

# **Rivendell Radio Automation System**

## **Operations and Administration Guide**

**Fred Gleason**



**3.6.0 Edition**

---

# **Rivendell Radio Automation System: Operations and Administration Guide**

Fred Gleason

Copyright © 2003-2020 Fred Gleason

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in Appendix A, *GNU Free Documentation License*.

---

# Table of Contents

I. Rivendell Operations .....	1
1. System Overview .....	5
1.1. Introducing Rivendell .....	5
1.1.1. The Rivendell Object Paradigm .....	6
1.1.2. The Rivendell Hardware Paradigm .....	6
2. Managing the Current User with RDLogin .....	8
2.1. RDLogin .....	8
3. Content Management with RDLibrary .....	9
3.1. The Rivendell Library Structure and RDLibrary .....	9
3.1.1. Carts .....	9
3.1.2. Cuts .....	11
3.2. Alternative Methods of Audio Ingestion .....	14
3.2.1. Importing Audio from a File .....	14
3.2.2. Ripping Audio from a CD Track .....	15
3.2.3. Ripping Multiple CD Tracks at a Time .....	16
3.3. Macro Carts .....	17
3.4. Navigating the Audio Library .....	18
3.4.1. Changing the Cart Sort Order .....	18
3.4.2. Selecting Carts by the Filter Field .....	19
3.4.3. Selecting Carts by Group .....	19
3.4.4. Selecting Carts by Type .....	19
3.4.5. Selecting and Opening Carts .....	19
3.4.6. Viewing and Selecting Cuts .....	19
3.4.7. Playing Carts and Cuts .....	19
3.4.8. Running Macros .....	19
3.5. Library Maintenance .....	19
3.5.1. Editing Markers .....	19
3.5.2. Copying and Pasting Audio from Cut to Cut .....	21
3.6. Generating Library Reports .....	21
3.6.1. The Cart Report .....	21
3.6.2. The Cut Report .....	22
3.6.3. The Cart Data Dump (CSV) .....	22
4. Automating Tasks with RDCatch .....	23
4.1. Choosing the Correct Automation Tool .....	23
4.2. The RDCatch Main Window .....	23
4.2.1. The Record / Play Out Deck Area .....	23
4.2.2. The Filter Area .....	24
4.2.3. The Event List .....	24
4.2.4. The Button Area .....	26
4.3. Adding New Events .....	26
4.4. Automating Recordings .....	26
4.4.1. The 'Start Parameters' Section .....	26
4.4.2. The 'End Parameters' Section .....	27
4.4.3. Programming Multiple Recordings in a Single Event .....	27
4.4.4. Selecting a Record Source .....	28
4.4.5. Selecting a Record Destination .....	28
4.4.6. Setting the Active Days for a Recording .....	28
4.4.7. Record List Management with Event Active and Make OneShot .....	28
4.5. Automating Playouts .....	28
4.6. Automating Uploads/Downloads .....	29
4.7. Automating Macro Execution .....	30

4.8. Automating Switcher Operations .....	31
5. Generating and Maintaining Logs with RDLogEdit .....	32
5.1. Logs and Log Events .....	32
5.1.1. Audio Carts .....	35
5.1.2. Macro Carts .....	35
5.1.3. Note Markers .....	35
5.1.4. Track Markers .....	35
5.1.5. Chain Events .....	35
5.1.6. Import Links .....	35
5.2. Event Transitions .....	37
5.2.1. The PLAY Transition .....	37
5.2.2. The SEGUE Transition .....	37
5.2.3. The STOP Transition .....	37
5.3. Time and Time Types .....	37
5.3.1. The Relative Time Type .....	38
5.3.2. The Hard Time Type .....	38
5.3.3. Estimated vs. Scheduled Start Times .....	38
5.4. Editing Log Event Parameters .....	39
5.4.1. Specifying a Cart .....	39
5.4.2. Specifying Meta Event Parameters .....	39
5.4.3. Rearranging Log Events .....	39
5.4.4. Saving or Abandoning Changes to a Log .....	39
5.4.5. Missing/Invalid Cart Events .....	40
5.5. Generating Log Reports .....	40
5.5.1. Log Listing .....	40
5.5.2. Log Exception Report .....	40
5.6. Auditioning Audio .....	40
6. Running Logs with RDAirPlay .....	41
6.1. Overview .....	41
6.2. Log Machines .....	41
6.3. Layout .....	42
6.3.1. The Wall Clock .....	42
6.3.2. The Post Point Counter .....	42
6.3.3. The Audio Meter .....	43
6.3.4. The Pie Wedge Widget .....	43
6.3.5. The Next Stop Counter .....	43
6.3.6. The Mode Indicator .....	43
6.3.7. The Label Area .....	44
6.3.8. The Right-Hand Side .....	44
6.3.9. The Full Log Widget .....	44
6.3.10. The Button Log Widget .....	46
6.4. Editing a Log .....	47
6.4.1. Drag and Drop .....	47
6.4.2. The Editing Buttons .....	47
6.4.3. The SoundPanel .....	50
6.4.4. Panel Types .....	50
6.4.5. Programming a SoundPanel Button .....	50
7. Playing Audio with RDCartSlots .....	52
7.1. Overview .....	52
7.2. Setting the Slot Options .....	52
7.2.1. Cart Deck Slot Options .....	53
7.3. Operation in Cart Deck Mode .....	53
7.4. Operation in Breakaway Mode .....	54
8. Generating Logs with RDLogManager .....	56

8.1. Overview .....	56
8.2. Grids .....	56
8.3. Clocks .....	58
8.4. Events .....	60
8.5. Generating Logs .....	63
8.6. Generating Reports .....	65
8.6.1. Purging Old Report Data .....	66
9. VoiceTracking .....	67
9.1. Voicetracking in Rivendell .....	67
9.1.1. Prerequisites .....	67
9.1.2. VoiceTrack Markers .....	68
9.2. Using the Voicetrack Interface .....	68
9.2.1. The VoiceTracker Dialog .....	68
9.2.2. Editing Transitions .....	69
9.2.3. Inserting and Deleting Track Markers .....	70
9.2.4. Moving Between Track Markers .....	70
9.2.5. Recording a Voicetrack .....	71
9.2.6. Adjusting Transition Levels .....	72
9.2.7. Importing Voicetracks .....	72
9.2.8. Hitting the Post .....	72
10. Managing Podcasts with RDCastManager .....	73
10.1. Overview .....	73
10.2. Editing an Item's Metadata .....	74
10.3. Deleting an Item .....	76
10.4. Posting: Creating a New Item .....	76
10.4.1. Posting from a Rivendell Cart/Cut .....	76
10.4.2. Posting from a Rivendell Log .....	77
10.4.3. Posting an Audio File .....	79
11. Webget .....	80
11.1. Webget .....	80
11.1.1. Downloading Audio .....	80
11.1.2. Uploading Audio .....	81
II. Rivendell Administration .....	82
12. Configuring Rivendell with RAdmin .....	86
12.1. Overview .....	86
12.2. Managing Users .....	86
12.3. Managing Groups .....	89
12.3.1. Editing Group Information .....	89
12.3.2. Renaming Groups .....	90
12.3.3. Group Report .....	91
12.4. Managing Services .....	91
12.4.1. The General Section .....	92
12.4.2. Traffic/Music Data Importation Settings .....	95
12.4.3. Traffic/Music Import Parser Settings .....	96
12.4.4. Testing Data Importation .....	97
12.5. Managing Hosts .....	97
12.5.1. Configuring RDLibrary .....	100
12.5.2. Configuring RDCatch .....	102
12.5.3. Configuring RDAirPlay .....	104
12.5.4. Configuring RDPanel .....	109
12.5.5. Configuring RDLogEdit .....	110
12.5.6. Configuring RDCartSlots .....	111
12.5.7. Configuring Dropboxes .....	112
12.5.8. Configuring Switcher/GPIO Devices .....	115

12.5.9. Configuring Host Variables .....	119
12.5.10. Configuring Audio Ports .....	120
12.5.11. Configuring Serial Ports .....	121
12.5.12. Viewing Audio Resources .....	122
12.5.13. JACK Integration .....	122
12.5.14. Managing PyPAD Instances .....	123
12.6. Managing System Settings .....	126
12.7. Managing Scheduler Codes .....	128
12.8. Managing Replicators .....	129
12.9. Configuring Webget .....	130
12.9.1. Disallowing Duplicate Cart Titles .....	131
12.9.2. Configuring Encoder Formats .....	131
12.9.3. Configuring Webget Users .....	131
13. Managing the Rivendell Database with RDDbConfig .....	133
13.1. Overview .....	133
13.2. Creating a New Database .....	133
13.3. Backing Up the Database .....	134
13.4. Restoring the Database from a Backup .....	134
14. Rivendell Macro Language .....	135
14.1. Overview .....	135
14.2. Protocol .....	135
14.3. Command Delivery .....	135
14.4. Command Reply .....	135
14.5. Specifying Color .....	135
14.6. Binary Data .....	136
14.7. Log Machines .....	136
14.8. Commands .....	136
14.8.1. Air Gate [AG] .....	136
14.8.2. Append Log [AL] .....	136
14.8.3. Binary Serial Out [BO] .....	137
14.8.4. Clear Serial Trap [SC] .....	137
14.8.5. Command Send [CC] .....	137
14.8.6. Connect Jack Ports [JC] .....	137
14.8.7. Console Label [CL] .....	138
14.8.8. Copy Cut [CP] .....	138
14.8.9. Cut Event [CE] .....	138
14.8.10. Disconnect Jack Ports [JD] .....	138
14.8.11. Disconnect All Jack Ports [JZ] .....	139
14.8.12. Duck Panel Button [PD] .....	139
14.8.13. Execute Breakaway [DX] .....	139
14.8.14. Execute Cart [EX] .....	139
14.8.15. Fire Salvo [FS] .....	140
14.8.16. GPI Enable [GE] .....	140
14.8.17. GPI Enable [GE] (old format, deprecated) .....	140
14.8.18. GPI Set [GI] .....	140
14.8.19. GPI Set [GI] (old format, deprecated) .....	141
14.8.20. GPO Set [GO] .....	141
14.8.21. GPO Set [GO] (old format, deprecated) .....	141
14.8.22. Insert Cart [PX] .....	141
14.8.23. Insert Serial Trap [SI] .....	142
14.8.24. Label Panel [PC] .....	142
14.8.25. Load Log [LL] .....	142
14.8.26. Load Panel [PE] .....	142
14.8.27. Load Slot [DL] .....	143

14.8.28. Login [LO] .....	143
14.8.29. Macro Timer [MT] .....	143
14.8.30. Make Next [MN] .....	143
14.8.31. Message Box [MB] .....	144
14.8.32. No Operation [NN] .....	144
14.8.33. Pause Panel [PU] .....	144
14.8.34. Play Panel [PP] .....	145
14.8.35. Play Slot [DP] .....	145
14.8.36. Refresh Log [RL] .....	145
14.8.37. Run Shell Command [RN] .....	145
14.8.38. Select Widget [PW] .....	146
14.8.39. Serial Out [SO] .....	146
14.8.40. Serial Reload [SY] .....	146
14.8.41. Set Color Label [LC] .....	146
14.8.42. Set Default Now & Next Cart [SN] .....	147
14.8.43. Set Display [SD] .....	147
14.8.44. Set Duck Level [MD] .....	148
14.8.45. Set Label [LB] .....	148
14.8.46. Set Mode [PM] .....	148
14.8.47. Sleep [SP] .....	148
14.8.48. Start [PL] .....	149
14.8.49. Start Button [PB] .....	149
14.8.50. Start Next [PN] .....	149
14.8.51. Start Record Deck [RS] .....	149
14.8.52. Stop [PS] .....	150
14.8.53. Stop Panel [PT] .....	150
14.8.54. Stop Record Deck [RR] .....	150
14.8.55. Stop Slot [DS] .....	150
14.8.56. Switch Add [SA] .....	151
14.8.57. Switch Add With Gain [SG] .....	151
14.8.58. Switch Crosspoint Gain [SX] .....	151
14.8.59. Switch Level [SL] .....	151
14.8.60. Switch Reload [SZ] .....	151
14.8.61. Switch Remove [SR] .....	152
14.8.62. Switch Take [ST] .....	152
14.8.63. Toggle On Air Flag [TA] .....	152
14.8.64. UDP Out [UO] .....	152
15. Program Associated Data .....	154
15.1. Overview .....	154
15.1.1. The JSON Interface .....	154
15.1.2. PyPAD .....	155
16. Interfacing with the Linux Ecosystem: Command-Line Utilities .....	157
16.1. rdclilogedit(1) .....	157
16.2. rdconvert(1) .....	157
16.3. rddbcheck(8) .....	157
16.4. rdexport(1) .....	157
16.5. rdimport(1) .....	157
16.6. rdmarkerset(8) .....	158
16.7. rdrevert(8) .....	158
16.8. rmlsend(1) .....	158
III. ....	159
A. GNU Free Documentation License .....	162
A.1. GNU Free Documentation License .....	162
A.1.1. ADDENDUM: How to use this License for your documents .....	168

B. The GNU General Public License, Version Two .....	169
B.1. GNU GENERAL PUBLIC LICENSE .....	169
B.1.1. Preamble .....	169
B.1.2. GNU GENERAL PUBLIC LICENSE .....	169
B.1.3. NO WARRANTY .....	172
B.1.4. END OF TERMS AND CONDITIONS .....	173
B.2. How to Apply These Terms to Your New Programs .....	173
B.2.1. ....	173
B.2.2. ....	173
C. Supported GPIO/Switcher Devices .....	175
C.1. 360 Systems AM-16/B Audio Crosspoint Switcher .....	175
C.2. BroadcastTools 10x1 .....	175
C.3. BroadcastTools 16x1 .....	175
C.4. BroadcastTools 16x2 .....	175
C.5. BroadcastTools 8x2 .....	176
C.6. BroadcastTools ACS8.2 .....	176
C.7. BroadcastTools ADMS 44.22 Analog/AES Digital Matrix Switcher .....	177
C.8. BroadcastTools GPI-16 General Purpose Input Module .....	177
C.9. BroadcastTools Sentinel 4 Web AES Switcher .....	177
C.10. BroadcastTools SRC-16 .....	178
C.11. BroadcastTools SS 12.4 .....	178
C.12. BroadcastTools SS 2.1 .....	178
C.13. BroadcastTools SS 16.4 .....	178
C.14. BroadcastTools SS 4.1 MLR Switcher/Router .....	179
C.15. BroadcastTools SS4.2 .....	179
C.16. BroadcastTools SS4.4 .....	180
C.17. BroadcastTools SS8.2 .....	180
C.18. BroadcastTools Universal 4.1MLR>>Web .....	180
C.19. Grass Valley 7000 Protocol .....	181
C.20. Harlond Virtual Mixer .....	181
C.21. Kernel GPIO .....	181
C.22. Livewire LWRP Audio .....	182
C.23. Livewire LWRP GPIO .....	182
C.24. Livewire Multicast GPIO .....	182
C.25. Local Audio Adapter .....	183
C.26. Local GPIO .....	183
C.26.1. 15 Pin Joystick Port .....	183
C.26.2. MeasurementComputing GPIO Cards .....	184
C.27. Logitek vGuest .....	187
C.28. Modbus TCP .....	187
C.29. Quartz Electronics Type 1 Routing Protocol .....	187
C.30. Ross NK Video Switchers (via SCP/A Serial Interface) .....	187
C.31. Serial Port Modem Control Lines .....	188
C.32. Sierra Automated Systems 16000(D) Audio Router .....	188
C.33. Sierra Automated Systems 32000 Audio Router .....	188
C.34. Sierra Automated Systems 64000 Audio Router .....	189
C.35. Sierra Automated Systems 64000 Audio Router .....	189
C.36. Sierra Automated Systems User Serial Interface (USI) .....	189
C.37. Sine Systems ACU-1 (Prophet Version) .....	190
C.38. Software Authority Protocol .....	190
C.39. Starguide III Satellite Receiver .....	190
C.40. Wegener Unity4000 DVB Satellite Receiver .....	190
C.41. Wheatnet Blade LIO .....	191
C.42. Wheatnet Blade SLIO .....	191

D. Filepath Wildcards .....	192
D.1. Definition .....	192
D.2. Examples .....	194
E. ....	195
E.1. Metadata Wildcards .....	195
F. Rivendell Filter .....	197
F.1. Overview .....	197
F.2. Usage .....	197
F.3. Procedure .....	197
F.3.1. Create Rivendell Groups .....	197
F.3.2. Locate the External Rivendell Database and Audio Files .....	197
F.3.3. Verify Available Disk Space .....	197
F.3.4. Invoke Script .....	198
G. Wings Filter .....	199
G.1. Overview .....	199
G.2. Usage .....	199
G.3. Procedure .....	199
G.3.1. Create Rivendell Groups .....	199
G.3.2. Locate the 'Wings' Database and Audio Files .....	199
G.3.3. Verify Available Disk Space .....	199
G.3.4. Invoke Script .....	199
G.3.5. Clean Up .....	200

---

## List of Tables

3.1. Rivendell Marker Types .....	21
4.1. RDCatch Event States .....	23
4.2. RDCatch Event State Colors .....	25
4.3. RDCatch Event Icons .....	25
5.1. Log Event Type Icons .....	34
10.1. RDCastManager Item States .....	74
12.1. Default Import Title Wildcards .....	90
12.2. Dropbox PathSpec Examples .....	114
12.3. Audio Port Mode Switch Settings .....	121
C.1. Harlond Output Buss Mappings .....	181
C.2. 15 Pin Joystick Port Wiring .....	183
C.3. PCI-PDIS08 and PCI-PDIS16 Connector Pinout (DB37F) .....	184
C.4. PCI-DIO24 Connector Pinout (DB37F) .....	186
C.5. Modem Serial Lines GPI Signal Mapping .....	188
C.6. Modem Serial Lines GPO Signal Mapping .....	188
E.1. Metadata Wildcards .....	195
E.2. Metadata DateTime Specification .....	196

---

# **Part I. Rivendell Operations**

---

---

# Table of Contents

1. System Overview .....	5
1.1. Introducing Rivendell .....	5
1.1.1. The Rivendell Object Paradigm .....	6
1.1.2. The Rivendell Hardware Paradigm .....	6
2. Managing the Current User with RDLogin .....	8
2.1. RDLogin .....	8
3. Content Management with RDLibrary .....	9
3.1. The Rivendell Library Structure and RDLibrary .....	9
3.1.1. Carts .....	9
3.1.2. Cuts .....	11
3.2. Alternative Methods of Audio Ingestion .....	14
3.2.1. Importing Audio from a File .....	14
3.2.2. Ripping Audio from a CD Track .....	15
3.2.3. Ripping Multiple CD Tracks at a Time .....	16
3.3. Macro Carts .....	17
3.4. Navigating the Audio Library .....	18
3.4.1. Changing the Cart Sort Order .....	18
3.4.2. Selecting Carts by the Filter Field .....	19
3.4.3. Selecting Carts by Group .....	19
3.4.4. Selecting Carts by Type .....	19
3.4.5. Selecting and Opening Carts .....	19
3.4.6. Viewing and Selecting Cuts .....	19
3.4.7. Playing Carts and Cuts .....	19
3.4.8. Running Macros .....	19
3.5. Library Maintenance .....	19
3.5.1. Editing Markers .....	19
3.5.2. Copying and Pasting Audio from Cut to Cut .....	21
3.6. Generating Library Reports .....	21
3.6.1. The Cart Report .....	21
3.6.2. The Cut Report .....	22
3.6.3. The Cart Data Dump (CSV) .....	22
4. Automating Tasks with RDCatch .....	23
4.1. Choosing the Correct Automation Tool .....	23
4.2. The RDCatch Main Window .....	23
4.2.1. The Record / Play Out Deck Area .....	23
4.2.2. The Filter Area .....	24
4.2.3. The Event List .....	24
4.2.4. The Button Area .....	26
4.3. Adding New Events .....	26
4.4. Automating Recordings .....	26
4.4.1. The 'Start Parameters' Section .....	26
4.4.2. The 'End Parameters' Section .....	27
4.4.3. Programming Multiple Recordings in a Single Event .....	27
4.4.4. Selecting a Record Source .....	28
4.4.5. Selecting a Record Destination .....	28
4.4.6. Setting the Active Days for a Recording .....	28
4.4.7. Record List Management with Event Active and Make OneShot .....	28
4.5. Automating Playouts .....	28
4.6. Automating Uploads/Downloads .....	29
4.7. Automating Macro Execution .....	30
4.8. Automating Switcher Operations .....	31

5. Generating and Maintaining Logs with RDLogEdit .....	32
5.1. Logs and Log Events .....	32
5.1.1. Audio Carts .....	35
5.1.2. Macro Carts .....	35
5.1.3. Note Markers .....	35
5.1.4. Track Markers .....	35
5.1.5. Chain Events .....	35
5.1.6. Import Links .....	35
5.2. Event Transitions .....	37
5.2.1. The PLAY Transition .....	37
5.2.2. The SEGUE Transition .....	37
5.2.3. The STOP Transition .....	37
5.3. Time and Time Types .....	37
5.3.1. The Relative Time Type .....	38
5.3.2. The Hard Time Type .....	38
5.3.3. Estimated vs. Scheduled Start Times .....	38
5.4. Editing Log Event Parameters .....	39
5.4.1. Specifying a Cart .....	39
5.4.2. Specifying Meta Event Parameters .....	39
5.4.3. Rearranging Log Events .....	39
5.4.4. Saving or Abandoning Changes to a Log .....	39
5.4.5. Missing/Invalid Cart Events .....	40
5.5. Generating Log Reports .....	40
5.5.1. Log Listing .....	40
5.5.2. Log Exception Report .....	40
5.6. Auditioning Audio .....	40
6. Running Logs with RDAirPlay .....	41
6.1. Overview .....	41
6.2. Log Machines .....	41
6.3. Layout .....	42
6.3.1. The Wall Clock .....	42
6.3.2. The Post Point Counter .....	42
6.3.3. The Audio Meter .....	43
6.3.4. The Pie Wedge Widget .....	43
6.3.5. The Next Stop Counter .....	43
6.3.6. The Mode Indicator .....	43
6.3.7. The Label Area .....	44
6.3.8. The Right-Hand Side .....	44
6.3.9. The Full Log Widget .....	44
6.3.10. The Button Log Widget .....	46
6.4. Editing a Log .....	47
6.4.1. Drag and Drop .....	47
6.4.2. The Editing Buttons .....	47
6.4.3. The SoundPanel .....	50
6.4.4. Panel Types .....	50
6.4.5. Programming a SoundPanel Button .....	50
7. Playing Audio with RDCartSlots .....	52
7.1. Overview .....	52
7.2. Setting the Slot Options .....	52
7.2.1. Cart Deck Slot Options .....	53
7.3. Operation in Cart Deck Mode .....	53
7.4. Operation in Breakaway Mode .....	54
8. Generating Logs with RDLogManager .....	56
8.1. Overview .....	56

8.2. Grids .....	56
8.3. Clocks .....	58
8.4. Events .....	60
8.5. Generating Logs .....	63
8.6. Generating Reports .....	65
8.6.1. Purging Old Report Data .....	66
9. VoiceTracking .....	67
9.1. Voicetracking in Rivendell .....	67
9.1.1. Prerequisites .....	67
9.1.2. VoiceTrack Markers .....	68
9.2. Using the Voicetrack Interface .....	68
9.2.1. The VoiceTracker Dialog .....	68
9.2.2. Editing Transitions .....	69
9.2.3. Inserting and Deleting Track Markers .....	70
9.2.4. Moving Between Track Markers .....	70
9.2.5. Recording a Voicetrack .....	71
9.2.6. Adjusting Transition Levels .....	72
9.2.7. Importing Voicetracks .....	72
9.2.8. Hitting the Post .....	72
10. Managing Podcasts with RDCastManager .....	73
10.1. Overview .....	73
10.2. Editing an Item's Metadata .....	74
10.3. Deleting an Item .....	76
10.4. Posting: Creating a New Item .....	76
10.4.1. Posting from a Rivendell Cart/Cut .....	76
10.4.2. Posting from a Rivendell Log .....	77
10.4.3. Posting an Audio File .....	79
11. Webget .....	80
11.1. Webget .....	80
11.1.1. Downloading Audio .....	80
11.1.2. Uploading Audio .....	81

---

# Chapter 1. System Overview

## 1.1. Introducing Rivendell

Rivendell is a digital audio content management and delivery system that is targeted for use in professional radio broadcast environments. It includes robust tools for the acquisition, organization, management and play out of audio material from and to a diverse array of sources and destinations. Support for a wide variety of external third party hardware devices and software packages commonly used in the radio industry is featured, including interfaces for:

- Audio Routing Switchers
- Satellite Downlink Receivers
- Audio Mixing Consoles
- Commercial Traffic and Music Scheduling Systems

Rivendell is made available under the terms of the GNU General Public License, version 2. As such, it comes with *absolutely no warranty*, not even the implied warranties of merchantability or fitness for a particular purpose. See the full text of the GPLv2 for details.

Rivendell has been designed and developed from the ground up to run on the popular and highly stable GNU/Linux™ operating system. Selected tools (mostly having to do with log generation) have also been ported to run in the Microsoft Windows™ environment as well. Full source code as well as binary installation packages for Windows and select Linux distributions are available on line.

Rivendell has been designed to be able to operate in a wide variety of roles, ranging from single, self-contained workstations to large, multi-station clusters consisting of multiple workstations and centralized servers. Also included are redundancy and hot-standby capabilities to allow for reliable operation even in the presence of hardware faults.

Rivendell is implemented as a set of interactive tools or 'modules' that collectively provide the complete functionality of the system. Briefly, these modules and their functions are:

RDLibrary	Library content management
RDCatch	Automatic event scheduler
RDAirPlay	On-air play out application
RDLogEdit	Log editing and voicetracking tool
RDLogManager	Automated log generation and interface utility
RDLogin	Set the current user on a Rivendell host
RDCartSlots	Emulate a traditional broadcast cart machine
RDPANEL	Large "cart wall" application
RDCastManager	Podcast feed manager
RDAdmin	System wide configuration

The operation of each of these modules is explained in detail in the chapters that follow. However, we first need to cover some basic concepts common to all Rivendell modules.

## 1.1.1. The Rivendell Object Paradigm

All Rivendell modules make use of the following four classes of system resources:

- Hosts
- Users
- Groups
- Services

We'll cover each of these concepts in turn.

### 1.1.1.1. Hosts

Every physical computer within a given network that is running Rivendell software is referred to as a *host*. Any host in a Rivendell network can be individually configured and controlled from any other host (provided the system administrator has enabled this capability). Hosts can be used for a wide variety of applications, including content ingestion and management, automatic recording (sometimes referred to as netcatching), on-air play out or log (sometimes also referred to as playlist) generation. It is also possible for a single host to perform all of these functions.

### 1.1.1.2. Users

Every host on a Rivendell network has one or more *users* available to it. In this context, a 'user' is merely a set of access policies established by the system administrator that defines what tasks a given host is or is not allowed to perform. Every host has at least one user, called the *default user*. As the name suggests, this is the set of user policies that are loaded by default when the system starts up. It is also possible to change the user currently in use on a given host by running the RDLogin module.

### 1.1.1.3. Groups

A Rivendell *group* is a system of categories that is used by the audio library to classify and organize the audio within the library. Groups are a very powerful capability, and many operations within Rivendell can be specified on the basis of group membership. The actual classification scheme, including the number of available groups and their names, is completely arbitrary so as to allow each facility to tailor a schema that best fits its own operational requirements. Designing and implementing the group schema is one of the most important tasks facing the Rivendell system administrator, as a well-designed schema can make long-term maintenance and management of the system substantially easier vis-a-vis a poorly thought out one. We will cover groups in detail in the chapters devoted to the RDLibrary and RDAdmin modules.

### 1.1.1.4. Services

Every facility at which Rivendell is deployed is presumed to have one or more ultimate destinations for which audio is intended. These could be radio stations (e.g. WAVA), satellite uplink channels, live Internet audio streams, or any mix of the above. Each of these sorts of destinations is referred to in Rivendell as a *service*, and certain parameters, particularly as regards audio play out and log (playlist) creation, can be configured on the basis of what particular service is being referenced.

## 1.1.2. The Rivendell Hardware Paradigm

In addition to the core computer hardware (CPU, motherboard, etc), each Rivendell host typically interacts with specialized hardware required to accomplish the task at hand. Three main categories of such 'special'

hardware are of interest to us here, the three being audio adapters, serial ports and GPIO/switcher devices. We'll cover each below.

### 1.1.2.1. Audio Adapters

An *audio adapter* in Rivendell is simply a device or facility for getting audio into and/or out of a host on a realtime basis. Most commonly this will be a sound card, although other, more exotic possibilities (using TCP/IP networking or direct routing to other audio applications) also exist. The three main classes of audio adapters supported by Rivendell are:

Advanced Linux Sound  
Architecture (ALSA)

The standard Linux sound card driver starting with the 2.6.x kernel series, ALSA supports a huge array of commercially available sound cards, ranging from entry level 'game' cards to high-end cards aimed at professional audio uses. More information, including a current list of supported cards, is available at the ALSA web site, <http://www.alsa-project.org/>.

HPI Adapters

These are high-performance sound cards manufactured by AudioScience Corporation. Designed and built specifically for broadcast automation applications, many feature advanced capabilities (such as on-board MPEG codecs and AES3 i/o) specially aimed for use in that setting. They are so-called because Rivendell uses AudioScience's special 'HPI' driver to access and control them. More information is available at AudioScience's web site, <http://www.audioscience.com/>.

JACK Audio Interconnect Kit

JACK is not a particular set of hardware devices, but rather an audio 'framework' that allows compliant applications to share audio resources and route audio in realtime amongst themselves. JACK is different from similar efforts within the Linux realm in that it was designed from the ground up for professional audio work, with particular focus upon low-latency operation and synchronous execution of all clients. More information can be found at the JACK web site, <http://jackit.sourceforge.net/>.

### 1.1.2.2. Serial Ports

Commonly known in the DOS/Windows world as 'COM ports', *serial ports* are often used to communicate with outboard gear, such as satellite receivers and audio switchers. Up to eight serial ports can be accessed simultaneously by each Rivendell host.

### 1.1.2.3. GPIO/Switcher Devices

Because these capabilities are often (although not always) bundled together in the same device, Rivendell lumps GPIO and switcher devices together within the same class. *GPIO* stands for 'General Purpose Input Output'. As the name implies, these devices can be used to interface to a huge variety of outboard equipment by means of control lines. *GPI* (General Purpose Input) lines can be used to sense changes in an outboard system's state (and Rivendell programmed to take various actions on the basis of that), while *GPO* (General Purpose Output) lines can be used to send commands to an outboard system. The actual physical interfacing of GPIO devices is complex and generally beyond the scope of this document. Readers are encouraged to consult a good handbook on radio engineering for more information. A current list of GPIO/Switcher devices supported by Rivendell can be found in 'docs/GPIO.txt' file in the Rivendell sources.

---

# Chapter 2. Managing the Current User with RDLogin

## 2.1. RDLogin

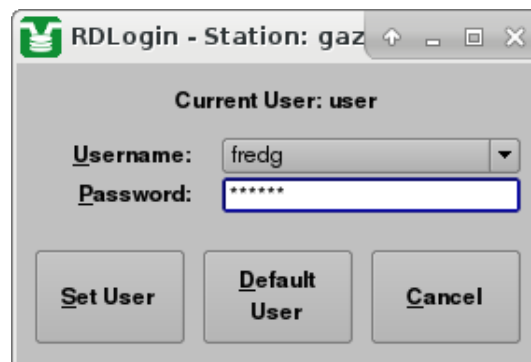
Rivendell uses a sophisticated system of user privileges to keep track of which users have permission to perform what operations. These privileges are tracked by the system on the basis of *user accounts*. Creating user accounts and administering their permissions are done in the RDAdmin module and are covered in the Rivendell Technical and Administration Guide.

It's important to note that these user accounts are not the same thing as the “Login Name” that is used to log into the computer system itself. Rather, they exist and have meaning only within the Rivendell system. For the rest of this discussion, when we talk about “users”, it is these “Rivendell users” that we are referring to.

Each Rivendell host has a default user. As the name implies, this is the user that is automatically logged in after the system is booted. By default, the name of this user is “user”, but the system administrator may have changed this to some other name.

For many sites, a single default user is all that is ever required. For some sites however, particularly larger ones, it is desirable to have multiple user accounts, each tailored to a particular person or “role”, with privileges assigned appropriately. Such sites require a means to log different users in and out of the system, without interfering with any playout operations that may be ongoing at the time. RDLogin is the module for doing this.

RDLogin will display a small window after being started, showing the currently logged-in user. To change to a different user, select the desired user name from the Username: control, enter the correct password, and then touch the Set User button. To “log out” of the system (in reality, just return to the default user), simply touch the Default User button (no password is required to set the default user). To exit RDLogin and do nothing, simply touch the Cancel button.



# Chapter 3. Content Management with RDLibrary

## 3.1. The Rivendell Library Structure and RDLibrary

### 3.1.1. Carts

The Rivendell Library consists of a set of objects called *carts*. A cart is a data container that holds either one or more pieces of audio (called an *audio cart*), or macro commands to the system (called a *macro cart*). The cart is the fundamental schedule building block in Rivendell, in that it is the smallest object or 'atom' that the outside world (like a traffic or music scheduler) can see.

RDLibrary, upon startup, will show the current list of all carts on the system (see below).



RDLibrary Main Window

A number of important attributes of carts can be seen from this illustration. First is the cart's number. Each cart in the Library gets assigned a unique number when it is created. This number can range between 000001 and 999999, and is the primary 'handle' by which both Rivendell and external systems (like traffic or music schedulers) refer to the cart. Very often, sites have specific rules concerning which types of audio (commercials, promos, music, etc) and macros get assigned which numbers. We'll cover this area in some detail when we discuss groups.

Immediately to the left of the cart number is an icon indicating the type of cart. Just to the right of the cart number is the average length of the cart. Except in the case of where timescaling is in use (in which case it will be indicated in blue numerals), this value is calculated automatically by the system.

Next comes various columns showing information from the cart label – Title, Artist, Client and Agency data, etc. This information can be edited by opening RDLibrary's Edit Cart dialog, either by double-clicking on the desired cart entry in the list, or by touching the desired cart entry and then touching the Edit button. In either case, you should get a dialog similar to that shown in the illustration.

**070000 - FF-PROMO**

Number: 070000 Group: FF/PROMO Type: AUDIO

Average Length: 1:00.3 ☐ Enforce Length Forced Length: 00:01:00.3

Title: Station Promo

Artist: Various

Year Released: Usage: Commercial/Jingle/Pro Scheduler Codes

Song ID: Beats per Minute: Unknown

Album:

Record Label:

Client:

Agency:

Publisher:

Composer:

Conductor:

User Defined:

Schedule Cuts: By Weight

WT	DESCRIPTION	LENGTH	LAST PLAYED	#C
1	WCR Support-Jack	:31.3	3/26/15	
1	FF_Boy in the Boot_Tina_032015	1:00.8	3/26/15	
1	MatchStix 5k/10k Promo	1:01.4	3/26/15	
1	WCR Support Promo_Matt_021515	:59.6	3/26/15	
1	WCR Support Promo_Jack_021615	1:21.1	2/21/17	
1	WCR Support Promo_Tim_021615	:58.3	3/26/15	
1	WCR Support Promo_Joe_021715	1:01.8	3/26/15	
1	WCR Support Promo_Tom_021715	1:09.9	3/26/15	

Buttons: Add, Delete, Copy, Paste, Edit Notes, OK, Cancel, Cut Info Record, Edit Markers, Import Export, Rip CD

The Edit Cart Dialog

Near the center of the dialog will be a dropdown box labeled *Schedule Cuts*. When set to *By Weight* (the default), this will allow cut rotation to be managed by means of daypart settings (see Section 3.1.2.2, “Cut Dayparting”). When set to *By Specified Order*, the precise rotation of the cuts within the cart can be set manually.

This is how an audio cart looks when loaded into the Edit Cart dialog. The upper half of the dialog is the cart label data. The meaning of most of these fields should be fairly self-evident, but a few call for special comment:

Enforce Length	When checked, this indicates that timescaling should be applied to this cart when it is played in RDAirPlay, meaning that the cart will air at the length indicated by the Forced Length field, rather than the native length of the audio. Care is needed when implementing timescaling within a facility, as there are limits to how much the length can be altered, while only certain types of audio adapters support it at all. See the Rivendell Technical Guide for more information.
Group	This is a pull down menu by which the group ownership for the cart can be set. The system administrator configures the list of available groups for each user in RDAdmin.
User Defined	As the name implies, this field has no dedicated meaning to Rivendell itself, but is provided for each site to use as is seen fit.

