8. Once an Edit Decision List has been selected and the Start Time set, click OK or press Return to close the Edit Decision List Info dialog box.
   The display returns to the Delivery Log dialog box, showing the new entry for the Edit Decision List.

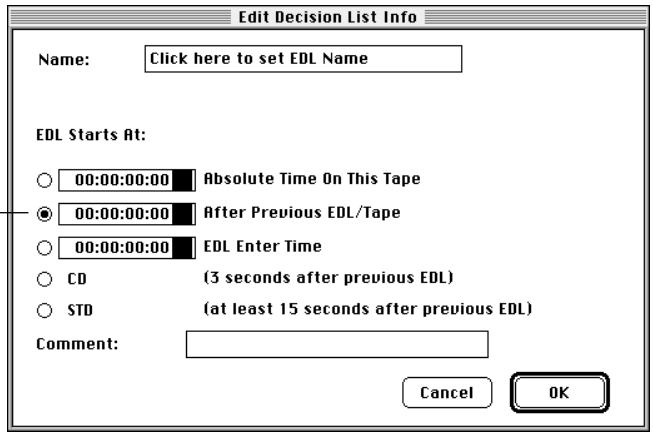


The names of Edit Decision Lists are added to the Delivery Log beneath the name of the Tape (CD).

A Delivery Log for a CD master may consist of a single Edit Decision List that includes all cuts, or of multiple Edit Decision Lists, each representing a single cut or group of cuts. The PQ marks in each Edit Decision List are assembled to create the full CD's worth of track information.

To add additional Edit Decision Lists to the Delivery Log

1. Click the Add EDL button.
2. Select the next Edit Decision List to appear on disc.
   After the first Edit Decision List in the Log, the Start Time for each List is specified in terms of the pause between cuts.



Start times for additional Edit Decision Lists are specified by the length of the pause following the preceding cut.

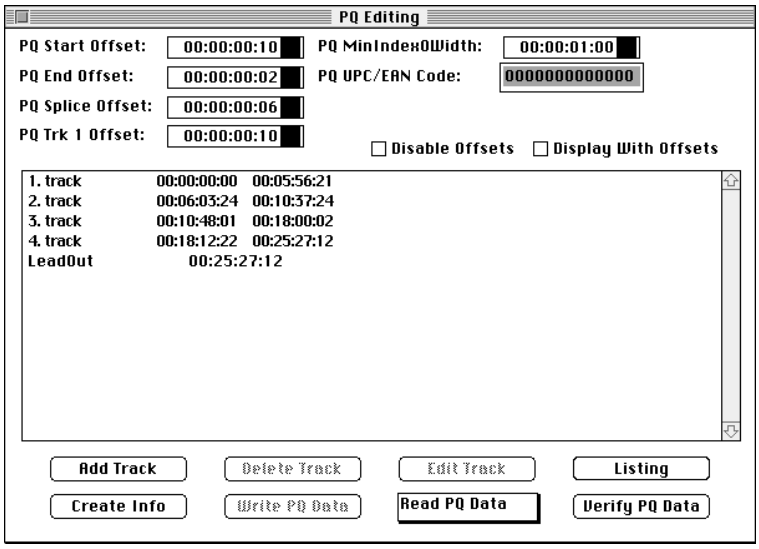
The Edit Decision List Info dialog box specifies the time between successive Edit Decision Lists (Cuts) in the Delivery Log.

This pause is typically a few seconds, but it may be as long or a short as desired. For convenience, the CD button may used to set a standard value of three seconds between cuts.

Creating the PQ Log

To open the PQ Log:

1. In the Delivery Log, select the topmost line (containing the delivery Tape by name)
2. Click the button labeled PQ Edit.
   This opens the PQ Editing dialog box which shows track information.



When the dialog box is first opened, no track information is displayed. The first step is to create this information.

If marks have been placed in each Edit Decision List to represent Track points, the Project Manager can generate the PQ information automatically.

PQ Subcode Definitions

There are several values that are used to build the PQ subcode information. Please note that PQ subcode information cannot be edited with the PQ Basic option. Expanded PQ Code Editing (SS-525) is required to edit PQ offsets.

PQ Start Offset

It is standard practice to apply offsets to the PQ information before placing it on the CD. The reason for the offset is because it takes about 2-10 frames for the CD player to start making sound after it has found the start of track location. This offset ensures that the beginning of music is not clipped. The default value is 10 frames.

PQ Splice Offset

Used to specify the splice offset between Tracks, usually a six frame offset. This is a compromise to make sure that the music for the Track is not clipped, without also hearing the end of the previous Track.

Note – The PQ splice offset must be less than the PQ Start Offset. The default value is six frames.

PQ End Offset

Offset is applied to End of Track to prevent the CD player from muting too early and clipping the music. The default value is two frames.

PQ MinIndex0Width

If the length of the pause interval is much less than one second, the time display on most CD players will glitch briefly showing negative time. The MinIndex0Width parameter is used to set this time, and it defaults to around one second. If the time between Index 0 and 1 is less than the MinIndex0Width, the software will delete Index 0, creating a “splice” between the two Tracks.

The value of PQ MinIndex0Width should be approximately one second. To disable this feature, set the MinIndex0Width to 0.0 seconds.

UPC/EAN

The Universal Product Code for the CD. This is Q Mode 2 information. Note that the Sony DAQ-1000 among other devices will not accept this information unless it is a valid UPC code.

ISRC

International Standard Recording Code. This contains information about the recording (country code, owner code, year of recording, and serial number).

Default Offsets

The dialog box has several fields along the top that display the default PQ offset parameters used to build the PQ subcode information. The default offsets are applied to all Tracks whose offsets were not specified in the Edit Decision List. They are also applied if no offsets are specified when creating PQ points manually. Most of you will not need to change the default offsets.

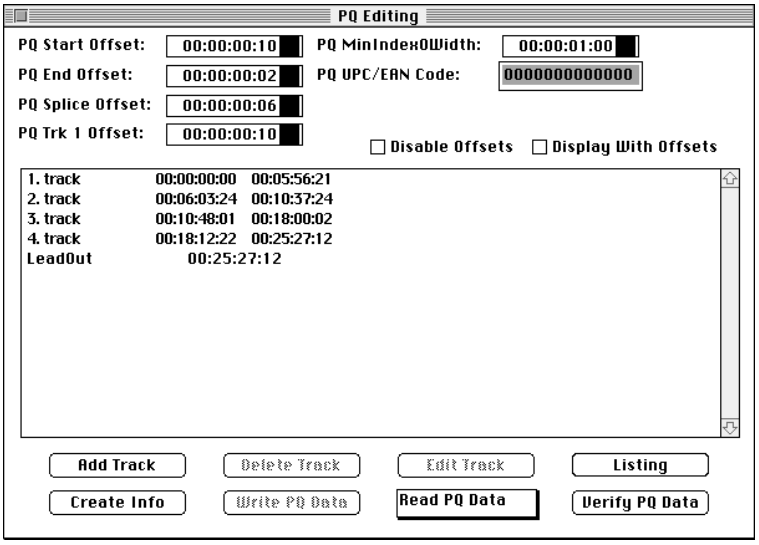
Creating PQ Information from the Delivery Log

To create the PQ information for the contents of the Delivery Log:

1. Click the Create Info button in the PQ Editing dialog box.

When you select the Create Info button, the Project Manager scans the Delivery Log, and all Edit Decision Lists in it, to read the Track information specified in the marks. This information is converted into valid PQ subcode information and displayed in the dialog box.

The assembled Tracks are displayed in the main window of the PQ Editing dialog box. The start and end times for each Track are displayed alongside the Track name.



After selecting Create Info, the assembled Track information displays in the main window of the PQ Editing dialog box. When the PQ information is first created, only the Tracks are displayed. To display Index points within the Track, click a Track entry.

PQ Info Error Messages

To create a valid CD, the Edit Decision Lists entered in the Delivery Log must have audio and Track /Index marks that make sense and conform to the requirements of the CD format. If the Delivery Log does not match these requirements, the system warns you that the PQ Log information cannot be created.

For less severe errors, the log will be created but the results may not be as you expected. In that instance, the system also alerts you to confirm that all marks are placed as desired.

Error: Missing Marks

Each Edit Decision List in the Delivery Log must have a Start of Track mark, or it will not be included on the actual CD.

If an Edit Decision List entered in the Delivery Log does not have Start or End of Track marks entered, the system will simply omit these from the PQ information.

In this case, the system produces no error message, but the results of the dump are probably not going to be what you intended.

After the PQ information has been created, it is a good idea to examine the contents of the PQ Editing dialog box to make sure that all needed cuts have been included. This simple precaution can avoid the costly mistake of recording a CD-R that must be redone.

If an Edit Decision List has been omitted from the PQ log because it lacks appropriate marks, it is necessary to open the offending Edit Decision List, enter Track Start and End marks where needed, and save the newly-altered Edit Decision List. Then the PQ information must be created again in order to include the new information.

Error: Incorrect Sample Rate

The Compact Disc format dictates a sample rate of 44.1 KHz. No CD can be made at any other rate.

The system marks each Sound File and Edit Decision List with the sample rate used at the time of its creation. The system will refuse to create PQ information if the Delivery Log contains Edit Decision Lists that use other sample rates.

This Warning message indicates that one or more of the Edit Decision Lists in the Delivery Log were created at a sample rate incompatible with the CD standard.

The setting for the Edit Decision List's sample rate can be changed by opening it and using the Edit Decision List Prefs selected from the Preferences item of the File menu. After you save it with the corrected sample rate, the PQ information can be created normally. However, the Sound Files included in the Edit Decision List must be loaded in the system at the correct sample rate, or they will play off pitch on the final disc.

Error: Insufficient Time between Track Start Marks

The Red Book standard for Compact Disc specifies that Track Start marks may not be placed closer together than four seconds. (There is no restriction on the placement of Track End marks.)

If marks are placed too close together, the PQ information cannot be created.

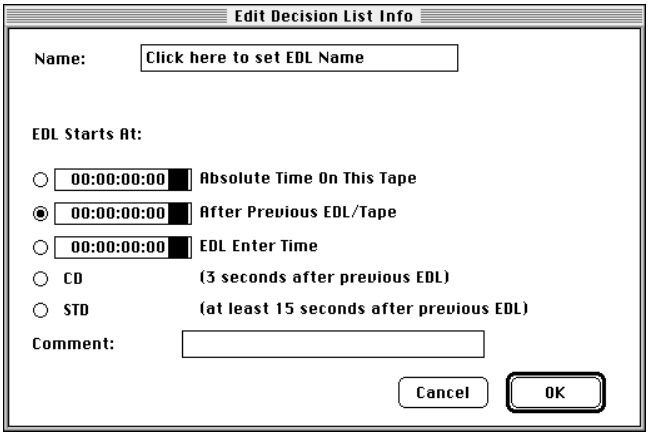
According to the Compact Disc specification, Track Start marks must be placed at least four seconds apart.

There are two typical causes for the appearance of this message. First Track Start marks were indeed placed too close together in one of the source Edit Decision Lists. If this is the case, the offending Edit Decision List must be opened and the placement of the marks changed. The PQ information can then be created normally.

The other situation that results in the appearance of this message is that the Start Time of one of the Edit Decision Lists is incorrectly specified.

If there is more than one Edit Decision List in the Delivery Log, then the Start time of all Edit Decision Lists after the first must be specified as an interval after the preceding Edit DecisionList. If it is not, the system attempts to place the list at the same time as the first List, resulting in conflict in the placement of Track marks.

The start time of all Edit Decision Lists after the first one must be specified as an interval after the preceding Edit Decision List.