The example in the illustration above shows an audio cart. As such, the bottom half of the dialog displays the lists of cuts contained within the cart.

### 3.1.2. Cuts

Each audio cart can contain one or more *cuts*. A Rivendell cut is an actual piece of audio, somewhat analogous to a 'track' on a CD. Up to 999 such cuts can exist within a single cart. Each line in the cut list contains information about the cut, including:

WT	The <i>weighting</i> value for the cut. see Section 3.1.2.2, "Cut Dayparting" for discussion.
ORDER	The <i>order</i> value for the cut. see Section 3.1.2.2, "Cut Dayparting" for discussion.
DESCRIPTION	n arbitrary name, assignable by the user as an aid in keeping track of the content, it is roughly analogous to the 'Title' field in the cart label.
LENGTH	The actual, measured play out length of the cut audio. This field is calculated automatically by the system.
LAST PLAYED	he last date and time that the cut was aired by one of the on-air modules. Useful for keeping track of stale inventory.
# OF PLAYS	The total number of times the cut has been aired by the one of the on-air modules.
ORIGIN	The name of the host upon which the audio in the cut was last recorded, along with the date and time.
OUTCUE	A user settable field. This line shows up in the RDAirPlay log when the cut is played.
START DATE	The effective start date/time of the cut.
END DATE	The effective end date/time of the cut.
START DAYPART	The start time of the cut's daypart.
END DAYPART	The start time of the cut's daypart.
NAME	The internal CUTNAME of the cut as used in Rivendell's database.
SHA1	The SHA-1 hash value of the cut's file in Rivendell's audio store.

### 3.1.2.1. Multiple Cuts in a Cart

What happens when more than one cut is placed into a cart? The answer, in a word, is *rotation*. Rotation is the ability to schedule a single cart in a log, but to have that cart play out different material at different times. This capability has a myriad of uses. One of the simplest, common in commercial radio facilities, is to allow multiple versions of a spot to be placed into the system, while still allowing the traffic department to have to track and schedule only one cart number. A more sophisticated use involves use of the cut's *dayparting* settings, forcing different cuts to play based upon certain date/time criteria, such as day of the week or time of day. Cut dayparting is a very powerful feature in Rivendell, and is something we will discuss shortly.

To edit the properties of a cut, either double-click its entry in the cut list, or touch it once to highlight and then touch the Cut Info/Record button. The Record Dialog will now open up.

The screenshot shows the 'RDLibrary - Record' dialog box. It has a title bar with a green icon and standard window controls. The main area contains several sections:
 

- Description:** WCR Support-Jack
- Outcue:** (empty field)
- ISCI Code:** (empty field)
- ISRC:** (empty field)
- Source:** [unknown]
- Ingest:** rdhost - 1/8/2015 15:56:39
- Last Played:** 3/26/2015 14:48:09
- # of Plays:** 539
- Cut is EVERGREEN:** (unchecked checkbox)
- Weight:** 1 (spin box)
- Air Date/Time:**
  - Enabled:** (radio button)
  - Disabled:** (radio button)
  - Start:** 00/00/0000
  - End:** 00/00/0000
- Daypart:**
  - Enabled:** (radio button)
  - Disabled:** (radio button)
  - Start Time:** 00:00:00
  - End Time:** 00:00:00
- Day of the Week:**
  - Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday (all checked)
  - Set All** and **Clear All** buttons
- Timeline:** A horizontal bar with 'L' and 'R' markers and a time display of 0:00:31.3.
- Channels:** 2 (dropdown menu)
- Record Mode:** Manual (dropdown menu)
- AutoTrim:** Off (dropdown menu)
- Close** button

The Record Dialog

Roughly the upper third of the dialog is for editing the various cut parameters, the middle section is for configuring the cut's daypart settings, and the bottom third is a record machine that can be used both to record new audio into the system and to audition any recording already made.

### 3.1.2.2. Cut Dayparting

For carts for which Schedule Cuts is set to By Weight, each cut in can be dayparted on the basis of these parameters:

- Weight
- Absolute Start and End Date-Time
- Relative Start and End Time
- Day of the Week

While not strictly a dayparting parameter, the `WEIGHT` setting of a cut can strongly influence the order (and hence placement) of when a particular cut will play. The weight value of each cut in a cart constitutes the numerator of a fraction, the denominator of which is the sum of the weight values of every cut in the cart. Rivendell's cut selection algorithm will seek to play each cut in like proportion. If it is important in some cases to be able to specify the precise order of each cut play-out, consider changing the `Schedule Cuts` dropdown to `By Specified Order`.

By default, each newly created cut in a `By Weight` cart starts out with dayparting disabled, meaning that it will be 'eligible to play' at all times. By clicking the `Enabled` radio button in the `Air Date/Time` box, an absolute start and end date for the cut can be entered, meaning that the cut will be prevented from airing in the on-air modules at any time outside the range of those date-times. Likewise, by selecting the `Enabled` radio button in the `Daypart` box, start and end times (relative to the day the cut is to air) can be entered. Cuts designated in this way will be allowed to air only within the specified range of times. Finally, by ticking or clearing the appropriate boxes in the `Day of the Week` box, a cut can be constrained to air only on certain days of the week.

All of the dayparting parameters can be used either singly or in combination with each other. When combined, the resulting 'eligibility' is calculated as the logical AND of the applied dayparting limits. For example, a cut with the 'Monday' box cleared will refuse to air on Mondays, regardless of whether any of the other daypart rules match.

It's important to remember that dayparting rules affect audio play out only within the on-air modules. You will still be able to audition and play the audio without limitation in the other Rivendell modules.

### 3.1.2.3. Cart and Cut Color Coding

Each cart or cut in RDLibrary is assigned a color to indicate its 'playability' for air, as follows:

NO	Event will play normally
COLOR	
CYAN	Event will not play (cut datetime is in the future)
RED	Event will not play (outside of dayparting limits or audio is not available)
GREEN	Event will play an Evergreen

It's important to remember that the color displayed for each event indicates playability *at the instant that the event is being viewed*.

### 3.1.2.4. Recording and Auditioning a Cut in the Record Dialog

The lower third of the Record Dialog is used both to audition and record audio. To audition the cut, simply press the play button (the one with the triangular symbol). The button will illuminate, audio will show on the bar meter and start playing immediately. The audio will play to completion, unless either the stop button (square symbol) is pressed, or the Record Dialog is closed.

To record new material into a cut, first ensure that the `Channels` drop-down menu is set to record the appropriate number of channels, then touch the `Record` button (round symbol). If the cut contains audio that was recorded previously, a warning box will pop up at this point to inform you of this and to give

you a chance to abort the recording without erasing what was previously recorded. If **Yes** is selected here, the previous recording will be overwritten and no longer accessible. The **Record** button will now be illuminated steadily, while the **Play** button will be flashing, indicating that the record machine is in 'ready' mode. The bar meter will also be active to indicate input levels, and this is the point where you want to verify that your levels are correct, with peaks just into the yellow area being optimal. Nothing is actually being recorded just yet.

We have two options for actually starting the record machine. We can start it manually by pressing the **Play** button, at which point the machine will immediately begin recording, or we can set the **Record Mode** drop-down menu to the **VOX** (short for voice activated) setting. When in **VOX** mode, the record machine will start automatically as soon as it senses the presence of audio at the input.

Once started, recording will continue until either the **Stop** button is pushed, or the maximum allowed length for a manual recording (set by the system administrator) has been reached. Once stopped, if the **AutoTrim** drop-down menu has been set to **On**, the **Start** and **End** markers will be automatically set to the beginning and end of detected audio within the cut. (We will discuss **Markers** in detail when we get to the section on the **Edit Markers** dialog).

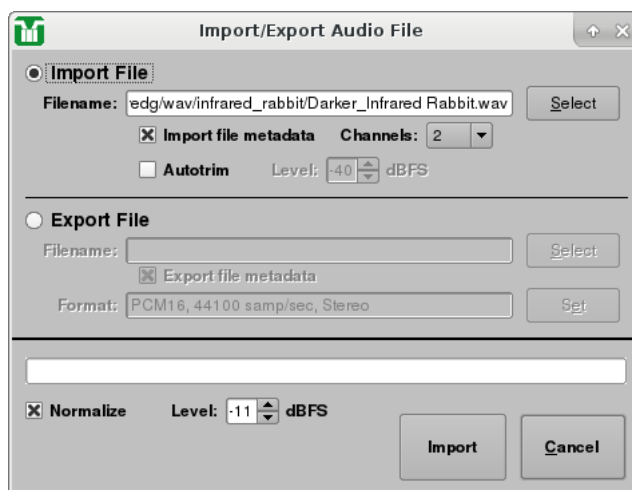
## 3.2. Alternative Methods of Audio Ingestion

In addition to manually recording material in realtime, RDLibrary supports two alternative methods for audio ingestion:

- Importing from a File
- Ripping from a CD

### 3.2.1. Importing Audio from a File

To import audio from a file directly into a cut, we start by opening the cut's parent cart in the **Edit Cart** Dialog. Next, touch the cut's entry in the cut list and then touch the **Import/Export** button to open the **Import/Export Audio** Dialog.



The Import/Export Audio Dialog

Select the file you wish to import, either by entering the path and filename to it in the **Filename** field or by clicking the **Select** button to open a file browsing dialog. Rivendell is capable of importing the following types of audio files:

- Microsoft WAV (\*.wav) – PCM16, PCM24 and MPEG are supported
- MPEG (\*.mp1, \*.mp2, \*.mp3)
- OggVorbis (\*.ogg)
- Free Lossless Audio Codec [FLAC] (\*.flac)

Next, set the Channels drop-down menu to the appropriate number of channels. You may also wish to adjust the Normalize or Autotrim controls, although these will normally be set to reasonable default values by the system administrator and should seldom have to be altered. If Normalize is selected, then the imported audio will be peak normalized to the level indicated. The Autotrim does the same thing as in the Record Dialog (see section 2.0.1.2, 'Recording and Auditioning a Cut in the Record Dialog' above for details).

Finally, touch the Import button. A progress bar will indicate percentage completion of the import, followed by a popup box to announce completion. The Import Audio Dialog will automatically close after acknowledging completion. The audio is now imported, and can now be auditioned and otherwise processed in the usual way.

### 3.2.2. Ripping Audio from a CD Track

To rip audio directly off of a CD into a cut, we again start by opening the cut's parent cart in the Edit Cart Dialog. Next, select the cut's by touching the cut's entry in the cut list, and then touch the Rip button to open the Rip CD Dialog.



The Rip CD Dialog

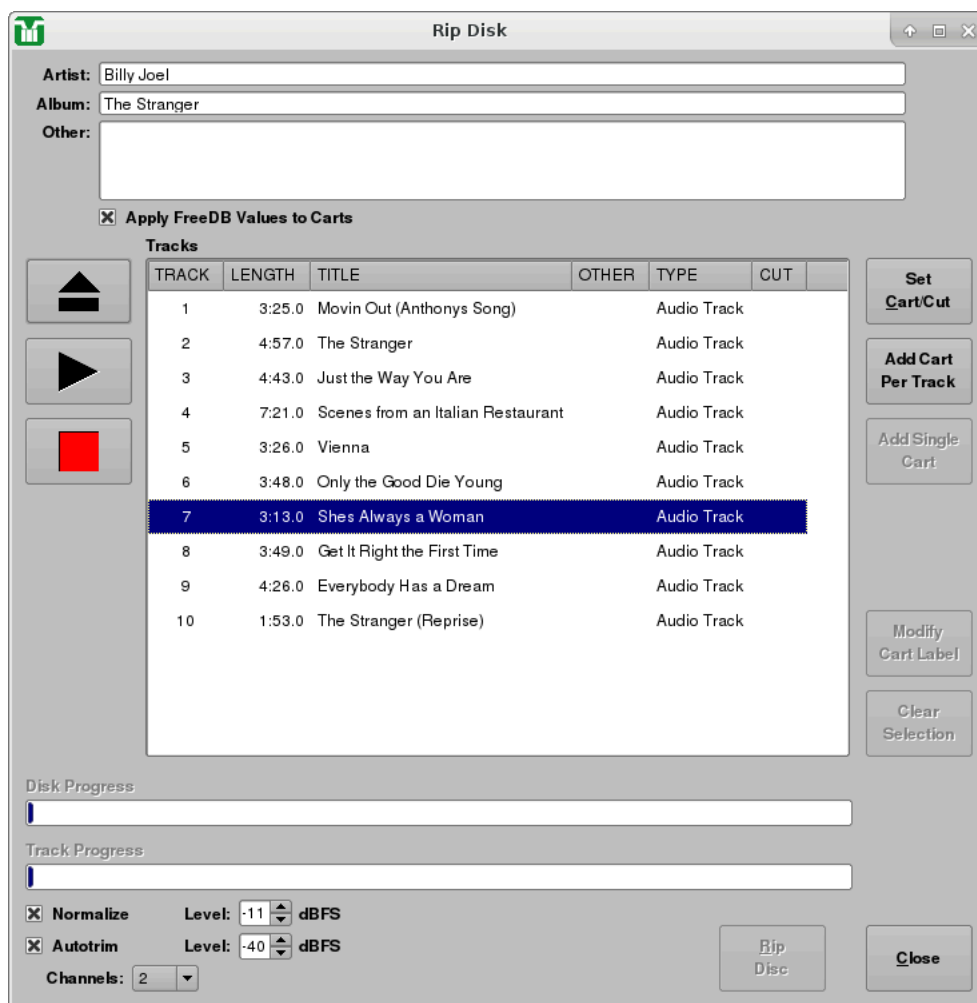
Load a CD into the CD drive. After a few seconds, list of tracks should appear in the Tracks area. If the system administrator has enabled the FreeDB CD Lookup Service, the names of the various tracks may appear as well.

Set the Channels, Normalize and Autotrim controls appropriately (see section 2.1.0 for more details on using the Normalize and Autotrim controls). Next, touch the track you wish to rip and then press the **Rip Track** button. The track will now be ripped into the cut, with a progress bar keeping you informed of progress. When the rip is complete, a message box will pop up to inform you of this.

If FreeDB data was found for the CD, you can have the FreeDB track, artist and album names be automatically placed on the cart label for the cart by checking **Apply FreeDB Values to Cart** before closing the Dialog.

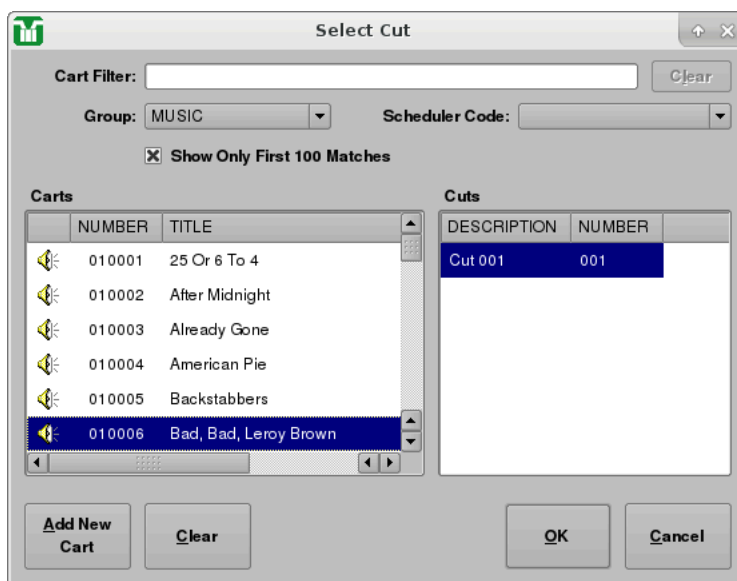
### 3.2.3. Ripping Multiple CD Tracks at a Time

Sometimes, when transferring multiple audio tracks from CD, it's more convenient to be able to set up the entire transfer at once and then let the rip run in a 'batch' mode. RDLibrary is capable of ripping audio in this manner as well. To do this, click the **Rip CD** button near the bottom of the main RDLibrary screen, bringing up the Rip Disk Dialog.



The Rip Disk Dialog

This dialog is similar in many ways to the Rip CD Dialog described above, except that each track can be assigned to transfer to a different cut by double clicking on its listing, or by touching the listing and then the Set Cut button, bringing up the Select Cart/Cut Dialog.



The Set Cart/Cut Dialog

The destination cut is selected by first choosing the cart from the left-hand pane, followed by the desired cut within that cart on the right-hand pane. The complete set of library filtering tools are available to you here – see section 2.2, 'Navigating the Audio Library' for details on their function, just as in the main RDLibrary screen.

Once all of the desired tracks have been assigned to cuts, be sure that the Normalize, Autotrim, Channels and Apply FreeDB Values to Cart controls have been set as desired, then click the Rip Disk button. A set of progress bars will keep you informed of the progress of each track, as well as overall progress. When, the rip is finished, a message box will let you know.

### 3.3. Macro Carts

A macro cart is a cart that contains one or more commands written in Rivendell Macro Language (or 'RML' for short). The Edit Cart dialog for a macro cart is similar in many ways to that for an audio cart with the exception of the lower half, which contains a list of RML commands to be executed rather than a list of cuts. (NOTE: for a complete description of Rivendell Macro Language, including a breakdown of available commands, see Chapter 14, *Rivendell Macro Language*).

To add a new line of RML, select the desired location in the list and touch the Add button. Similarly, a line can be deleted by selecting it and then touching the Delete button, or modified by touching the Edit button. The RML can be tested, eight line-by-line or as a whole by touching the Run Line or Run Cart button respectively. It is also possible to Copy and Paste individual lines both within a given cart or between carts.

In addition to RML code, lines can also contain host variables (see Section 12.5.9, “Configuring Host Variables”) and filepath wildcards (see Appendix D, *Filepath Wildcards*).

**RDLibrary - Edit Cart 050002 [Label Test]**

Number: 050002    Group: MACROS    Type: MACRO

Average Length: :02.0    ☐ Enforce Length    Forced Length: 00:00:02.0

Title: Label Test

Artist:

Year Released:    Usage: Feature    Scheduler Codes

Song ID:    Beats per Minute: Unknown

Album:

Record Label:

Client:

Agency:

Publisher:

Composer:

Conductor:

User Defined:

☐ Execute Asynchronously    ☐ Use RDLogManager Length for PAD Updates

Line	Command
001	LC red Today is %m/%d/%Y!
002	SP 2000!
003	LB!
--- End of Cart ---	

Buttons: Add, Delete, Copy, Paste, Edit, Run Line, Run Cart, Edit Notes, OK, Cancel

The Edit Macro Cart Dialog

## 3.4. Navigating the Audio Library

The uppermost section of RDLibrary's main window contains tools designed to allow for fast searching of the entire audio library, making locating a particular piece of audio easy even in a library containing thousands of carts. It's possible to control what carts are listed, as well as how they are sorted.

### 3.4.1. Changing the Cart Sort Order

The order in which carts are displayed in the cart list can be changed by simply clicking on the header of the column by which you want them sorted by. By default, the carts are sorted by Cart Number. To instead sort them alphabetically by Title, simply click the **TITLE** header once. To sort them by Title in reverse – i.e. from 'Z' to 'A' – click the **TITLE** header once again. Clicking the **TITLE** header a third time restores the sort to normal 'A' to 'Z' again. And so on for all of the columns in the cart list – it's possible to sort the Library by **ARTIST**, **LENGTH**, or any other parameter shown in the cart list.

### 3.4.2. Selecting Carts by the Filter Field

Very often, one will want to find a cart or set of carts whose label(s) contains a particular word or phrase. It's possible to narrow the list of displayed carts to this set by simply entering the desired word or phrase into the `Filter` field at the top of the main RDLibrary screen. The full list can be restored by clearing the `Filter` field or by clicking the `Clear` button.

### 3.4.3. Selecting Carts by Group

It's possible to limit the list of carts to only those in a particular group by setting the `Group` drop-down menu to the desired group name.

### 3.4.4. Selecting Carts by Type

You can tell RDLibrary what type of carts to list by checking the `Show Audio Carts` and `Show Macro Carts` boxes. Clearing both boxes obviously results in no carts at all being displayed.

It's also possible to combine all four of the above search and sorting methods.

### 3.4.5. Selecting and Opening Carts

Once the desired cart has been located on the cart list, load it into the `Edit Cart Dialog` by either double clicking its list entry, or by touching its list entry and then touching the `Edit` button.

### 3.4.6. Viewing and Selecting Cuts

If a cart contains more than one cut, you can view all the cuts contained by the cart by clicking the `+` icon. The cuts can be hidden by clicking the `-` icon.

### 3.4.7. Playing Carts and Cuts

A selected cart or cut can be played by either pressing the play button (the one with the triangular symbol) or by pressing the space bar. If a cart or cut is currently playing, selecting another cart or cut with the mouse or arrow keys will automatically play the newly selected item. To stop a playing cart or cut, press the stop button (square symbol) or press the space bar again.

### 3.4.8. Running Macros

A selected macro can be run by pressing the `Run Macro` button.

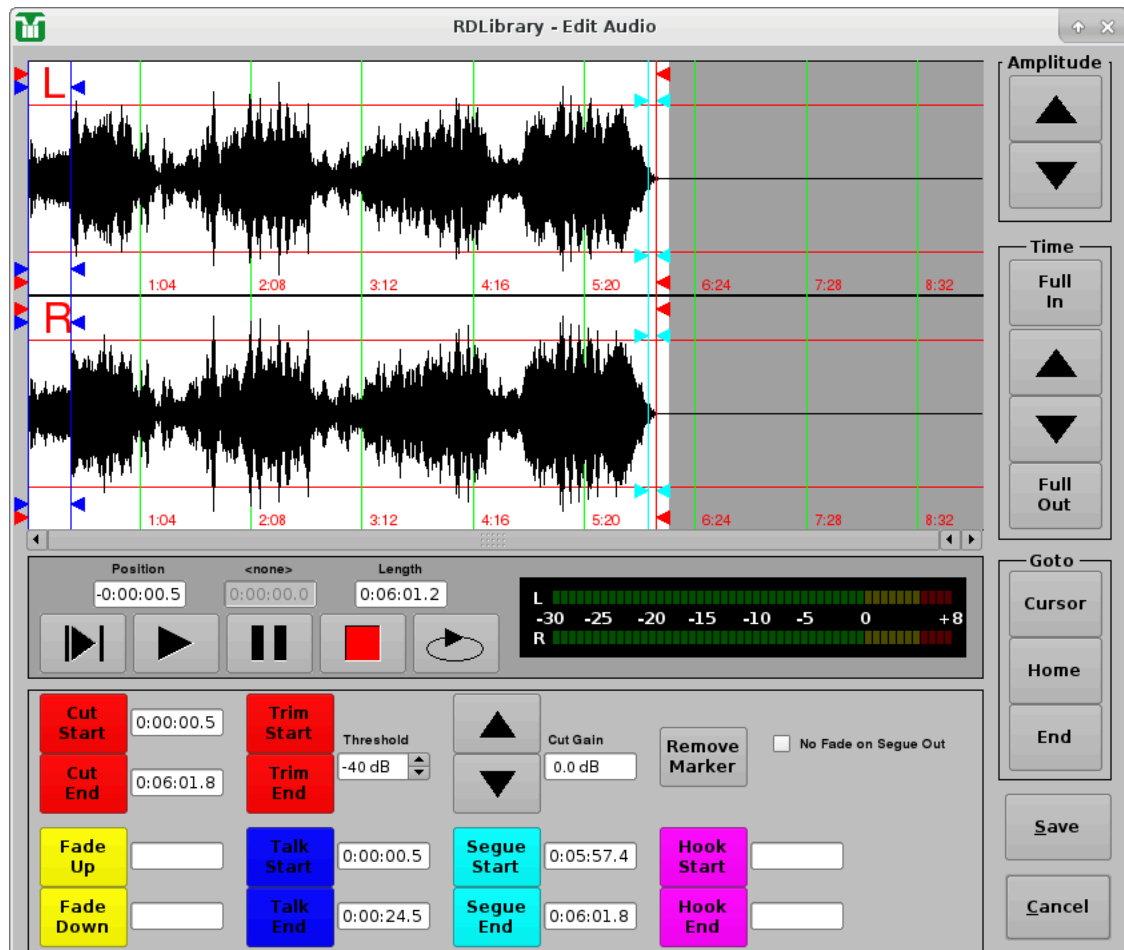
## 3.5. Library Maintenance

### 3.5.1. Editing Markers

Rivendell uses a system of cue points within audio cuts, referred to as *markers*. Markers can be used to specify a number of parameters for a piece of audio. Consult Table 3.1, “Rivendell Marker Types” to see what markers are available, their purpose and their corresponding color.

Markers are set in the `Edit Markers Dialog`. To access the Dialog, open an audio cart, select the cut to open on the cut list and then touch the `Edit` button.

The Dialog is divided into three areas: the waveform area in the upper half, consisting of the waveform display and Amplitude and Time buttons; the transport controls area in the center, consisting of Start, Pause, Stop and Loop buttons along with an audio meter; and the marker button area in the lower third of the window, consisting of controls for selecting and positioning markers.



The Edit Marker Dialog

It's possible to 'zoom-in' on the waveform in various ways by clicking the Amplitude and Time buttons. By default, the waveform is displayed fully 'zoomed-out', thus showing the entire length of the audio cut. The GoTo buttons can be used to jump directly to the current play out cursor position, start or end of the waveform.

Audio can be played one of two ways: either by clicking on the waveform to indicate where play out should start and then clicking the left-hand Play button, causing play out to start from the selected position, or by clicking the right-hand Play button, which will cause play out to start from the Start Marker (just as it would in RDAirPlay). Clicking the Pause button while playing will cause audio to stop and the play out cursor (a thin vertical black line in the waveform area) to freeze at its current position, while pressing the Stop button will stop the audio while resetting the play out cursor to the position it was in when Play was started. Clicking the Loop button will cause the audio to play out continuously, looping from end back to start, until either the Stop, Pause, Save or Cancel buttons are clicked.

To set a marker, click on the corresponding marker button and then left-click on the waveform area to indicate where on the audio the marker should be placed. (NOTE: With the exception of the FadeUp and FadeDown markers, all markers in Rivendell are assigned in pairs. For example, placing a TalkStart

marker will also cause a TalkEnd marker to be placed.) Markers that have already been placed can be moved by selecting the appropriate marker button and then dragging the marker to the desired location. It's also possible to specify the position of a marker in the form of hh:mm:ss.s (relative to time after the Start marker) by entering the desired value next to a selected marker button. It is also possible to remove a set of markers that have already been placed, either by accessing the marker menu by doing a right-click on the waveform display, or by touching the **Remove Marker** button and then touch the marker button corresponding to the marker to be removed. (NOTE: the exceptions to this are the Start / End markers, which are always present and hence cannot be removed.)

**Table 3.1. Rivendell Marker Types**

Marker Type	Function	Color
Start / Stop	Indicates start and end points of audio.	RED
TalkStart / Talk Stop	Indicates point to start and stop the Talk Counter in RDAirPlay.	BLUE
SegueStart / SegueEnd	Indicates the start and end of the audio overlap during Segue transitions in RDAirPlay.	CYAN
HookStart / HookEnd	Indicates "highlighted" audio, used by button panels and RDCartSlots when placed in Hook Mode.	VIOLET
FadeUp	Indicates the point at which audio should be faded up to full level after starting in RDAirPlay.	YELLOW
FadeDown	Indicates the point at which audio should start fading down to off before ending in RDAirPlay.	YELLOW

As an aid for accurately setting the Start and End markers, it's possible to use the **Trim Start** and **Trim End** buttons to automatically set the markers to the first and last instances of the level specified by the **Threshold** field, respectively.

## 3.5.2. Copying and Pasting Audio from Cut to Cut

It's possible to make copies of existing an audio cut on the system by opening up the cut's parent cart in the **Edit Cart** Dialog, selecting it on the cut list and clicking the **Copy** button. To paste the copied audio, simply select the desired destination cut (within the same cart or a different one) and press **Paste**.

## 3.6. Generating Library Reports

Various Library reports can be generated by touching the **Reports** button on the main RDLibrary screen and then selecting the desired report and touching the **Generate** button. The following reports are available:

### 3.6.1. The Cart Report

The cart report consists of a list of all selected carts on the system, with their attributes.

### **3.6.2. The Cut Report**

The cut report consists of a list of all cuts contained by the selected carts on the system, with their attributes.

### **3.6.3. The Cart Data Dump (CSV)**

The CSV cart data dump is a special type of report that consists of CSV formatted data elements, one line per cut for the selected carts on the system. It is intended for use where a 'dump' of available carts in the system is desired for import into an external system (such as a music scheduling system).

---

# Chapter 4. Automating Tasks with RDCatch

## 4.1. Choosing the Correct Automation Tool

Rivendell includes two modules specially optimized for performing automatic operations: the RDCatch and RDAirPlay modules. However, these two modules take radically different approaches in how they go about organizing and controlling operations, so a few words regarding each may be in order here.

RDCatch is aimed at executing actions on the basis of a strict time-based schedule, referred to as an event list. Each action (which can be a *recording*, a *play out*, an *upload* or *download*, a *macro* execution or an operation on an audio *switcher* device) executes on the basis of its scheduled time in the event list, independently of all other actions. As such, RDCatch is often best suited for use in settings such as network head end operations or 'auxiliary' roles at broadcast stations, where the transitions between events are generally not an important part of the presentation.

RDAirPlay takes a very different approach, in that most events are organized into one or more playlists or logs. A Rivendell log is a list of one or more carts, organized in chronological order. As the name implies, RDAirPlay is optimized for use in situations where the transitions between the various program elements are a key part of the delivery and presentation of the content, such as in live air play environments.

Of course, it's entirely possible to use both modules, even together on the same machine at the same time – the Linux OS makes for a very robust and capable multitasking system. In this chapter, we will take a look at the capabilities of RDCatch.

## 4.2. The RDCatch Main Window

After starting up RDCatch, you will see the The RDCatch Main Window. The window consists of four areas: the record / play out decks at the top, the filter areas just below the decks, the events list and the audition buttons and other buttons at the bottom. We'll cover each of these in turn.

### 4.2.1. The Record / Play Out Deck Area

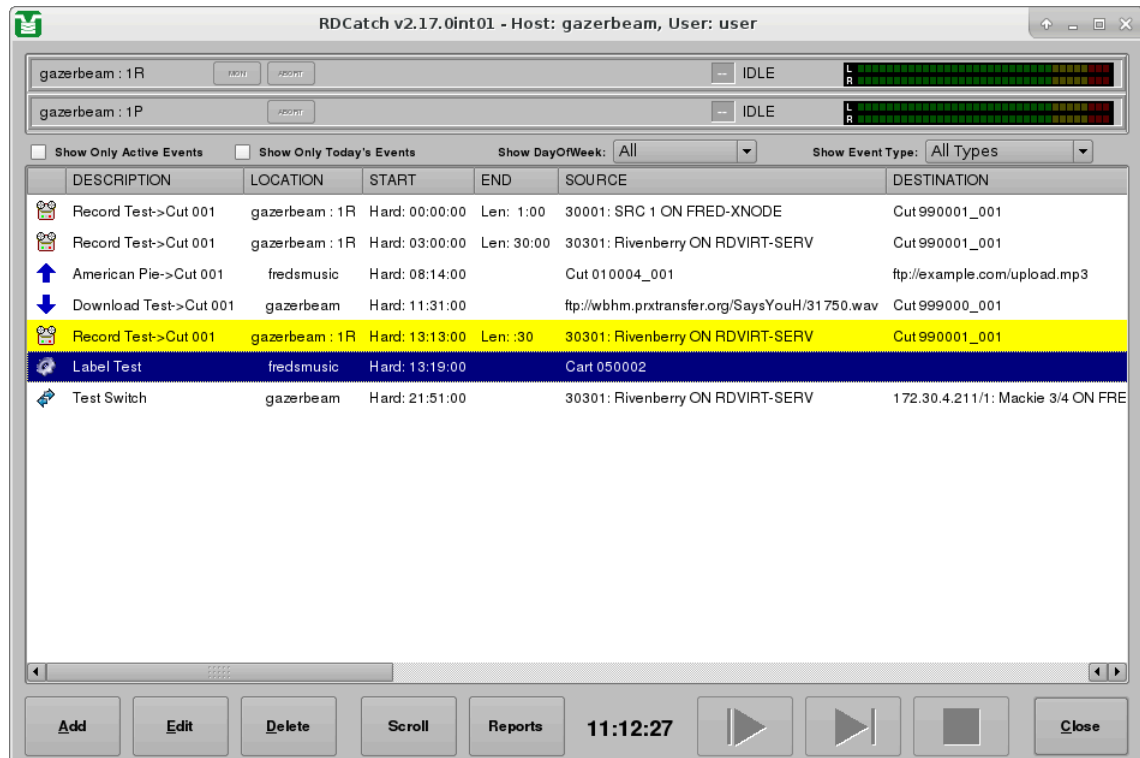
If the system administrator has configured one or more RDCatch record or play out decks, they will be visible at the top of the RDCatch main window. A record deck is a virtual 'recorder' that can be used to make automated recordings, while a play out deck can be used to automatically play out audio. It does not matter on which particular host a particular deck resides – all Rivendell decks throughout the system are visible in RDCatch, regardless of which host it is run upon.

Starting at the left-hand edge of each deck, there is the deck's name, consisting of the name of the deck's host machine followed by a number and a letter, an R to indicate a record deck and a P to indicate a play out deck. Next, for record decks, there is a MON button, used to monitor the audio present at the deck input, followed by an ABORT button, used to manually stop an event running in the deck. A description of the currently running event next appears (this area will be blank if no event is currently active), followed by the deck's status, which could be any of the values in Table 4.1, "RDCatch Event States".

**Table 4.1. RDCatch Event States**

Status	Meaning
IDLE	The deck is available for events

Status	Meaning
READY	The deck has started monitoring audio but the transport is not yet rolling (record decks only).
WAITING	The deck is waiting for a GPI event (record decks only)
RECORDING	The deck is recording (record decks only)
PLAYING	The deck is playing out (play out decks only)
OFFLINE	The deck is configured but not available



The RDCatch Main Window

Finally, each deck has an audio meter on its right-hand end, used to verify audio levels in realtime.

## 4.2.2. The Filter Area

Immediately below the decks is the filter area, consisting of the Show Only Active Events, Show Only Today's Events Show DayOfWeek and Show Event Type controls, which are used to select which events will be visible in the events list area immediately below.

## 4.2.3. The Event List

The event list is a system wide list of all events to be executed by RDCatch on all of the various hosts on the Rivendell network, with each event occupying a single line. The status of each event is indicated by its background color, as shown in Table 4.2, “RDCatch Event State Colors”

**Table 4.2. RDCatch Event State Colors**

Color	Meaning
YELLOW	The event is next to be executed.
GREEN	The event is active.
CYAN	The event is in the READY state.
VIOLET	The event is in the WAITING state.
RED/PINK	The event is reporting an error.

Each entry in the event list starts with an icon that indicates the type of the event, as shown in Table 4.3, “RDCatch Event Icons”

**Table 4.3. RDCatch Event Icons**

[RECORD_ICON]	Record Event
[PLAYOUT_ICON]	Play Out Event
[SWITCH_ICON]	Switch Event
[MACRO_ICON]	Macro Event
[UPLOAD_ICON]	Upload Event
[DOWNLOAD_ICON]	Download Event

Next on each line comes the *Description* (settable by the user) and *Location* for the event, the location being the name of the host/deck where the event will run. Then comes the *Start* and *End* parameters. These time-based parameters come in one of three different forms: a hard time, which is simply an absolute time (in twenty-four hour 'military' format), a length (in HH:MM format, relative to an earlier start time), or a GPI start. The GPI parameters can be somewhat involved. They are specified in the following format:

Gpi: <start-time>,<end-time>,<gpi-num>,<wait-time>

Where:

<start-time>	The time, in HH:MM:SS format, when RDCatch will start looking for a GPI event (also sometimes referred to as the window start time).
<end-time>	The time, in HH:MM:SS format, when RDCatch will stop looking for a GPI event (also sometime referred to as the window end time).
<gpi-num>	The number of the GPI event to wait for, in the format MATRIX:LINE. We will deal with GPI matrix and line numbers in detail when we cover RDAdmin.
<wait-time>	The amount of time to wait, in MM:SS format, between the reception of the GPI event and the actual start of the event (used only for Start parameters).

For example, the start parameter 'Gpi: 14:00:00,14:05:59,0:1,01:00' has a window start time of 14:00:00 [2:00:00 PM], a window end time of 14:05:59, looks for a GPI event on line 0:1 and will wait one minute [01:00] after receiving the GPI before starting the event.

Next come the *Source* and *Destination* fields. The uses of these will vary depending upon what type of event is being listed, but should normally be fairly self-evident. For example, for a record event, the source field indicates the audio source from which the recording is to be made, while the destination indicates the cat/cut combo to which the recording should be made. Some events may leave one or the other of these fields blank.

Now come the day of the week fields. These indicate on which days of the week the listed event should be executed, followed by the `Origin` field, which is simply a readout of the `Origin` data of the events underlying cut. There are a number of other fields which follow, but these are less important for understanding the operation of RDCatch.

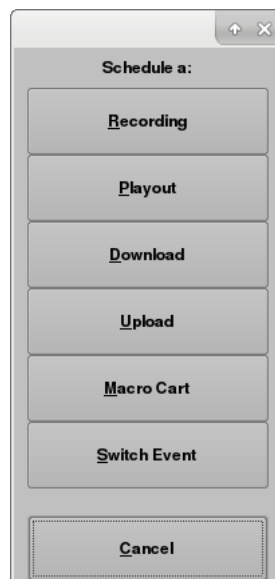
### 4.2.4. The Button Area

At the bottom of the main window are various buttons. On the left-hand side, the `Add`, `Edit` and `Delete` buttons are used to manage events in the event list. Clicking the `Scroll` button toggles RDCatch into and out of 'scroll mode'. In this mode, the event list display will be advanced automatically so as to keep the first actively running event centered within the event list area.

On the right hand side, in addition to `Close`, are three audition buttons. These buttons can be used to audition the head and tail of each cut referenced by an event, thus making it possible to quickly verify that a set of automatic recordings were properly executed.

## 4.3. Adding New Events

A new event can be added to the event list by simply clicking the `Add` button to bring up the `Add Event Dialog` (see `The Add Event Dialog`). Simply clicking the button that correspond to the desired type of event will create it.



The Add Event Dialog

## 4.4. Automating Recordings

Automated recordings are configured by means of the `Edit Recording` dialog (see `The Edit Recording Dialog`), which can be accessed either by clicking the `Recording` button in the `Add Event` dialog to create a new record event or by touching the `Edit` button to modify an existing event.

### 4.4.1. The 'Start Parameters' Section

The start parameters of each recording are configured in the 'Start Parameters' section. A recording can be programmed to start on the basis of the wall clock time, referred to the hard start time, or upon reception

of a general-purpose input, or GPI event originated by a satellite receiver, tone decoder or other external device. Programming a hard start time is merely a matter of entering the desired start time, in 24 hour 'military' format. Programming a GPI start involves, in addition to entry of the GPI parameters themselves (matrix and GPI line numbers) that `Window Start` and `Window End` times be entered, that define the 'window' during which reception of the appropriate GPI event will be 'recognized' by RDCatch. It is also optionally possible to specify a `Start Delay` between reception of the GPI event and the actual start of the recording.

The Edit Recording Dialog

## 4.4.2. The 'End Parameters' Section

The end parameters of each recording are configured in the 'End Parameters' section. A recording can be programmed to end on the basis of a hard time, its absolute length or in response to a GPI event. Programming of the `Hard Time` and `Length` parameters should be fairly self-explanatory, while the parameters needed to program a GPI event are similar to those used for the start parameters, with the exception of the `Max Record Length` setting, which limits the maximum length of the recording in the event that the expected GPI event is never received.

## 4.4.3. Programming Multiple Recordings in a Single Event

If a record event is configured to use GPI for its start and `Length` or GPI for its end parameter, then it is possible to configure the event to make repeated, multiple recordings within a single event by checking

the `Allow Multiple Recordings Within This Window` box in the 'Start Parameters' section. This can significantly reduce the amount of required record events when capturing material with high on-air turnover, such as newscasts or traffic reports.

#### 4.4.4. Selecting a Record Source

If the selected record deck (chosen in the `Location` drop-down menu at the top of the dialog) as been configured to operate with an audio switcher device, the appropriate audio input can be chosen from the `Source` drop-down menu.

#### 4.4.5. Selecting a Record Destination

Each programmed recording must have a 'destination', a designated Cart/Cut which will hold the audio. The currently programmed destination is shown in the `Destination` field, and can be changed by clicking the `Select` button.

#### 4.4.6. Setting the Active Days for a Recording

A check should be placed next to each day of the week for which a recording should be made in the `Active Days` box. If no days are checked, then no recordings at all will be made.

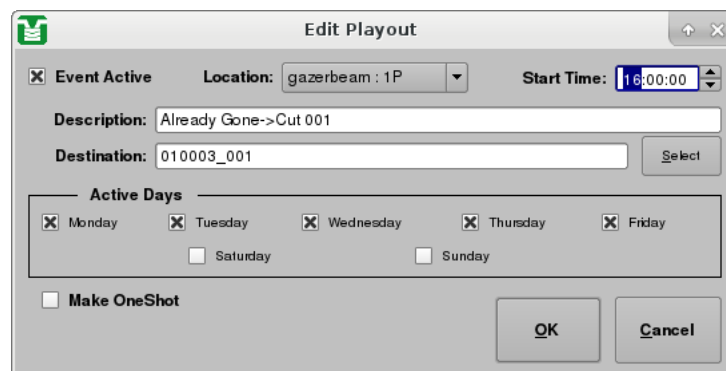
#### 4.4.7. Record List Management with Event Active and Make OneShot

The record event will be actually executed only if `Event Active` check box (in the upper left corner of the dialog box) is ticked. By clearing this box, it's possible to 'bank' a record event without actually having it run, useful for events that are only used sporadically.

For events that need to be executed only once, the `Make OneShot` box can be ticked. Such an event will execute just once, and then automatically delete itself from the event list.

### 4.5. Automating Playouts

Automated playouts are configured by means of the `Edit Playout` dialog (see `The Edit Playout Dialog`), which can be accessed either by clicking the `Playout` button in the `Add Event` dialog to create a new record event or by touching the `Edit` button to modify an existing event. The process of configuring a playout is very similar to that for configuring a recording – see the Section 4.4, “Automating Recordings” above for details.



## The Edit Payout Dialog

## 4.6. Automating Uploads/Downloads

It's possible to use RDCatch to automatically upload and download material from both local and Internet-based servers. Automated downloads are configured by means of the Edit Download dialog, which can be accessed either by clicking the Download button in the Add Event dialog (see The Edit Download Dialog) to create a new record event or by touching the Edit button to modify an existing event.

The Edit Download Dialog

With the exception of the Url, Username and Password controls, the process of configuring a download is very similar to that for configuring a recording – see the Section 4.4, “Automating Recordings” above for details.

The Url control is used to specify the Uniform Resource Locator for the material to be downloaded. The following download types are supported: **http:**, **ftp:**, **sftp:** and **file:**. The Url field can also include wildcard characters that can be used to construct date-based URLs.

The Username and Password fields are used to indicate the username and password required for access to the server referenced in the Url. For public web pages and anonymous FTP servers, these fields can be left blank.

Automated uploads are configured by means of the Edit Upload dialog (see The Edit Upload Dialog), which can be accessed either by clicking the Upload button in the Add Event dialog to create a new record event or by touching the Edit button to modify an existing event. The following upload types are supported: **ftp:**, **sftp:** and **file:**. As with downloads, the Url field can also include wildcard characters that can be used to construct date-based URLs.

The Edit Upload Dialog

Configuration of an upload event is very similar to that of a download, with the addition of the `Export Format` control. This is used to set what file format should be used for the upload. Depending upon what software encoders have been installed by the system administrator, the following export types may be available:

- PCM16 Linear (\*.wav)
- Free Lossless Audio Codec [FLAC] (\*.flac)
- MPEG Layer 2 (\*.mp2)
- MPEG Layer 3 (\*.mp3)
- OggVorbis (\*.ogg)

The desired upload format and parameters are set by clicking the `Set` button.

## 4.7. Automating Macro Execution

It's possible to configure the automatic execution of a Macro Cart by means of the Edit Cart Event dialog (see The Edit Cart Event Dialog), which can be accessed either by clicking the `Macro Cart` button in the Add Event dialog to create a new Macro Cart event or by touching the `Edit` button to modify an existing event. The process of configuring a macro cart event is very similar to that for configuring a recording – see Section 4.4, “Automating Recordings” above for details.

The Edit Cart Event Dialog

## 4.8. Automating Switcher Operations

It's possible to configure an automatic operation on a switcher device by means of the Edit Switcher Event dialog (see The Edit Switcher Event Dialog), which can be accessed either by clicking the **Switch Event** button in the Add Event dialog to create a new switch event or by touching the **Edit** button to modify an existing event.

The Edit Switcher Event Dialog

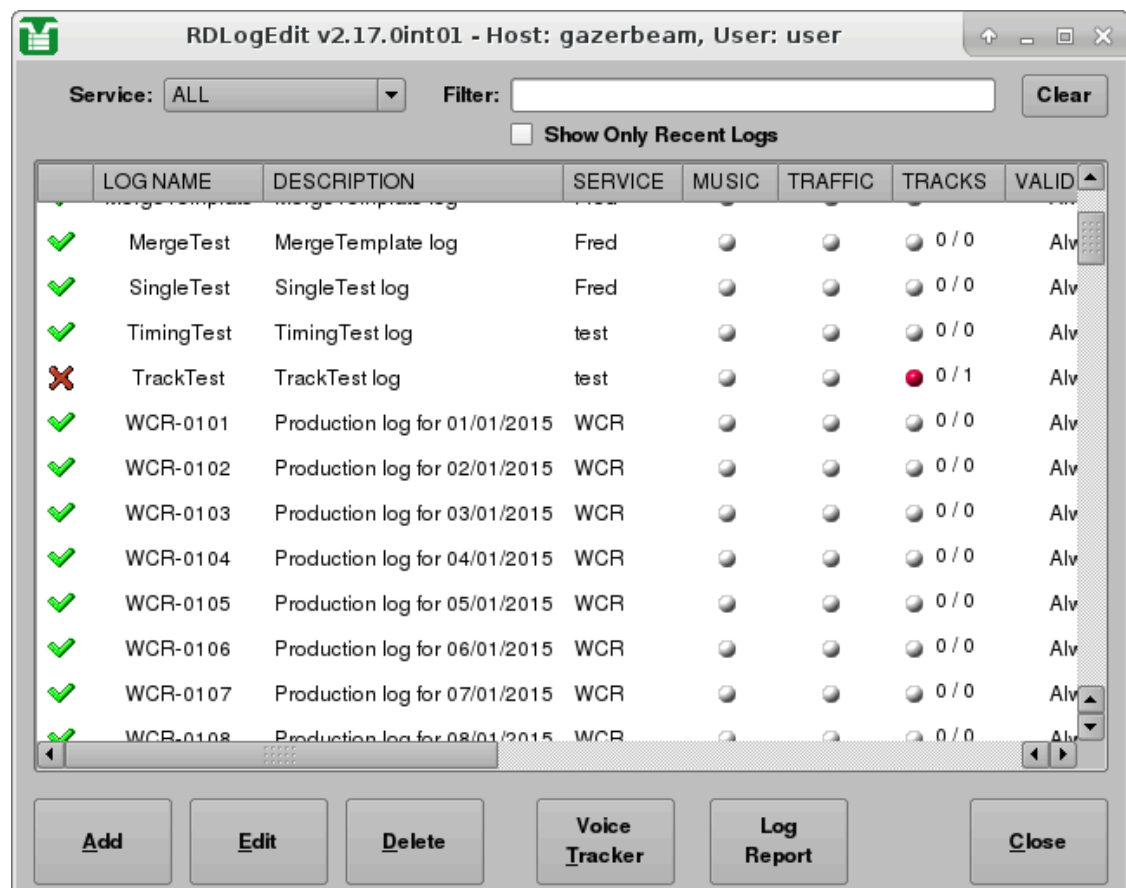
In addition to the usual fields, a switch event has **Switch Matrix** (the name of one of the switch matrices associated with the selected **Location**), **Switch Input** and **Switch Output** controls. When executed, a switch events causes a take operation to be performed on the specified switcher device between the specified input and output. It is possible to specify the input and output either by their alphanumeric names (assigned in RDAAdmin) or by their absolute numbers.

# Chapter 5. Generating and Maintaining Logs with RDLogEdit

## 5.1. Logs and Log Events

A Rivendell log is a sequence of one or more events to be executed by the system, arranged in chronological order. (This functionality is sometimes referred to as a playlist in other automation systems). Several different types of events can be included in a log, along with parameters governing how and under what circumstances they will be executed.

Upon startup, RDLogEdit will show the current list of all logs on the system. A number of important attributes of logs can be seen from The RDLogEdit Main Window, the first being the log name, with a summary status indicator next to it. The name is an alpha-numeric label that is used as a unique “handle” by the system to reference each log, and can be up to a maximum of 64 characters long. The status indicator is intended as a quick visual guide as to whether a particular log is ready for air (green check mark) or not (red ex).



The RDLogEdit Main Window

Next comes the log's unique Name, assigned at the time the log was created, followed by it's Description. This is a free-form alpha-numeric label that can be used to record any information that might be useful to have appear on the log list (e.g. “This log for Sunday's show, don't modify!”).

Next comes a column showing the owning `Service`. Each log is owned by exactly one service, which determines under what circumstances the log can be played and where electronic log reconciliation (ELR) data resulting from log playouts is sent (for an overview of Rivendell services, see Section 1.1.1.4, “Services”).

Next comes three “status indicator” columns (`Music`, `Traffic` and `Tracks`) indicating the log's degree of readiness for air. A red indicator indicates that the particular data element is required but currently missing, a green indicator indicates an element is required and present, while a white indicator indicates that an element is not required. Additionally, the `TRACKS` column contains a pair of numbers indicating how many completed voice tracks exist in the log versus how many total track markers exist (the subject of voice tracks and track markers will be covered in more detail below). When all three of these status indicators show either green or white, the summary status indicator (at the beginning of the log's entry in the list) will show as a green check mark, while a red indicator in any of these three fields will show a red ex. (NOTE: because a log sports a red ex does not indicate that the respective log cannot be played. It is merely a visual indicator to allow logs to be quickly “eyeballed” for completeness).

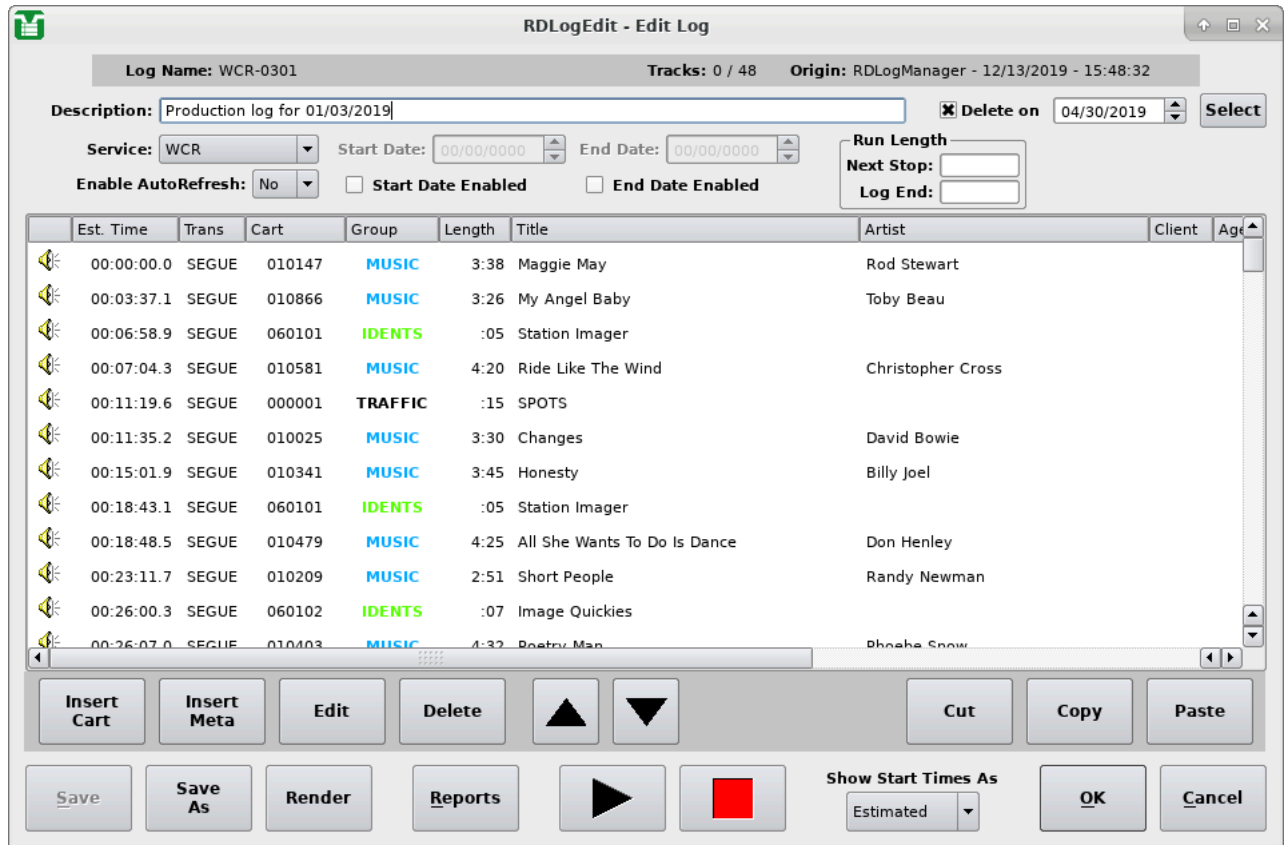
Next comes a pair of columns indicating the valid start date and end date for the log.

Next comes an `Auto Refresh` column that indicates whether the log has auto refresh enabled. (For a discussion of auto refresh, see `FIXME`).

Finally, there are “datestamp” columns, indicating date/time of the log's `Origin`, `Last Linked` and `Last Modified` operation.

A report that lists the available logs on the system can be generated by touching the `Log Report` button.









A new log can be created by touching the `Add` button and entering a name, or an existing log inspected and modified by touching its entry on the log list and then touching the `Edit` button, resulting in the log being opened in the `Edit Log` dialog. The `Edit Log` dialog consists of three parts: the top section, where much of the information shown on the log list can be inspected and modified; the middle section, which shows the list of events comprising the log, and the bottom section, where buttons for modifying and saving the log are located. Each event in a log can be one of several different types, indicated by the icon displayed at the start of the line (see Table 5.1, “Log Event Type Icons” for a breakdown of the various icons).



The Edit Log Dialog

The following types of events can be incorporated into a Rivendell log:

**Table 5.1. Log Event Type Icons**

	Audio Cart
	Voice Track Audio Cart
	Macro Cart
	Note Marker
	Track Marker
	Chain Event
	Music Import Link
	Traffic Import Link

### 5.1.1. Audio Carts

The first, and usually most common type of log event is an audio cart. As the name implies, audio carts are Library entries that contain audio material intended for playout. Audio carts were covered in detail in Chapter 3, *Content Management with RDLibrary*.

### 5.1.2. Macro Carts

A macro cart is a cart from the Library that contains one or more system commands that can be used to cause the system to take various actions. They were touched upon in Chapter 3, *Content Management with RDLibrary*, and will be discussed in detail in Chapter 14, *Rivendell Macro Language*.

### 5.1.3. Note Markers

A note marker is an entry in the log that contains text intended to be seen by operators and used as a guide or reminder (program coders sometimes refer to this sort of functionality as a *remark* or *comment*, as seen in the REM command used by BASIC programmers). Note markers belong to a class of log events known as meta events because (unlike carts, which exist in the Library independently of whether they are placed in a log or not), they have no independent existence outside of the specific log where they are placed. A note marker has absolutely no effect on the execution of a log other than to simply display some text at a specified point in a log, and as such can be useful as a mechanism for making notes or reminders to oneself or to others who may be executing the log.

### 5.1.4. Track Markers

A track marker is another meta event that is very similar in operation to note markers, with one key addition: track markers designate or "bookmark" a place in the log where a voice track is to be recorded. (The entire topic of voice tracks and tracking will be covered in detail in Chapter 9, *VoiceTracking*). As with note markers, track markers have absolutely no effect on the execution of a log.

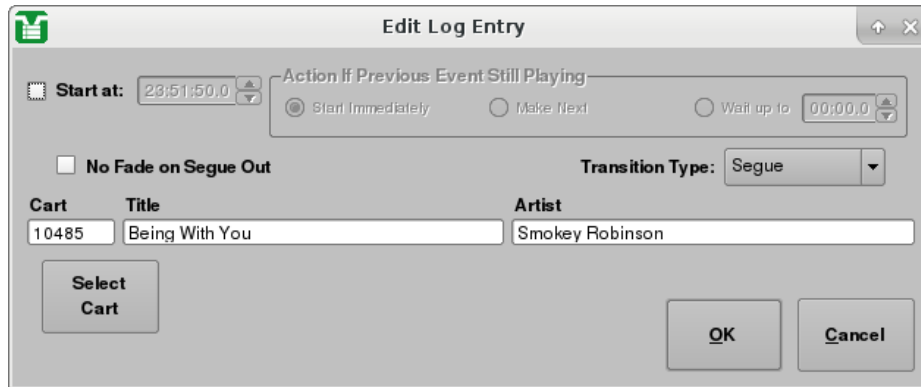
### 5.1.5. Chain Events

Each event in a log has a transition type, shown in the Trans column of the Edit Log dialog. The transition type determines what happens when one event in a log ends and the next starts. Three basic transition types can exist in a Rivendell log: PLAY, SEGUE and STOP.

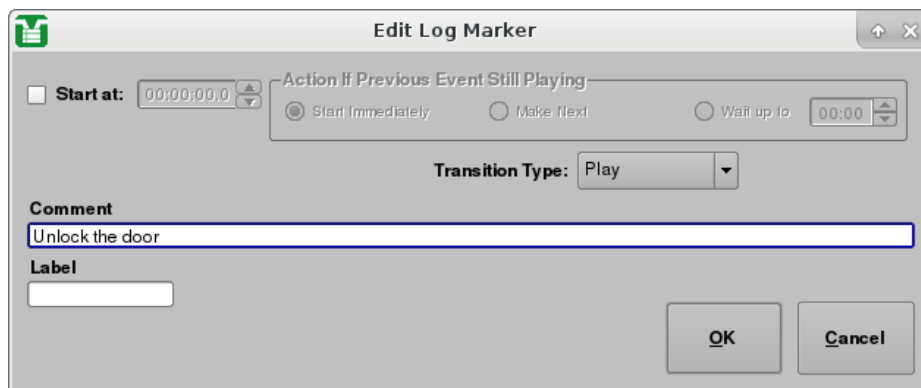
### 5.1.6. Import Links

An import link is a placeholder event that shows where events imported from the external music or traffic scheduling system will eventually go. They will be covered in detail in Chapter 8, *Generating Logs with RDLogManager*.

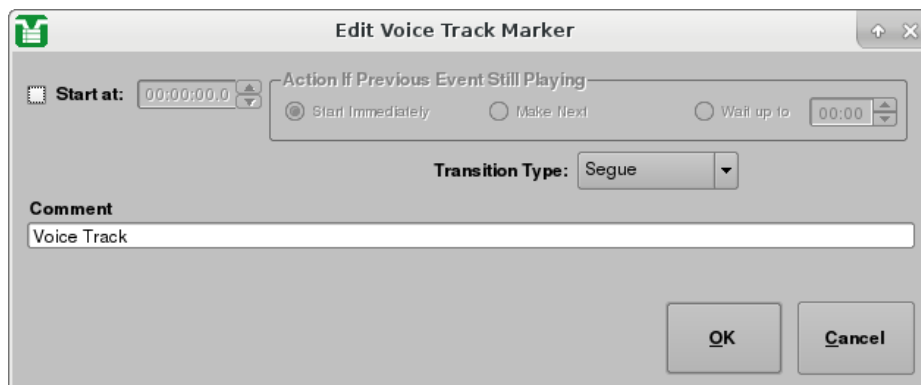
Each event in a Rivendell log can have its parameters modified by touching its entry in the Edit Log dialog and then clicking the Edit button, thus opening up the Edit Log Entry dialog, shown below.



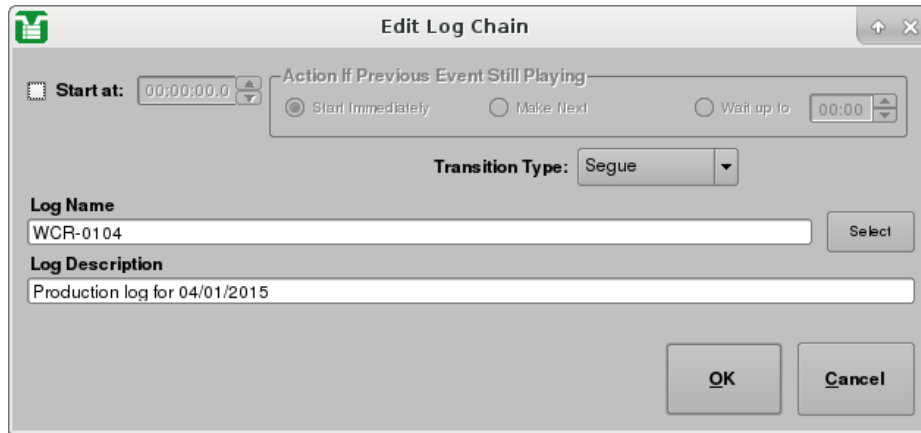
The Edit Log Entry Dialog



The Edit Log Marker Dialog



The Edit Voice Track Marker Dialog



The Edit Log Chain Dialog

## 5.2. Event Transitions

Each event in a log has a transition type, shown in the **Trans** column of the Edit Log dialog. The transition type determines what happens when one event in a log ends and the next starts. Three basic transition types can exist in a Rivendell log: **PLAY**, **SEGUE** and **STOP**.

### 5.2.1. The **PLAY** Transition

If an event has a **PLAY** transition, then it will begin playing when the previous event has finished. **PLAY** transitions are used when automatic event sequencing is desired with no audio overlap (such as when playing two voice-only announcements back-to-back).

### 5.2.2. The **SEGUE** Transition

**SEGUE** transitions are similar to **PLAY** transitions, with one key difference: if the finishing event contains segue data (either from the Library or from a custom transition programmed in the voice tracker), then the event will start before the prior event is finished, causing the two pieces of audio to overlap and mix together. **SEGUE** transitions can be a very powerful tool for creating a variety of special effects, particularly when used in conjunction with musical material.

### 5.2.3. The **STOP** Transition

As the name implies, **STOP** transitions cause execution of the log to be suspended prior to execution of the event. This is often the desired behavior in situations where the log playout needs to be synchronized to one or more external audio sources (such as remote satellite feeds), and is commonly used in conjunction with **Hard Timed** events (see Section 5.3, “Time and Time Types”).

## 5.3. Time and Time Types

All Rivendell log events have an associated time type, which controls what effect (if any) the passage of time will have on the event. There are two basic time types: *relative* and *hard*. Additionally, the hard time type has several additional options that further modify its behavior.

## 5.3.1. The Relative Time Type

The default time type for log events, a relative time type simply means that the event is assumed to have a start time of whenever the previous event ends (if it has a `PLAY` or `SEGUE` transition) or whenever it is started (if it has a `STOP` transition).

## 5.3.2. The Hard Time Type

A hard time type causes the event to be executed or otherwise acted upon when the wall clock equals the time associated with the event. Hard times are a powerful feature that can be used to synchronize the log to various external events. An event can be assigned a hard time by clicking the `Start at` check box in the Edit Log Entry and filling in the desired time, and will show up with the letter `T` appearing at the beginning of its listed time in the `Time` column of the Edit Log dialog.

The specific action that is performed when the time matches is determined by the option parameters supplied as part of the event. Three basic actions are possible:

- Start the event immediately
- Cue to the event ("Make Next")
- Wait up to some period of time, then start the event

### 5.3.2.1. Start Immediately

As implied by the name, if the event is set to start immediately, it will be started as soon as the hard time is reached. Any currently playing events in the log will be simultaneously stopped down.

### 5.3.2.2. Cue to the Event ("Make Next")

If set to 'Make Next', the event will be cued up to become the next event to be executed in the log, bypassing any intervening events in the log between the currently playing event and the hard timed one. Any currently playing events are unaffected.

### 5.3.2.3. Wait up to some period of time, then start the event

Very similar to "start immediately", with the difference that, if one or more events are currently playing, the log will wait up to the specified amount of time before stopping them and starting the new event. If the currently playing event(s) finish before the specified time period has elapsed, then the event is started immediately.

## 5.3.3. Estimated vs. Scheduled Start Times

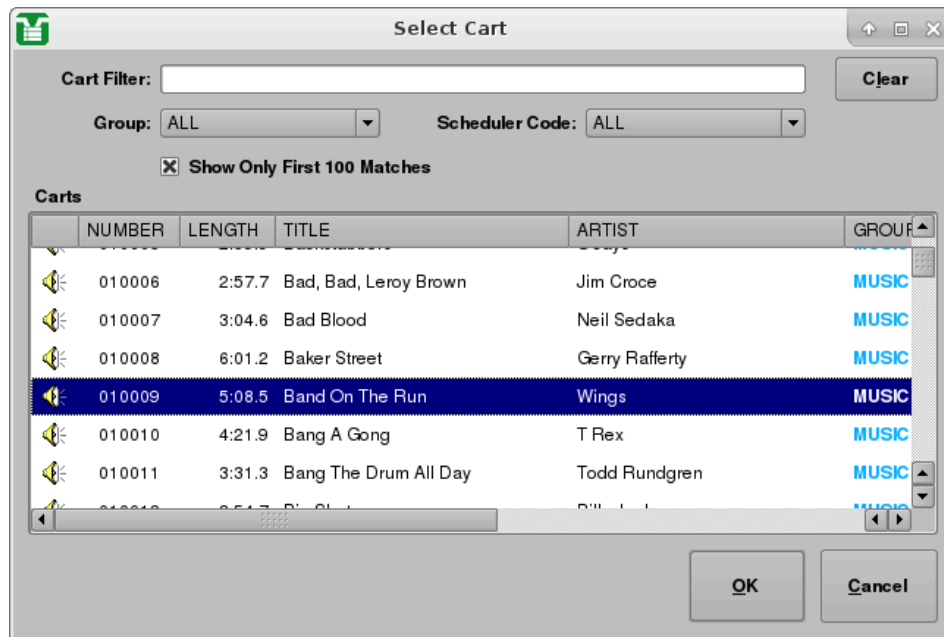
When viewing log events in `rdlogedit(1)`, the displayed start time style for each event can be either **Estimated** or **Scheduled**, as selected in the `Show Start Times As` dropdown box. **Estimated** will give start time values based on any hard start times in the log, taking the known lengths of the relevant carts, while **Scheduled** will display the start times as provided by an external music and/or traffic scheduling system.

The optimum style to use is largely dependent on how a particular log was assembled. If the log was generated using `rdlogmanager(1)` and largely populated with events from external music and traffic systems, the **Scheduled** style will usually be preferred as this permits the start times provided by those external schedulers to be visible. On the other hand, if the log was mostly assembled "on the fly" in `rdlogedit(1)`, the **Estimated** style will usually provide more insight on a log will actually time out when played.

## 5.4. Editing Log Event Parameters

### 5.4.1. Specifying a Cart

The cart number to use for an event can be specified by touching the `Select Cart` button in the `Edit Log Entry` dialog, which will open up the `Select Cart` dialog. Alternatively, it is possible to simply enter the cart number in the `Cart` field if the number is already known. The `Title` and `Artist` information will be supplied automatically by the system from the cart's label.



The Select Cart Dialog

### 5.4.2. Specifying Meta Event Parameters

Note marker and track marker events each take only a single parameter: a `Comment` text that will show up on the log entry. In the case of a chain event, the name of the log to chain to must be supplied in the `Log Name` field, or the `Select` button can be touched to bring up the `Select Log` dialog to allow a name to be picked from a list of all those available. Note that meta events are assigned transition and time types just the same as cart events.

### 5.4.3. Rearranging Log Events

Existing events in a log can be cut, copied, pasted or rearranged by touching the appropriate buttons in the `Edit Log` dialog. In addition, touch the `Delete` button will cause the selected log event(s) to be removed from the log.

### 5.4.4. Saving or Abandoning Changes to a Log

Any changes made to a log can be saved by touching either the `Save` or `OK` buttons in the `Edit Log` dialog. The current log can be saved under a different name by touching the `Save As` button, while touching `Cancel` will abandon any changes made since the last save.

### 5.4.5. Missing/Invalid Cart Events

If a given event has a problem (such as referencing a cart that does not exist in the Library, or that is not enabled for play on the log's owning service) its entry will be highlighted either RED (indicating a missing/invalid cart) or MAGENTA (indicating a cart without permission to run on the owning service). It's also possible to generate an exception report summarizing problem cart entries by touching the Check Log button.

## 5.5. Generating Log Reports

Various Log reports can be generated by touching the Reports button on the Edit Log dialog and then selecting the desired report and touching the Generate button. The following reports are available:

### 5.5.1. Log Listing

A chronological listing of all events in the log.

### 5.5.2. Log Exception Report

A list of missing/unplayable carts referenced in the log.

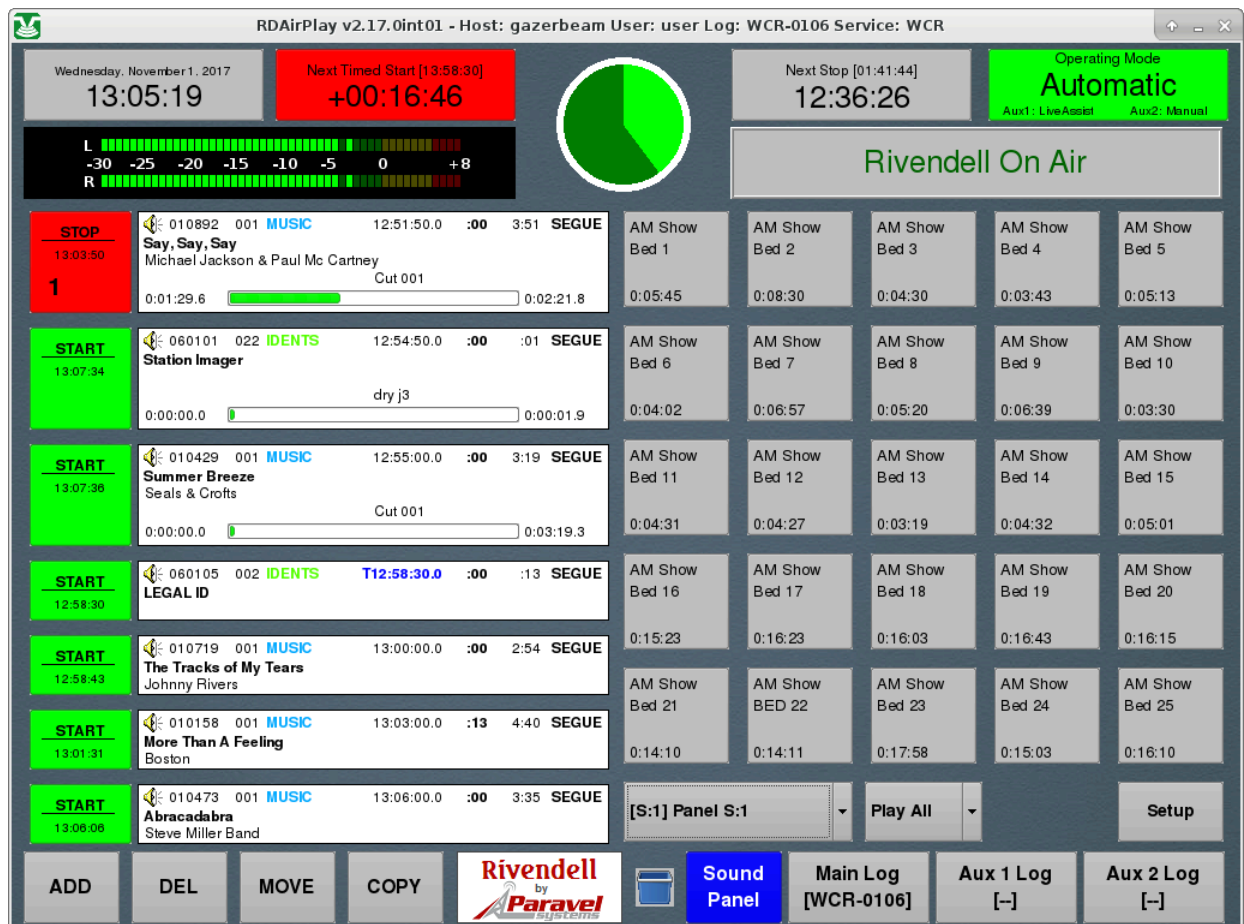
## 5.6. Auditioning Audio

The audio referenced by an audio event can be sampled in the Edit Audio dialog by highlighting the desired event and then touching the Play button. No attempt to evaluate the rotation logic of the event is made – the audio played is intended solely as a 'sample' to help identify the type of material.