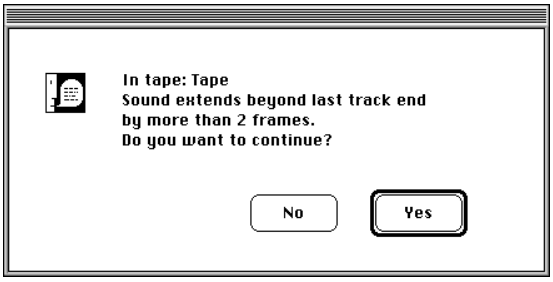
If the start time of an Edit Decision List is incorrectly specified, the system may produce an error saying that the Track Start marks were too close together.

The problem may be corrected by selecting the offending EDL in the Delivery Log and using the Edit EDL button to open the EDL Information dialog box. The setting for the Start Time should be changed. After closing the dialog box, the PQ information may be created normally.

Error: Track Marks not at Beginning or End of EDL

In creating the PQ information and dumping to CD-R, the system ignores any audio that comes before the first Start of Track mark. This makes it possible to use the Start of Track mark to eliminate dead air at the start of an EDL without actual editing. This is not a fatal error, but an advisory message.

In this case the system provides a warning to you, on the assumption that the Track marker might have been placed in error.



When a CD-R disc is recorded using the CD Printer, any audio ahead of the first Start of Track mark is deleted. If the Track marks have been placed as desired, click Yes in this dialog box. The system will create the rest of the PQ information and dump the CD as specified.

If you click No in this dialog box, the creation of the PQ information is halted, providing an opportunity for you to see whether marks have been placed correctly. After correcting any errors in the place of marks in the Edit Decision List, the Create Info operation is restarted.

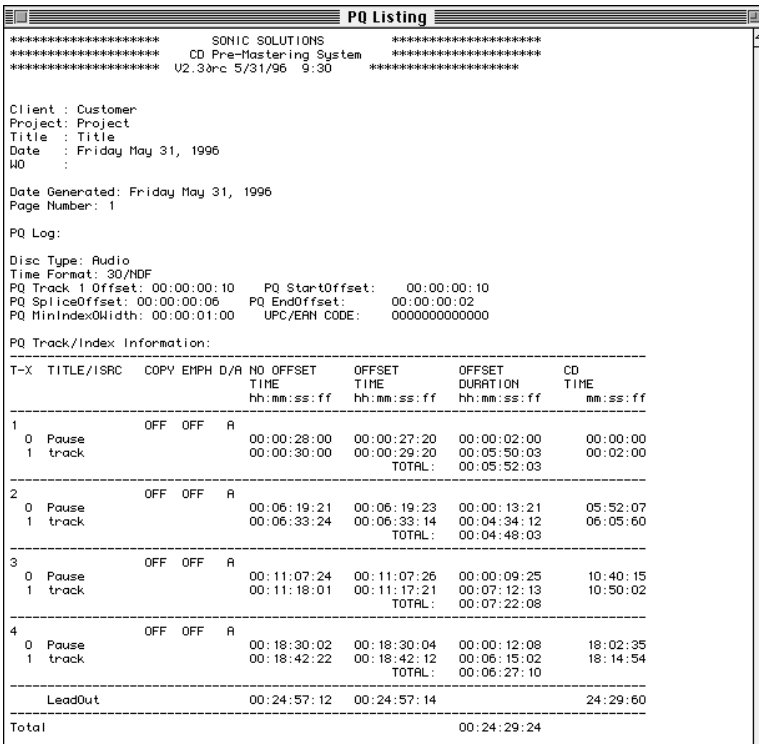
Error: Log has changed. Recreate PQ information

After any change is made to the Delivery Log the system prompts you to recreate the PQ information.

If a series of changes are being made to the Delivery Log it makes to sense to wait until all changes have been entered before recreating the PQ information.

Formatting the PQ Information

The Format button is used to produce a formatted version of the PQ Information. This formatted version can then be printed to produce a permanent record.



PQ Listing

```
********************       SONIC SOLUTIONS         ********************
********************    CD Pre-Mastering System    ********************
********************  V2.3arc 5/31/96  9:30     ********************


Client : Customer
Project: Project
Title  : Title
Date   : Friday May 31, 1996
WO     :

Date Generated: Friday May 31, 1996
Page Number: 1

PQ Log:

Disc Type: Audio
Time Format: 30/NDF
PQ Track 1 Offset: 00:00:00:10    PQ StartOffset:    00:00:00:10
PQ SpliceOffset: 00:00:00:06    PQ EndOffset:      00:00:00:02
PQ MinIndex0Width: 00:00:01:00    UPC/EAN CODE:    0000000000000

PQ Track/Index Information:
-------------------------------------------------------------------------------
T-X  TITLE/ISRC   COPY EMPH D/A NO OFFSET     OFFSET        OFFSET        CD
                                TIME          TIME          DURATION      TIME
                                hh:mm:ss:ff   hh:mm:ss:ff   hh:mm:ss:ff     mm:ss:ff
-------------------------------------------------------------------------------
1                 OFF  OFF   A
  0  Pause                      00:00:28:00   00:00:27:20   00:00:02:00     00:00:00
  1  track                      00:00:30:00   00:00:29:20   00:05:50:03     00:02:00
                                                  TOTAL:    00:05:52:03
-------------------------------------------------------------------------------
2                 OFF  OFF   A
  0  Pause                      00:06:19:21   00:06:19:23   00:00:13:21     05:52:07
  1  track                      00:06:33:24   00:06:33:14   00:04:34:12     06:05:60
                                                  TOTAL:    00:04:48:03
-------------------------------------------------------------------------------
3                 OFF  OFF   A
  0  Pause                      00:11:07:24   00:11:07:26   00:00:09:25     10:40:15
  1  track                      00:11:18:01   00:11:17:21   00:07:12:13     10:50:02
                                                  TOTAL:    00:07:22:08
-------------------------------------------------------------------------------
4                 OFF  OFF   A
  0  Pause                      00:18:30:02   00:18:30:04   00:00:12:08     18:02:35
  1  track                      00:18:42:22   00:18:42:12   00:06:15:02     18:14:54
                                                  TOTAL:    00:06:27:10
-------------------------------------------------------------------------------
     LeadOut                    00:24:57:12   00:24:57:14                   24:29:60
-------------------------------------------------------------------------------
Total                                                       00:24:29:24
```

A formatted PQ Log for a simple CD project. The log lists all of the Tracks and their associated times.

PMCD Mastering

Virtually all CD pressing plants accept Compact Disc final masters in PreMaster CD format and / or CD-R format. Most plants also continue to use the Sony 1630 / Umatic mastering format. PQ Basic does not support 1630 mastering. For 1630 mastering, use the Expanded PQ option (SS-525).

Mastering to Write-Once Compact Disc

To start the dump to CD:

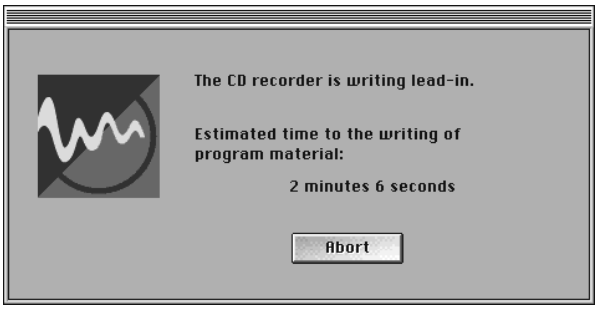
1. Open the Delivery Log.
2. Select the tape line in the Delivery Log.
3. Then click the Dump button.

After clicking the Dump button, the Macintosh cursor arrow changes to its watch icon while the system prepares the information for dumping to CD. This process takes between one to three minutes. At the finish of preparation, a dialog box displays and prompts you to make sure that the CD recorder is loaded with a blank disc.

When the system finishes preparing the audio and PQ information for dumping, a prompt dialog box appears.

4. After making certain that the CD recorder is ready, click OK.

The system will alert you than the CD printer is being checked and the speed set and media verified. After a few seconds, the Dump to CD dialog box displays.



The Dump to CD dialog box indicates the current stage of writing and the amount of time remaining before completion.

The dump proceeds in three stages. First the Lead In area of the disc is written. After that, the audio data is transferred to disc along with the PQ information prepared from the Delivery Log. When the end of the audio is reached, the system writes the Lead Out section.

The Dump to CD dialog box indicates the amount of time that remains before completion. The total time is the length of audio plus a few minutes to write the Lead In and Lead Out of the disc.

When the dump is finished, the Dump to CD dialog box closes, and the system prompts you.

Once this prompt displays, the newly-written CD may be removed from the drawer of the recorder and labeled. This disc is complete and ready to be played on any ordinary CD player, or (in the case of a PreMaster CD) sent to a CD pressing plant for mass replication.

Dump Error Messages

Once the Delivery Log has been prepared, and the PQ information created, the actual dump to CD should proceed smoothly. However, some circumstances may require the intervention of you.

Warning messages vary in their degree of severity. Many of the system's Warning messages are actually advisory alerts. Some Warning and Error messages, however, indicate conditions that may prevent the CD from being recorded properly.

Error: Edit Decision List selected instead of Tape

SonicStudio can dump to CD only when the line representing the delivery Tape has been selected. If you select the Dump button when an Edit Decision Lists is also selected, a Warning message displays right away.

After clicking OK to close the Warning dialog box, simply select the uppermost line of the Delivery Log and restart the dump operation.

Error: Cannot write at double speed

The Tape Info dialog box includes a checkbox that sets the system to dump to CD at double normal speeds (a great time saver). However, some CD recorders that might be used with the system, such as the predecessor to the CD-200 CD Printer, do not support double-speed writing. Also, the system cannot perform double-speed writing if the SSP-3 card is not equipped with expanded RAM memory. (All current versions of SonicStudio include this memory as standard.)

If double-speed writing is selected, but cannot be supported by the hardware in use, a Warning message advises you of this condition.

If the current hardware configuration does not support the write speed selected, a Warning message advises you of this condition.

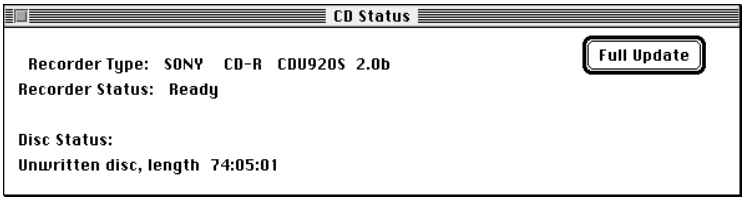
This is simply an advisory message. After clicking OK, the dump proceeds, albeit at 1x speed instead of the 2x speed selected in the Tape Info dialog box.

Error: CD Recorder not ready

If the CD recorder connected to the system is accidentally turned off or disconnected, the system detects this state and warns you.

Most commonly, this message indicates a simple flaw in the hardware connection, such as a disconnected cable or a CD recorder whose power is turned off. A detailed description of the error condition can be found by selecting CD Maker Status from the Status Monitors item of the File menu.

This opens a dialog box to query the state of all CD recorders connected to the system.



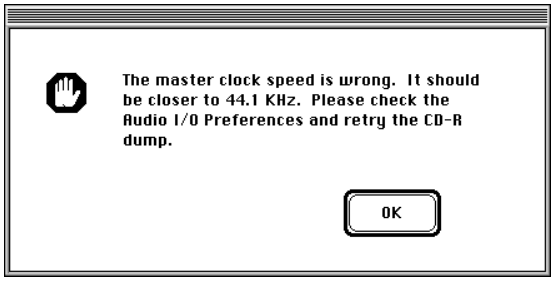
The CD Status dialog box, found in the Status sub-menu of the File menu, can be used to determine the cause of an error or Warning message.

If the recorder is disconnected or turned off, the CD Status dialog box will indicate No Writer Found. If this occurs, carefully check all cable connections to the CD Printer or other compatible recorder and verify that power is connected and the unit power is On. After correcting the fault, close the Status and Warning dialog boxes, and initiate the dump again.

If failure persists, the next step is to power-cycle the CD recorder by turning it off and then on again. If results are not good, it is best to shut down the system and reboot it. If dump still cannot be completed, contact Sonic Solutions Customer Support or your dealer.

Error: Incorrect Clock Speed

Compact Discs can *only* be created with a sample rate of 44.1 KHz. In order to dump to CD-R the master clock must be set to this rate. If you attempt to dump to CD while the system is clocked at another rate, a Warning message displays.



If the system is clocked at a rate other than 44.1 KHz, this Warning dialog box will appear when the dump to CD is initiated.

Usually, the system master clock is provided by the loading device connected to its input and the sample rate can be changed simply by changing the clock rate of the connected device. For example, the SS-610 A/D-D/A Converter has a switch on its front panel to select 44.1 or 48 KHz sample rate. Most other digital audio devices have a similar function.

If there is no source device connected, or if the device in use is not capable of supplying a clock at 44.1 KHz (some consumer DAT machines match this description), the SSP-3 card must be set to provide its own clock.

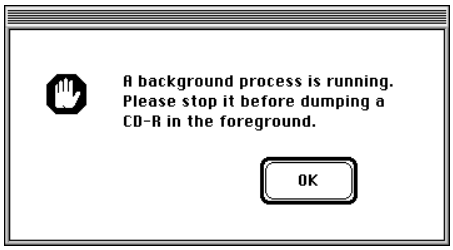
To switch the SSP-3 to self-clock at 44.1 KHz:

1. Select Audio I/O Prefs... from the Preferences item of the File menu. Audio I/O Preferences dialog box displays.
2. In the Audio I/O Preferences dialog box, click the Input Mode button. A small dialog box displays.
3. In the small dialog box, select Off for the input mode.
4. Click OK to close this dialog box. The Audio I/O Preferences dialog box displays
5. Click the Audio I/O Parameters button.
6. Set the Default Sampling Rate to 44100.
7. Click OK to close the selection dialog box.
8. Close I/O Parameters and Audio I/O Preferences.

Error: System Occupied

SonicStudio is able to both record and play audio at the same time, and to continue play/record operations while the Macintosh system is used for other tasks such as word processing. However, it is not able to dump to CD while another background task such as recording or restoring an Archive is taking place.

You are also prevented from changing the audio I/O configuration while a background operation is taking place. If this occurs, you receive a Warning message.

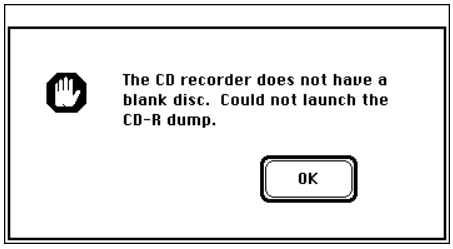


If you attempt to change the audio input or output configuration (Audio I/O Preferences) while a background process is in progress, the system produces this Warning.

If the operation in progress is known, you can decide whether to wait until it is finished, or halt the operation to change the configuration.

Error: PreRollSSP errors: CD recorder not ready

If the CD recorder does not contain a blank disc (CD-R discs may be written once and once only), or if the drawer of the recorder is open, the system delivers the following message.



If a message of this type occurs, first verify that the CD Printer has a completely blank disc in it, and that the recorder's drawer is closed. Also, double-check the SCSI connections and SCSI ID assignments between the SSP-3 card, Sound Disks, and the CD Printers. Then try the dump again.

If messages of this type persist after correcting all obvious flaws, it could indicate a problem with the CD recorder itself. Contact your dealer or Sonic Solution's Customer Support for assistance.

Summary

SonicStudio, which is equipped with the SS-524 PQ Basic editing and CD Premastering option, provides a general environment for preparing the audio and codes used for Compact Disc mastering.

With the Sony/Start Lab CD Maker or CD Printer, the system can be used to create Reference and Premaster CDs, which can be both played on a normal CD player for reference as well as sent to a replication facility for direct glass mastering.

The Premaster CD is increasingly accepted as an alternative to master in the Sony Umatic format and provides significant benefits in speed, cost, and quality assurance.

2 Expanded PQ Editing (SS-525)

The SS-525 Expanded PQ Code Editing / CD Audio option for SonicStudio provides the tools to create finished masters for Compact Disc production.

The PQ editing software provides a simple and intuitive interface for creating and editing the information that defines the placement of Track and Index points on the finished product. PQ Editing supports two formats for CD masters:

- 1630 Pre-Master tape
- Write Once Pre-Master CD

Both formats may be used as final masters to send to the pressing plant. This manual describes the creation of PQ subcode information and how it is used for each format.

With addition of the SS-423 8mm Tape Drive and SS-502 8mm Premastering option, you can also generate CD masters in DDP format, accepted increasingly for CD mastering.

Hardware

For mastering to PCM 1630 Umatic tape, SonicStudio must be connected to an actual Sony 1630/Umatic combination. The SS-612 SDIF converter is used to interface from SonicStudio's SSP-3 card to the 1630. An SS-610 A/D-D/A Converter is connected to the Monitor output to provide conversion of the PQ Burst into analog audio. This output is connected to audio channel 1 of the DMR or BVU video deck that is linked to the 1630. SonicStudio's machine control port is connected to the DMR/BVU's serial control input.

For mastering to CD-R, SonicStudio's SCSI bus is connected with a Sony/Start Lab CD recorder. This device shares the SSP-3's SCSI bus with the other Sound Disks.

For flow-through CD making, the output of the video decks's audio channel 1 is connected to the time code input of the SSP-3. This allows SonicStudio to read a PQ Burst recorded on a Umatic master tape. The information in the burst is transferred to the CD output.

Creating a CD Master

Cuts or sections of the final CD are prepared in the Edit display, with Track Start/End and Index marks. Once all of the Edit Decision Lists are prepared, the Project Manager is used to create a Delivery Log that lists all of the Edit Decision List to be included. The cuts (Edit Decision Lists) are listed in sequence, with a specification of the space between each Track.

Practical creation of Umatic (1630) CD Masters requires the use of serial machine control. If the system in use is not equipped for this function, it may be added by purchasing option SS-516, Machine Control.

To create a CD Master on digital tape of recordable CD:

1. In the edit display, place markers to specify Track and Index information for each cut in the final product.
2. Move to the Project Manager to create a new Project.

3. Open the Delivery Log and create a Tape to be used for the final master:
   This Tape must of be of type Timed Tape or Pre-Master CD
4. Enter the names of all Edit Decision Lists to be included on the finished master into the Delivery Log. Specify track spacing for each.
5. Open the PQ Editing dialog box, and use it to create PQ subcode information from the marks placed in each Edit Decision List.
6. (Tape masters only.) From the PQ Editing dialog box, create a PQ Burst file containing the PQ subcode information encoded into audio (FSK) form.
   The PQ burst file is automatically added to the head of the Delivery Log.
7. Dump the complete Delivery Log to the mastering medium, either tape or recordable CD.

What is PQ Subcode?

The data on a Compact Disc includes PQ subcode information that tells the CD player where each Track and Index are located. The cueing and programming features that the CD format is know for depend on this subcode information.

The Red Book Standard

The “Red Book” standard for audio CD (CD-A) was developed by Sony and Philips to specify the layout of PQ information and musical data on the CD. PQ subcode information is interleaved with musical information, with one complete PQ frame for every 588 audio samples. This translates to 75 PQ frames per second.

The first section on the CD is used for a Table of Contents (TOC) where the PQ information contains a repeated list of all Tracks (not Index points) and their start times on the CD. Program material starts following the Table of Contents.

Timing Formats

During play, the PQ information interleaved with program indicates the numbers of the current Track and Index, as well as two running time counts. These time counts are formatted as:

minutes:seconds:CD frames

The first time count provides the running time from the beginning of program material. The second time count contains the relative time from the beginning of the current Track. At the end of a Track, the second time count provides a negative time count relative to the beginning of the next Track. At the end of the last Track there are two minutes of lead-out.

Track Information

The Start and End of Tracks are given by specifying a Track number, an Index number, and a time code position. The Red Book standard limits the number of Tracks on a CD to 99.

Start of Track (Index 1)

Index number 1 of any Track marks the start of sound for that Track. Index 1 is where the CD player will start playing when it skips to that Track.

The Red Book standard requires at least four seconds between consecutive Start of Track marks (Index 1), so it is impossible to have a Track shorter than 4.0 seconds.

End of Track (Index 0 or Index 1)

The end of a Track is specified by the first Index of the next Track, which may be Index 0 or 1. If the first Index of the next Track is 1, the program material is “spliced” together without pause (i.e., the first Track of music ends just as the second Track starts). If the first Index of the next Track is 0, then there is space or silence between the two Tracks, called the “pause intervalFlowthrough.” During the pause interval, most CD players show a negative time counting down.

On some CD players the output mutes during this pause interval so the mastering engineer should make sure that there is nothing important in the area between the Start and End of Tracks.

Index Points (Indices 2-99)

There are a maximum of 99 Index points for each Track. Index points 2-99 are optional, used to mark significant points in a Track. The Red Book standard requires that the last Index in a Track be at least 4 seconds from the end. There is no restriction on how close together Index points can be within a Track, but some older CD players have problems finding Index points that are closer than 1 second apart.

Many CD players do not let the listener cue to Index points at all, so Indexes should not be used so as to be essential to the use of the disc.

Summary of Red Book Restrictions

- Maximum 99 Tracks on a CD
- Maximum 99 Index points per Track
- Track must be at least four seconds in length
- The last Index must be at least four seconds from the end of the Track

The SonicStudio PQ Editing Environment

SonicStudio uses the intuitive nature of the waveform display and the text-style editing of the Project Manager to make it as easy and automatic as possible to create PQ subcode information.

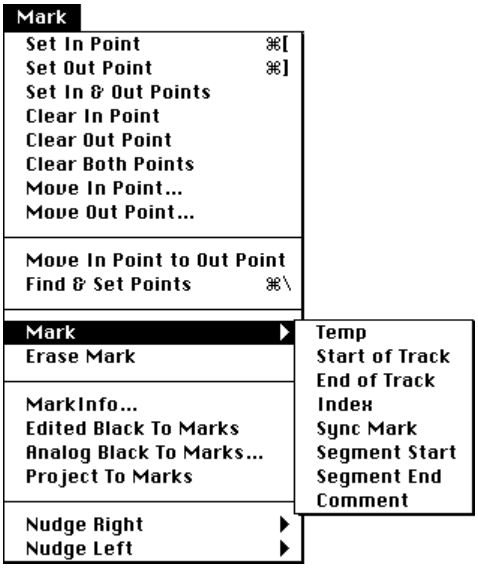
- In the waveform display, marks are placed to signify the Start and End of Tracks, as well as Index points within a Track.
- Once the marks have been placed in the waveform display, the Project Manager can read them and automatically generate PQ information and the PQ burst.
- The Project Manager can then print out a PQ log and automate the transfer of audio and PQ information to 1630, DAT, or CD Recorder. PQ points may also be typed in from within the Project Manager.

SonicStudio provides a comprehensive environment for entering and editing Track and Index information and transferring that to the subcode data on the final CD.

Placing Track and Index Marks

Marks for Track Start, Track End and Index are placed as part of the process of audio editing. These marks are used to assemble the PQ code information in the Project Manager's Delivery Log.

The Mark command in the Mark menu brings up a submenu that lists the various types of marks that can be set in the Edit Decision List. The marks that are used for PQ points are Start of Track, End of Track, and Index.