# Chapter 6. Running Logs with RDAirPlay

## 6.1. Overview

RDAirPlay is the Rivendell module used to run logs generated by the RDLogEdit or RDLogManager (for an overview of Rivendell logs, see Chapter 5, *Generating and Maintaining Logs with RDLogEdit*). It contains a wide array of features for enabling playout of audio content in live assist as well as fully automated environments.



The RDAirPlay Main Window

## 6.2. Log Machines

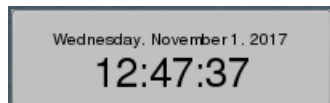
Fundamental to the operation of RDAirPlay is the concept of a *log machine*. A log machine is a virtual “device” into which a Rivendell log may be loaded and executed. RDAirPlay has three such log machines, called Main Log, Aux 1 Log and Aux 2 Log. Each of these log machines is completely independent of the others in the sense that different logs can be loaded and executed simultaneously in the respective machines.

## 6.3. Layout

The RDAirPlay main screen consists of four primary areas: the top area, which contains a variety of indicators for use in live assist situations as well as a set of audio meters; the button widget, which occupies the bulk of the left-hand side of the screen; the right-hand side, which displays either a SoundPanel array or a full log width; and the edit buttons in the lower left-hand corner of the screen.

The top area contains the following indicators:

### 6.3.1. The Wall Clock



In the upper left-hand corner is the wall clock indicator, which indicates the current system date and time. The style used for displaying times throughout RDAirPlay can be toggled between 24 hour “military” format and the traditional “AM/PM” presentation by clicking once on this display. If the system administrator has enabled it, this display will also flash RED to indicate possible clock inaccuracy due to loss of master clock synchronization.

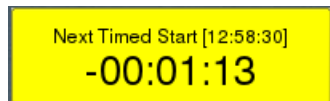
### 6.3.2. The Post Point Counter



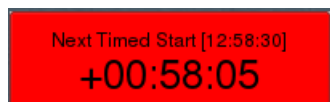
Immediately to the right of the wall clock is the Post Point Counter. A post point is an attribute applied to a log event with a hard time type. The post point counter uses this information to display countdown and timing information.

The counter can be in one of four possible states: `Idle`, `On Time`, `Under Time` or `Over Time`. The counter will provide an estimate of how “on-time” the log currently is, on the basis of the current time and events still scheduled to be played.

If the playout is such that the next hard time will be reached within one second of its programmed time, then the counter will be in `On Time` mode. The value shown in the square brackets is the scheduled time of the hard-timed event.



If the playout is such that the next hard time will be reached one second or more before its programmed time, then the counter will be in `Early` mode. It will also give an indication of how much more material would need to be added to make the join on time.



If the payout is such that the next hard time will be reached one second or more after its programmed time, then the counter will be in `Late` mode. It will also give an indication of how much material would need to be removed to make the join on time.

### 6.3.3. The Audio Meter



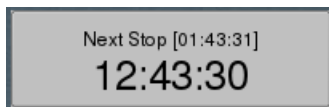
Immediately beneath the wall clock and post point counter is the audio meter. The meter shows the current peak levels of audio being played out of RDAirPlay, with '0' level referenced to -16 dBFS.

### 6.3.4. The Pie Wedge Widget



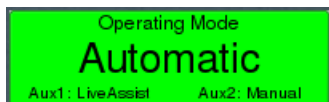
In the top center of the top area is the pie wedge widget. This widget counts down the final few seconds of each event. The length of time it counts down, along with whether it counts to the start of the next transition or the absolute end of the event are both configurable in RDAAdmin. The color of the band that grows as the countdown progresses (shown in GREEN in the illustration) will change color to indicate if the currently playing event is the last event before a log stopdown. If it is the last, it will be RED, if not, GREEN. A BLUE band and countdown will also appear to indicate the event's talk time (if talk time markers have been set in the underlying cart). If the On-Air flag has been set to ON, the area around the pie widget will be RED.

### 6.3.5. The Next Stop Counter



Immediately to the right of the pie wedge widget is the next stop counter. The large numerals indicate the predicted interval of time before the next stopdown of the `Main Log` machine, with the actual predicted time in the square brackets. If the `Main Log` is already stopped, then the counter simply displays `Stopped`.

### 6.3.6. The Mode Indicator



In the upper right-hand corner of the top area is the mode indicator, showing the current automation mode of the log machines. Three different modes are possible: `Automatic`, in which all log features,

including PLAY and SEGUE transitions and hard times are fully enabled; LiveAssist, in which no automatic transitions or hard start times are executed but automatic crossfades are done between elements; and Manual, which is very similar to LiveAssist except that not even automatic crossfades are enabled (thus permitting fully manual crossfade control by means of an external console). To change RDAirPlay to a different mode, simply touch the mode indicator until the desired mode is indicated.

### 6.3.7. The Label Area

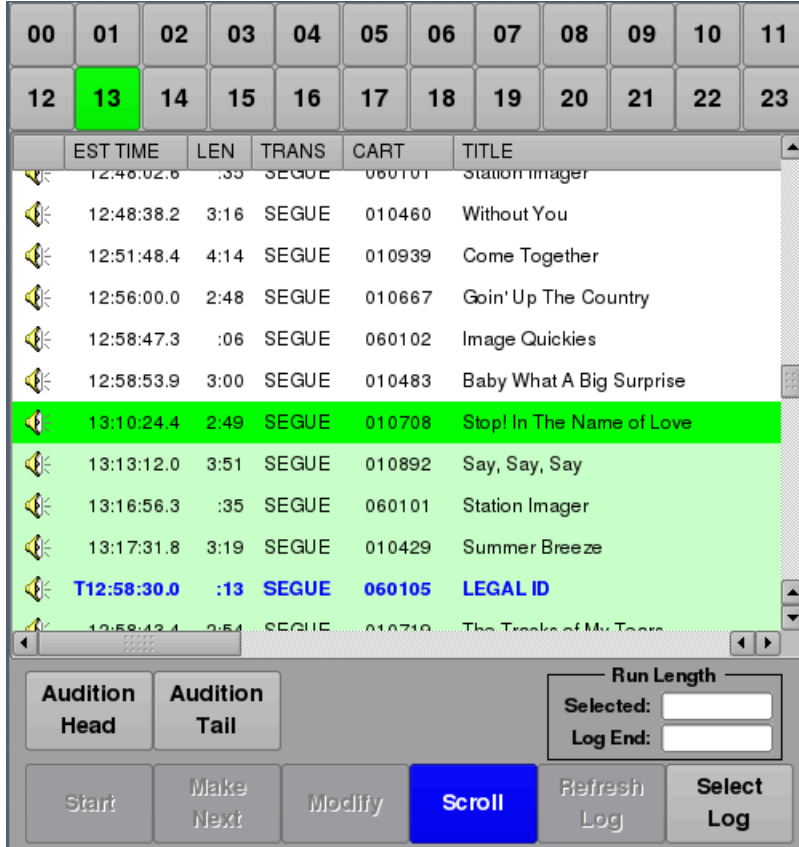


Immediately below the next stop counter and mode indicator is the label area. Text messages can be made to appear here (by means of RML commands) to signal the operator concerning the state of the system or need to take some kind of action.

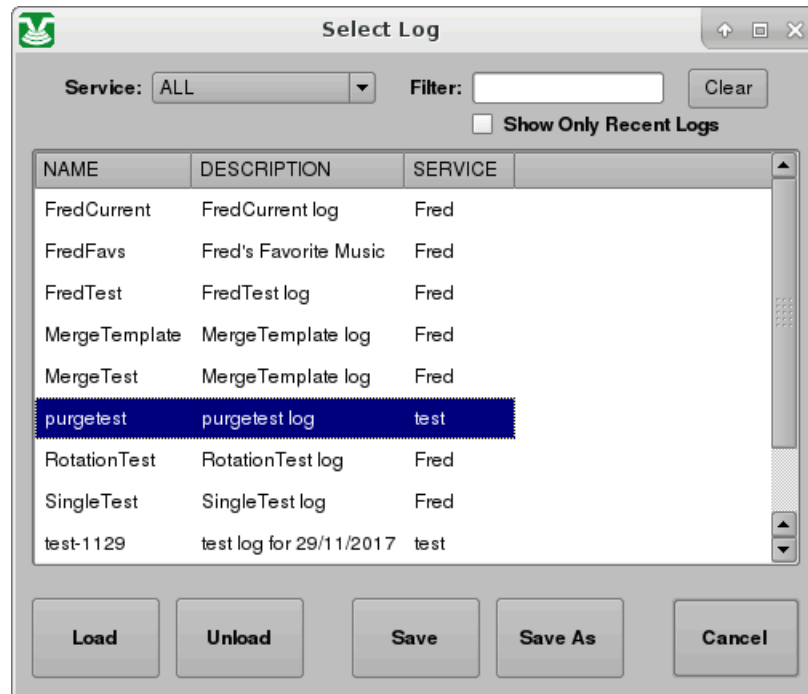
### 6.3.8. The Right-Hand Side

Directly below the label area is the right-hand side. The right-hand side can display either a SoundPanel array or a full log widget for each of the three log machines, selected by clicking the appropriate button in the lower right-hand corner of the screen. (NOTE: depending upon how the system administrator has configured the system, not all of the log machine buttons may be visible on your system).

### 6.3.9. The Full Log Widget



As the name implies, the full log widget can be used to view the contents of a log over its entire length. To load a log, touch the **Select Log** button to bring up the **Select Log** dialog, select the desired log from the list and then touch **Load**. The currently loaded log can also be saved by touching the **Save** or **Save As** buttons, or the current log unloaded by touching **Unload**.



The Select Log Dialog

Once a log is loaded, it can be started at any point by touching an event and then pressing the **Play** button. Any playing event can likewise be stopped by touching in the event and then pressing the **Stop** button. To cue-up an event so that it is the next to play (indicated by the event being the first with a light green background), touch the event and then press the **Make Next** button. The play parameters of an event can be modified by touching the event, then pressing the **Modify** button, bringing up the **Edit Event** dialog.

In addition to having the ability to modify the event's time and transition parameters, the **Edit Event** dialog can be used to audition the event's audio in **Cue** or set the start position of the audio for on-air playback (so as to allow a program to be joined "in progress", for example). To audition the audio, simply press the **Play** button. The slider can be moved to adjust where in the audio to audition from. To set the start position, press the **Start** button and then position the slider where you wish the start to be. The red line on the progress display indicates the current start position. Pressing the **Start** button again returns the dialog to **Audition** mode.



The Edit Event Dialog

When running a log, it is often desirable to have the currently playing event always in sight. To do this, toggle the Scroll button "ON" (blue background).

### 6.3.10. The Button Log Widget

<b>STOP</b> 13:17:31 <b>1</b>	010429 001 <b>MUSIC</b> 12:55:00.0 :00 3:19 <b>SEGUE</b> <b>Summer Breeze</b> Seals & Crofts Cut 001 0:02:06.6  0:01:12.7
<b>START</b> 12:58:30	060105 002 <b>IDENTS</b> <b>T12:58:30.0</b> :00 :13 <b>SEGUE</b> <b>LEGAL ID</b> Legal ID_B_In Wad-For Wad 0:00:00.0  0:00:13.5
<b>START</b> 12:58:43	010719 001 <b>MUSIC</b> 13:00:00.0 :00 2:54 <b>SEGUE</b> <b>The Tracks of My Tears</b> Johnny Rivers Cut 001 0:00:00.0  0:02:54.6
<b>START</b> 13:01:31	010158 001 <b>MUSIC</b> 13:03:00.0 :13 4:40 <b>SEGUE</b> <b>More Than A Feeling</b> Boston
<b>START</b> 13:08:06	010473 001 <b>MUSIC</b> 13:06:00.0 :00 3:35 <b>SEGUE</b> <b>Abracadabra</b> Steve Miller Band
<b>START</b> 13:09:38	000001 006 <b>TRAFFIC</b> 13:08:50.0 :00 :15 <b>SEGUE</b> <b>SPOTS</b>
<b>START</b> 13:09:54	060102 008 <b>IDENTS</b> 13:09:00.0 :00 :06 <b>SEGUE</b> <b>Image Quickies</b>

To the left of the full log widget is the button log widget, consisting of a column of seven large buttons adjacent to cart labels. This widget provides another, specialized “view” of the Main Log log machine. Specifically, the first seven currently playing and/or next events in that log machine will always be visible here. Events visible in the button log will be shown in the full log widget as having a green background. Unlike the full log widget, the button log is always visible, regardless of which display has been selected for the right-hand side.

To start an event from the button log, simply touch an event's corresponding Start button. Touching the button of a running event will either (depending upon how the system administrator has configured RDAirPlay) stop or pause it. To modify an event's parameters (via the Edit Event dialog), simply double-click the event's cart label.

## 6.4. Editing a Log

### 6.4.1. Drag and Drop



If the System Administrator has enabled Drag and Drop operation, any event can be copied by clicking and holding the right mouse button and then dragging it to the desired location of the copy. An event can also be deleted from a log by dragging the trash can icon and dropping it onto the event to be deleted.

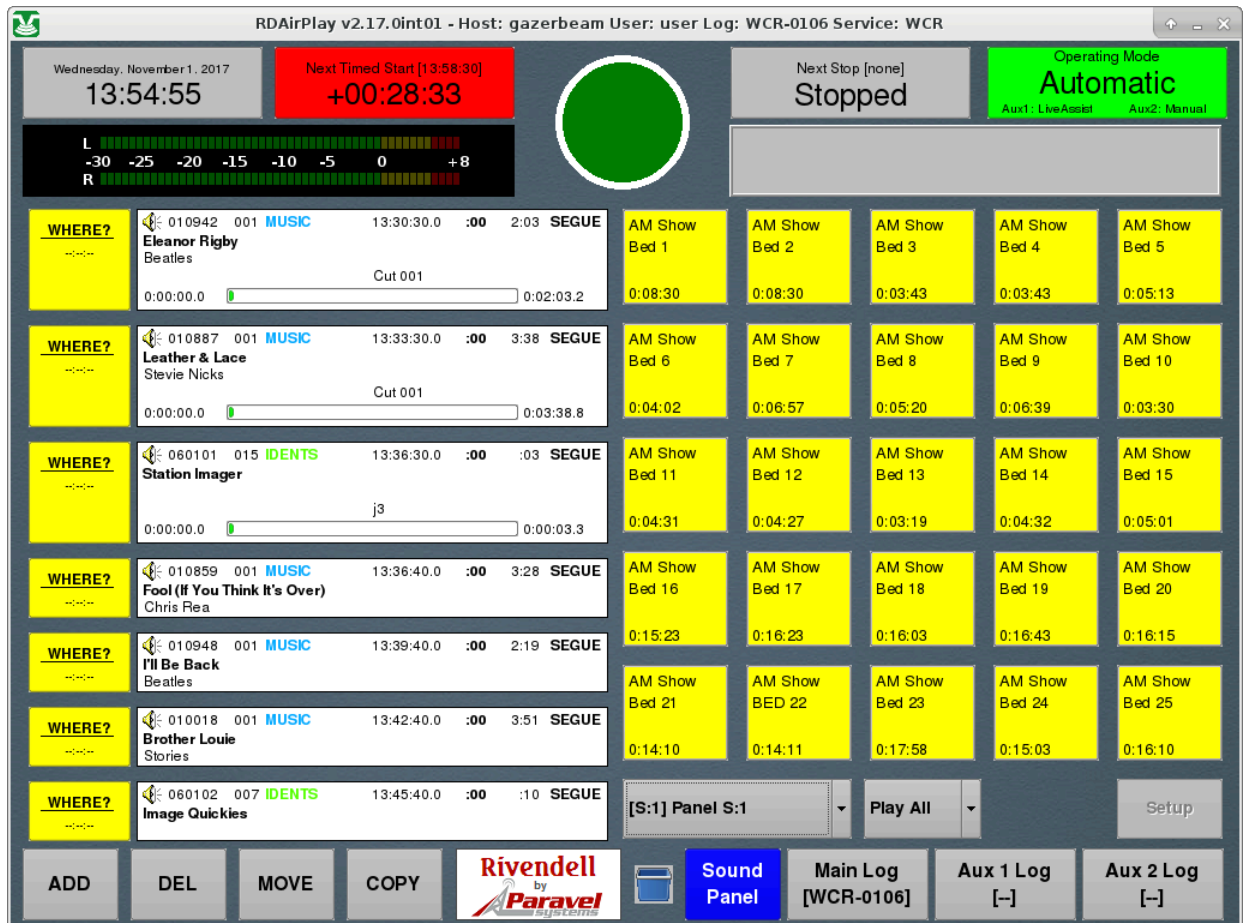
### 6.4.2. The Editing Buttons



It is possible to edit the log loaded into any of the three log machines by means of the log edit buttons in the lower left-hand corner of the screen.

#### 6.4.2.1. Adding an Event

To add an event, touch the ADD button to open the Select Cart dialog, pick the desired cart and then touch OK. To place the selected cart using the button log widget, simply touch one of the yellow WHERE? buttons. To place it using the full log widget, click the event where you wish it to go and then touch the yellow WHERE? button. If, after selecting a cart from the Select Cart dialog, you decide you don't want to add it after all, simply touch the ADD button again to cancel the operation.



RDAirPlay Prompting for a Location

Alternatively, if the System Administrator has enabled Drag and Drop functionality, carts can be dragged directly from an instance of RDLibrary and dropped into the desired location on RDAirPlay.

### 6.4.2.2. Deleting an Event

To delete an event, touch the DEL button, then touch one of the violet DELETE buttons in the button log widget, or select an event and then touch the violet DELETE button. To cancel the operation, simply touch the DEL button again.

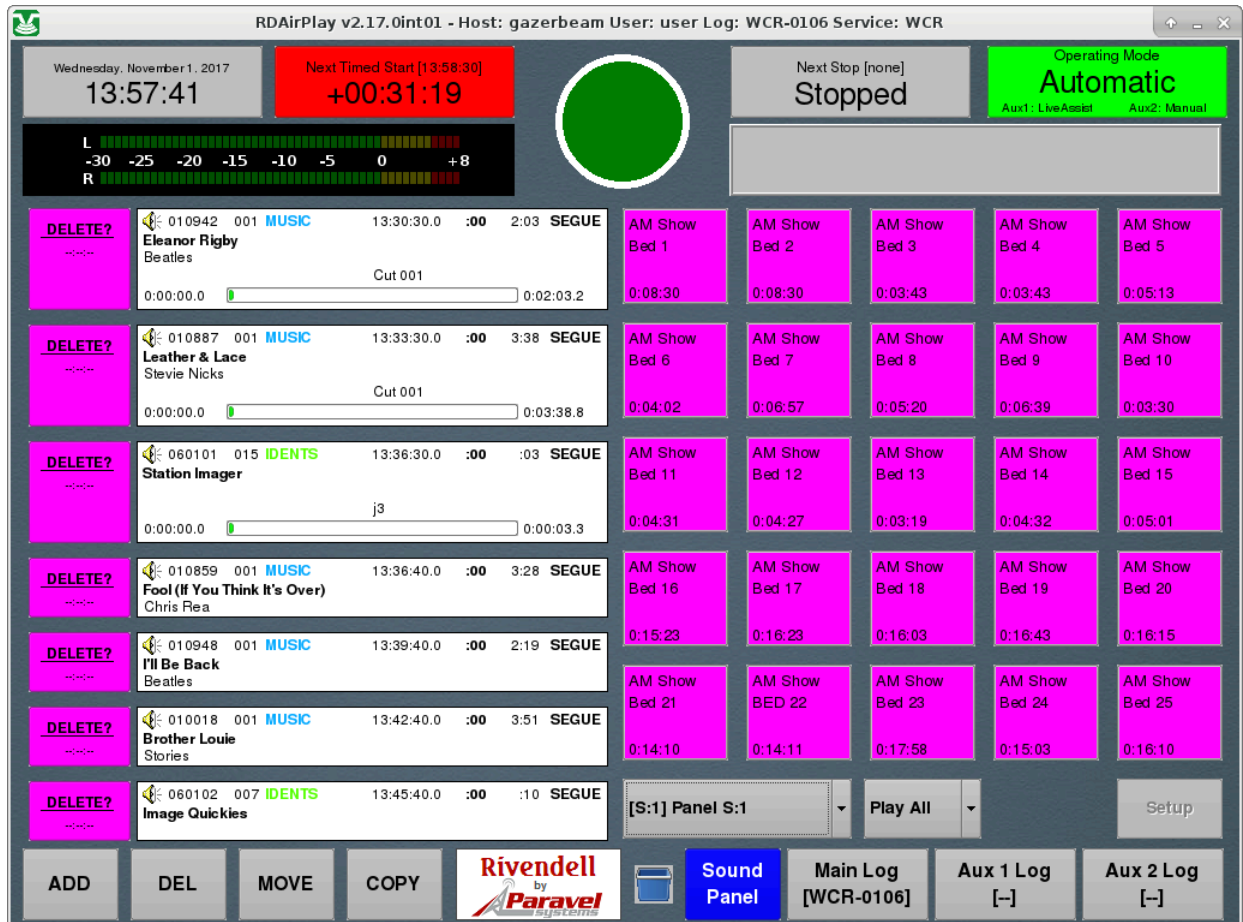
If the System Administrator has enabled Drag and Drop functionality, carts can also be deleted by dragging the icon of the trash can and dropping it onto the appropriate event.

### 6.4.2.3. Moving an Event

To move an event, touch the MOVE button, then touch one of the violet MOVE buttons in the button log widget, or select an event and then touch the violet MOVE button, then touch one of the yellow TO buttons in the button log widget, or select an event and then touch the yellow TO button. To cancel the operation at any stage, simply touch the MOVE button again. It is perfectly permissible to move an event between two different log machines.

### 6.4.2.4. Copying an Event

To copy an event, touch the COPY button, then touch one of the violet COPY buttons in the button log widget, or select an event and then touch the violet COPY button, then touch one of the yellow TO buttons in the button log widget, or select an event and then touch the yellow TO button. To cancel the operation at any stage, simply touch the COPY button again. It is perfectly permissible to copy an event between two different log machines.



RDAirPlay Prompting for a Cart to Copy

If the System Administrator has enabled Drag and Drop functionality, carts can also be copied by simply dragging them from where they are to the new location where they are wanted.

### 6.4.3. The SoundPanel



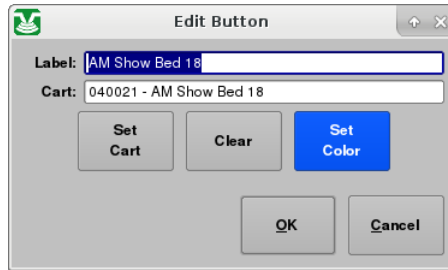
The SoundPanel is an array of buttons that appears in the right-hand side of RDAirPlay when the Sound Panel button is selected. Each button can be associated with a particular cart in the Library (either Audio or Macro carts), which is then played each time the button is clicked. The soundpanel is particularly useful in live assist situations where it is desired to drop in some piece of audio on a live, improvised basis.

### 6.4.4. Panel Types

The SoundPanel has multiple panels or “panes” that can scrolled through by touching the double-left or double-right arrow buttons. Each panel has a designator, (displayed just to the right of the arrow keys), consisting of the letter U or S followed by a number. An S indicates that the panel is a 'system' panel, meaning that its button assignments will show up only on this particular host system; while a U indicates a 'user' panel, one which is associated with a particular user and that will "follow around" that user wherever he logs in the site. (Depending upon how the system administrator has configured RDAirPlay, you may not have both of these panel types available to you).

### 6.4.5. Programming a SoundPanel Button

To associate a cart with a panel button, first touch the Setup button, which will begin to flash. (Depending upon how the system administrator has configured RDAirPlay, the Setup button may be disabled). Next, touch the button you wish to program, opening the Edit Button dialog.



The Edit Button Dialog

Touch the `Set Cart` button to open the Select Cart dialog and pick a cart. To clear the button –i.e. have no cart associated with it – touch the `Clear` button. To assign a custom background color to the button, touch the `Set Color` button. A custom label can be entered in the `Label` field, or the name of the cart will be used by default. Touch the `OK` button when done. When done programming all the desired buttons, touch the `Setup` button again to toggle off `Setup` mode.

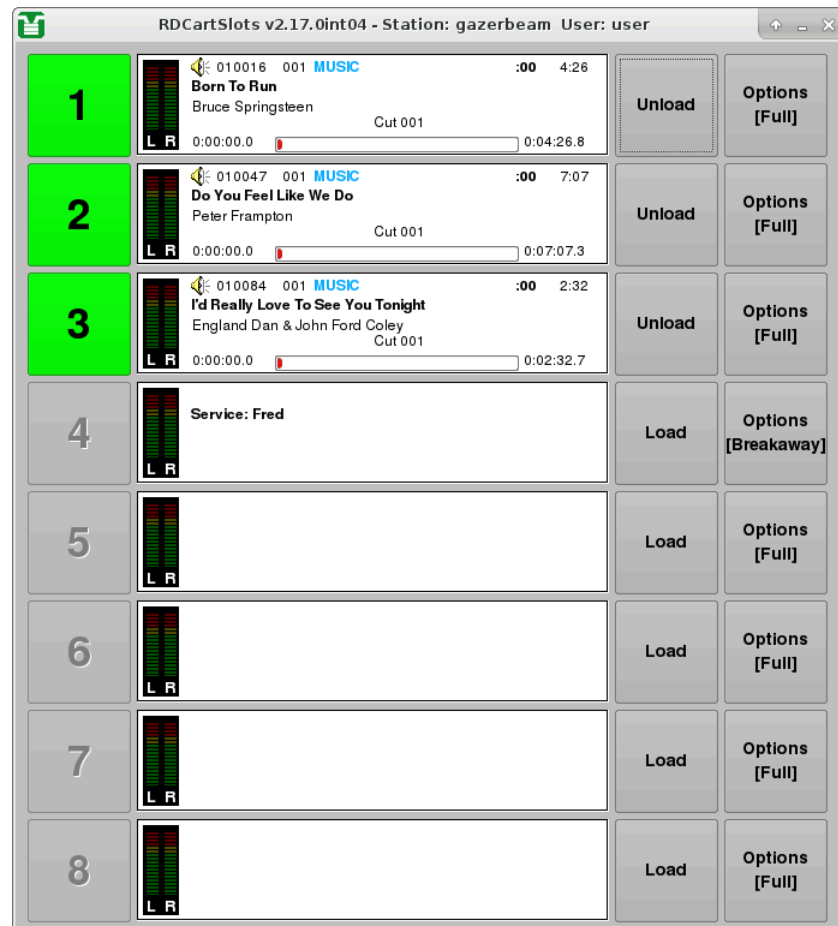
If the System Administrator has enabled Drag and Drop functionality, buttons can also be programmed by simply dragging and dropping a cart (from RDLibrary or from elsewhere in RDAirPlay) onto the desired button.

---

# Chapter 7. Playing Audio with RDCartSlots

## 7.1. Overview

RDCartSlots is a Rivendell module designed for use in fast-paced live or "live-assist" environments, with facilities for quickly locating carts and getting them on the air.

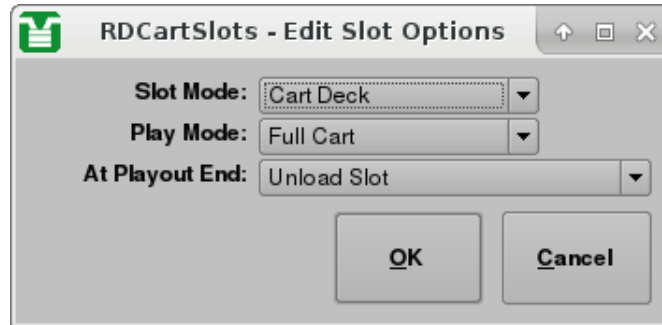


The RDCartSlots Main Window

RDCartSlots can be configured to display one or more *slots*, each of which can be thought of as an independent audio player. In its default *Cart Deck* mode, a slot behaves much like a traditional analog "cart deck"; with the ability for the user to load and play carts from the Rivendell library. *Breakaway* mode allows the slot to be used for automated play-out and replacement of upstream content by means of the "Execute Breakaway" [DX] RML.

## 7.2. Setting the Slot Options

The options for a particular slot, including its mode, can be set by touch its *Options* button, bringing up the *Edit Slot Options* dialog.



The Edit Slot Options Dialog

The slot mode is set by selecting either `Cart Deck` or `Breakaway` from the `Slot Mode :` dropdown box.

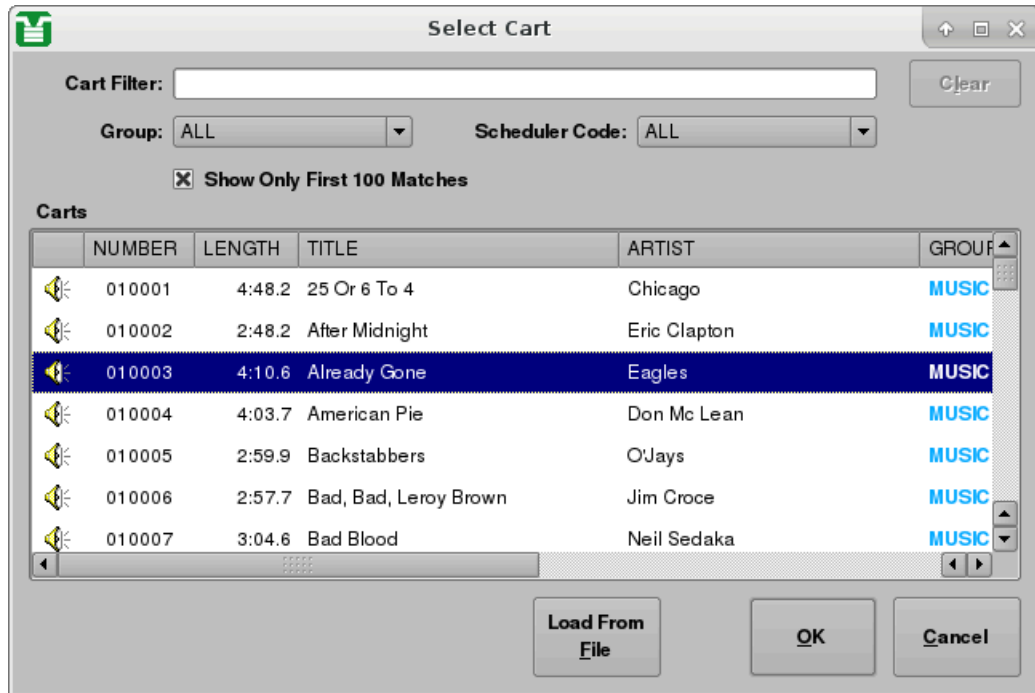
### 7.2.1. Cart Deck Slot Options

When set for `Cart Deck` mode, the following additional options are available:

- |                             |   |
|-----------------------------|---|
| <code>Play Mode</code>      | When set to <code>Full Cart</code> , the slot will play audio from the Start marker to the End Marker of cuts (as set in <code>RDLibrary</code> ).  |
|                             | When set to <code>Hook</code> , the slot will play audio from the <code>HookStart</code> marker to the <code>HookEnd</code> marker of cuts.   |
| <code>At Playout End</code> | When set to <code>Unload Slot</code> , the slot will automatically unload when play-out reaches its end.  |
|                             | When set to <code>Recue to Start</code> , the slot will retain the previously loaded cart when play-out reaches its end. Touching the numbered start button will cause play-out to be repeated. |
|                             | When set to <code>Restart Playout (Loop&gt;</code> , the the slot will retain the previously loaded cart and automatally repeat play-out from the begining when play-out reaches its end.       |

## 7.3. Operation in Cart Deck Mode

When set to be in `Cart Deck` mode, an empty slot can be loaded by touching the `Load` button, bringing up the `Select Cart` dialog.



The Select Cart Dialog

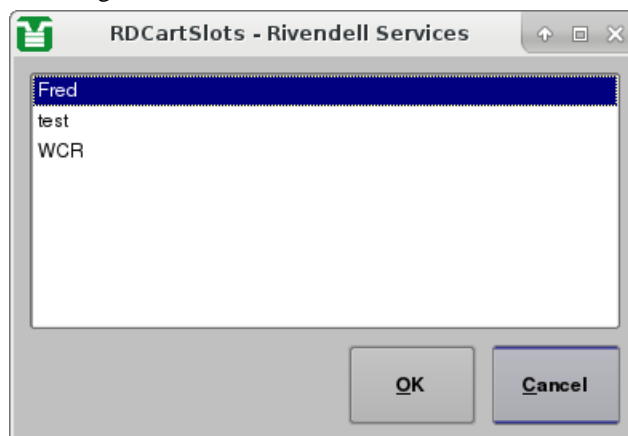
To load a cart, touch the desired cart on the list (using the filter tools as necessary) and then touch the OK button. To load a file directly, touch the Load From File button and select the desired audio file. Touching Cancel will abandon the load operation.

After loading a cart or file, the Load button will change to say Unload. Touching this button will now cause the slot to be unloaded.

To start play-out of a loaded slot, touch its numbered button at the left-hand end. The button will turn RED and the play-out will start. Touching the button while the play-out is active will stop the play-out and cause the loaded cart to be re-cued to its start.

## 7.4. Operation in Breakaway Mode

When set to be in Breakaway mode, an empty slot can be loaded by touching the Load button, bringing up the Rivendell Services dialog.



### The Rivendell Services Dialog

Touch the desired Rivendell service on ths list, then touch the OK button.

---

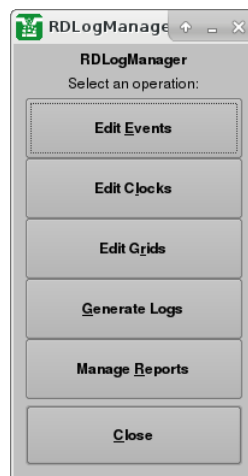
# Chapter 8. Generating Logs with RDLogManager

## 8.1. Overview

RDLogManager is a tool for generating Rivendell logs. It is different from RDLogEdit in that, instead of building logs line-by-line, it allows log structures to be defined by a series of rules (called *events* and *clocks*) that are then plugged into a time framework (called a *grid*). This grid is then used to generate logs automatically on an as-needed basis. Each Rivendell service has its own, separately defined grid, thus allowing for separate log generation rules for each service. This system of rules allows for very powerful, modular features, including the ability to import and use scheduling data from various external third party systems, such as music schedulers and traffic and billing systems.

RDLogManager also includes facilities for generating *reports*. Reports are data outputs that detail whether certain events aired as scheduled, and under what circumstances. Reports are available in various formats. Some are intended to be read by humans, while others are intended for use by other, external software systems as a means of reconciling exported schedules.

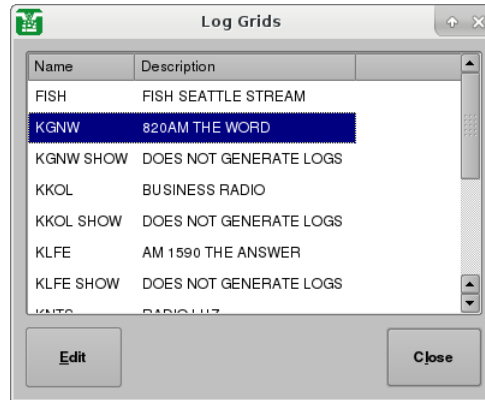
When RDLogManager is started, it displays its main menu.