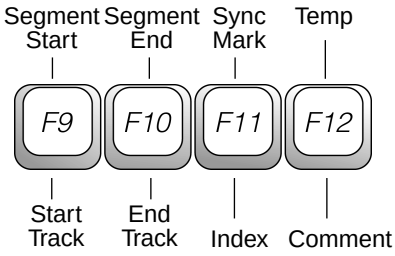


The pull-right menu for the Mark command lists the various types of marks used in the system. Selecting a mark type places it in the selected panel:

- If audio is playing the mark is placed at the position of the sound pointer when the mark type is selected.
- If audio is not playing, the mark will be placed at the location of the left gate.

The QuicKeys equivalents to the Mark commands can be used to place marks quickly and easily.

Note: Hold down Command key



The QuicKeys set for SonicStudio includes assignments to place editing marks using the keyboard Function keys.

Automatic Track Placement

Most of the information required to generate a PQ list already exists upon completing the editing stage of the mastering process. There are two commands that can automatically set Start and End of Track marks on the waveform:

Special commands are available to simplify placement of Track Start and Track End marks.

In digital audio, Black is a term used to indicate silence. Digital recorders such as the Sony 1630 encode digital audio into video form. When viewed on a video monitor, the output of these systems appears as solid black when the audio samples are all zero.

These two commands scan through audio, and place Start and End of Track marks wherever audio starts or stops.

Edited Black to Marks searches throughout the panel and places marks wherever audio adjoins perfect, digital black.

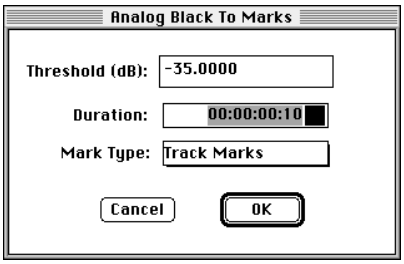
Analog Black To Marks... uses a threshold value to search for sections of relative, or analog, silence. Analog Black To Marks is used when audio to be mastered is transferred directly from a non-digital medium. Edited Black to Marks is best used when cuts have been assembled digitally, so that they are separate by perfect silence (sample values of zero).

To place marks using Edited Black To Marks:

1. Place the Tracks to be marked in the upper two panels of the Edit Decision List.
2. Assign the panels to Edit Group Destination.
3. Select the top panel and place the left and right gates around the area to be marked.
   In this case, the beginning and the end of the entire track.
4. Select Edited Black to Marks... from the Mark menu.
   The marks are placed wherever audio adjoins digital silence.

To place marks using Analog Black To Marks:

1. Place the Track to be marked in the upper two panels of the Edit Decision List.
2. Assign the panels to Edit Group Destination.
3. Select the top panel and place the left and right gates around the area to be marked.
   In this case, the beginning and the end of the entire track.
4. Select Analog Black to Marks... from the Mark menu.
   A dialog box appears to set the parameters by which the System will search for silences.



The Analog Black to Marks dialog box sets the parameters for searching.

Threshold is the level (in negative dB) that triggers placement of a mark. The default value of -60 dB is appropriate for most purposes. If source material is particularly noisy, a higher value may be used. A lower value could be used for material with very wide dynamic range.

Duration sets the minimum length of time that will be seen as a silence. With the default value of 2 seconds, for example, any silences shorter than that time are ignored.

Editing Track and Index Marks

Every mark in the Edit Decision List has an information dialog box for you to alter the information about that mark.

To call up the mark information dialog box, do one of the following:

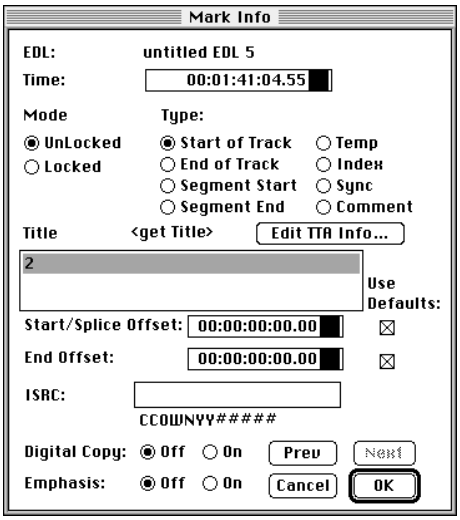
- Hold down the option key and click on the mark

or

- Place the Left and Right Gates around the mark, then select the command Mark Info from the Mark menu.

Start of Track

The information dialog box of a Start of Track mark indicates the mark type and mode (locked or unlocked), as well as information that is particular to CD mastering:



Time - Sets the location (in time) of the mark. This may be used to move the mark anywhere in the display panel.

Mode - An *unlocked* mark moves with the audio when ripple edits are performed. A *locked* mark is tied to its time location and will not move from that assigned position.

Type - Any type of mark can be changed to any other type. For mastering, you may sometimes wish to change a Start of Track mark to an Index mark, and vice versa.

Title (Comment) - The user can type any title into this Track. The title of a Start of Track mark appears in the formatted PQ Log.

ISRC Code - This is in internationally standardized code for identifying individual CD titles. The information inserted into this box will be included in the subcode are of the final CD.

Start/Splice Offset - Sets a start offset or the splice offset for this particular Track. If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

End Offset - Sets the end offset for this particular Track. If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

Digital Copy - Sets the Digital Copy permit flag for the Track.

Emphasis - Sets the Emphasis flag for the Track.

PQ Code Offsets

To accommodate the cueing times of CD players, offsets are applied to the PQ information entered in the Delivery Log. It takes about 2-10 frames for a CD player to start making sound after it has found the Start of Track location. PQ Start Offset makes sure that the start of music is not clipped. The default value is 10 frames.

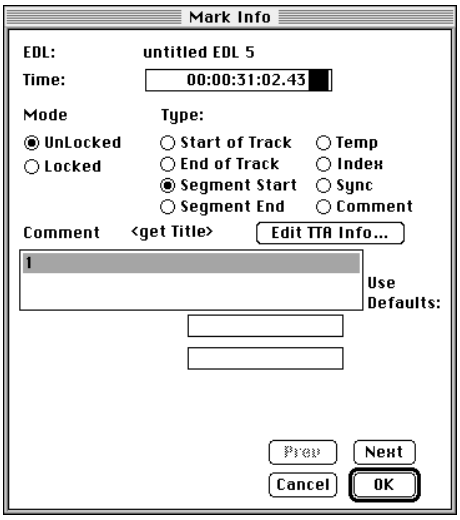
The PQ Splice Offset between Tracks is usually 6 frames. This is a compromise to make sure that neither the start of music, nor the end of the previous Track are clipped. PQ Splice Offset must always be less than the PQ Start Offset.

The offset applied to End of Track (PQ End Offset) prevents the CD player from muting too early and clipping the music. The default value is two frames.

If no offset values are entered in Mark Info, the system uses the default offsets included in the PQ Log, described later in this manual.

End of Track Mark

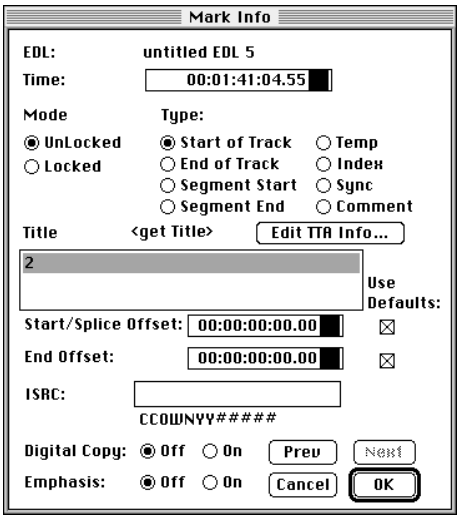
The information dialog box for an End of Track mark includes only the standard information associated with any editing mark on SonicStudio.



Since the End of Track translates into an Index point (0 or 1) in the final PQ codes, there are no offsets associated with it, as there are for the Start of Track.

Index Mark

The Index Mark's information dialog box includes a Start / Splice Offset field like that for the Start of Track mark.



If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

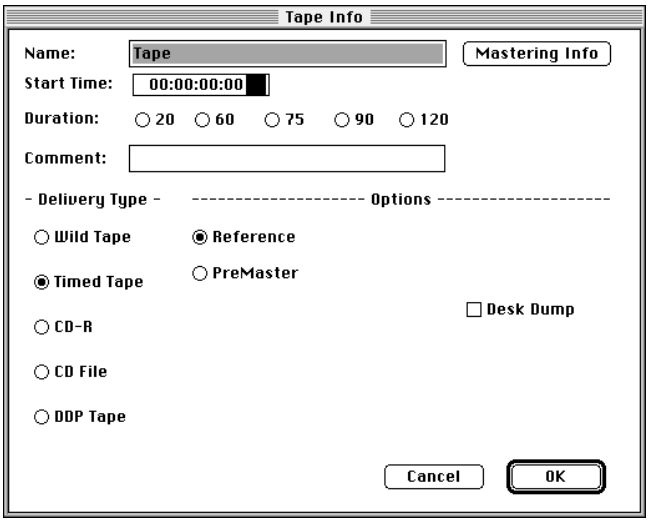
Creating Delivery and PQ Logs

The Project Manager Delivery Log is used to define the contents are timing of information to be included in the final master.

The Delivery Log

To prepare the Delivery Log, create a new Project (or open an existing Project) using the File menu commands. In the Project dialog box, click on the button to open the Delivery Log.

When the Delivery Log is first opened, the system prompts you to define the first Tape in the Log. The Delivery Log can include multiple tapes (which can be used for multi-CD sets, for example), but more commonly the Delivery Log will have only a single tape, for the master itself.



The Project Manager's Tape Info dialog box includes information that defines whether the output can be used as a master for Compact Disc, whether the dump is Double-Speed (CD-R only), and if there is a Mixing Desk Session Desk Dump associated with the Edit Decision List.

The Tape Info dialog box include buttons to specify the Type and Format of final output. For CD Mastering, the output must be either:

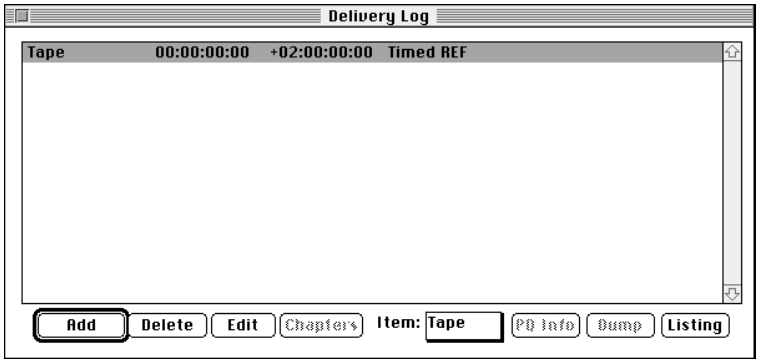
- Timed Tape (for 1630 Umatic-format masters), or
- CD in PreMaster Format (for recordable CD)

The PreMaster CD format includes the PQ Burst information required by the cutting equipment at a CD pressing plant. The PreMaster CD is accepted by a growing number of CD plants as a direct master for mass replication.

Flow-Thru CD -- The Tape Info dialog box also includes a box to select Flow CD. This may be used to transfer from a tape master in 1630 format to the recordable CD via a Sony/Start Lab CD recorder attached to SonicStudio's SCSI bus. The procedures for creating a Flow-Thru CD are detailed later in this manual.

Note – If a Double-Speed dump is specified (CD-R only), the ability to add a Desk Dump mixing desk session is eliminated. Also, if a Desk Dump is selected, the ability to do a Double Speed dump is eliminated.

Once the Tape is specified, close the Tape Info dialog box. The Delivery Log dialog box then appears immediately below the Project dialog box.



The Delivery Log dialog box lists all elements to be included in the final CD master.

When the dialog box first opens, the tape is the only item listed. Edit Decision Lists to be dumped to CD are entered into this dialog box.

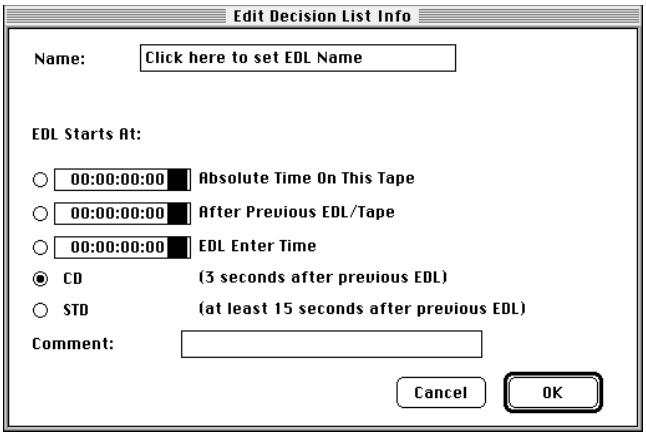
To open the Tape, double-click on the line in the Log dialog box where the name of the Tape is shown. The Add Tape button then changes its name to Add EDL.

To enter the names of Edit Decision Lists to be included in the delivery CD:

1. Double-click on the name of the tape, as displayed at the top of the main field of the Delivery Log.
   The Add Tape button changes its name to read Add EDL/Sound.

2. Click the Add EDL/Sound button.

This brings up a dialog box to select an Edit Decision List (EDL) or Sound File.

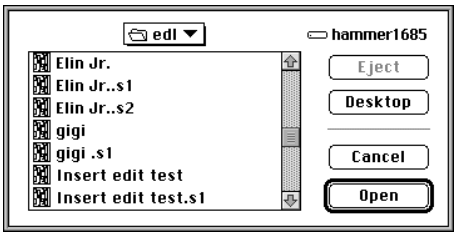


The Edit Decision List Info dialog box is used to enter the names of Edit Decision Lists to be dumped to CD.

The important items in this dialog box at this point are the Name and the Timing Information fields.

3. Click the Name field in the Edit Decision List Info dialog box. This opens a regular Macintosh File Select dialog box to locate and open the Edit Decision List to be added to the Delivery Log.

4. Use the Macintosh File Select dialog box to locate and select the Edit Decision List to be dumped to CD.

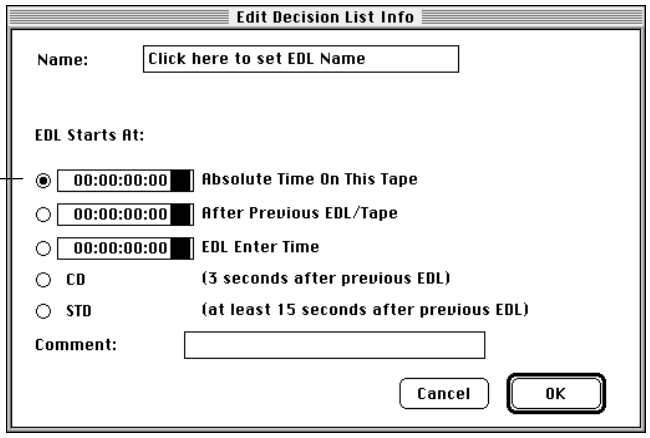


A standard Macintosh File Select dialog box is used to locate and select the Edit Decision List or Sound File desired.

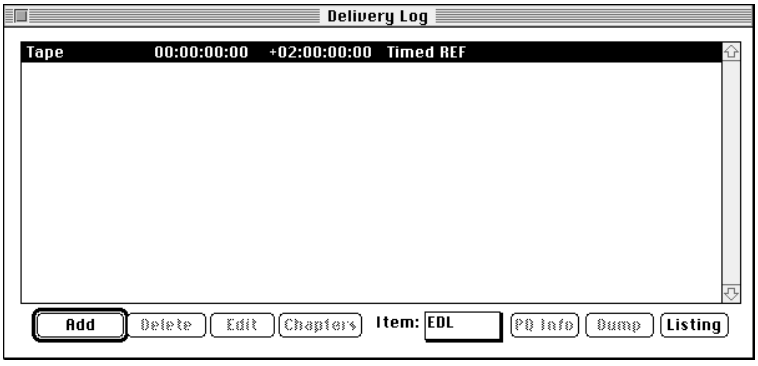
If you selected Desk Dump in the Tape Info dialog box, the Edit Decision List Info dialog box will also contain a field for selecting the appropriate Desk Session. To open a session, click on this field and locate the session using the standard Macintosh File Select dialog box which appears.

5. After selecting an Edit Decision List, specify its Start Time.

For the first Edit Decision List in a Delivery Log, set the absolute Time to one minute



6. Once an Edit Decision List has been selected and the Start Time set, click OK or press Return to close the Edit Decision List Info dialog box.
   The display returns to the Delivery Log dialog box, showing the new entry for the Edit Decision List.



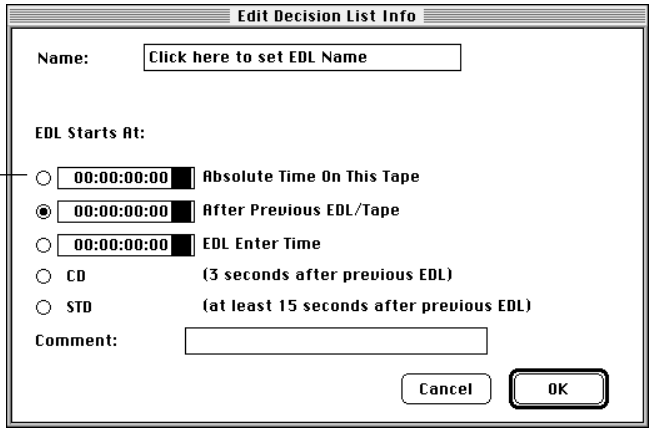
The names of Edit Decision Lists are added to the Delivery Log beneath the name of the Tape (CD).

A Delivery Log for a CD master may consist of a single Edit Decision List that includes all cuts, or of multiple Edit Decision Lists, each representing a single cut or group of cuts. The PQ marks in each Edit Decision List are assembled to create the full CD's worth of track information.

To add additional Edit Decision Lists to the Delivery Log:

1. Click the Add EDL button.
2. Select the next Edit Decision List to appear on disc.
   After the first Edit Decision List in the Delivery Log, the Start Time for each List is specified in terms of the pause between cuts.

Start times for additional Edit Lists are specified by the length of the pause following the preceding cut.



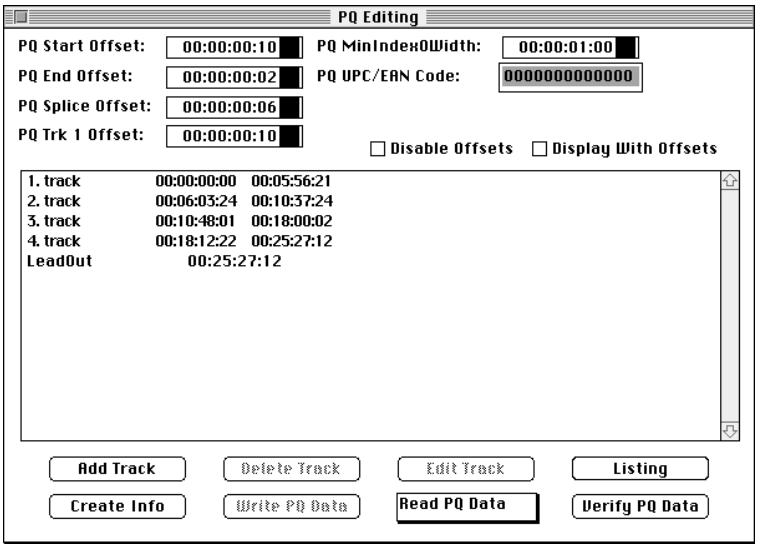
The Edit Decision List Info dialog box specifies the time between successive Edit Decision Lists (Cuts) in the Delivery Log.

This pause is typically a few seconds, but it may be as long or a short as desired. For convenience, the CD button may used to set a standard value of three seconds between cuts.

Creating the PQ Log

To open the PQ Log:

1. In the Delivery Log, select the topmost line (containing the delivery Tape by name)
2. Click on the button labeled PQ Edit.
   This opens the PQ Editing dialog box.



The PQ Editing dialog box contains track information.

When the dialog box is first opened, there is no track information displayed. The first step is to create this information.

If marks have been placed in each Edit Decision List to represent Track and Index points, the Project Manager can generate the PQ information automatically.

PQ Subcode Definitions

There are several values that are used to build the PQ subcode information.

PQ Start Offset

It is standard practice to apply offsets to the PQ information before placing it on the CD. The reason for the offset is because it takes about 2-10 frames for the CD player to start making sound after it has found the start of track location. This offset ensures that the beginning of music is not clipped. The default value is 10 frames.

PQ Splice Offset

Used to specify the splice offset between Tracks, usually a 6 frame offset. This is a compromise to make sure that the music for the Track is not clipped, without also hearing the end of the previous Track.

Note – The PQ splice offset must be less than the PQ Start Offset. The default value is 6 frames.

PQ End Offset

Offset applied to End of Track to prevent the CD player from muting too early and clipping the music. The default value is two frames.

PQ MinIndex0Width

If the length of the pause interval is much less than 1 second, the time display on most CD players will glitch briefly showing negative time. The MinIndex0Width parameter is used to set this time, and it defaults to around 1 second. If the time between Index 0 and Index 1 is less than the MinIndex0Width, the software will delete Index 0, creating a “splice” between the two Tracks.

The value of PQ MinIndex0Width should be approximately 1 second. To disable this feature, set the MinIndex0Width to 0.0 seconds.

UPC/EAN

The Universal Product Code for the CD. This is Q Mode 2 information. Note that the Sony DAQ-1000 among other devices will not accept this information unless it is a valid UPC code.

ISRC

International Standard Recording Code. This contains information about the recording (country code, owner code, year of recording, and serial number).

Default Offsets

The dialog box has several fields along the top that display the default PQ offset parameters used to build the PQ subcode information. The default offsets are applied to all Tracks whose offsets were not specified in the Edit Decision List. They are also applied if no offsets are specified when creating PQ points manually. Most users will not need to change the default offsets.

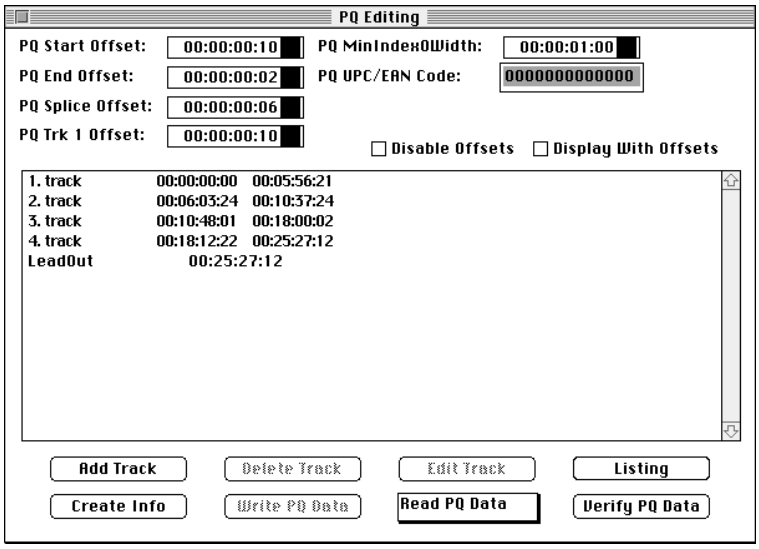
Creating PQ Information from the Delivery Log

To create the PQ information for the contents of the Delivery Log:

♦ Click the Create Info button in the PQ Editing dialog box.