The Log Grids Dialog

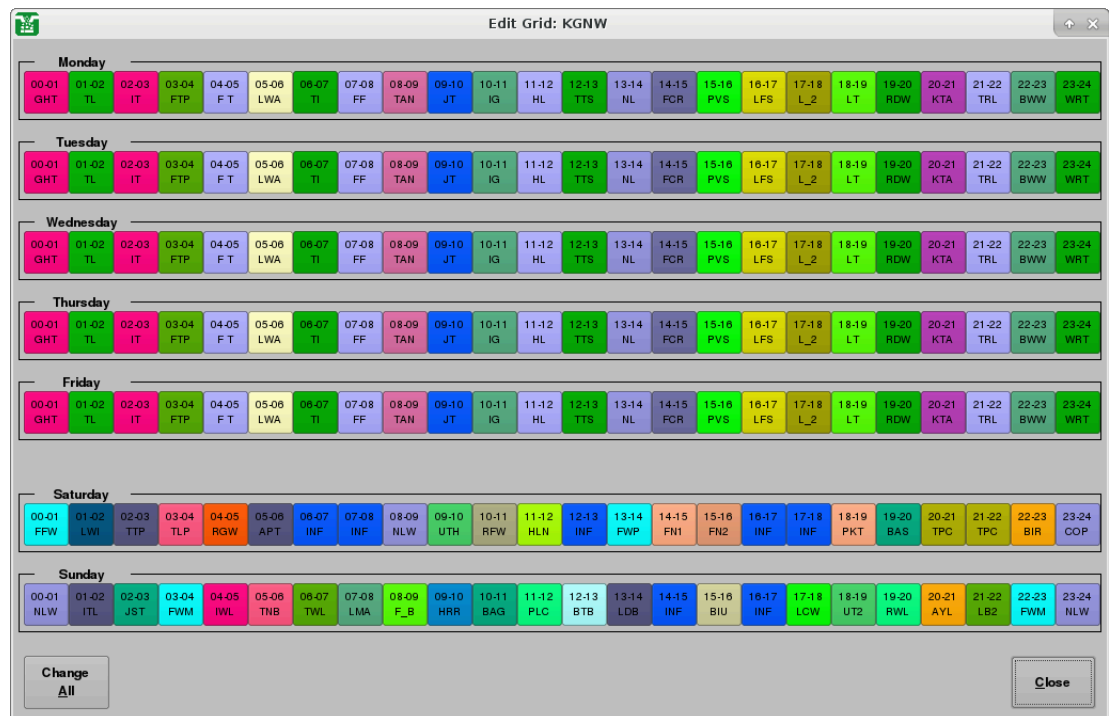
## 8.2. Grids

Each Rivendell service has an RDLogManager grid. To see the list of available grids, touch the **Edit Grids** button to open the Log Grids dialog.



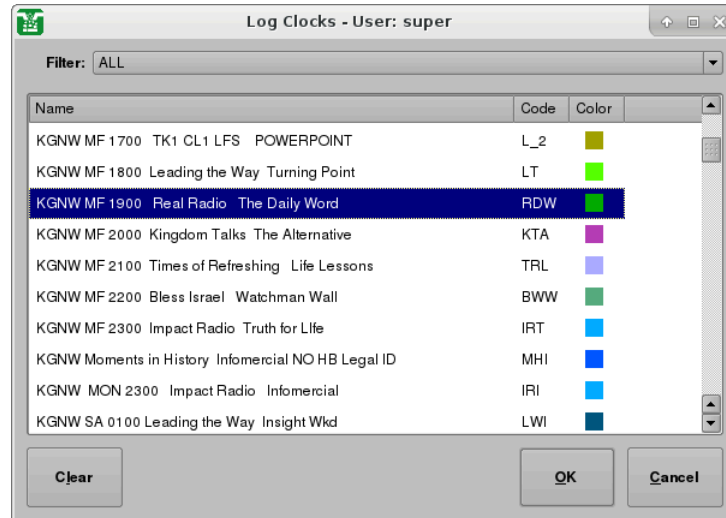
The Log Grids Dialog

To open a particular grid, select its service name and touch the Edit button.



The Edit Grid Dialog

Each grid has slots for every hour of every day of the broadcast week – 168 slots in all. By specifying a particular clock to go into each of these slots, a set of rules that RDLogManager can use to generate a log for any given day of the week is built up. To specify a clock, simply touch the particular hour of interest to open up the Select Log Clock dialog.



The Log Clocks Dialog

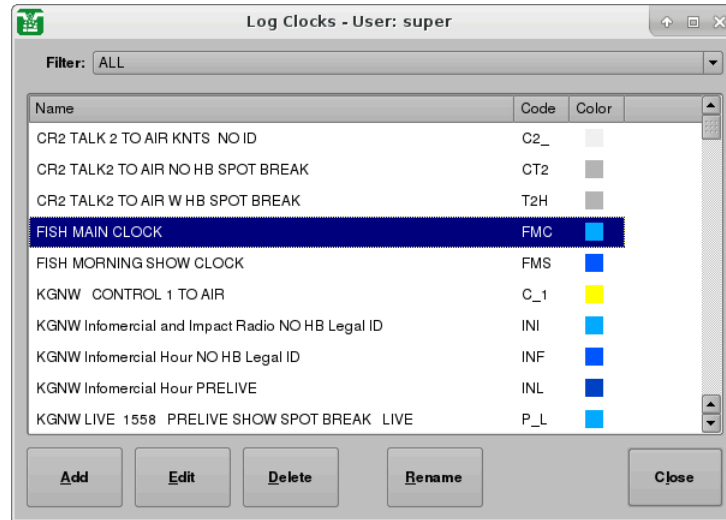
Click the desired clock, then touch the OK button. To clear the assignment of any clock to the selected hour, touch the Clear button, then OK.

It is possible to 'drill down' directly to the underlying configuration of a clock (to be covered shortly) by right-clicking on the relevant hour in a grid and selecting `Edit Clock`.

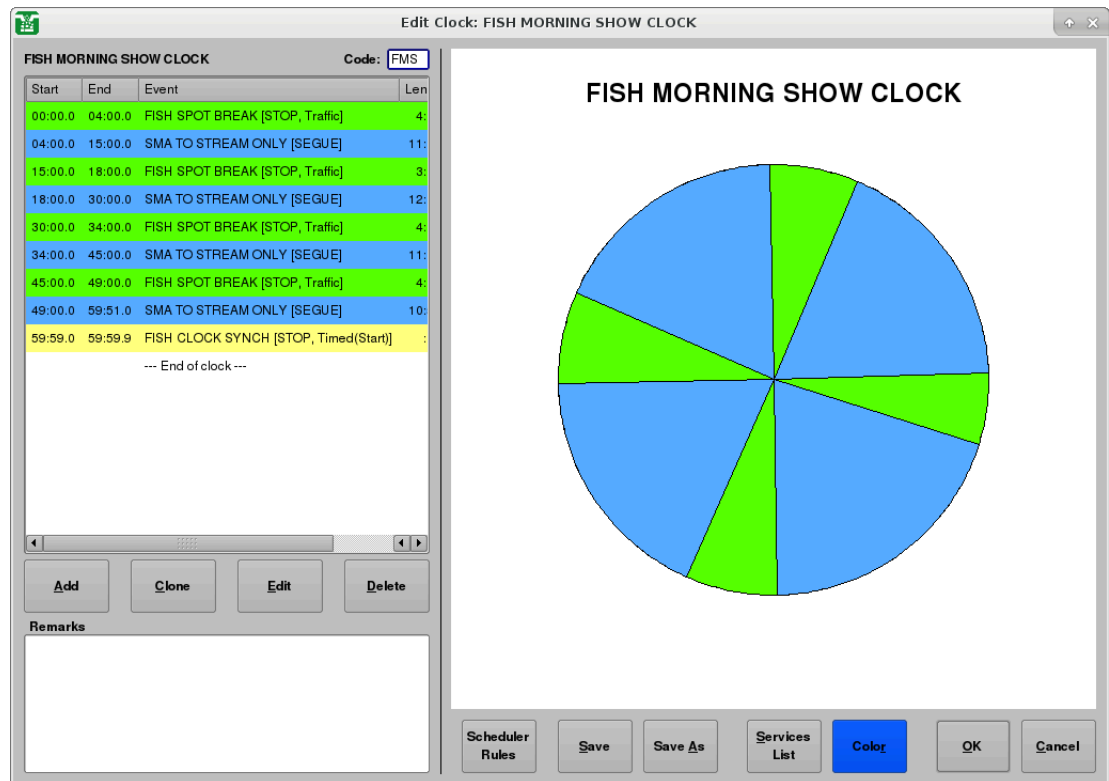
## 8.3. Clocks

An RDLogManager clock is a collection of RDLogManager events, arranged in terms of their start time (relative to the beginning of the hour) and length. It basically can be thought of as the "schedule" of an hour – *any* hour. Once defined, a clock can be plugged into any hour of a grid of any service, thus making for easy modularization and changes to a service's schedule.

To see the list of available clocks, touch the `Edit Clocks` button in RDLogManager's Main Menu to open the Log Clocks dialog. Each RDLogManager clock can be assigned a three-letter code and color, as an aid in identifying it when assigned to grids. To add a new clock, touch the Add button, or to edit a clock's parameters, click on it and touch the Edit button. In each case, the Edit Clock dialog will open. Clocks can also be deleted by touching the Delete button or renamed by touching the Rename button.



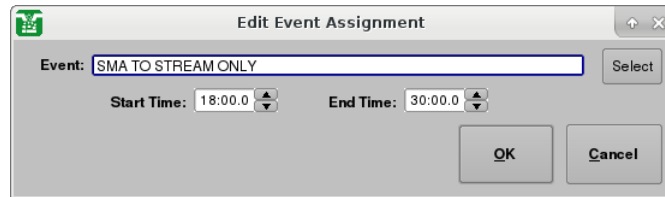
The Log Clock List Dialog



The Edit Clock Dialog

The Edit Clock dialog consists of three main sections: a tabular list of events in chronological order, a graphical depiction of the clock in the traditional “broadcast clock” format, and a series of action buttons across the bottom. The clock's three-letter code is set by means of the Code field in the upper right-hand corner of the table area. Its color can be set by touching the Color button. To save the clock without exiting the dialog, touch the Save or Save As buttons. To add a new event to the clock, touch the Add button, or to edit an existing entry touch the Edit button. In either case, the Edit Event Assignment dialog will open. To delete an entry, touch the Delete button. As in the case of grids, it is possible to 'drill down'

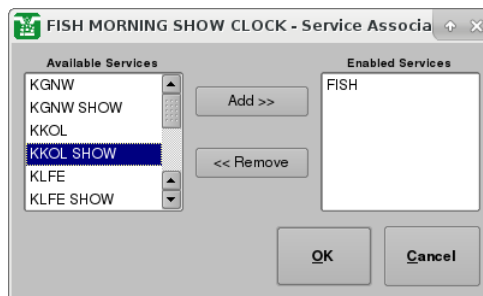
into the underlying RDLogManager event by right-clicking on the respective entry in the clock event table and selecting `Edit Event`.



The Edit Event Assignment Dialog

The Edit Event Assignment dialog simply consists of an `Event` field for the name of the RDLogManager event and `Start Time` and `End Time` fields for the start and end times relative to the start of the hour. A list of available events can be brought up by touching the `Select` button to bring up the Log Events dialog.

Each clock can be designated as being associated with one or more services. This can make finding the correct clock for a given service much faster, as the `Filter` control on the List Clocks dialog can then be used. To program these associations, touch the `Services List` button in the Edit Clock dialog to bring up the Service Associations dialog.



The Service Association Dialog

To designate a service as being valid for this clock, select the services name in the `Available Services` list and then touch the `Add >>` button. Likewise, to deselect a service, select its name in the `Enabled Services` list and then touch the `<< Remove` button.

## 8.4. Events

An RDLogManager event is a set of rules that define a series of log elements (audio carts, macro carts, markers, etc) that should be inserted into a log, along with the appropriate log event parameters (transition type, time type, etc) that should be associated with them. The actual elements to be inserted can be specified directly within the event itself, or imported from a data file generated by an external scheduling system. Up to two such external scheduling sources can be defined for each service. While for convenience sake these are designated as 'Traffic' and 'Music' within RDLogManager, they can each be used anywhere a means of importing external scheduling data into the system is needed, regardless of whether such data actually references commercial or musical material or not.

To see the list of available RDLogManager events, touch the `Edit Events` button on the RDLogManager Main Menu to open the Log Events dialog. It is possible to filter the list of available events to only those used for a particular service by selecting the service in the `Filter` control. To add a

new event, touch the Add button, or to edit an event's parameters, click on it and touch the Edit button. In each case, the Edit Event dialog will open. Events can also be deleted by touching the Delete button or renamed by touching the Rename button.

RDLogManager - Editing Event - CALENDAR

Filter:

Group: **BEDS**

☒ All ☐ Audio Only ☐ Macros Only

Cart	Group	Length	Title
040001	BEDS	:41	My99.7 Weather Bed
040002	BEDS	:19	My99.7 Community Calendar Bed
040003	BEDS	:15	My99.7 Community Update Bed
040004	BEDS	:35	CTM Intro Bed
040005	BEDS	3:26	Slide (Instrumental Bed)
040006	BEDS	:34	Dead Air Open
040007	BEDS	:22	Dead Air Close
040008	BEDS	4:03	Closer (Instrumental Bed)
040009	BEDS	:19	Future Me
040010	BEDS	:18	Not My Pub
040011	BEDS	:20	On It
040012	BEDS	:14	Strictly House (A)
040013	BEDS	:14	Strictly House (B)
040014	BEDS	2:44	The Only JT

PRE-POSITION LOG

☐ Cue to this event 00:00 before scheduled start. (First cart will have a STOP transition.)

TIMED START

☒ Use hard start time ☐ Make Post Point

Action If Previous Event Still Playing

☐ Start immediately ☒ Make next ☐ Wait up to 00:00

Transition if previous event ends before start time: Segue

ENFORCING LENGTH

☐ Use AutoFill ☐ Warn if fill is over or under by at least 00:00

PRE-IMPORT CARTS Len: 0:00:19

Cart	Group	Length	Title	Transition	Count
040002	BEDS	:19	My99.7 Community Calendar Bed	SEGUE	0

IMPORT ☒ None ☐ From Traffic ☐ From Music ☐ Select from: CALENDAR

Import carts scheduled 00:00 prior to the start of this event.

Import carts scheduled 00:00 after the end of this event.

First cart has a Segue transition.

Imported carts have a Segue transition.

Import inline traffic with the [none] event.

Artist Separation 75 None

Title Separation 1 None

Must have code and code

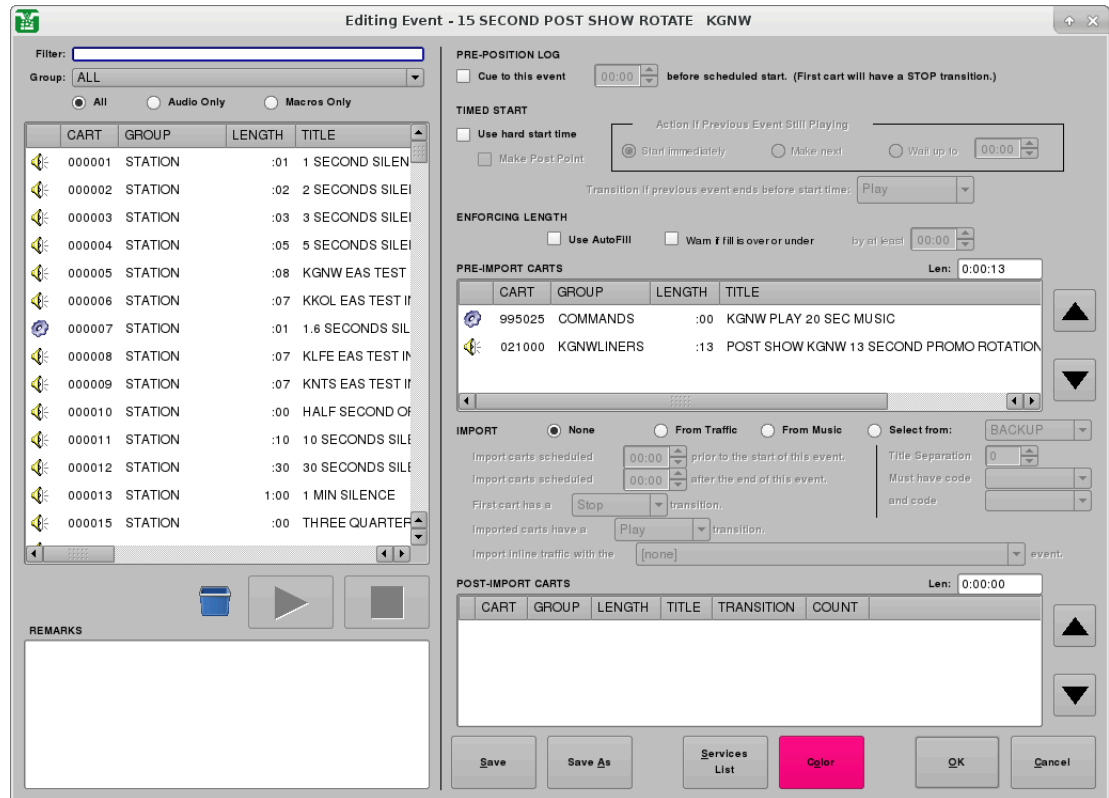
POST-IMPORT CARTS Len: 0:00:35

Cart	Group	Length	Title	Transition	Count
080101	EVENTS	:35	COMMUNITY CALENDAR	SEGUE	0

REMARKS

Save Save As Services List Color OK Cancel

The Log Events Dialog



The Editing Event Dialog

The Edit Event dialog consists of two main parts: a Library cart picker widget on the left side, and an area showing the various event parameters on the right. Audio contained within audio carts can be sampled by selecting the desired cart and then touching the Play button. Programming an event basically consists of specifying four things: its log parameters (transition and time types), the list of Pre-Import events, the event import (if any) and the list of Post-Import events. The first matter to be decided is if the event should have a hard start time: if so, then the `Use hard start time` check box in the TIMED START section should be ticked. Ticking this box will enable all of the usual hard start parameters to be specified. If an automatic timed start is not desired, then it is possible to check the `Cue to this event` checkbox in the PREPOSITION LOG section. This will cause RDLogManager to place a hard time with a 'Make Next' attribute on the first item of the event – effectively, causing the event to be automatically “cued up” at the scheduled time – something that can be particularly handy for keeping spot breaks in sync when “overscheduling” music.

Next, if it is desired to have RDLogManager try to insert material automatically from the Autofill List to ensure that the event has the length indicated by its parent clock, the `Use Autofill` box in the ENFORCING LENGTH section should be checked. (Configuring the Autofill List is covered in detail in the Rivendell Technical and Administration Guide). If Autofill is enabled, it is also possible to tick the `Warn if fill is under or over` checkbox to have RDLogManager generate a warning if it was unable to properly fill the event when the log was generated.

Next, the list of log events (if any) to be inserted before the data import should be placed in the PRE-IMPORT CARTS list. For audio or macro carts, these can be simply dragged and dropped from the Library cart list on the left-hand side of the dialog. Meta events can be inserted by right-clicking on the list and selecting the desired element. It is also possible to edit or delete elements and set the transition type of each element through the right-click menu.

The `IMPORT` section then defines which (if any) source will be used for importing external scheduling events into the log. Either `Music`, `Traffic` or `None` can be selected. If `Music` or `Traffic` is selected, then `RDLogManager` will import any events from those sources that fall within the start and end times of the event (as supplied by the parent clock). These start and end times can be further broadened by means of 'slop factors' entered into the `Import carts` scheduled controls (this is sometimes necessary to get the import to work properly with certain external scheduler systems). The transition types to be used for the first and subsequent imported elements can be specified with the `First cart has a` and `Imported carts have a` controls. If `Music` has been selected as the import source, it is also possible to specify the event to use to import traffic breaks embedded in the music log with the `Import inline traffic` with the control. (Configuration of the actual parser parameters for data importation is covered in the Rivendell Technical and Administration Guide).

Finally, the list of log events (if any) to be inserted after the data import should be placed in the `POST-IMPORT CARTS` list. Configuration of the events works very similarly to that of the `PRE-IMPORT CARTS` list.

The color of the event (as seen in the `Edit Clock` dialog) can be set by touching the `Color` button. The list of services for which this event is valid can be edited by touching the `Services List` button. To save the event without exiting the dialog, touch the `Save` or `Save As` buttons.

## 8.5. Generating Logs

After all of the appropriate hours have been populated in a service's grid, it's time to start generating logs. To do this, touch the `Generate Logs` button in `RDLogManager`'s Main Menu to open the `Generate Log` dialog.

Depending upon how many external scheduling sources are involved, generating a log involves one, two or three steps. Before performing any of the steps, it is first necessary to select the relevant service for which to generate the log (using the `Service` control) and the log date (either by entering the date in the `Date` control or by touching the `Select` button and picking it off of the calendar).



The `Generate Log` Dialog

In all cases, a new log is initially generated by touching the `Create New Log` button. If the log for the selected date and service does not already exist, it will be created at this point (becoming visible in `RDLogEdit`). If the log already exists, it will be overwritten. (NOTE: if completed voicetracks exist in the old log, they will be deleted when the log is overwritten!)

When generating a log, `RDLogManager` will look for possible problems (such as scheduled carts that are missing in the Library) and generate an exception report if it finds any.

Once generated, the status lights in the `Generate Log` dialog indicate which (if any) additional import data are needed to complete the log. Two types of status light exist: `Available`, which indicates if the required

data file is available to RDLogManager, and Merged, indicating whether the data has been merged into the log as yet. Each light can show one of three different colors: GREEN, meaning "yes", RED, meaning "no" and WHITE, meaning "not required".



The Generate Log Dialog (music merge required)

For an example, see the figure above. This is showing a log that has been generated and has music data available but not yet merged. To perform the merge, touch the Merge Music button. The dialog now changes to that shown below, indicating that Music data has been merged but that traffic data is still needed.



The Generate Log Dialog (traffic merge required)

Once a log has reached this state – that of having any necessary music data merged – it can be voicetracked without having to wait for traffic data to become available. Traffic data can be merged at any time before, during or after the generation of voicetracks. The actual traffic merge is performed by touching the Merge Traffic button, resulting in a dialog as illustrated. (NOTE: the configuration of the various data file names and parser parameters needed for data import is done in the RDAdmin module and is covered in the Rivendell Technical and Administration Guide).

It is important to note that the sequence of operations from the example above is typical, but may vary depending upon how the system administrator has configured RDLogManager at each site. Some services, for example, will have no music data, only traffic, so the music indicator lights will be "whited out" accordingly.



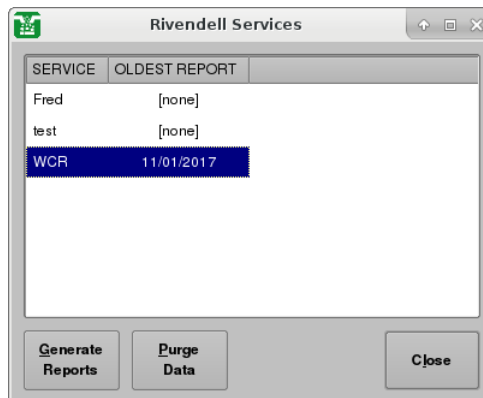
The Generate Log Dialog (fully merged)

## 8.6. Generating Reports

A Rivendell report is a data output that details whether certain events aired as scheduled, and under what circumstances. Reports are available in various formats. Some are intended to be directly read by humans, while others are intended for use by other, external software systems as a means of reconciling exported schedules.

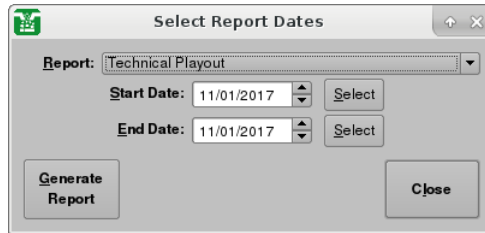
Rivendell has the ability to filter the data that go into any particular report on the basis of the type of material played (traffic spots, music or all), the playing service(s) and the originating host(s). The configuration of reports is done in the RDAdmin module and is covered in the Rivendell Technical and Administration Guide. Once configured however, reports are actually generated by the RDLogManager module.

To generate a report, touch the **Manage Reports** button on the RDLogManager Main Menu to open the **Select Service** dialog.



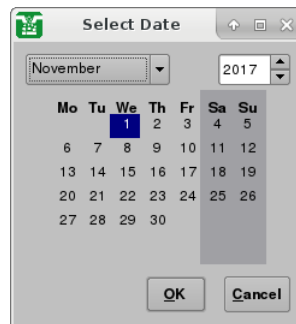
The Rivendell Services Dialog

The dialog will show each service on the system, along with the date of the oldest data available for generating reports. Touch the **Generate Reports** button to open the **Select Report Dates** dialog.



The Select Report Dates Dialog

The desired report can be selected with the Report control, and the start and end dates of the report specified with the Start Date and End Date controls, respectively (NOTE: not all reports are capable of being generated so as to span more than one day).



The Select Date Dialog

Once the parameters are set, touch the Generate Report button to write out the report.

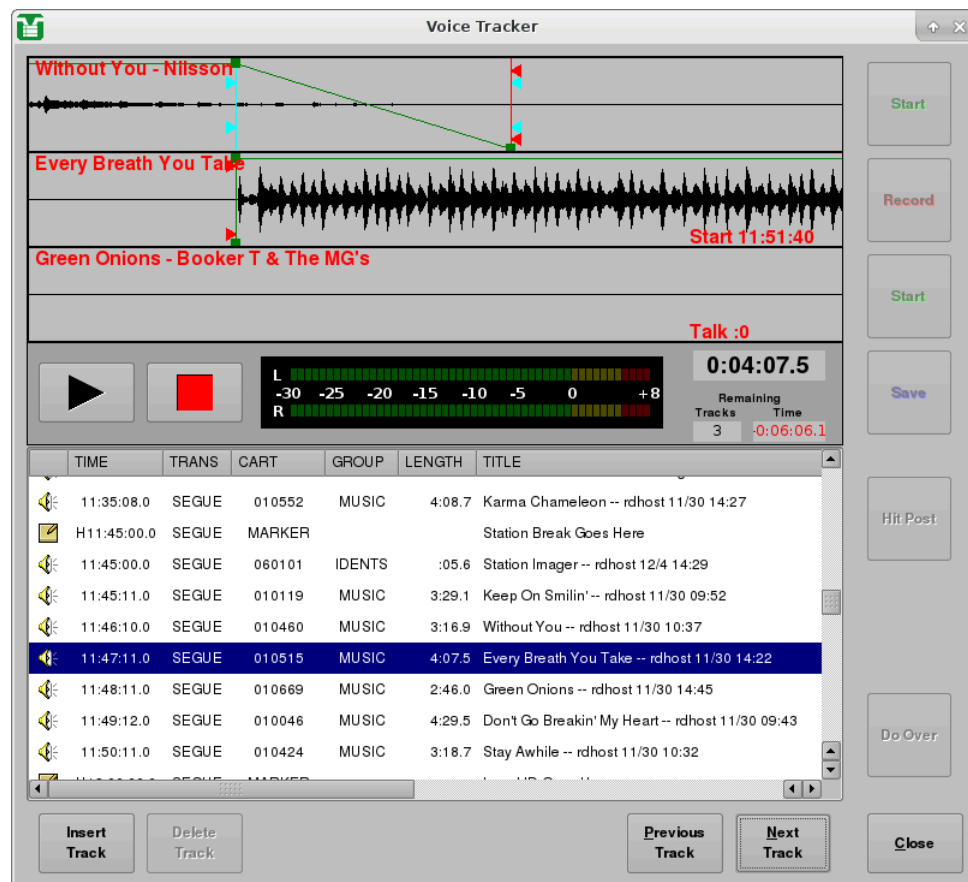
## 8.6.1. Purging Old Report Data

Rivendell keeps the raw data used to generate reports indefinitely, until manually purged out of the system. Periodic purging of old data is a good idea from the standpoint of minimizing the amount of system resources utilized, and can be done by selecting the desired service and then touching the Purge Data button in the Select Service dialog, opening up a calendar dialog. Each date that has data eligible for purging will be shown in bold. To purge a particular day, select it and then touch the Purge Data button. (NOTE: once purged, no reports can be generated for that particular service/date, so be sure that all required reports have been produced before purging!)

# Chapter 9. VoiceTracking

## 9.1. Voicetracking in Rivendell

Voicetracking is a capability wherein custom "one-off" content is created and inserted into logs, making it possible to create programming that sounds very spontaneous and "live". In Rivendell, such voicetracks are placed into a special type of audio cart known as a voicetrack cart. These carts are automatically created, deleted and managed by the voicetracker interface (part of the RDLogEdit module), with no manual user intervention required. The voicetracker module also includes extensive capabilities for allowing customization of the transitions between log elements.



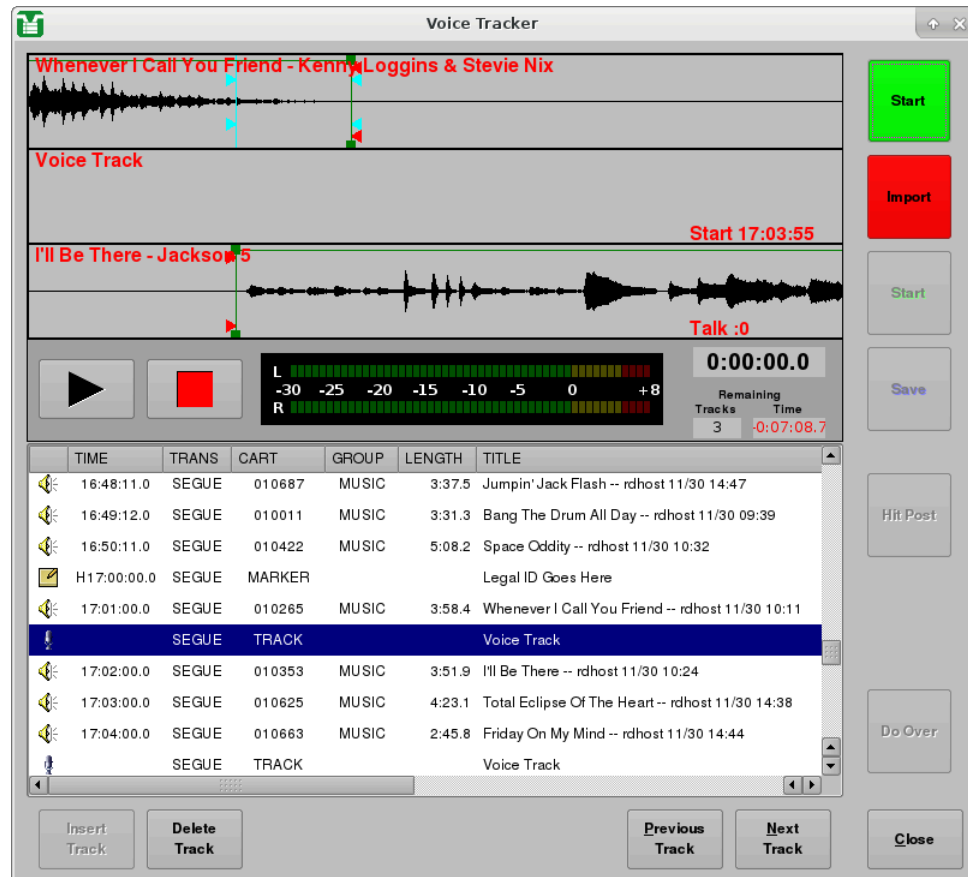
The Voice Tracker Dialog

### 9.1.1. Prerequisites

Before beginning voicetracking for a particular service, a voicetracker group and pool of available cart numbers must be configured in the RDAdmin module. These procedures are detailed in the Rivendell Technical and Administration Guide.

## 9.1.2. VoiceTrack Markers

A voicetrack marker is a meta event that can be inserted into a log as a "placeholder" to others to indicate where a voicetrack is to be recorded. Track markers can be inserted by RDLogEdit, RDLogManager events or even embedded in data generated by external schedulers.



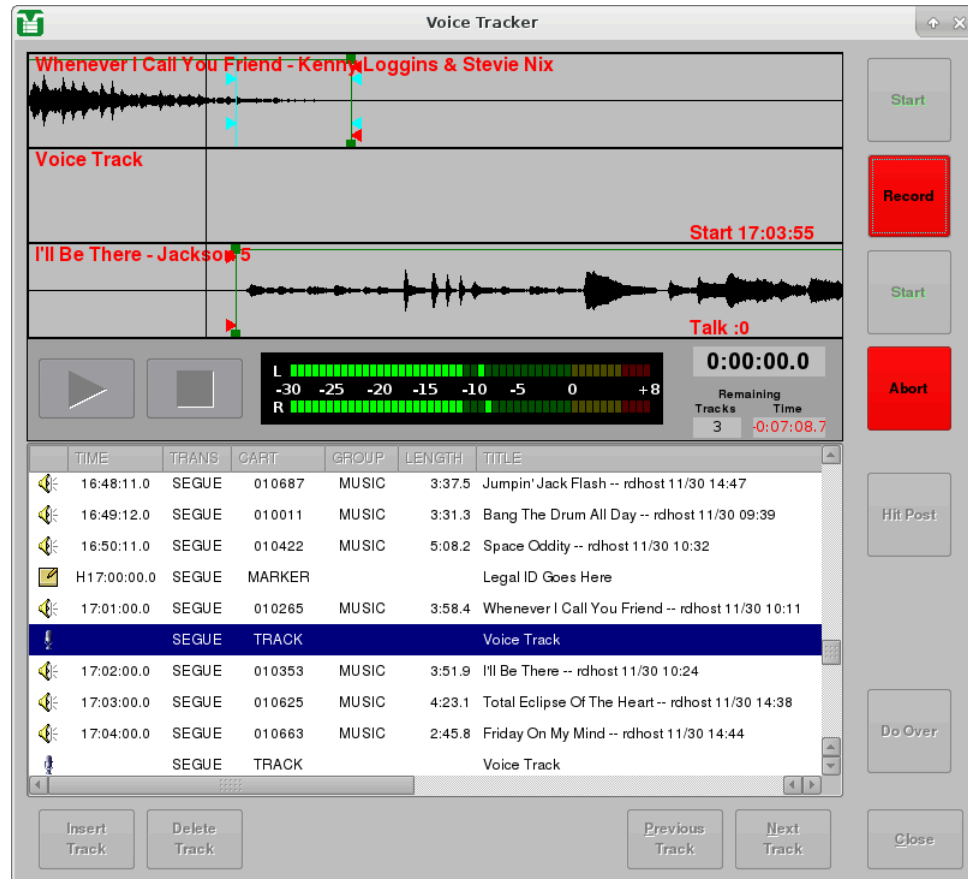
The Voice Tracker Dialog (track selected)

## 9.2. Using the Voicetrack Interface

### 9.2.1. The VoiceTracker Dialog

To voicetrack a log, start the RDLogEdit module, highlight the desired log and touch the VoiceTracker button, opening the VoiceTracker dialog. This dialog consists of three major parts: the waveform area, the log list and the control buttons.

The waveform area is in the upper center part of the dialog, and consists of four "panes". The upper three display waveform depictions while the fourth contains audition control buttons, an audio meter and various counters. Directly below this is the log list, showing a copy of the currently loaded log. The control buttons occupy the bottom and right-hand edges of the dialog.

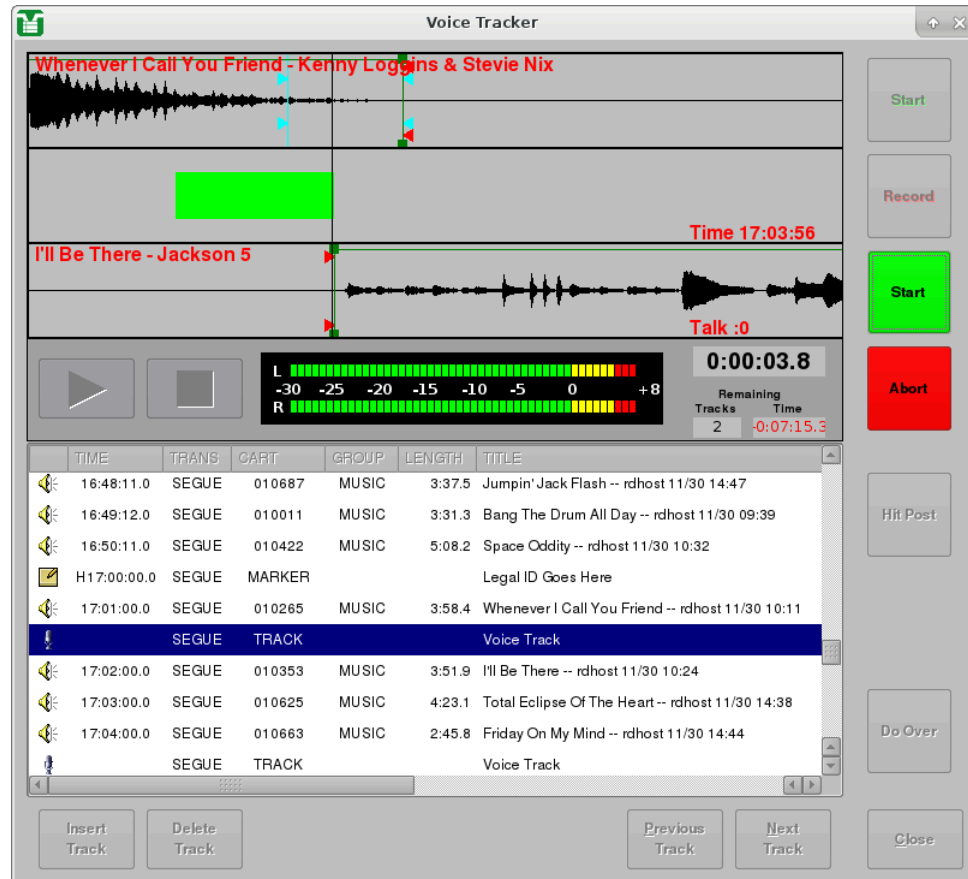


The Voice Tracker Dialog (1st track playing)

## 9.2.2. Editing Transitions

When an event is selected in the log list, a graphical depiction of the transition into that event is loaded into the waveform area. If the selected event and its prior event in the log is not a voicetrack or track marker, then the selected event will be displayed in the third pane of the waveform area and the previous event displayed in the first pane. If the selected event or its prior event is a voicetrack or track marker, then voicetrack or marker will be displayed in the second pane of the waveform area.

Once selected, a transition can be auditioned by touching the play button in the fourth pane of the waveform area. Play will start from the left-hand edge of the topmost waveform. This start location can be adjusted by dragging the topmost waveform to the left or right by means of the mouse or touchscreen. If the transition type of the selected event is SEGUE, it is also possible to adjust the degree of audio overlap by dragging the second or third waveform as well. It's possible to “undo” changes made in the segue overlap by right-clicking on the waveform and selecting **Undo Segue Changes** from the menu. To make the overlap permanent, touch the **Save** button. To restore the transition to its default state (calculated on the basis of segue markers from the Library) touch the **Do Over** button. The transition type can be changed by right-clicking on an event and selecting the desired transition type from the menu.



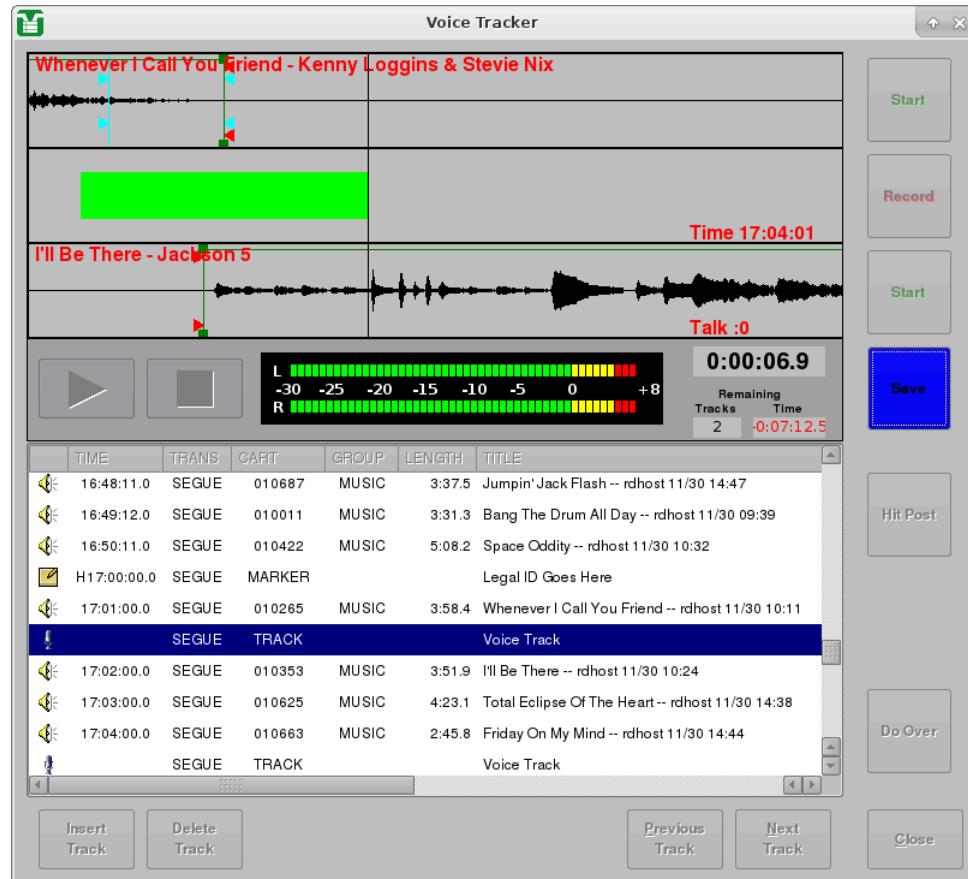
The Voice Tracker Dialog (recording)

### 9.2.3. Inserting and Deleting Track Markers

It is possible to insert a new voicetrack marker by selecting the desired location in the log list and touching the **Insert Track** button. An existing voicetrack marker can likewise be deleted by selecting it in the log list and touching the **Delete Track** button.

### 9.2.4. Moving Between Track Markers

It is possible to move directly to the next or previous voicetrack marker simply by touching the **Next Track** or **Previous Track** buttons, respectively.



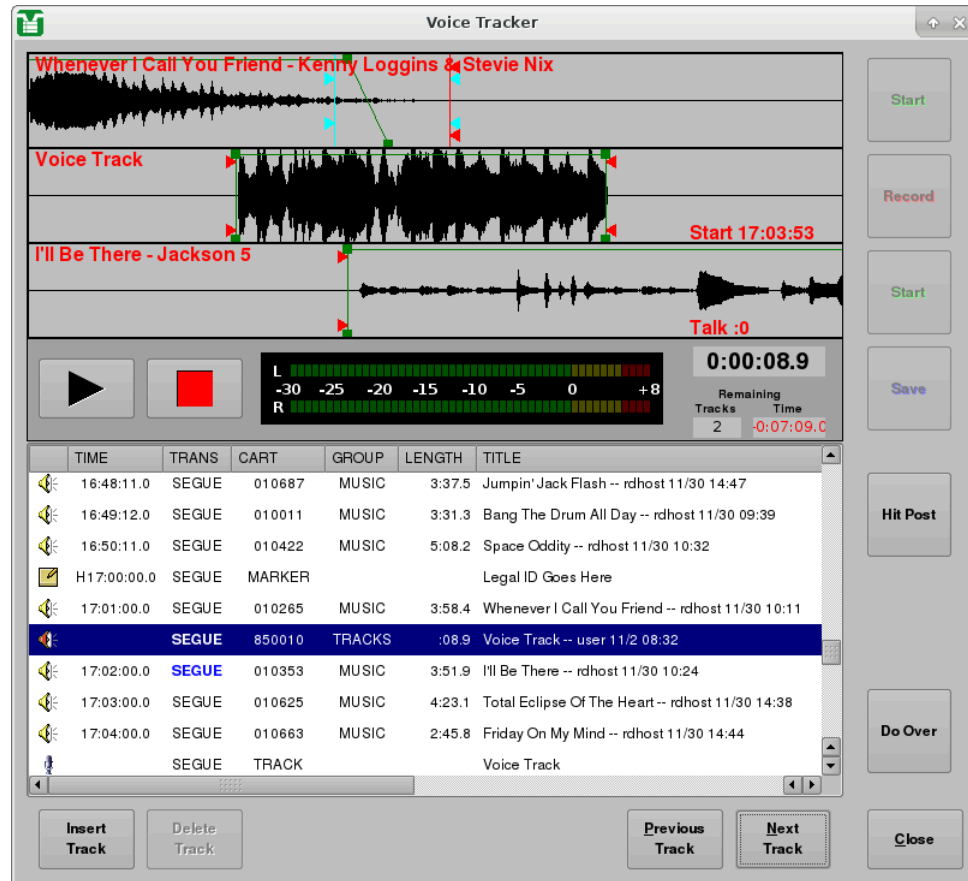
The Voice Tracker Dialog (2nd track playing)

## 9.2.5. Recording a Voicetrack

Once the desired voicetrack marker has been selected, the process of recording a voicetrack consists of four steps, each initiated by one of the four square control buttons in the upper right-hand corner of the dialog.

To begin, touch the topmost **Start** button. This will cause the audio in the topmost pane to begin playing, with a cursor to show playback position. To begin the actual recording, touch the **Record** button. To start the following event (in the third pane), touch the second **Start** button. Finally, to stop recording, touch the **Save** button. The record process can be canceled at any time by touching the **Abort** button, restoring the transition to its default state. It is also possible to undo a completed voicetrack by touching the **Do Over** button.

Once completed, the segue overlaps into and out of a voicetrack can be adjusted in the same manner as for simple transitions –i.e. by dragging the appropriate waveforms with the mouse.



The Voice Tracker Dialog (track completed)

## 9.2.6. Adjusting Transition Levels

It is possible to adjust the audio fade levels applied during transitions by means of rubber bands on the waveform displays. These are green lines with small square targets. To adjust a rubber band, use the mouse to grab one of the targets and drag it to the desired location.

## 9.2.7. Importing Voicetracks

In addition to recording in realtime, it's possible to import a voicetrack directly from an audio file. To do so, select the desired voicetrack marker and then touch the **Import** button to open the Import/Export Audio dialog. (For more information on using the Import/Export Audio dialog, see Section 3.1.0 Importing Audio from a File). Once imported, the voicetrack can be manipulated in the same manner as those that were directly recorded.

## 9.2.8. Hitting the Post

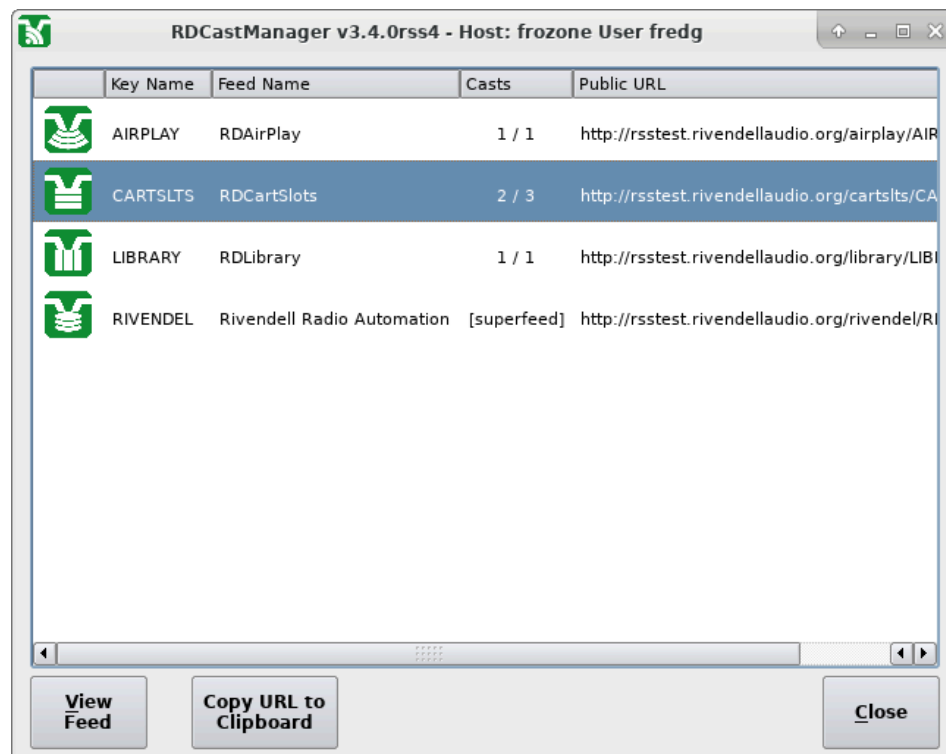
If the event following a voicetrack has its Talk Time markers set, it is possible to set the transition so that the end of the voicetrack automatically aligns with the end of the Talk Time (commonly referred to as hitting the post). To do this, simply touch the **Hit Post** button.

---

# Chapter 10. Managing Podcasts with RDCastManager

## 10.1. Overview

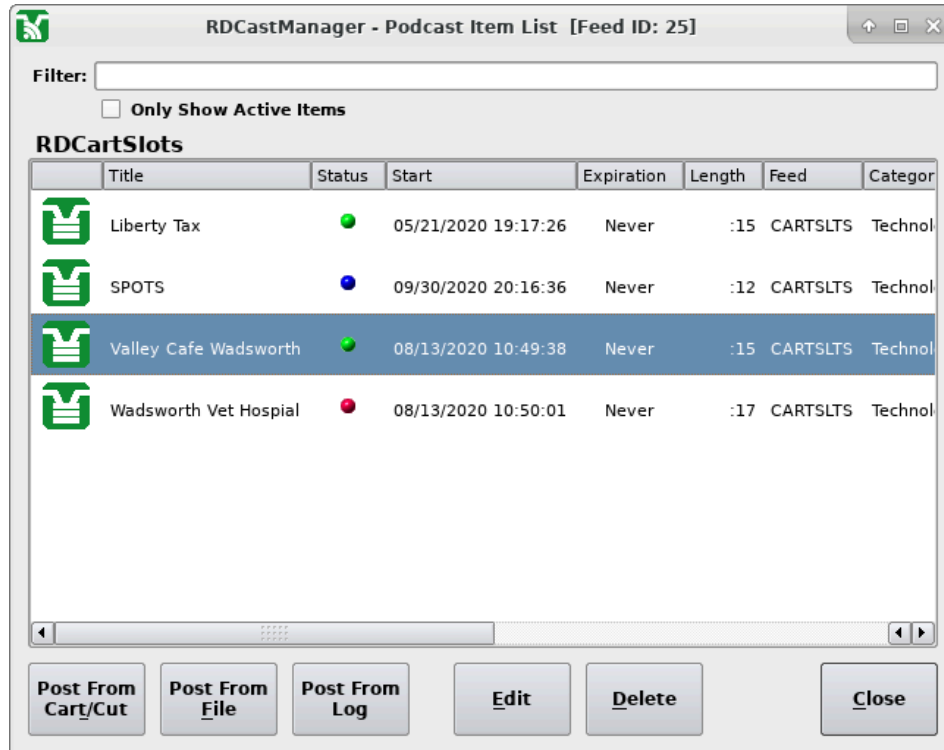
RDCastManager is a Rivendell module designed for posting items and managing item metadata for audio podcasts managed by Rivendell.



The RDCastManager Main Window

When started, RDCastManager will display the list of available podcast feeds for the currently logged in user. Each line begins with an icon, showing the assigned channel image for the repective feed.

To see the list of items posted to a particular feed, select the desired feed on the list and then touch the View Feed button to open the Podcast Item List dialog.



The Podcast Item List Dialog

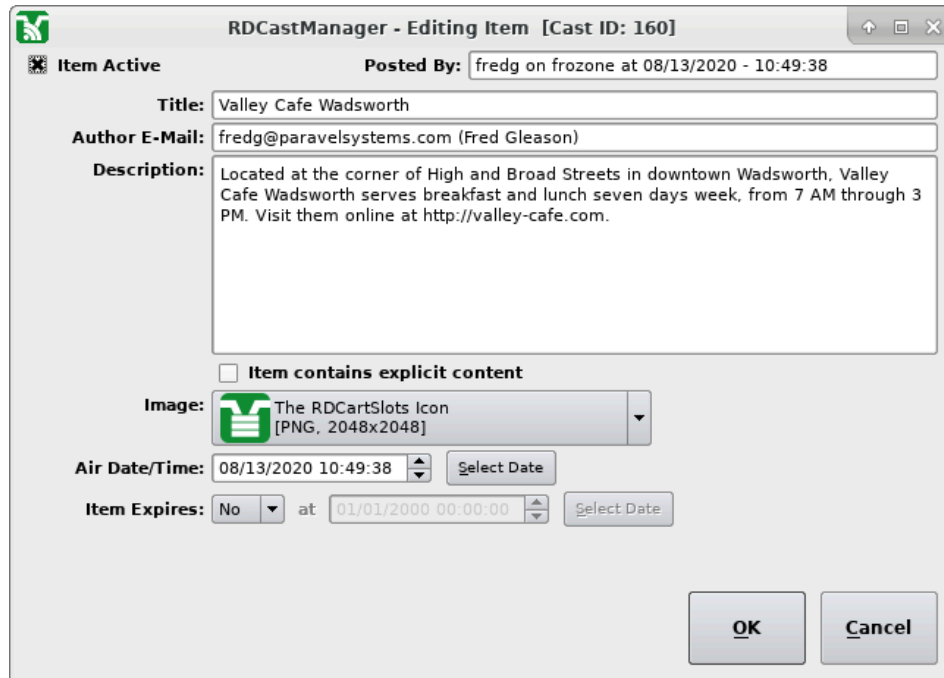
Each posted item has a *status*, indicated by the color of the icon in the *Status* column.

**Table 10.1. RDCastManager Item States**

Status	Meaning
●	Item is active and visible to the audience.
●	Item is inactive and not visible to the audience.
●	Item is active, but currently embargoed and not visible to the audience.

## 10.2. Editing an Item's Metadata

To view (and possibly modify) an item's metadata, select the item on the list and then touch the **Edit** button to open the **Editing Item** dialog.



The Editing Item Dialog

The following controls are available:

Item Active	When ticked, this makes the item visible to the audience (but see Air Date/Time below).  Unticking this is a good way to put an item "on hold" without permanently deleting it from the feed.
Posted By	This is a "read-only" field that provides details on the provenance of the item.
Title	The title of the item.
Author E-Mail	The e-mail address (and optionally, full name) of the author/originator of the item.
Description	Text describing the content of the item.  The accompanying Item contains explicit content checkbox should be ticked if the item contains content that may not be suitable for under-age listeners.
Image	The icon that will associated with this item when viewed by the audience.
Air Date/Time	The date/time that the item was/will be published. If this is set to a value in the future, the item will be <i>embargoed</i> --i.e. hidden from the audience-- until this date/time.
Expires	If this dropdown is set to <b>Yes</b> , then the item will be automatically deleted from the feed at the specified date/time. If set to <b>No</b> , the item will never be deleted automatically.

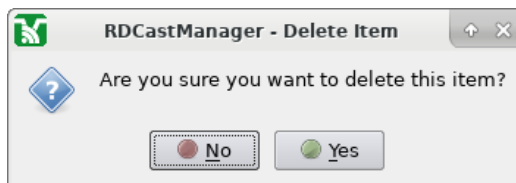
## Warning

Deleting an item cannot be undone!

To save any changes made to the item's metadata and close the dialog touch the OK. To close the dialog while abandoning any pending changes, touch Cancel.

## 10.3. Deleting an Item

To delete an item and permanently remove it from the feed, select the desired item and touch the Delete button. The system will prompt for confirmation:



The Delete Item Dialog

then touch the Yes button to complete the operation.

### Warning

Deletion of an item is permanent; it cannot be undone!

### Note

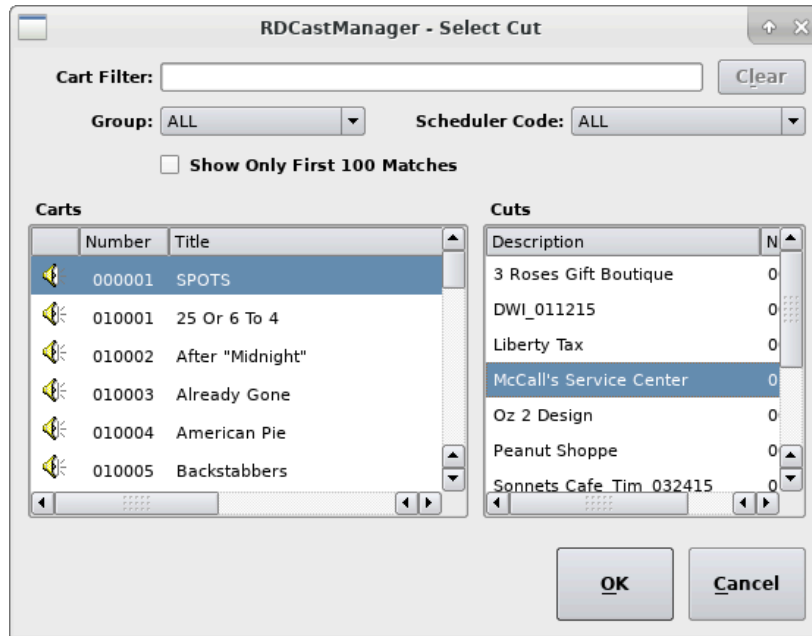
If it is desired to temporarily hide an item, simply untick the Item Active checkbox in the item's Editing Item dialog.

## 10.4. Posting: Creating a New Item

"Posting" is the action by which a new item is added to a podcast feed. RDCastManager is capable of posting to a feed from three different sources: a Rivendell cart/cut, a Rivendell log, and directly from an audio file.

### 10.4.1. Posting from a Rivendell Cart/Cut

To post the contents of a Rivendell cart/cut, touch the Post from Cart/Cut button to open the Select Cut dialog:

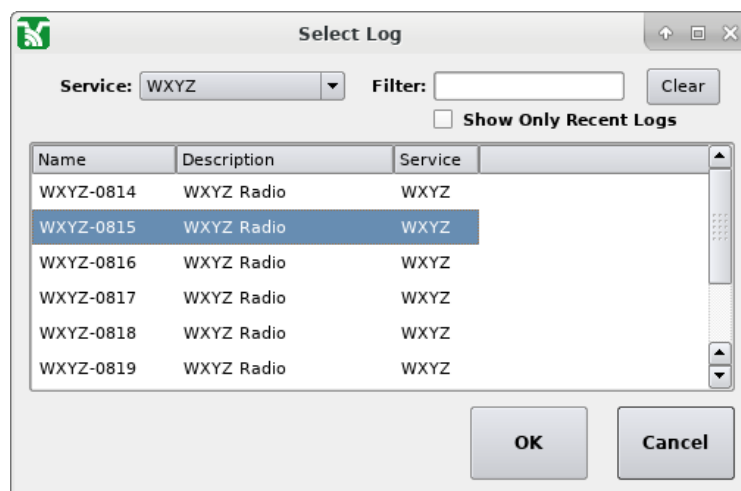


The Select Cut Dialog

Select the desired cart/cut, then touch the OK button. RDCastManager will upload the audio and then open the `Editing Item` dialog to allow the new item's metadata to be set.

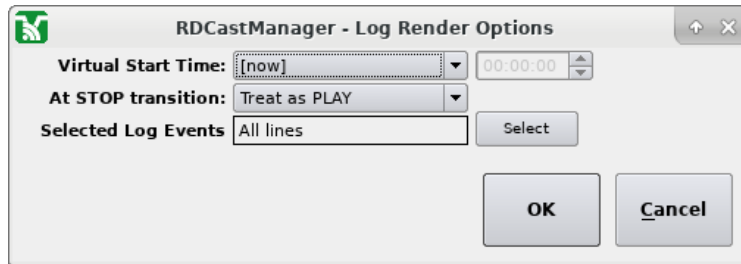
## 10.4.2. Posting from a Rivendell Log

To post one or more events from a Rivendell log, touch the `Post from Log` button to open the `Select Log` dialog:



The Select Log Dialog

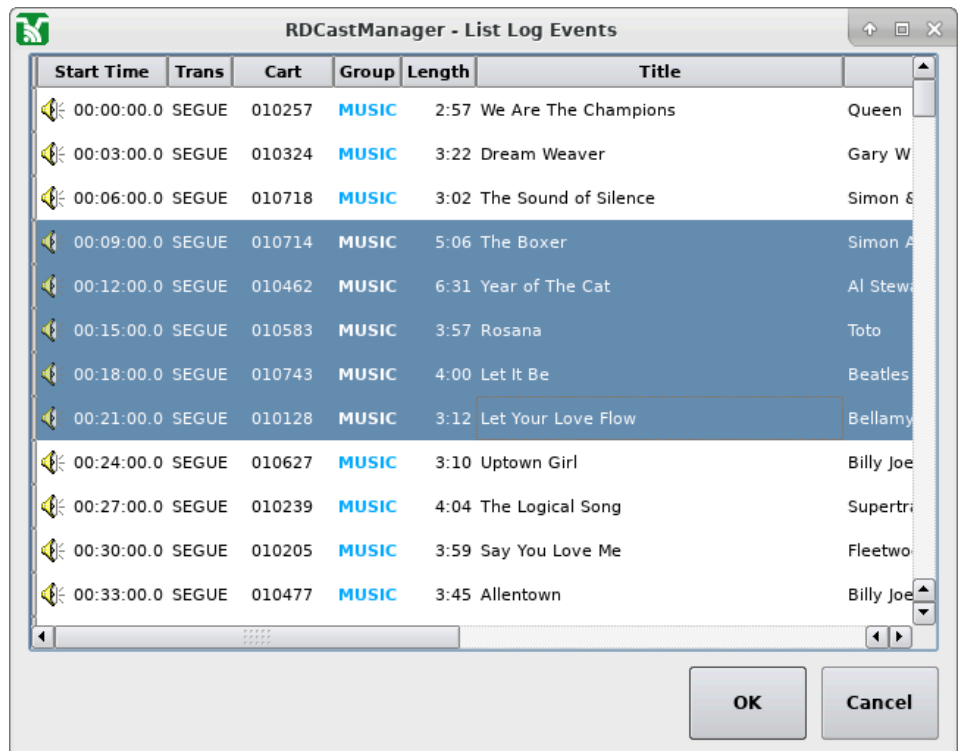
Select the log to post, then touch the OK button to bring up the `Log Render Options` dialog:



The Select Log Dialog

The following controls are available in this dialog:

- Virtual Start Time** Set the virtual start time to be used when rendering the log. This can be useful for simulating a "real" log play-out so that dayparting of cuts works as expected. By default, the wall time when the OK is touched will be used.
- At STOP transition** Set the action to take during log rendering if a STOP transition is encountered. If `Treat as PLAY` (the default) is selected, rendering will continue as if a PLAY transition were found. If `Stop Rendering` is selected, rendering of the log will be terminated at that point.
- Selected Log Events** By default, all of the events in the log will be rendered (subject to possible truncation by a STOP transition as specified by the setting of `At STOP Transition`). To select a subset of events to be rendered, touch the `Select` button bring up the `List Log` dialog:



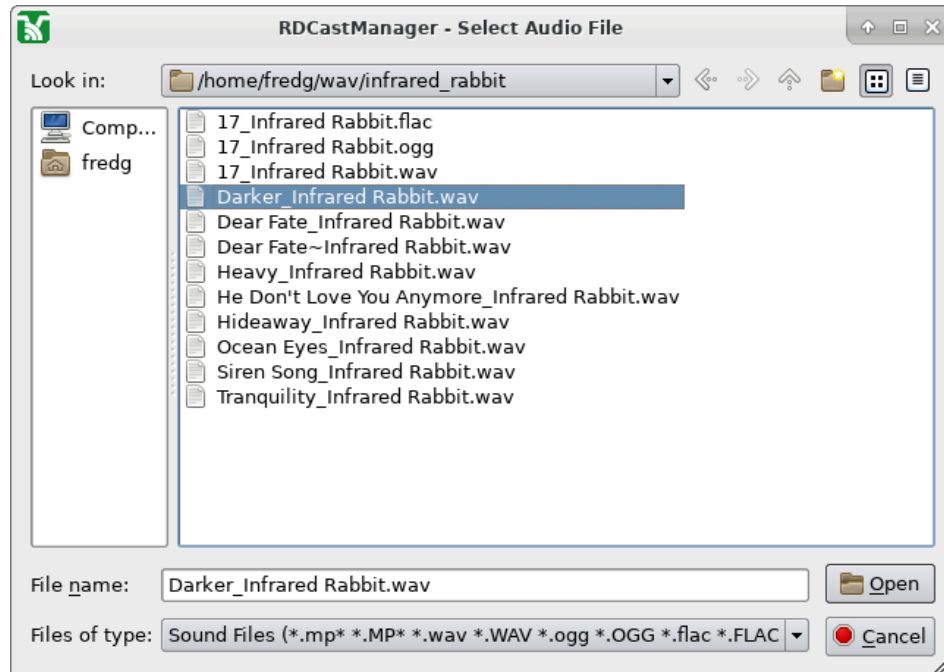
The List Log Events Dialog

Select the events to be rendered and then touch the OK button to return to the Log Render Options dialog.

After the desired rendering options set, touch the OK button. RDCastManager will upload the audio and then open the Editing Item dialog to allow the new item's metadata to be set.

### 10.4.3. Posting an Audio File

To post the contents of an audio file, touch the Post from File button to bring up the Select Audio File dialog.



The Select Audio File Dialog

Select the file to be posted and then touch the OK button. RDCastManager will upload the audio and then open the Editing Item dialog to allow the new item's metadata to be set.

---

# Chapter 11. Webget

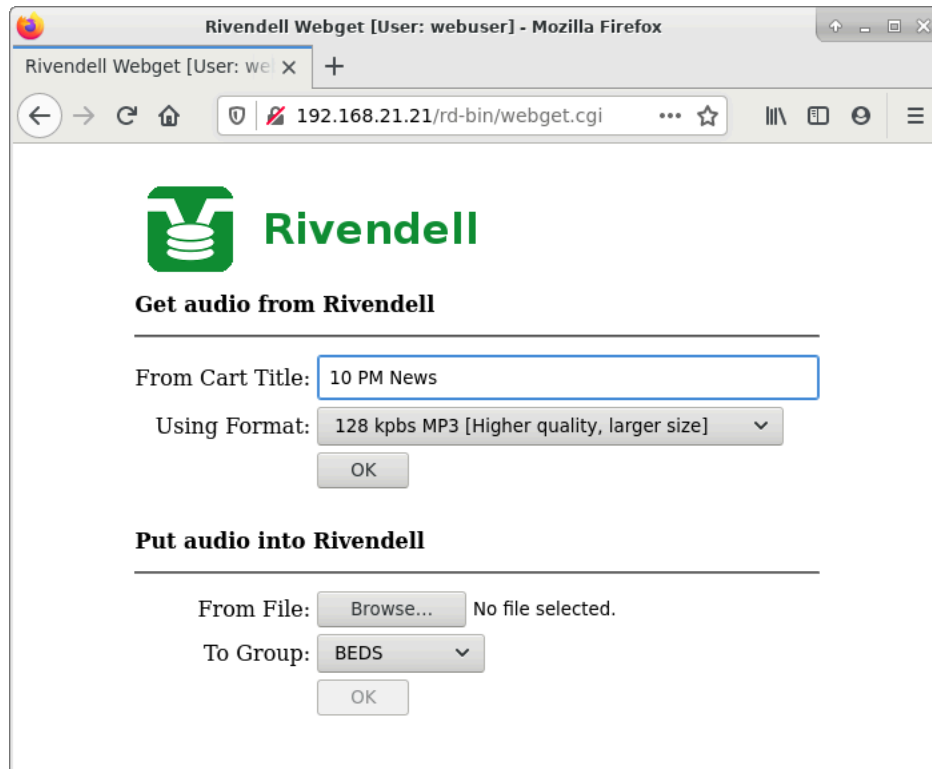
## 11.1. Webget

Webget is a web-based utility for up- and down-loading Rivendell audio content to and from remote locations. It can be accessed at **http://*host-name*/rd-bin/webget.cgi**, where *host-name* is the host name or IP address of the Rivendell system.

### Note

Depending on the site-specific configuration of Rivendell, Webget may need to be accessed at **https://*host-name*/rd-bin/webget.cgi**.

After entering a set of valid credentials, the user will be taken to the main Webget screen:



The Webget screen

### Note

To configure Webget, see the Configuring Webget section in Configuring Rivendell with RAdmin.

### 11.1.1. Downloading Audio

Content can be downloaded using Webget by entering the Title of the desired Cart in the From Cart Title field, with the format of the downloaded audio selected by means of the Using Format dropdown. Touch the OK button to initiate the download.

**Note**

If multiple carts with the specified title exist, then the cart with the lowest Cart Number will be used.

**Note**

If the selected cart contains multiple cuts, then the cut with the lowest Cut Number will be used.

## 11.1.2. Uploading Audio

Content can be uploaded using Webget by selecting the desired audio file with the From File browser button, selecting the destination Rivendell Group from the To Group dropdown and then touching the OK button.

After the upload is complete, Webget will display a dialog with the Cart Number and Title containing the uploaded audio.