When the Create Info button is selected, the Project Manager scans the Delivery Log, and all Edit Decision Lists in it, to read the Track information specified in the marks. This information is converted into valid PQ subcode information and displayed in the dialog box.

The assembled Tracks are displayed in the main dialog box of the PQ Editing dialog box. The start and end times for each Track are displayed alongside the Track name.



After clicking the Create Info button, the assembled Track information is displayed in the main dialog box of the PQ Editing dialog box. When the PQ information is first created, only the Tracks are displayed. To display Index points within the Track, double click on a Track entry.

PQ Info Error Messages

To create a valid CD, the Edit Decision Lists entered in the Delivery Log must have audio and Track /Index marks that make sense, and that conform to the requirements of the CD format. If the Delivery Log does not match these requirements, the system warns you that the PQ Log information cannot be created.

For less severe errors, the log will be created but the results may not be as you expected. In that instance, the system also alerts you to confirm that all marks are placed as desired.

Error: Missing Marks

Each Edit Decision List in the Delivery Log must have a Start of Track mark, or it will not be included on the actual CD.

If an Edit Decision List entered in the Delivery Log has no Start or End of Track marks entered, the system simply omits these from the PQ information.

In this case, the system produces no error message, but the results of the dump are probably not going to be what you intended.

After the PQ information has been created, it is a good idea to examine the contents of the PQ Editing dialog box to make sure that all needed cuts have been included. This simple precaution can avoid the costly mistake of recording a CD-R that must be redone.

If an Edit Decision List has been omitted from the PQ log because it lacked appropriate marks, it is necessary to open the offending List, enter Track Start and End marks where needed, and save the newly-altered List. Then the PQ information must be created again in order to include the new information.

The Compact Disc format dictates a sample rate of 44.1 KHz. No CD can be made at any other rate.

The system marks each Sound File and Edit Decision List with the sample rate used at the time of its creation. The system will refuse to create PQ information if the Delivery Log contains Edit Decision Lists that use other sample rates.

This Warning message indicates that one or more of the Edit Decision Lists in the Delivery Log were created at a sample rate incompatible with the CD standard.

The setting for the Edit Decision List's sample rate can be changed by opening the List and using the Edit Decision List Prefs selected from the Preferences item of the File menu. After the Edit Decision List is saved with the corrected sample rate, the PQ information can be created normally. However the Sound Files included in the Edit Decision List must be loaded in the system at the correct sample rate, or they will play off pitch on the final disc.

Error: Insufficient time between Track Start marks

The Red Book standard for Compact Disc specifies that Track Start marks may not be placed closer together than four seconds. (There is no restriction on the placement of Track End marks.)

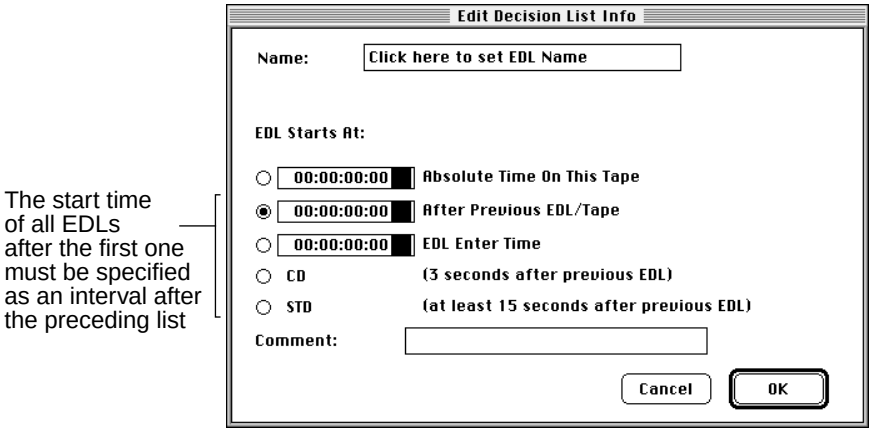
If marks are placed too close together, the PQ information cannot be created.

According to the Compact Disc specification, Track Start marks must be placed at least four seconds apart.

There are two typical causes for the appearance of this message. The first is that Track Start marks were indeed placed too close together in one of the source Edit Decision Lists. If this is the case, the offending Edit Decision List must be opened and the placement of the marks changed. The PQ information can then be created normally.

The other situation that results in the appearance of this message is that the Start Time of one of the Edit Decision Lists is incorrectly specified.

If there is more than one Edit Decision List in the Delivery Log, then the Start time of all Lists after the first must be specified as an interval after the preceding Edit Decision List. If it is not, the system attempts to place the list at the same time as the first Edit Decision List, resulting in conflict in the placement of Track marks.



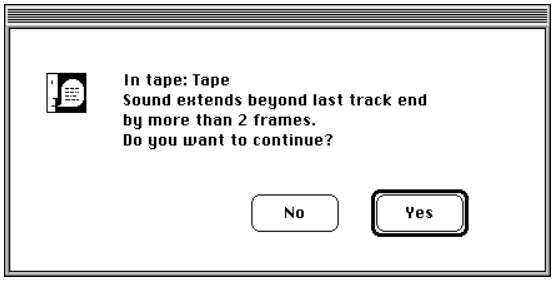
If the start time of an Edit Decision List is incorrectly specified, the system may produce an error saying that the Track Start marks were too close together.

The problem may be corrected by selecting the offending EDL in the Delivery Log, and using the Edit EDL button to open the EDL Information dialog box. The setting for the Start Time should be changed. After closing the dialog box, the PQ information may be created normally.

Error: Track Marks not at beginning or end of Edit Decision List

In creating the PQ information and dumping to CD-R the system ignores any audio that comes before the first Start of Track mark. This makes it possible to use the Start of Track mark to eliminate dead air at the start of an Edit Decision List without actual editing. This is not a fatal error, but an advisory message.

In this case the system provides a warning to you, on the assumption that the Track marker might have been placed in error.



When a CD-R disc is recorded using the CD Printer any audio ahead of the first Start of Track mark is deleted. If the Track marks have been placed as desired, you should answer Yes to this dialog box. The system will create the rest of the PQ information and dump the CD as specified.

If you answer No to this dialog box, the creation of the PQ information is halted, providing an opportunity for you to see whether marks have been placed correctly. After correcting any errors in the place of marks in the Edit Decision List, the Create Info operation is restarted.

Error: Log has changed. Recreate PQ information

After any change is made to the Delivery Log the system prompts you to recreate the PQ information.

If a series of changes are being made to the Delivery Log it makes to sense to wait until all changes have been entered before recreating the PQ information.

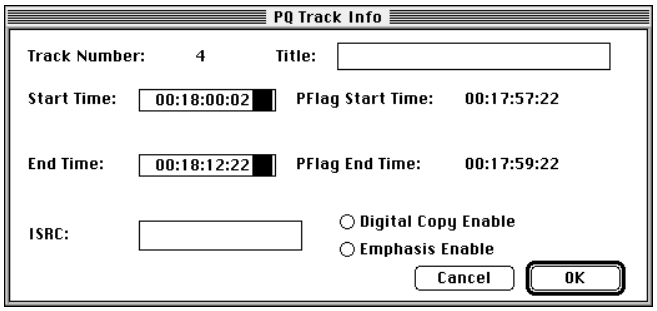
Editing the PQ Log Information

The PQ Editing dialog box provides comprehensive editing for the information in the PQ Log. It is also possible to create Track and Index points manually, to alter the placement and information for each Track and Index, and to delete any points that are not needed.

Adding Tracks

To add a Track:

♦ Click on the Add Track button in the PQ Editing dialog box.



PQ Track Info

This dialog box includes the same information provided in the Mark Info dialog box for a Track Start mark. After clicking OK on the PQ Track Info dialog box, the Track will be added.

Title - Specify the title of the Track here. This title will appear in the formatted PQ sheet.

Start Time - Specify the start time of the Track.

Start Offset - Sets the start offset or the splice offset of the Track. If no offset is specified, the default offset will be used.

PFlag Start Time - Displays the start time after the offset has been applied.

End Time - Specify the end time of the Track.

End Offset - Sets the end offset of the Track. If no offset is specified, the default offset will be used when the PQ information is created in the Project Manager.

PFlag End Time - Displays the end time after the offset has been applied.

ISRC - Specifies the International Standard Recording Code for this Track. This is an optional field.

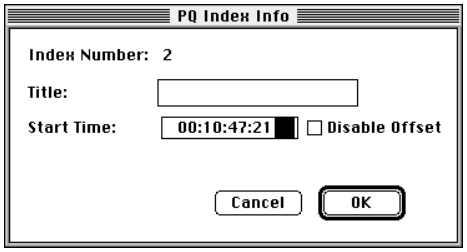
Digital Copy Enable - Sets the copy permit flag for this Track.

Emphasis Enable - Sets the emphasis flag for this Track.

Adding Index Points

To add an Index point:

1. Double click on the Track for which an Index point is to be set. The Add Track button on the bottom of the PQ Editing dialog box changes to read Add Index.
2. Click on the Add Index button.



The Index point requires less information than the Track.

Index Number - The Index number is automatically set by the Project Manager in sequence order. Up to 99 Index points are allowed for each Track.

Title - Specify the title of the Index here. This title will appear in the formatted PQ sheet.

Start Time - Specify the start time of the Index.

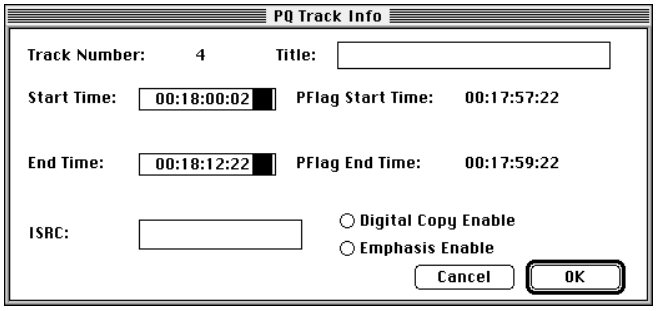
Start Offset - Sets the start offset of the Index. If no offset is specified, the default offset is used.

3. Click OK in the Index Information dialog box to add the Index.

Editing Track information and offsets

To change a Track's information:

1. Select the Track to be changed in the PQ Editing display.
2. Click on the Edit Track button.
   The PQ Track Info dialog box appears with the information entered when the Track was created.



The user may entered any information desired into this dialog box.

3. Click OK to change the Track Information.

Deleting a Track

To delete a Track:

1. Select the Track to be deleted.
2. Click on the Delete Track button.

Editing Index information and offset

To change a Track's information:

1. Select the Index to be changed.
2. To see Index points for a Track, double click on the Track.
   The Edit Track button changes to read Edit Index.
3. Click on the Edit Index button to open the PQ Index Info dialog box.
   Any desired changes may be made to the information for the selected Index. The new information takes effect when the dialog box is closed.
4. Click on the OK button.

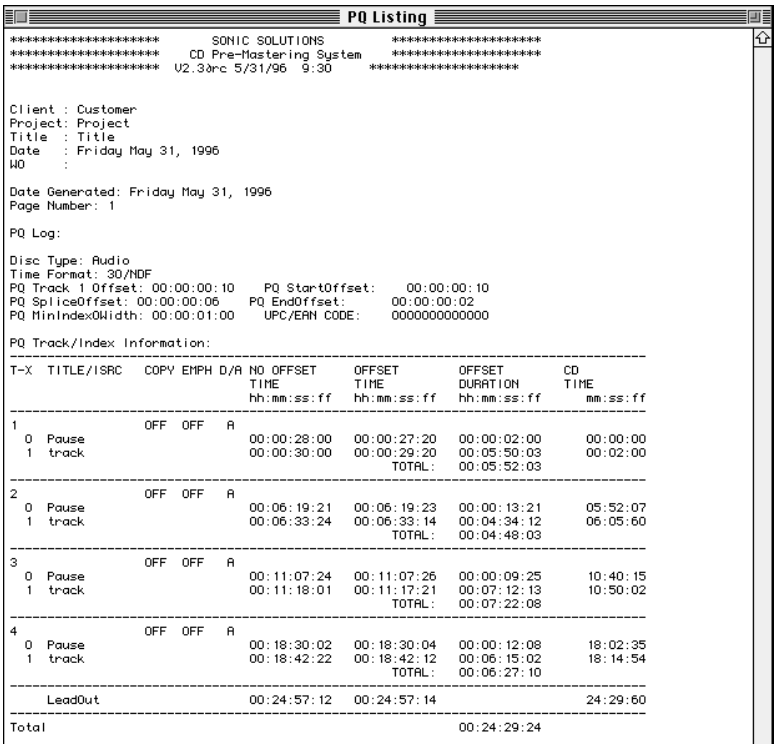
Deleting an Index

To delete an Index:

1. Select the Index to be deleted.
2. To see Index points for a Track, double click on the Track.
   The Delete Track button on the bottom of the PQ Edit dialog box will change to read Delete Index.
3. Click on the Delete Index button.

Formatting the PQ Information

The Format button is used to produce a formatted version of the PQ Information. This formatted version can then be printed to produce a permanent record.



PQ Listing

```
********************       SONIC SOLUTIONS         ********************
********************    CD Pre-Mastering System    ********************
********************  V2.3∂rc 5/31/96  9:30     ********************


Client : Customer
Project: Project
Title  : Title
Date   : Friday May 31, 1996
WO     :

Date Generated: Friday May 31, 1996
Page Number: 1

PQ Log:

Disc Type: Audio
Time Format: 30/NDF
PQ Track 1 Offset: 00:00:00:10    PQ StartOffset:    00:00:00:10
PQ SpliceOffset: 00:00:00:06    PQ EndOffset:      00:00:00:02
PQ MinIndex0Width: 00:00:01:00    UPC/EAN CODE:    0000000000000

PQ Track/Index Information:
-------------------------------------------------------------------------------
T-X  TITLE/ISRC   COPY EMPH D/A NO OFFSET     OFFSET        OFFSET        CD
                                TIME          TIME          DURATION      TIME
                                hh:mm:ss:ff   hh:mm:ss:ff   hh:mm:ss:ff     mm:ss:ff
-------------------------------------------------------------------------------
1                 OFF  OFF   A
  0  Pause                      00:00:28:00   00:00:27:20   00:00:02:00      00:00:00
  1  track                      00:00:30:00   00:00:29:20   00:05:50:03      00:02:00
                                                    TOTAL:  00:05:52:03
-------------------------------------------------------------------------------
2                 OFF  OFF   A
  0  Pause                      00:06:19:21   00:06:19:23   00:00:13:21      05:52:07
  1  track                      00:06:33:24   00:06:33:14   00:04:34:12      06:05:60
                                                    TOTAL:  00:04:48:03
-------------------------------------------------------------------------------
3                 OFF  OFF   A
  0  Pause                      00:11:07:24   00:11:07:26   00:00:09:25      10:40:15
  1  track                      00:11:18:01   00:11:17:21   00:07:12:13      10:50:02
                                                    TOTAL:  00:07:22:08
-------------------------------------------------------------------------------
4                 OFF  OFF   A
  0  Pause                      00:18:30:02   00:18:30:04   00:00:12:08      18:02:35
  1  track                      00:18:42:22   00:18:42:12   00:06:15:02      18:14:54
                                                    TOTAL:  00:06:27:10
-------------------------------------------------------------------------------
     LeadOut                    00:24:57:12   00:24:57:14                    24:29:60
-------------------------------------------------------------------------------
Total                                                       00:24:29:24
```

A formatted PQ Log for a simple CD project. The log lists all of the Tracks and Indexes, along with their associated times.

Transfer to Umatic or CD-R Master

All CD pressing plants accept Compact Disc final masters in the form of digital audio tapes in the format used by the Sony PCM 1630, using 3/4" Umatic video tape. An increasing number of plants also accepts the PreMaster CD format.

Umatic (PCM 1630) Mastering

The Sony 1630/DMR400 mastering system operate under serial control in oder to align digital audio to time code.

For mastering to Umatic tape, the Type of the Tape in the Delivery Log should be set as Timed Tape. All of the Edit Decision List and cueing information is entered in the Delivery Log as described earlier, and the information is converted into PQ code data using the PQ Editing dialog box.

Once the PQ information is created, it is used to produce an audio PQ Burst, which encodes the PQ data in a form that can be read by the cutter for the glass masters used in replicating Compact discs.

The PQ Burst is placed on the left analog track of the Umatic tape within the first 30 seconds of the tape. SonicStudio sends the PQ Burst to the Monitor port. A digital to analog (D/A) converter is connected to this port to convert the burst into analog audio.

To create a PQ Burst soundfile and Edit Decision List:

- Click the Create Burst button.

A dialog box appears to advise you that this process takes "…about 45 seconds…."

This step creates a PQ Burst Soundfile and a PQ Burst Edit Decision List. The system inserts the PQ Burst Edit Decision List as the first entry in the Delivery Log at +00:00:15:00 (15 seconds) on the tape.

Preparing for Transfer to Tape

For dump to tape, the software automatically patches the PQ Burst to SonicStudio's Monitor port.

1. Connect the monitor port to a digital to analog (D/A) converter. See the manual titled *Installation and Maintenance* for information about the audio Ports.

2. Connect the D/A's left output to the DMR–4000's channel 1 (LEFT) analog input.

3. Select the command Tape Configuration… under the File menu Preferences command.
   The Umatic tape used for mastering should be pre-striped with SMPTE time code for its entire length.

4. In the Tape Preferences dialog box, select only the Video check box under "Record Mode."
   If desired, the Umatic tape may be striped for the first few minutes only, and the remaining time code written by SonicStudio. (Prestriping the length of the tape is preferred, however.) For this case, select *Assemble* for the Record Mode.

5. Set the input gain to zero for Aux Ch 1 on the DMR–4000.
   Also note that the PQ Burst will automatically recorded on Aux channel 1.

6. Select the Audio I/O Prefs command under the File menu.

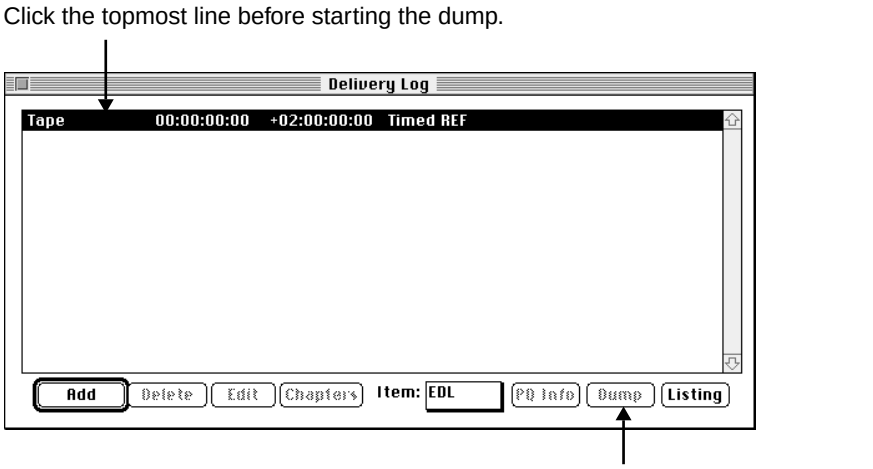
7. Check that P2 is set as the Load and Dump port.

8. Set P3 (audio outputs 3 and 4) to Monitor.

Dumping to Tape

To dump to tape:

1. After closing the Audio I/O Preferences dialog box, return to the Delivery Log.



2. To transfer the Delivery Log to the final output medium, select the Tape (topmost line of the log) and click the Dump button.

3. Click the Dump button at the bottom of the Delivery Log dialog box.
   SonicStudio will prompt to insert a tape into the Umatic.

4. Insert the tape and click OK.
   When the dump starts, the system prompts you to patch the left channel output of the Monitor port to the Aux 1 (analog channel 1) of the Umatic tape machine.

   The CD Master is dumped in two steps. When recording of the first entry (the PQ Burst Edit Decision List) begins, the Background Manager dialog box may used to see how much time is remaining to finish writing the burst.

   When the PQ Burst dump starts, SonicStudio automatically arms the Umatic to perform an insert edit on Aux 1 only, regardless of the Tape Configuration record mode setting. When the PQ Burst dump is finished, the system pauses to let you disconnect the patch from the monitor to the Umatic Aux 1.

Afterward, the system dumps the program material through the dump port using the record mode indicated in the Tape Configuration dialog box.

5. After completion of the dump of the PQ Burst, click a second time on the Dump button.
   SonicStudio shuttles the tape to the start time of the Edit Decision List containing the (first) Soundfiles. The Background Queue shows the amount of time remaining to finish writing out the Delivery Log.

To monitor the dump while making the tape, patch B1 and B2 into the mixing desk. The audio is heard on these outputs as it goes to the tape. Mixing Desk settings do not affect the signal going to tape.

Mastering to Write-Once Compact Disc

The process of mastering to recordable CD is similar to that of dumping to Umatic tape, except that there is no need to create the PQ Burst soundfile and edit list.

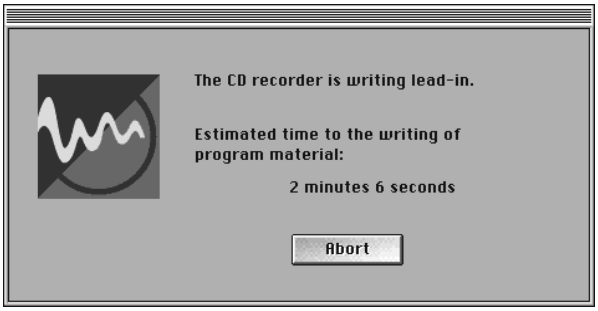
The dump to CD is initiated the same as a dump to tape or other media. you selects the tape line in the Delivery Log, then clicks on the Dump button. The type of dump is determined by the Type selected for the Tape in its information dialog box.

After clicking the Dump button, the Macintosh cursor arrow changes to its watch form while the system prepares the information for dumping to CD. This process takes about 1 to 3 minutes. At the finish of preparation, a dialog box appears to prompt you to make sure that the CD recorder is loaded with a blank CD-R disc.

When the system finishes preparing the audio and PQ information for dumping, a prompt dialog box appears.

6. After making certain that the CD recorder is ready, click OK.

The system will alert you than the CD printer is being checked and the speed set and media verified. After a few seconds, the Dump to CD dialog box appears.



The Dump to CD dialog box indicates the current stage of writing and the amount of time remaining before completion.

The dump proceeds in three stages. First the Lead In area of the disc is written. After that the audio data is transferred to disc, along with the PQ information prepared from the Delivery Log. When the end of the audio is reached, the system writes the Lead Out section.

The Dump to CD dialog box indicates the amount of time that remains before completion. The total time is the length of audio plus a few minutes to write the Lead In and Lead Out of the disc.

When the dump is finished, the Dump to CD dialog box closes, and the system prompts you.

Once this prompt appears, you can remove the newly-written CD from the drawer of the recorder and label it. This disc is complete and ready to be played on any ordinary CD player, or in the case of a PreMaster CD, sent to a CD pressing plant for mass replication.