---

## **Part II. Rivendell Administration**

---

---

## Table of Contents

12. Configuring Rivendell with RAdmin .....	86
12.1. Overview .....	86
12.2. Managing Users .....	86
12.3. Managing Groups .....	89
12.3.1. Editing Group Information .....	89
12.3.2. Renaming Groups .....	90
12.3.3. Group Report .....	91
12.4. Managing Services .....	91
12.4.1. The General Section .....	92
12.4.2. Traffic/Music Data Importation Settings .....	95
12.4.3. Traffic/Music Import Parser Settings .....	96
12.4.4. Testing Data Importation .....	97
12.5. Managing Hosts .....	97
12.5.1. Configuring RDLibrary .....	100
12.5.2. Configuring RDCatch .....	102
12.5.3. Configuring RDAirPlay .....	104
12.5.4. Configuring RDPanel .....	109
12.5.5. Configuring RDLogEdit .....	110
12.5.6. Configuring RDCartSlots .....	111
12.5.7. Configuring Dropboxes .....	112
12.5.8. Configuring Switcher/GPIO Devices .....	115
12.5.9. Configuring Host Variables .....	119
12.5.10. Configuring Audio Ports .....	120
12.5.11. Configuring Serial Ports .....	121
12.5.12. Viewing Audio Resources .....	122
12.5.13. JACK Integration .....	122
12.5.14. Managing PyPAD Instances .....	123
12.6. Managing System Settings .....	126
12.7. Managing Scheduler Codes .....	128
12.8. Managing Replicators .....	129
12.9. Configuring Webget .....	130
12.9.1. Disallowing Duplicate Cart Titles .....	131
12.9.2. Configuring Encoder Formats .....	131
12.9.3. Configuring Webget Users .....	131
13. Managing the Rivendell Database with RDDbConfig .....	133
13.1. Overview .....	133
13.2. Creating a New Database .....	133
13.3. Backing Up the Database .....	134
13.4. Restoring the Database from a Backup .....	134
14. Rivendell Macro Languauge .....	135
14.1. Overview .....	135
14.2. Protocol .....	135
14.3. Command Delivery .....	135
14.4. Command Reply .....	135
14.5. Specifying Color .....	135
14.6. Binary Data .....	136
14.7. Log Machines .....	136
14.8. Commands .....	136
14.8.1. Air Gate [AG] .....	136
14.8.2. Append Log [AL] .....	136
14.8.3. Binary Serial Out [BO] .....	137

14.8.4. Clear Serial Trap [SC] .....	137
14.8.5. Command Send [CC] .....	137
14.8.6. Connect Jack Ports [JC] .....	137
14.8.7. Console Label [CL] .....	138
14.8.8. Copy Cut [CP] .....	138
14.8.9. Cut Event [CE] .....	138
14.8.10. Disconnect Jack Ports [JD] .....	138
14.8.11. Disconnect All Jack Ports [JZ] .....	139
14.8.12. Duck Panel Button [PD] .....	139
14.8.13. Execute Breakaway [DX] .....	139
14.8.14. Execute Cart [EX] .....	139
14.8.15. Fire Salvo [FS] .....	140
14.8.16. GPI Enable [GE] .....	140
14.8.17. GPI Enable [GE] (old format, deprecated) .....	140
14.8.18. GPI Set [GI] .....	140
14.8.19. GPI Set [GI] (old format, deprecated) .....	141
14.8.20. GPO Set [GO] .....	141
14.8.21. GPO Set [GO] (old format, deprecated) .....	141
14.8.22. Insert Cart [PX] .....	141
14.8.23. Insert Serial Trap [SI] .....	142
14.8.24. Label Panel [PC] .....	142
14.8.25. Load Log [LL] .....	142
14.8.26. Load Panel [PE] .....	142
14.8.27. Load Slot [DL] .....	143
14.8.28. Login [LO] .....	143
14.8.29. Macro Timer [MT] .....	143
14.8.30. Make Next [MN] .....	143
14.8.31. Message Box [MB] .....	144
14.8.32. No Operation [NN] .....	144
14.8.33. Pause Panel [PU] .....	144
14.8.34. Play Panel [PP] .....	145
14.8.35. Play Slot [DP] .....	145
14.8.36. Refresh Log [RL] .....	145
14.8.37. Run Shell Command [RN] .....	145
14.8.38. Select Widget [PW] .....	146
14.8.39. Serial Out [SO] .....	146
14.8.40. Serial Reload [SY] .....	146
14.8.41. Set Color Label [LC] .....	146
14.8.42. Set Default Now & Next Cart [SN] .....	147
14.8.43. Set Display [SD] .....	147
14.8.44. Set Duck Level [MD] .....	148
14.8.45. Set Label [LB] .....	148
14.8.46. Set Mode [PM] .....	148
14.8.47. Sleep [SP] .....	148
14.8.48. Start [PL] .....	149
14.8.49. Start Button [PB] .....	149
14.8.50. Start Next [PN] .....	149
14.8.51. Start Record Deck [RS] .....	149
14.8.52. Stop [PS] .....	150
14.8.53. Stop Panel [PT] .....	150
14.8.54. Stop Record Deck [RR] .....	150
14.8.55. Stop Slot [DS] .....	150
14.8.56. Switch Add [SA] .....	151
14.8.57. Switch Add With Gain [SG] .....	151

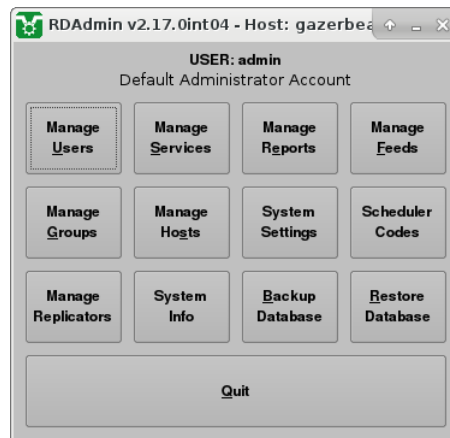
14.8.58. Switch Crosspoint Gain [SX] .....	151
14.8.59. Switch Level [SL] .....	151
14.8.60. Switch Reload [SZ] .....	151
14.8.61. Switch Remove [SR] .....	152
14.8.62. Switch Take [ST] .....	152
14.8.63. Toggle On Air Flag [TA] .....	152
14.8.64. UDP Out [UO] .....	152
15. Program Associated Data .....	154
15.1. Overview .....	154
15.1.1. The JSON Interface .....	154
15.1.2. PyPAD .....	155
16. Interfacing with the Linux Ecosystem: Command-Line Utilities .....	157
16.1. rdclilogedit(1) .....	157
16.2. rdconvert(1) .....	157
16.3. rddbcheck(8) .....	157
16.4. rdexport(1) .....	157
16.5. rdimport(1) .....	157
16.6. rdmarkerset(8) .....	158
16.7. rdrevert(8) .....	158
16.8. rmlsend(1) .....	158

---

# Chapter 12. Configuring Rivendell with RAdmin

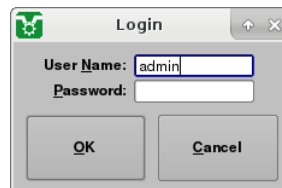
## 12.1. Overview

RAdmin is the Rivendell module designed for the comprehensive configuration of the Rivendell system.



The RAdmin Main Window

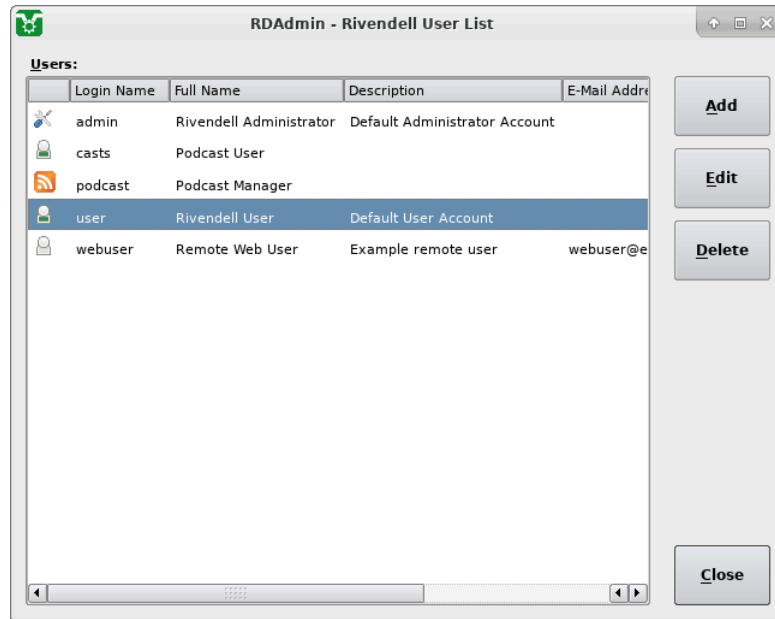
When starting up RAdmin, you will be prompted to login in. For a freshly created Rivendell database, the default login parameters are a User Name : of **admin** with no Password :.



The Login Dialog

## 12.2. Managing Users

To manage users in RAdmin, touch the Manage Users to open the Rivendell User List dialog.



The Rivendell User List Dialog

Two different types of user exist within Rivendell: *administrator* users (those which have the `Administer System` right set), who are allowed to log into RDAdmin, and *operational* users, who are configured to have rights to operate specific portions of the Rivendell system but do not have access to RDAdmin. It is not possible for a single user to act in both roles.

A newly created Rivendell database will have one user of each type populated automatically, called "admin" and "user" respectively. To see the attributes of an existing user, select its entry on the `Users` list and touch the `Edit` button to open the User Dialog.

The Rivendell User Dialog

The upper third of the dialog provides fields for basic information regarding the user as well as authentication settings. If the `Authenticate This User Locally` box is ticked, then the login password for this user can be set by touching the `Change Password` button. If unticked, then authentication is delegated to the Pluggable Authentication Module (PAM) specified in the `PAM Service:` field.

The `WebAPI Timeout:` field sets the timeout (in seconds) when connecting to Rivendell's WebAPI component, while the `Allow Web Logins` box, if ticked, permits this user to use the web component of RDCastManager.

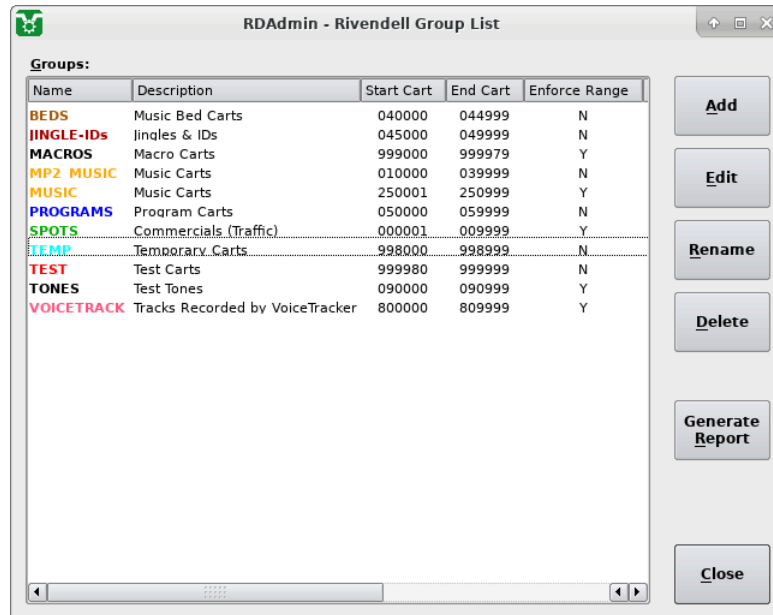
The middle section of the dialog is where individual user rights are assigned for this user. The `Administer System` box, if ticked, will make this user an administrative user while disallowing the selection of any other rights. The other listed rights should be self-explanatory.

The bottom of the dialog contains three large buttons. The `Assign Group Permissions` button allows assignment of the specific groups which this user will be allowed to access in RDLibrary, the `Service Permissions` allows assignment of the services which this user will be allowed to access in RDLogEdit and the `Assign Podcast Feed Permissions` allows the assignment of the podcast feeds which this user will be allowed to manage in RDCastManager.

Touch the `OK` button to commit any changes made, or `Cancel` to abandon them.

## 12.3. Managing Groups

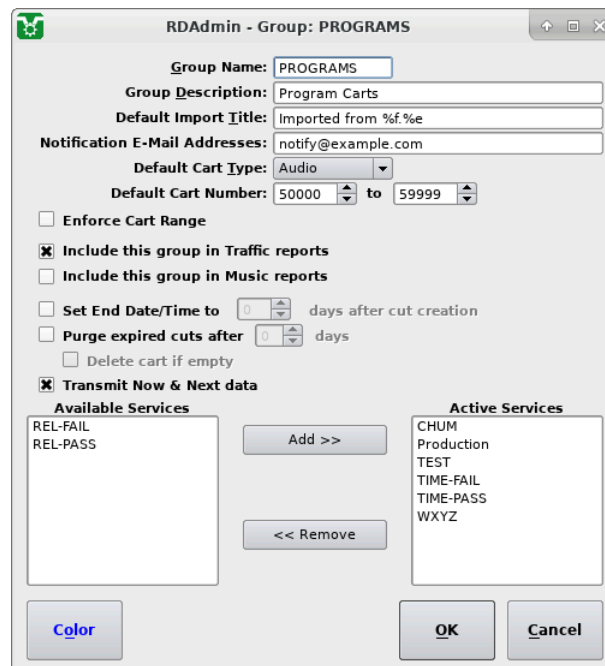
To manage groups in RAdmin, touch the Manage Groups button to open the Rivendell Group List dialog.



The Rivendell Group List Dialog

### 12.3.1. Editing Group Information

To examine and modify an existing group, touch its entry in the Groups list and then touch the Edit button to open the Group Dialog.



## The Rivendell Group Dialog

The `Default Import Title` is the title string that will be assigned to carts created by dropboxes or **rdimport(1)** when no file-specific title metadata is found. This field recognizes the following wildcards:

**Table 12.1. Default Import Title Wildcards**

%f	Body part of the filename
%e	Extension part of the filename

The `Notification E-Mail Addresses` is the e-mail address(es) to use when generating import reports with dropboxes or with the **rdimport(1)** command-line tool. Multiple e-mail address can be used by separating each address with a comma.

The `Default Cart Type`: controls which type of cart (Audio or Macro RDLibrary) will default to when creating a new cart in this group.

The `Default Cart Number`: fields define a range of cart numbers to use by default for this group --i.e. by RDLibrary or **rdimport(1)**. If the `Enforce Cart Range` box is ticked, Rivendell will not permit carts to be created in or moved to this group whose cart number does not fall within this range.

If the `Include this group in Traffic reports` or `Include this group in Music reports` box is ticked, play-outs of carts belonging to this group in a log will be included in traffic or music reports, respectively.

If this `Set End Date/Time` box is ticked, then new cuts that belong to this group will have their end date/time automatically set to the specified number of days after the date of creation.

If the `Purge expired cuts` box is ticked, then cuts in the group will be purged --i.e. deleted -- the specified number of days after they expire. If `Delete cart if empty` is also ticked, then the cart containing the deleted cut will also be deleted if it contains no other cuts.

If the `Transmit Now ' Next` box is ticked, then carts in this group will generate an RLM event when played in a log.

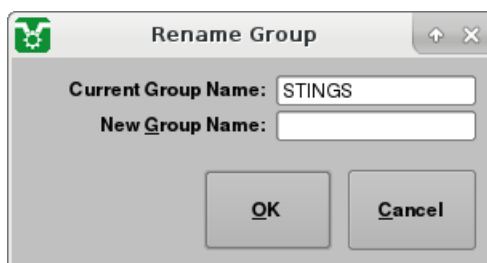
Carts in this group will be allowed to play only on those services that are shown in the `Active Services` list.

To set a color for the group (used when the group name is displayed elsewhere in Rivendell, touch the `Color` button.

Touch the `OK` button to commit any changes made, or `Cancel` to abandon them.

## 12.3.2. Renaming Groups

A group can be renamed by touching the `Rename` button. If the `New Group Name`: given already exists, then the carts in this group will be moved into that group.



The Rename Group Dialog

### 12.3.3. Group Report

A printable report listing the defined groups and their attributes can be generated by touching the `Generate Report` button.

## 12.4. Managing Services

To manage services in RDAdmin, touch the `Manage Services` button to open the Rivendell Services dialog.



The Rivendell Services Dialog

To examine and modify an existing service, touch its entry in the `Services` list and then touch the `Edit` button to open the `Edit Service` Dialog.

**RDAdmin - Edit Service**

**General**

Service Name: WXYZ  
 Service Description: Radio Station WXYZ  
 Program Code: WXYZ  
 Log Name Template: WXYZ-%m%d  
 Log Description Template: WXYZ log for %d/%m/%Y  
 Inline Event Start/Length: From Scheduler File  
 Voicetrack Group: VOICETRACK  
 AutoSpot Group: [none]  
☒ Insert CHAIN TO at log end ☐ Enable AutoRefresh By Default

**Traffic Data Import**

Import Path: e/fredg/rivendell-reftest/imports/spots.tfc  
 Preimport Command:  
 Insert Marker String: MARKER  
 Insert Voice Track String: TRACK  
 Import Template: Rivendell Standard Import  
 Cart Number: Offset: 10 Length: 6  
 Title: Offset: 25 Length: 34  
 Start Time - Hours: Offset: 0 Length: 2  
 Start Time - Minutes: Offset: 3 Length: 2  
 Start Time - Seconds: Offset: 6 Length: 2  
 Length - Hours: Offset: 60 Length: 2  
 Length - Minutes: Offset: 63 Length: 2  
 Length - Seconds: Offset: 66 Length: 2  
 Globally Unique ID: Offset: 69 Length: 32  
 Event ID: Offset: 0 Length: 0  
 Annc. Type: Offset: 0 Length: 0

**Music Data Import**

Import Path: edg/rivendell-reftest/imports/absolute.tfc  
 Preimport Command:  
 Insert Marker String: MARKER  
 Insert Voice Track String: TRACK  
 Insert Traffic Break String: BREAK  
 Import Template: Rivendell Standard Import  
 Cart Number: Offset: 10 Length: 6  
 Title: Offset: 25 Length: 34  
 Start Time - Hours: Offset: 0 Length: 2  
 Start Time - Minutes: Offset: 3 Length: 2  
 Start Time - Seconds: Offset: 6 Length: 2  
 Length - Hours: Offset: 60 Length: 2  
 Length - Minutes: Offset: 63 Length: 2  
 Length - Seconds: Offset: 66 Length: 2  
 Globally Unique ID: Offset: 69 Length: 32  
 Event ID: Offset: 0 Length: 0  
 Annc. Type: Offset: 0 Length: 0

**Buttons:** Configure Autofill Carts, Enable Hosts, Set Logs to auto-delete, Purge ELR Data, Include Import Markers in Finished Logs, Test Traffic, Copy To Custom, Test Music, Copy To Custom, OK, Cancel

The Edit Service Dialog

## 12.4.1. The General Section

**General**

Service Name: WXYZ  
 Service Description: Radio Station WXYZ  
 Program Code: WXYZ  
 Log Name Template: WXYZ-%m%d  
 Log Description Template: WXYZ log for %d/%m/%Y  
 Inline Event Start/Length: From Scheduler File  
 Voicetrack Group: VOICETRACK  
 AutoSpot Group: [none]  
☒ Insert CHAIN TO at log end ☐ Enable AutoRefresh By Default

The General Section

The **Service Name** field contains the name of the service (read-only). This value is available in filepath wildcards as **%s**.

The **Service Description** field is for a free-form string that describes the service.

The **Program Code** is a string that is sent to PyPAD scripts as part of every Now & Next update.

The **Log Name Template** field is a string that defines how logs will be named when generated by RDLogManager. This field can take filepath wildcards.

The `Log Description Template` field is a string that defines how the `Description` for each log will be formatted for logs generated by `RDLogManager`. This field can take `filepath` wildcards.

The `Inline Event Start/Length` dropdown selects how the `Start Time` and `Length` will be calculated when inserting `Inline Events`. See the section on `Inline Event Scheduling Parameters` for details.

The `Voicetrack Group` dropdown specifies the Rivendell group to be used for storing voicetracks for this service.

The `AutoSpot Group` dropdown specifies the Rivendell group to be used for storing carts used for the `AutoSpot` functionality.

The `Insert CHAIN TO at log end`, if ticked, will cause a `CHAIN-TO` event to the following day's log to be appended to the log when generated by `RDLogManager`.

The `Enable AutoRefresh By Default` box, if ticked, will cause the log's `Enable AutoRefresh` attribute to be set to `Yes` when generated by `RDLogManager`.

The `Purge Logs after` box, if ticked, will set the deletion date for logs to be the specified number of days after being created by `RDLogManager`.

The `Purge ELR Data after` box, if ticked, will cause `Electronic Log Reconciliation (ELR)` as-played data to be purged from the database the specified number of days after being generated.

The `Include Import Markers in Finished Logs` box, if ticked, will cause markers to indicate the base location of imported `Music` and `Traffic` events to be retained even after such events have been imported. Some users find these markers distracting, so their retention can be disabled by clearing this check box.

### Warning

If import markers are not included in finished logs, then it will not be possible re-import music or traffic data into those logs.

## 12.4.1.1. Inline Event Scheduling Parameters

When inserting an `Inline Event` (such as a `Marker`, `Voice Track` or `Traffic Break`), the `Start Time` and `Length` used will be calculated on the basis of the `Inline Event Start/Length` setting, as follows:

From Scheduler File	When this mode is specified, all inline events must be formatted as if they were a regular element of the schedule, with <code>Start Time</code> and <code>Length</code> values explicitly given and the string specified by the <code>Insert Marker String</code> , <code>Insert Voice Track String</code> or <code>Insert Traffic Break String</code> field values aligned as if it was a cart number. <code>Inline Traffic Breaks</code> will generate <code>Traffic Links</code> with <code>Start Time/Length</code> values that correspond to those specified on the respective line of the imported file.
---------------------	---

From Relative Position	When this mode is specified, the string specified by the <code>Insert Marker String</code> , <code>Insert Voice Track String</code> or <code>Insert Traffic Break String</code> must occur somewhere on the line in the schedule file. The correct placement, <code>Start Time</code> and <code>Length</code> of each inline event will be determined heuristically, with <code>Inline Traffic Breaks</code> generating <code>Traffic Links</code> with <code>Start Time/Length</code> values taken from that of the parent <code>Music Event</code> .
------------------------	--

N.B. This means that only one `Inline Event` of each type may be placed within the same parent `Music Event`!

## Note

The From Relative Position mode is **deprecated**, and support for it will be removed in a future version of Rivendell. It is currently supported only to avoid breaking existing Rivendell setups. All new installations should use From Scheduler File!

### 12.4.1.1.1. Examples

Example of an inline Track Marker with Inline Event Start/Length set to **From Scheduler File**, using the **Rivendell Standard Import** template:

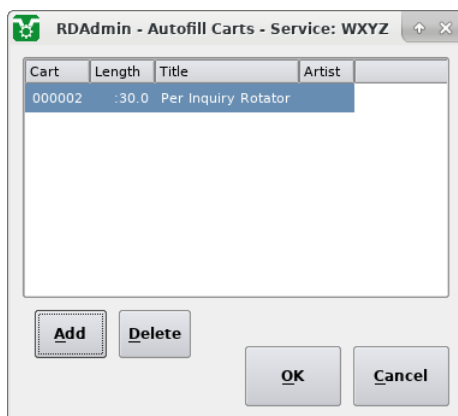
01:18:04	250098	Southern Nights	00:02:56
01:21:00	TRACK	Track Marker	00:00:45
01:22:30	250101	Come A Little Bit Closer	00:02:44

Example of an inline Track Marker with Inline Event Start/Length set to **From Relative Position**, using the **Rivendell Standard Import** template:

01:18:04	250098	Southern Nights	00:02:56
TRACK		Track Marker	
01:22:30	250101	Come A Little Bit Closer	00:02:44

### 12.4.1.2. Configuring Autofill Carts

The Configure Autofill Carts button will bring up the Autofill Carts dialog>

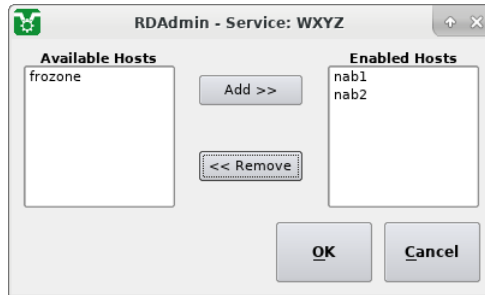


The Autofill Carts Dialog

Carts listed in this dialog will be considered for inclusion in an event by RDLogManager when the event's Use Autofill box is ticked. When filling a gap, RDLogManager will recursively scan the list of available carts, working from the longest to shortest, and insert the longest cart that will fit. The process will stop when either the available gap has been completely filled or no cart short enough to fit has been found.

### 12.4.1.3. Enabling Hosts for Service Payout

The `Enable Hosts` button will bring up the Hosts dialog, where the hosts for which this service is allowed to be played can be defined



The Hosts Dialog

### 12.4.2. Traffic/Music Data Importation Settings

With the exception of one field (`Insert Traffic Break String`), the `Traffic Data Import` and `Music Data Import` sections are identical. Thus, only the `Music Data Import` section will be described here.

The upper part of the section consists of string fields and a dropdown box.

Import Path:	edg/rivendell-reftest/imports/absolute.tfc
Preimport Command:	
Insert Marker String:	MARKER
Insert Voice Track String:	TRACK
Insert Traffic Break String:	BREAK

Log Importation String Fields

The `Import Path` field takes the fully-qualified path to the file to be used for import events by `RDLogManager`. This field can take filepath wildcards.

The `Preimport Command` field takes the fully-qualified path to the command to be run before attempting to import the file specified in `Import Path`. This field can take filepath wildcards. This can be useful when a schedule file requires pre-processing of some sort before being imported by `rdlogmanager(1)`.

The `Insert Marker String` field can be used to configure placement of a marker event in the generated log. When the string set here is found in the 'cart' field in a line of the specified import file, `RDLogManager` will insert a marker event, the text of which will be the 'title' field from that same line.

#### Note

See Section 12.4.1.1, “Inline Event Scheduling Parameters” for details on how the `Start Time` and `Length` parameters are calculated when inserting a `Marker String`.

The `Insert Voice Track String` field can be used to configure placement of a voice track marker in the generated log. When the string set here is found in the 'cart' field in a line of the specified import file, `RDLogManager` will insert a voice track event, the text of which will be the 'title' field from that same line.

#### Note

See Section 12.4.1.1, “Inline Event Scheduling Parameters” for details on how the `Start Time` and `Length` parameters are calculated when inserting a `Voice Track String`.

The `Insert Traffic Break String` field can be used to configuration placement of a traffic break from an entry in the music import log. When the string set here is found in the cart field, RDLogManager will insert a traffic import event, using the event specified in the `Import inline traffic` dropdown box in the relevant music event.

### Note

This field is available only in the `Music Data Import` section!

### Note

See Section 12.4.1.1, “Inline Event Scheduling Parameters” for details on how the `Link Start Time` and `Link Length` parameters are calculated when inserting a Traffic Break.

## 12.4.3. Traffic/Music Import Parser Settings

Field	Offset	Length
Cart Number	10	6
Title	25	34
Start Time - Hours	0	2
Start Time - Minutes	3	2
Start Time - Seconds	6	2
Length - Hours	60	2
Length - Minutes	63	2
Length - Seconds	66	2
Globally Unique ID	102	32
Event ID	69	8
Ann. Type	0	0

The Log Parser Settings

Rivendell includes the ability to import log schedule files from a variety of third-party scheduling utilities. To configure an import from one of these systems, all that is usually necessary is to select the appropriate system in the `Import Template` dropdown in the `Traffic Data Import` or `Music Data Import` sections. However, if the target scheduler system is not on this list, or if your system requires custom settings, a custom parser can be defined by selecting `[custom]` from the dropdown. The `Copy To Custom` button will copy the selected import template values to the custom parser.

### Warning

Using the `Copy To Custom` action will cause the prior custom import template values to be overwritten!

Log schedule files for Rivendell are assumed to be in so-called "column-aligned" format --i.e. each record occupies a single line in a text file that is terminated by a single linefeed or a carriage return, with each field occupying a fixed column position on the line. Each field takes two values: `Offset:`, which is the starting position of the field (starting from 0) on the line and `Length:`, which is the number of characters reserved for the field. Setting the `Length:` value for field to 0 disables the use of that field.

Most of the fields should be self-explanatory, but a few call for some comment:

`Globally Unique ID`

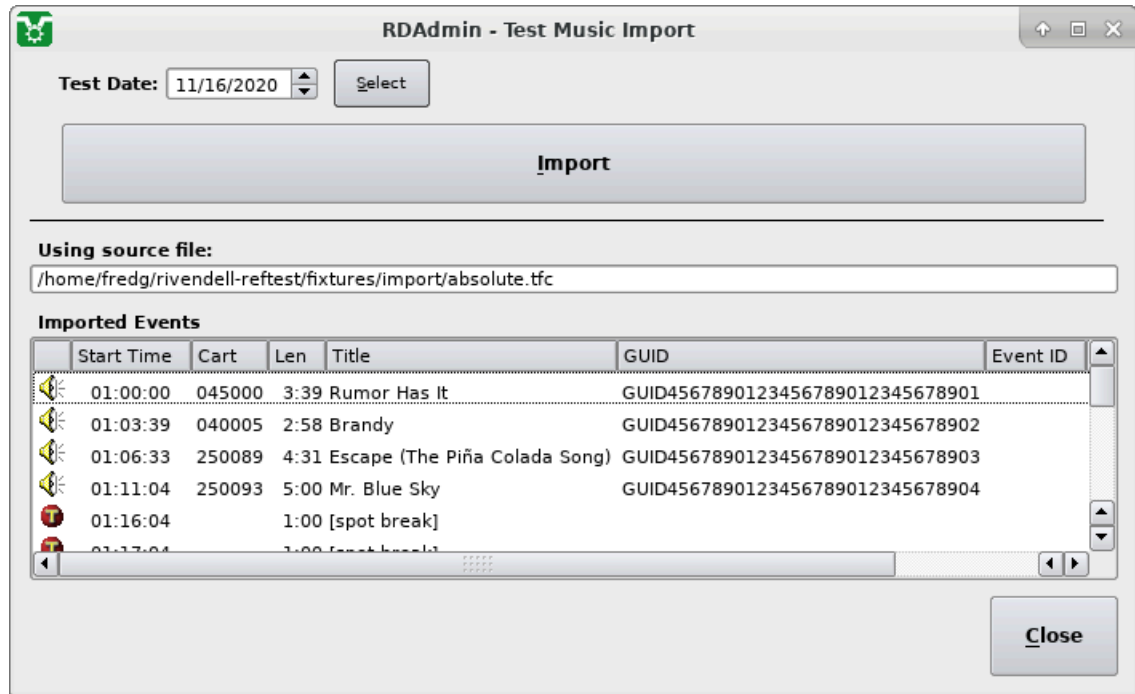
Many schedulers provide an opaque string with each scheduling record which they expect to be returned as part of the corresponding Electronic Log Reconciliation (ELR) feed back to the system. This field indicates where this "GUID" string should be found.

Event ID: / Annc. Type

Additional fields for GUID data. As of this writing, only scheduler products from Marketron require the use of these fields.

## 12.4.4. Testing Data Importation

Once the parameters have been configured, they can be tested with a sample import file by touching the **Test Music** or **Test Music** buttons to bring up the **Test Import** dialog.

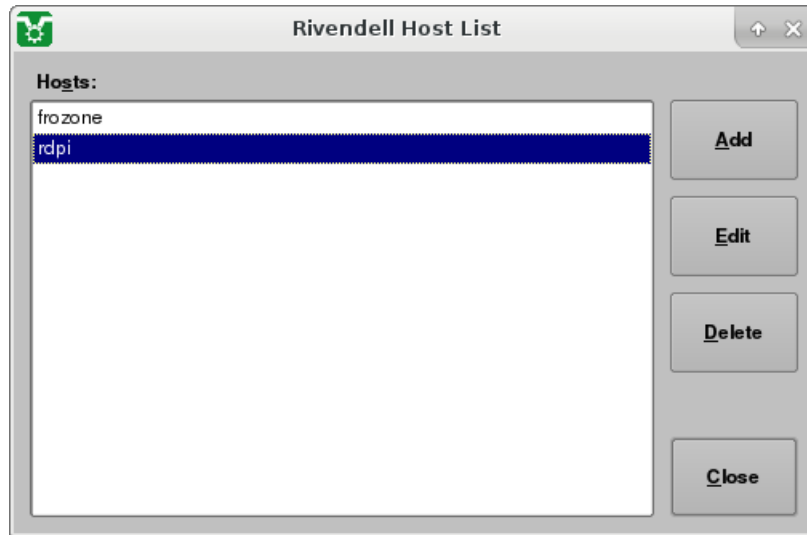


The Test Import Dialog

Select the date for the import to test, either by entering it in the **Test Date:** control or by touching the **Select** button. Then, touch the **Import** button. The import events for the day should appear in the **Imported Events** list.

## 12.5. Managing Hosts

To manage hosts in RDAdmin, touch the **Manage Hosts** button to open the Rivendell Host List dialog.



The Rivendell Host List Dialog

To examine and modify an existing host, touch its entry in the `Hosts` list and then touch the `Edit` button to open the Host Dialog.

RDAdmin - Host: elastigirl

Host Name: elastigirl

Short Name: elastigirl

Description: Workstation elastigirl

Default User: user

IP Address: 192.168.95.149

Audio Editor:

Report Editor:

Time Offset: 0 mS

Startup Cart: Select

Cue Output: Card: 0 Start Cart: Select  
Port: None Stop Cart: Select

☐ Enable Heartbeat ☒ Use Realtime Filtering

Cart: Select Interval: 1 secs

☒ Include in System Maintenance Pool

☒ Enable Drag & Drop

☒ Allow Drops on Panels not in Setup Mode

System Services

HTTP Xport: localhost

Core Audio Engine: localhost

RDLibrary RDCatch RDAirPlay RDPanel

RDLogEdit RDCart Slots Dropboxes Switchers GPIO

Host Variables ASI Audio Ports Serial Ports Audio Resources

JACK Settings PyPAD Instances

OK Cancel

The Host Dialog

## Note

After changing the configuration of a Rivendell module, it is generally necessary to restart that module for the changes to take effect!

The dialog is divided into roughly two parts: the upper half, which contains settings that pertain to the selected host overall, and the lower half, which contains buttons that access settings specific to a particular Rivendell module or subsystem.

The Host Name: (read-only), Short Name: and Description: fields are for text strings. The value of these fields is accessible using filepath wildcards.

The Default User sets the value of the Rivendell user that will be logged in by default --i.e. when the system is restarted or the Default User button is touch in rdlogin(1).

The IP Address: field should contain the IPv4 address of the host. For multi-homed systems, an address that is reachable from all other Rivendell hosts should be specified. If this host is the sole host in the Rivendell database, then it is acceptable to specify the loopback address (127.0.0.1) here.

The `Audio Editor:` can be used to specify an external audio editor for use by `rdlibrary(1)`. If desired, the value should consist of the command invocation needed to start the edit, with a `%f` wildcard to indicate the name of the file to open.

The `Report Editor:` can be used to specify an external text editor to be used to display reports. If desired, the value should consist of the command invocation needed to start the editor.

### Note

If left blank, the system will use the `vi(1)` editor running in an `xterm(1)` window --i.e. `xterm -e vi`.

The `Time Offset:` field can be used to specify a static time offset in milliseconds to be applied to events in `rdcatch(1)`.

The `Startup Cart:` field takes the number of a macro cart to be executed each time the Rivendell system is restarted. This can be useful for initializing state --e.g. JACK routes, etc.

The `Cue Output` controls specify the audio output to be used for off-line "audition" uses. The `Start Cart:` and `Stop Cart:` fields take the number of a macro cart that will be executed each time a cut play starts or stops, respectively (useful for things such as dimming control room audio monitors).

If the `Enable Heartbeat` box is ticked, then the macro cart specified in the `Cart:` will be executed at the specified interval as a means to provide a system watchdog heartbeat.

If the `Use Realtime Filtering` box is ticked, then the filter parameters when searching for carts will be applied after each keystroke or parameter change. If unticked, then the `Search` must be touched before altered filter parameters will be applied.

If the `Include in System Maintenance Pool` box is ticked, then this host will be included in the pool of systems eligible to run automatic system maintenance routines in the background.

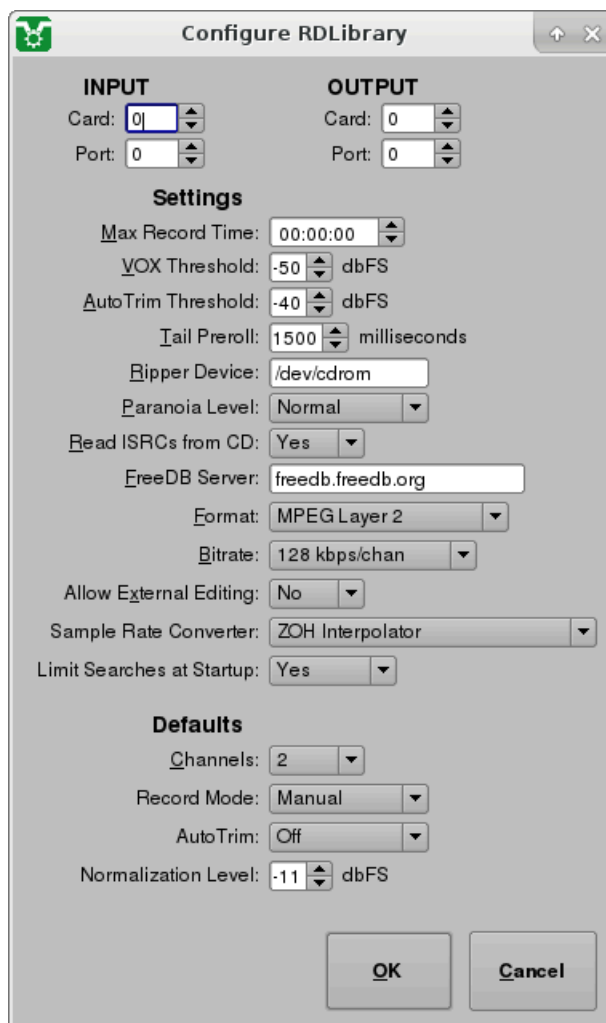
This setting should normally be left ticked unless the host in question has a limited bandwidth connection to the Rivendell database or audio store --e.g. is remotely located from the Rivendell server.

If the `Enable Drag & Drop` box is unticked, then Rivendell's drag and drop system will be disabled. If ticked, then dropping carts on `SoundPanels` can be disabled by unticking the `Allow Drops on Panels not in Setup Mode` box.

The `System Services` can be used to allow this host to use the `HTTP Xport:` or `Core Audio Engine` services of another host in the Rivendell network.

## 12.5.1. Configuring RDLibrary

To configure the `rdlibrary(1)` module, touch the `RDLibrary` button to open the `Configure RDLibrary` dialog.



The Configure RDLibrary Dialog

The INPUT and OUTPUT are used to specify the audio input and output to be used.

The Max Record Time field sets the maximum time that rdlibrary(1)'s Record widget will run in record mode; when this time is reached, it will be automatically stopped. To allow an unlimited record duration, set this to 00:00:00.

The VOX Threshold control sets audio level at which to automatically begin recording when the Record Mode control is set to VOX in the Record dialog.

The AutoTrim Threshold control sets audio level at which to trim the ends of the recorded audio when the AutoTrim control is set to On in the Record dialog.

The Tail Preroll control sets how far before an end marker the audio cursor will be positioned when auditioning a marker edit.

The Ripper Device field specifies the CD-ROM device to be used for ripping audio CDs.