Dump Error Messages

Once the Delivery Log has been prepared, and the PQ information created, the actual dump to CD should proceed smoothly. However, some circumstances may require your intervention.

Warning messages vary in their degree of severity. Many of the system's Warning messages are actually advisory alerts. Some Warning and Error messages, however, indicate conditions that may prevent the CD from being recorded properly.

Error: Edit Decision List selected instead of Tape

SonicStudio can dump to CD only when the line representing the delivery Tape has been selected. If the Dump button is hit while one of the Edit Decision Lists is selected, a Warning message appears right away.

After clicking OK to close the Warning dialog box, simply select the uppermost line of the Delivery Log and restart the dump operation.

Error: Cannot write at double speed

The Tape Info dialog box includes a checkbox that sets the system to dump to CD at 2 times normal speed (a great time saver). However, some CD recorders that might be used with the system, such as the predecessor to the CD-200 CD Printer do not support double speed writing. Also, the system cannot perform double-speed writing if the SSP-3 card is not equipped with expanded RAM memory. (All current versions of SonicStudio include this memory as standard.)

If double-speed writing is selected, but cannot be supported by the hardware in use, a Warning message advises you.

If the current hardware configuration does not support the write speed selected, a Warning message advises you.

This is simply an advisory message. After clicking OK, the dump proceeds, albeit at 1x speed instead of the 2x speed selected in the Tape Info dialog box.

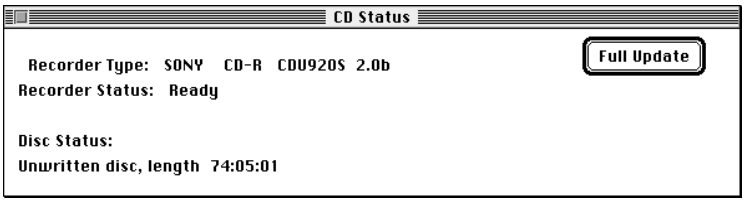
Error: CD Recorder not ready

If the CD recorder connected to the system is accidentally turned off or disconnected, the system detects this state and warns you.

If the CD recorder attached to the system is disconnected or turned off, the system produces this Warning.

Most commonly, this message indicates a simple flaw in the connection of hardware, such as a disconnected cable or a CD recorder whose power is turned off. A detailed description of the error condition may be found by selecting CD Maker Status from the Status Monitors item of the File menu.

This opens a dialog box to query the state of all CD recorders connected to the system.



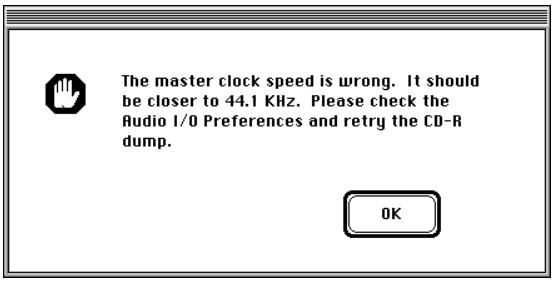
The CD Status dialog box, found in the Status sub-menu of the file menu, can be used to determine the cause of an error or Warning message.

If the recorder is disconnected or turned off, the CD Status dialog box will indicate No Writer Found. If this occurs, carefully check all of the cable connections to the CD Printer or other compatible recorder and verify that power is connected and the unit is turned on. After correcting the fault, close the Status and Warning dialog boxes, and initiate the dump again.

If failure persists, the next step is to power-cycle the CD recorder by turning it off and then on again. If there is still no good result, it is best to shut down the system and reboot it. If dump still cannot be completed, contact Sonic Solutions Customer Support or your dealer.

Error: Incorrect Clock Speed

Compact Discs can *only* be created with a sample rate of 44.1 KHz. In order to dump to CD-R the master clock must be set to this rate. If you attempts to dump to CD while the system is clocked at another rate, a Warning message appears.



If the system is clocked at a rate other than 44.1 KHz, this Warning dialog box displays when the dump to CD is initiated.

Usually, the system master clock is provided by the loading device connected to its input and the sample rate can be changed simply by changing the clock rate of the connected device. For example, the SS-610 A/D-D/A Converter has a switch on its front panel to select 44.1 or 48 KHz sample rate. Most other digital audio devices have a similar function.

If there is no source device connected, or if the device in use is not capable of supplying a clock at 44.1 KHz (some consumer DAT machines match this description), the SSP-3 card must be set to provide its own clock.

To switch the SSP-3 to self-clock at 44.1 KHz:

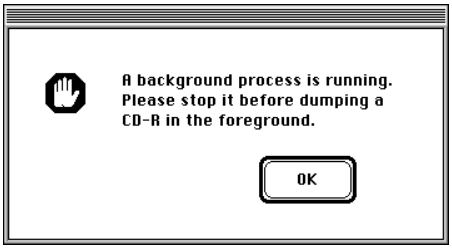
1. Select Audio I/O Prefs... from the Preferences item of the File menu.
2. In the Audio I/O Preferences dialog box, click the Input Mode button.
3. In the small dialog box that appears, select Off for the input mode.
4. Click OK to close the dialog box.
5. In the Preference dialog box, click the Audio I/O Parameters button.
6. Set the Default Sampling Rate to 44100.
7. Click OK to close the selection dialog box.

8. Close I/O Parameters and Audio I/O Preferences.

Error: System Occupied

SonicStudio is able to both record and play audio at the same time, and to continue play/record operations while the Macintosh system is used for other tasks such as word processing. However, it is not able to dump to CD while another background task such as recording or restoring an Archive is taking place.

The user is also prevented from changing the audio I/O configuration while a background operation is taking place. If this occurs, you receives a Warning message.

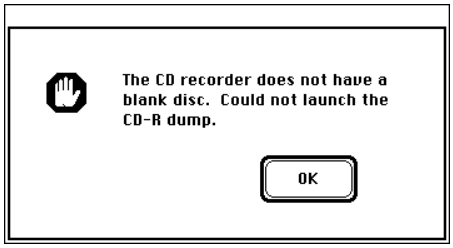


If you attempt to change the audio input or output configuration (Audio I/O Preferences) while a background process is in progress, the system produces this Warning.

If the operation in progress is known, you can decide whether to wait until it is finished, or halt the operation to change the configuration.

Error: PreRollSSP errors: CD recorder not ready

If the CD recorder does not contain a blank disc (CD-R discs may be written once and once only), or if the drawer of the recorder is open, the system delivers the following message.



If a message of this type occurs, first verify that the CD Printer has a completely blank disc in it, and that the recorder's drawer is closed. Also, double-check the SCSI connections and SCSI ID assignments between the SSP-3 card, Sound Disks, and the CD Printers. Then try the dump again.

If messages of this type persist after correcting all obvious flaws, it could indicate a problem with the CD recorder itself. Contact your dealer or Sonic Solution Customer Support for assistance.

Flow-through CDs

SonicStudio, equipped with CD recorder and PQ editing option, can be used to transfer from Umatic master directly to recordable CD. As part of this process, the system reads the PQ burst included on the master tape, and uses this to place the Track and Index marks on the disc. The CD-R output, then, is a faithful image of the discs that will be produced from the master in question.

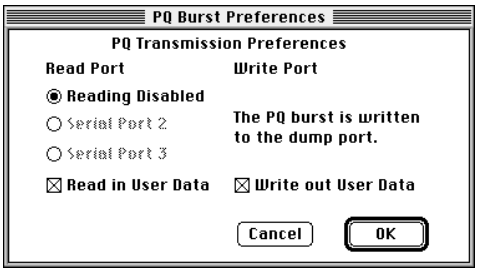
If the PQ burst is not available, Track and Index information may be entered into the PQ Log by hand.

Reading the PQ Burst

PQ Bursts are written and read using the same serial ports and XLR connector cable used for Time Code.

To prepare SonicStudio software for reading a PQ burst, select PQ Read/Write Configuration... under the Admin menu. Using the dialog box in the following illustration as a guide, set the radio buttons and check boxes as shown.

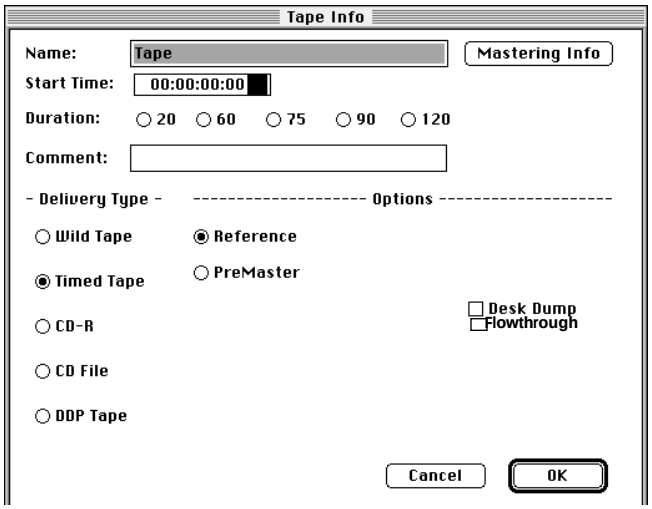
Serial Port 2 is always used for reading the PQ burst.



To create a recordable CD by flow-through from Umatic master

1. Make a new Project and Delivery Log.
   The tape start time should be the starting SMPTE/EBU timecode address at the beginning of the tape.

2. Click the appropriate radio buttons to set the type of tape as CD-R and the format as PreMaster.

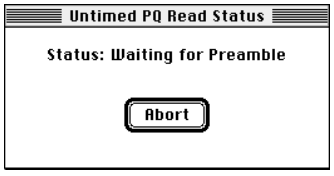


When the CD box is selected in the Tape Info dialog box, buttons appear to select Flowthrough.

3. Check the Flow (through) CD check box.
Note that the Delivery Tape *must* have PQ info. Flow-through with Machine Control is not currently supported.

4. Close the Tape Info dialog box, then click the PQ Info button in the Delivery Log.

5. In the PQ Editing dialog box, click the PQ Read button.
This reads the PQ information from the flow-though tape.



A dialog box appears when the system is waiting for a PQ burst to be read from the serial (time code) input.

A dialog box appears that allows you to continue or abort the operation. The Transport Panel may be used to remote control serially connected transports.

6. Cue to the head of the tape (before the PQ burst) and play 1630 tape.
   As the tape runs, you will see an increasing number of bytes being read in and the current status. The resulting incoming information appears in the PQ Info dialog box.
7. If CRC or code errors occur at this stage, increase or decrease the gain through the analog signal path for the incoming PQ Burst.
8. If satisfactory results are not obtained by adjusting gain, measure the voltage present at the input to the serial port and time conditioner.
   The nominal voltage of the TTL signal should be 4.2 volts RMS peak to peak (3 volts, zero to peak) with a maximum of 7 volts RMS peak to peak.
9. Close the PQ Info dialog box.
10. Click the Dump Button in the Delivery Section of the Project.

The system create a temporary buffer on the Sound Disk of five minutes duration. If autoselect is disabled, the system asks you to choose a Sound Disk for this buffer file.

SonicStudio then asks you to make sure that a blank CD is in the machine. Make sure that machine control is properly set up. After loading some audio data, the CD Maker will start.

Summary

SonicStudio systems equipped with the SS-510 PQ Editing and CD Premastering option, provides a comprehensive environment for preparing the audio and codes used for Compact Disc mastering.

Connected to a Sony 1630/DMR-4000 combination, the CD-prep system may be used to directly produce compatible masters that may be sent directly to a CD pressing plant. With the Sony/Start Lab CD Maker or CD Printer, the system can be used to create Reference and Premaster CDs.

The Premaster CD is increasingly accepted as an alternative to master in the Umatic format, and provides significant benefits in speed, cost, and quality assurance.

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