The Paranoia Level dropdown specifies the amount of error checking/recovery to be applied when ripping CDs, with Normal being the maximum amount. With modern CD-ROM hardware, it is often possible to obtain significantly faster ripper performance by setting this control to Low or even None.

For further information on the Low and None options, see the '-Y' and '-Z' options in the `cdparanoia(1)` man page or <https://linux.die.net/man/1/cdparanoia>.

The `Read ISRC from CD` dropdown controls whether the ripper will attempt to read International Standard Recording Code data from audio tracks when loading the disc. Setting this to Yes can cause CD-ROM drives to take significantly longer to read the table of contents of newly inserted discs when the disc does not contain ISRC data.

The `FreeDB Server` field takes the URL of the server to be used for doing FreeDB lookups for CDs by the CD ripper.

The `Format` dropdown indicates the audio encoding format to be used in Rivendell's audio store for ingested material.

The `Bitrate` dropdown indicates the bitrate to be used when encoding ingested material to MPEG Layer 2.

If set to Yes, the `Allow External Editing` dropdown will cause an `Edit Audio` button to be displayed when editing audio carts.

The `Sample Rate Converter` dropdown controls which algorithm will be used when resampling ingested audio to a different sample rate. For more information regarding the various algorithms available, see [http://mega-nerd.com/SRC/api\\_misc.html#Converters](http://mega-nerd.com/SRC/api_misc.html#Converters) [[http://mega-nerd.com/SRC/api\\_misc.html#Converters](http://mega-nerd.com/SRC/api_misc.html#Converters)].

When ticked, the `Limit Searches at Startup` box will cause the `Show Only First 100 Matches` box to be ticked when starting a new instance of `rdlibrary(1)`.

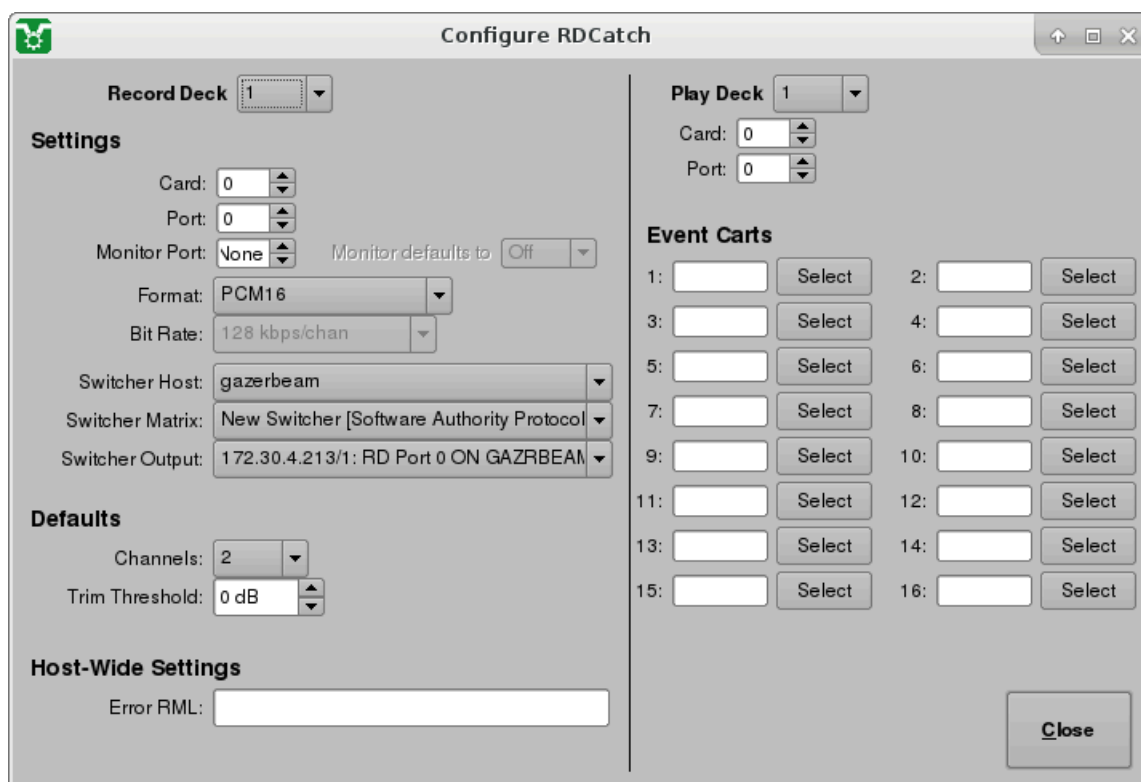
The `Channels` dropdown sets the default value of the `Channels` dropdowns in `rdlibrary(1)`.

The `Record Mode` and `AutoTrim` dropdowns set the default value of the respective dropdowns in the Record dialog.

The `Normalization Level` control sets the default value of the `Normalization Level` controls in `rdlibrary(1)`.

## 12.5.2. Configuring RDCatch

To configure the `rdcatch(1)` module, touch the `RDCatch` button to open the Configure RDCatch dialog.



The Configure RDCatch Dialog

The RDCatch Dialog consists of four sections: Record Deck, Play Deck, Defaults and Host-Wide Settings.

### 12.5.2.1. Record Decks

The `Record Deck` dropdown selects the record deck to be configured.

The `Card:` and `Port:` controls select which audio input will feed the deck, while `Monitor Port:` allows an audio output to be configured for monitoring audio during recording.

The `Format:` and `Bit Rate:` dropdowns are used to specify the audio encoding format used in the Rivendell audio store with recordings from this deck. `Bit Rate:` is used only for a `Format:` setting of MPEG Layer 2.

The `Switcher Host:`, `Switcher Matrix:` and `Switcher Output:` controls can be used to configure a switcher device for routing multiple audio signals into this record deck. The specified switcher output should be connected to the input specified by the `Card:` and `Port:` controls.

The `Channels:` control sets the default value of the same control in `rdcatch(1)`, while the `Trim Threshold` sets the default value of the `autotrim Level:` control.

### 12.5.2.2. Play Decks

The `Play Deck` dropdown selects the play deck to be configured.

The `Card:` and `Port:` controls select which audio output will be used by the deck.

The `Event Cart` take the number of the macro cart that will be executed each time the corresponding event marker (originally placed during recording by the Cut Event ['CE'] RML) is encountered during playback.

### 12.5.2.3. Host-Wide Settings

The `Error RML:` field takes RML code that will be executed whenever `rdcatch(1)` encounters an error in operations --e.g. a file download failure.

## 12.5.3. Configuring RDAirPlay

To configure the `rdairplay(1)` module, touch the `RDAirPlay` button to open the Configure RDAirPlay dialog.

The Configure RDAirPlay Dialog

### 12.5.3.1. Channel Assignments

The `Channel Assignments` section contains controls for configuring the audio outputs, along with associated fader metadata and automation.

**Channel Assignments**

Output Type	Output Name	Card	Port	Start RML	Stop RML	Action
Main Log	Main Log Output 1	0	0			Edit GPIOs
	Main Log Output 2	None	None			Edit GPIOs
Aux Log	Aux Log 1 Output	0	0			Edit GPIOs
	Aux Log 2 Output	0	0			Edit GPIOs
SoundPanel	SoundPanel First Play Output	0	1			Edit GPIOs
	SoundPanel Second Play Output	None	None			Edit GPIOs
	SoundPanel Third Play Output	None	None			Edit GPIOs
	SoundPanel Fourth Play Output	None	None			Edit GPIOs
	SoundPanel Fifth and Later Play Output	None	None			Edit GPIOs

### Channel Assignments Section

Audio outputs for the Main Log, both Aux Logs and the Sound Panel are configured by means of the Card: and Port: controls. For the Main Log, if *both* Output 1 and Output 2 are set to different card and/or port values, rdairplay(1)'s output will alternate between the two outputs.

Each of the corresponding Start RML: and Stop RML: fields can take RML code that will be executed each time the associated channel is started or stopped. Metadata wildcards can be used in these fields, which will reflect the values of the cart being started or stopped.

To configure fader automation for a given channel, touch its Edit GPIOs button to open the Edit Channel GPIOs dialog.

**RDAdmin - Edit Channel GPIOs**

**Main Log Output 1**

Start GPI:	1	1
Start GPO:	1	4
Stop GPI:	1	1
Stop GPO:	1	5
Signalling Type:	Edge	

OK Cancel

### Edit Channel GPIOs Dialog

The GPI fields specify a general input event coming into Rivendell (typically mapped from the fader ON or OFF status signal on the associated mixer desk). Reception of this signal will cause the corresponding RDAirPlay channel to be started or stopped. The GPO fields specify a general output event emitted by Rivendell each time the corresponding channel is started or stopped (typically mapped to the fader ON or OFF remote control on the associated mixer desk).

## 12.5.3.2. Start/Stop Settings

The Start/Stop Settings section controls the behavior of rdairplay(1) when the module is first opened and finally closed.

Start/Stop Section

The `Exit Password:` field can be used to specify a password that must be entered when exiting `rdairplay(1)` (useful for preventing inadvertent shutdowns).

For each of the log machines (Main Log, Aux 1 Log and Aux 2 Log), it is possible to specify the action to take at startup by selecting the appropriate value in the `At Startup:` dropdown. If the `Restart Log After Unclean Shutdown` box is ticked, then `rdairplay(1)` will attempt to restart the log from the event which was playing when the unclean shutdown occurred.

### 12.5.3.3. Display Settings

The `Display Settings` section controls the contents and formatting of the label areas of the button widget as well as the "skin" used for the overall `rdairplay(1)` window.

Display Settings

The `Background Image:` field takes the full path to a bitmap file to use as the background "skin" for `rdairplay(1)`'s main window. The file should be 1024x738 resolution and be of type JPG or PNG.

Each of the `Template:` fields define the formatting of one of the lines of the label areas in the button widget. Metadata wildcards are used to define the contents to be displayed.

### 12.5.3.4. Log Mode Control

The `Log Mode Control` section configures the behavior of `rdairplay(1)` mode controls.

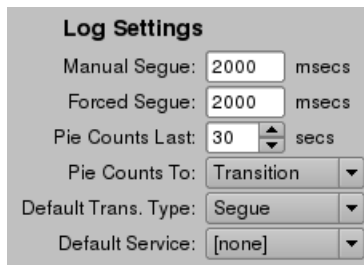
Log Mode Control

The `Mode Control Style` dropdown is used to specify whether operating mode of the log machines are always the same (Unified mode) or can be separately set (Independent mode).

The startup states of the log machines can be set by means of the `Start Mode` : dropdowns.

### 12.5.3.5. Log Settings

The `Log Settings` section configures the behavior of log operations.

The screenshot shows a dialog box titled "Log Settings". It contains several configuration fields: "Manual Segue:" with a text input "2000" and a unit dropdown "msecs"; "Forced Segue:" with a text input "2000" and a unit dropdown "msecs"; "Pie Counts Last:" with a spin box "30" and a unit dropdown "secs"; "Pie Counts To:" with a dropdown menu showing "Transition"; "Default Trans. Type:" with a dropdown menu showing "Segue"; and "Default Service:" with a dropdown menu showing "[none]".

Log Settings

The `Manual Segue` : field specifies the duration of the segue overlap to apply when manually starting a log event while one or more other events are currently playing.

The `Forced Segue` : field specifies the duration of the segue overlap to apply when a hard time event starts while one or more other events are currently playing.

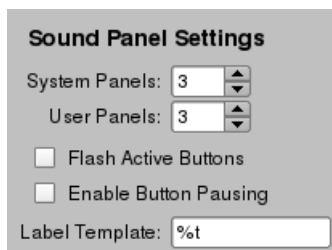
The `Pie Counts Last` : field specifies when the pie widget begins its countdown, relative to the setting of the `Pie Counts To` : dropdown. If set to `Cart End`, countdown will always be relative to the end marker of the cut, whereas a setting of `Transition` will count down relative to the start of the transition to the following event.

The `Default Trans. Type` dropdown determines what transition type will be applied by default when adding a new event to a log.

The `Default Service` : dropdown determines what service will be associated with a newly created log.

### 12.5.3.6. Sound Panel Settings

The `Sound Panel Settings` section configures the behavior of Sound Panel operations.

The screenshot shows a dialog box titled "Sound Panel Settings". It contains several configuration fields: "System Panels:" with a spin box "3"; "User Panels:" with a spin box "3"; two checkboxes, "Flash Active Buttons" and "Enable Button Pausing", both of which are currently unchecked; and "Label Template:" with a text input "%t".

Sound Panel Settings

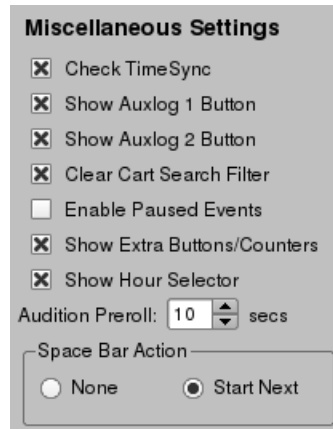
The total number of system and User panels are set with the `System Panels` : and `User Panels` : fields respectively.

If the `Flash Active Buttons` box is ticked, then the buttons in the button widget that correspond to playing events will flash.

If the `Enable Button Pausing` box is ticked, then touching the button of an playing event will cause it to pause rather than stopping. A paused event can be restarted by pressing its button again.

The `Label Template` control determines the default button legend for newly created Sound Panel buttons. Metadata wildcards can be used in this field.

### 12.5.3.7. Miscellaneous Settings



Miscellaneous Settings

If the `Check Time Sync` box is ticked, the status of the kernel's time synchronization PLL lock will be checked periodically. If not locked, the wall clock will flash red.

Ticking `Show Auxlog 1` or `Show Auxlog 2` boxes will cause selector buttons for the respective log machines to be displayed.

If the `Clear Cart Search Filter` box is ticked, the cart search dialog's filter will be cleared each time the dialog is redisplayed.

If the `Enable Paused Events` box is ticked, touching the button for a playing event will cause that event to be paused rather than stopped. A stopped event can be restarted by touching it again, dismissed by deleting the event.

Ticking the `Show Extra Buttons/Counters` box will cause `Audition Head`, `Audition Tail` buttons and the `Run Length` to be displayed as part of the List Log widget.

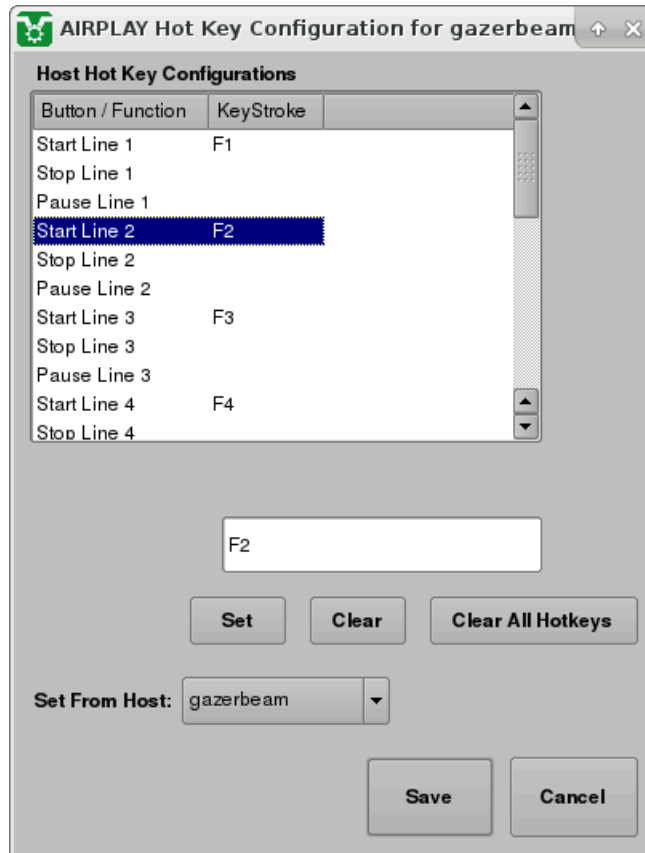
Ticking the `Show Hour Selector` will cause the Hour Selector to be displayed as part of the List Log widget.

The `Audition Preroll` sets how far before the current play position an audition playout will begin.

The `Space Bar Action` sets what action will be taken when the space bar is pressed.

### 12.5.3.8. Configuring Hotkeys

Keyboard shortcuts (also known as "hotkeys") can be configured by touching the `Configure Hotkeys` button, bringing up the Hot Key Configuration dialog.



The Hotkey Configuration Dialog

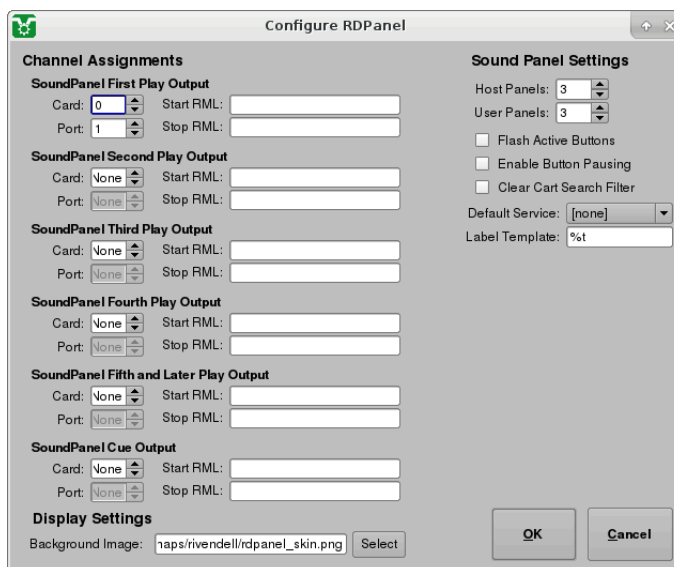
A hotkey can be assigned to a particular function by selecting that function off of the Host Hot Key Configuration list, pressing and releasing the desired key, and then touching the Set button. To remove a hotkey assignment, select the desired function and then touch the Clear button. Touching the Clear All Hotkeys button will clear *all* hotkey assignments for this host. Hotkey assignments from a different host can be copied to this one by selecting the desired source host in the Set From Host : dropdown and then touching Save.

### Note

Not all keys may be mappable as a hotkey, as certain window managers "steal" keys for their own use!

## 12.5.4. Configuring RDPanel

To configure the rdpanel(1) module, touch the RDPanel button to open the Configure RDPanel dialog.



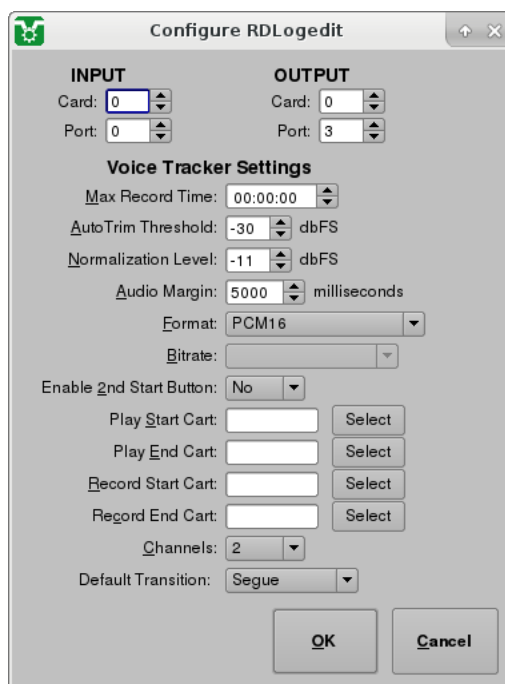
The Configure RDPanel Dialog

The `rdpanel(1)` application is merely a larger version of the Sound Panel portion of `rdairplay(1)`. As such, its configuration closely mirrors that of the `RDAirPlay` configuration. Please see that section for details.

Although `rdpanel(1)`'s panels appear similar to `rdairplay(1)`'s panels, `rdpanel(1)` has its own set of system and user panels that are independent of `rdairplay(1)` and must be set up separately.

## 12.5.5. Configuring RDLogEdit

To configure the `rdlogedit(1)` module, touch the `RDLogEdit` button to open the Configure `RDLogEdit` dialog.



### The Configure RDLogEdit Dialog

The `INPUT` and `OUTPUT` are used to specify the audio input and output to be used.

The `Max Record Time` field sets the maximum time that `rdlogedit(1)`'s voice tracker will run in record mode; when this time is reached, it will be automatically stopped. To allow an unlimited record duration, set this to `00:00:00`.

The `AutoTrim Threshold` control sets audio level at which to trim the ends of the recorded audio in the voice tracker.

The `Normalization Level` control sets audio level at which to peak normalize the recorded audio in the voice tracker.

The `Format:` and `Bit Rate:` dropdowns are used to specify the audio encoding format used in the Rivendell audio store with the voice tracker. `Bit Rate:` is used only for a `Format:` setting of MPEG Layer 2.

If the `Enable 2nd Start Button:` dropdown is set to `No`, then the voice tracker will not display the second `Start` button (and hence, not run the event that follows the recorded track), but wait for the `Save` button to be touched after starting the track recording.

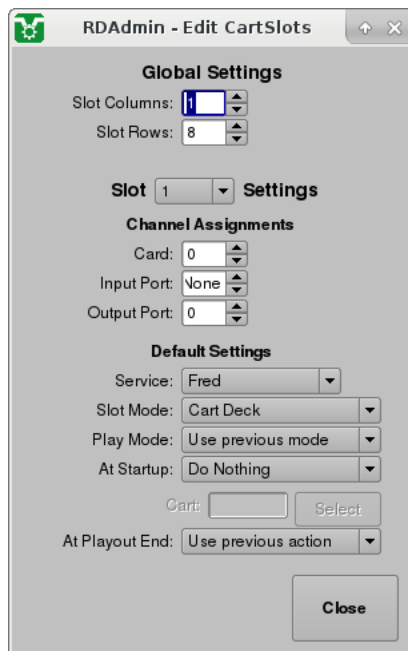
The `Play Start Cart:`, `Play End Cart:`, `The Record Start Cart:` and `The Record End Cart:` fields each take the number of a macro cart to be executed when the respective audio signal starts or ends. (Useful for automated external audio paths changes to support voicetracking operations).

The `Channels:` dropdown indicates the number of channels to use when recording voicetracks.

The `Default Transition` indicates the transition type to use by default when adding a new log event.

## 12.5.6. Configuring RDCartSlots

To configure the `rdcartslots(1)` module, touch the `RDCartSlots` button to open the Configure RDCartSlots dialog.



### The Configure RDCartSlots Dialog

The **Global Settings** section is used to configure the number and arrangement of cart slots. The number of supported slots is limited only by the available resolution of the display monitor.

The **Slot Settings** is used to configure each individual slot. **Channel Assignments** settings are used to specify the audio input and output to be used. (The **Input Port** value is used only when the slot is in **Breakaway** mode.)

The **Default Settings** settings are used to configure the detailed behavior of the specified cart slot. **Service**: defines the slot's default service when in **Breakaway** mode. **Slot Mode**: sets the mode of the slot and **Play Mode** sets the default state of the **Full** or **Hook** play mode. The contents of the slot at startup can be set using the **At Startup**: dropdown, and the action when play-out finishes set in the **At Playout End**: control.

## 12.5.7. Configuring Dropboxes

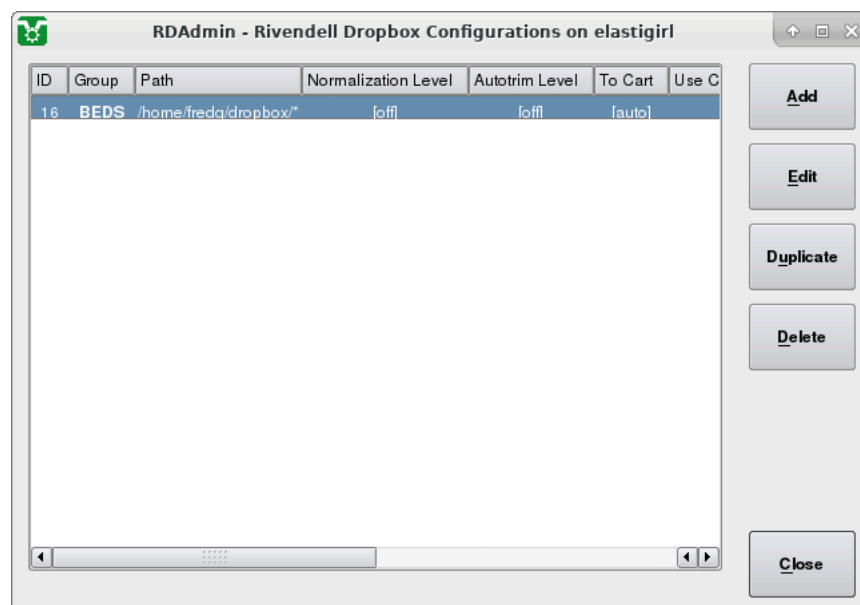
### 12.5.7.1. Overview

A *dropbox* is a Rivendell process that runs in the background and performs automatic file importation. At its most basic level, each dropbox is configured to have a specific *group* (within whose carts audio is saved) and a *path* (a location in the filesystem whence the dropbox will obtain audio to import). When one or more audio files that match the path specification are copied to the path location, the dropbox will automatically import the file(s). There are a number of additional parameters which can be set to influence the way in which a particular dropbox will process audio, which will be covered below.

The number of dropboxes capable of being configured on a given host is limited only by that host's hardware capabilities.

### 12.5.7.2. Configuration

To see the list of dropboxes currently configured on the system, touch the **Dropboxes** button to open the Rivendell Dropbox Configurations Dialog.



## The Rivendell Dropbox Configurations Dialog

A new dropbox can be created by touching the Add button, opening the Dropbox Configuration dialog.

The Dropbox Configuration Dialog

The group of the new dropbox is set with the `Default Group`: dropdown and the path with the `Path Spec`: field.

## Important

The `Path Spec`: field must match the *full file path* of the files to be processed, not just the sub-directory that contains those files.

For example: say we have a directory called `'/home/rd/dropbox'`, which contains the following files:

```
mysong.mp3
mysong.wav
yoursong.mp3
```

Table 10.2 shows the results using various example `PathSpec`: values.

**Table 12.2. Dropbox PathSpec Examples**

PathSpec	Matches	Comments
/home/rd/dropbox/*	mysong.mp3 mysong.wav yoursong.mp3	Matches <i>all</i> files in /home/rd/dropbox
/home/rd/dropbox/*.mp3	mysong.mp3 yoursong.mp3	Matches every file in /home/rd/dropbox that ends with .mp3
/home/rd/dropbox/ mysong.*	mysong.mp3 mysong.wav	Matches every file in /home/rd/dropbox that begins with mysong.
/home/rd/dropbox		Matches nothing. [No file part of the PathSpec].
/home/rd/dropbox/		Matches nothing. [No file part of the PathSpec].

A new dropbox created with just the `Default Group:` and `PathSpec:` fields set and no other parameters changed will detect any file that matches the `PathSpec:`, create a new cart in the `Default Group:` and then attempt to import the file into a new cut in the cart.

## Important

For this process to work, the specified group must also have its `Default Cart Number:` fields in the Group Dialog set to a valid range, and there must be a free number within that range available. If either of these conditions are not met, the dropbox will throw an error.

## Note

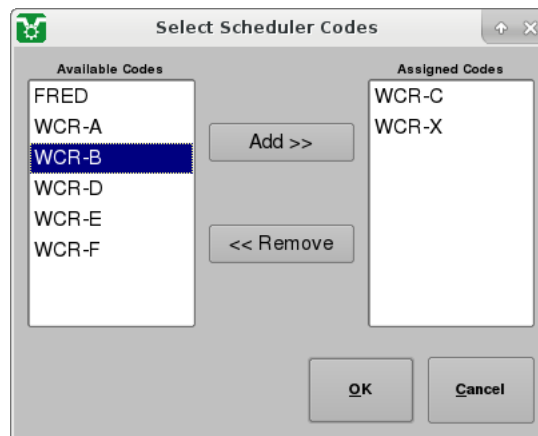
The importation will only happen *once* for each file matched. To get a dropbox to re-process files that have already been imported, touch the `Reset` button.

The following controls can be utilized to influence how a dropbox will process a matched file:

To Cart:	Add a new cut to the specified cart and import into that, rather than creating a new cart. If the <code>Delete cuts before importing</code> box is also ticked, then any existing cuts in the specified cart will be deleted before adding the new cut.
Metadata Pattern:	Attempt to discern the title to give to the new cart from the name of the matched file, using metadata wildcards as a template.
User Defined:	Set the value of this field as the user defined field of the new cart.
Log events in Syslog	If ticked, log messages for this dropbox will be sent to the system syslog. Otherwise, these events will be sent to the file specified by the <code>Log File:</code> setting below.
Log File:	The full path to a file to which to write a log of dropbox operations. Useful for troubleshooting problems. If a log file is not specified, the log will be written to the log specified in the <b>[Logs]</b> section of <code>rd.conf(5)</code> .
Delete source files after import	Delete the source file after successful importation.

Send e-mail reports	A report will be sent to the Notification E-Mail Addresses associated with the destination group for each file processed by the dropbox.
Force to Monaural	Import the matched file to a single channel (mixing multiple channels together if necessary).
Normalize Levels	Peak-normalize the matched file to the specified Level : in dBFS.
Autotrim Cuts	Autotrim the matched file, using a threshold of Level : dBFS.
Insert Segue Markers	If no segue marker information is found in the metadata of the matched file, create segue markers, starting at the last instance of Segue Level : and lasting for Segue Length : milliseconds.
Get cart number from CartChunk CutID	Determine the number of the destination cart from the matched file's CartChunk CutID field. If the cart does not exist, it will be created. The destination cart must lie within the valid range for the specified group.
Get cart title from CartChunk CutID	Determine the title of the destination cart from the matched file's CartChunk CutID field.
Offset start date	If a start date is found in the matched file's metadata, add the specified days to it.
Offset end date	If an end date is found in the matched file's metadata, add the specified days to it.
Create Dates when no Dates Exist	If no start or end date is found in the matched file's metadata, add such, adding the specified number of days to the current date.

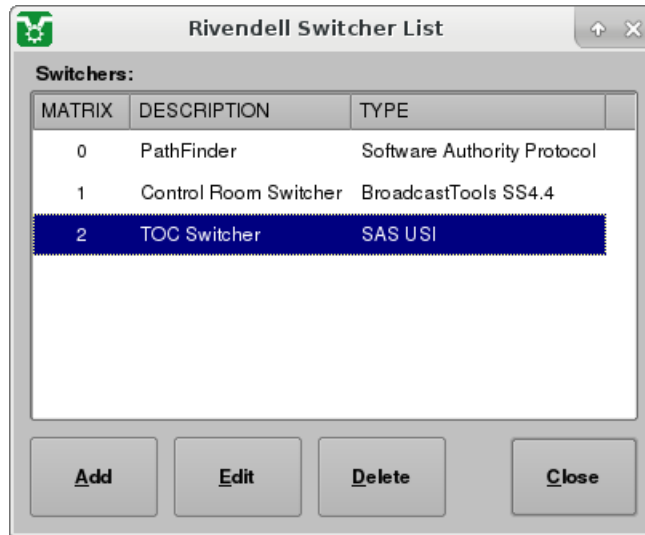
Carts created by this dropbox can be assigned one or more existing scheduler codes by touching the Scheduler Codes button to open the Select Scheduler Codes dialog.



The Select Scheduler Codes Dialog

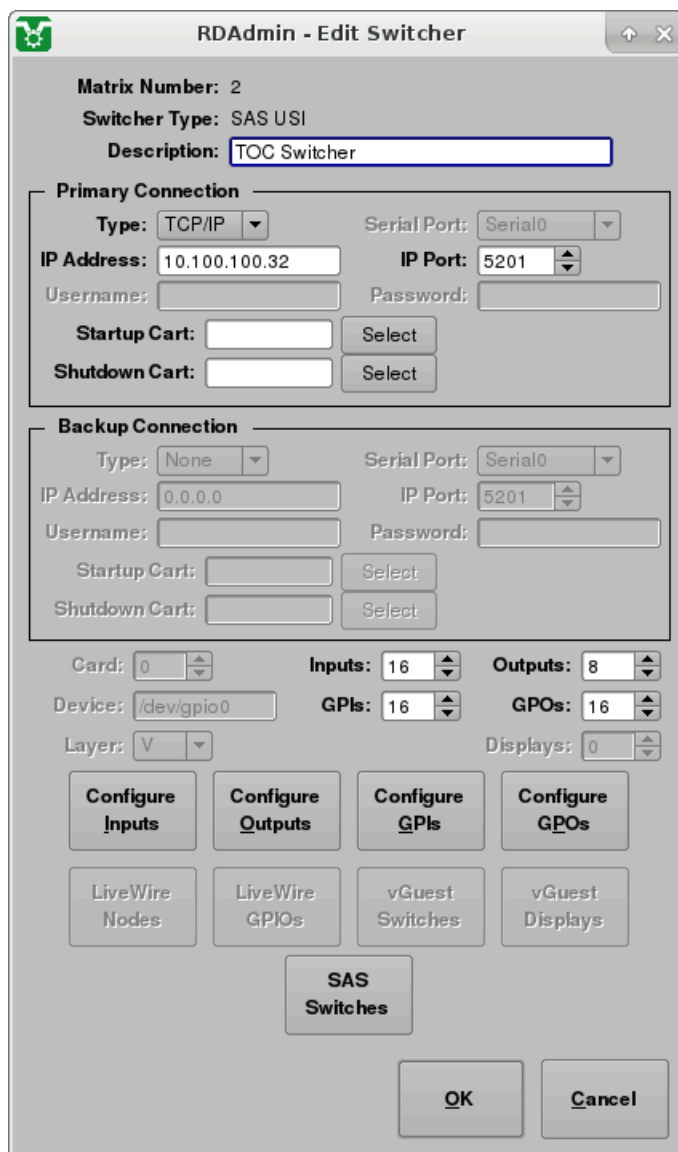
## 12.5.8. Configuring Switcher/GPIO Devices

To configure the Switcher/GPIO devices, touch the Switchers/GPIO button to open the Rivendell Switcher List dialog.



The Rivendell Switcher List Dialog

To add a new Switcher/GPIO device, touch the Add button to open the Edit Switcher dialog.



The image shows the 'RDAdmin - Edit Switcher' dialog box. It has a title bar with a green icon and standard window controls. The main area is divided into sections for configuration. At the top, it shows 'Matrix Number: 2', 'Switcher Type: SAS USI', and a 'Description' field containing 'TOC Switcher'. Below this is the 'Primary Connection' section, which includes a 'Type' dropdown set to 'TCP/IP', a 'Serial Port' dropdown set to 'Serial0', an 'IP Address' field with '10.100.100.32', an 'IP Port' spinner set to '5201', and empty fields for 'Username' and 'Password'. There are also 'Startup Cart' and 'Shutdown Cart' fields, each with a 'Select' button. Below the primary connection is the 'Backup Connection' section, which is similar but has 'Type' set to 'None' and 'IP Address' set to '0.0.0.0'. At the bottom of the dialog, there are several configuration options: 'Card' (0), 'Inputs' (16), 'Outputs' (8), 'Device' (/dev/gpio0), 'GPIOs' (16), 'GPOs' (16), and 'Layer' (V). There are also 'Displays' (0). Below these are eight buttons arranged in two rows: 'Configure Inputs', 'Configure Outputs', 'Configure GPIOs', 'Configure GPOs' in the first row, and 'LiveWire Nodes', 'LiveWire GPIOs', 'vGuest Switches', 'vGuest Displays' in the second row. A 'SAS Switches' button is centered below the second row. At the very bottom are 'OK' and 'Cancel' buttons.

The Edit Switcher Dialog

## Note

Rivendell supports a huge diversity of third-party switcher and GPIO devices, every one of which has its own unique operating requirements. The description which follows provides a broad overview of how these devices are configured, but be sure to consult the device-specific notes for the unit question in Appendix C, *Supported GPIO/Switcher Devices* as well!

### 12.5.8.1. Connections

If the target device is controlled via some sort of *connection* (TCP/IP or serial), that connection is configured in the `Primary Connection` section of the dialog. (Certain devices support multiple, redundant connections, in which case the `Backup Connection` section will be available as well).

The `Type` dropdown is used to indicate if the connection is via **TCP/IP** or **serial**. If **serial** is selected, then the serial device to use can be selected by means of the `Serial Port` dropdown.

## Important

If using a serial port, be sure that the selected port has also been configured! See Section 12.5.11, “Configuring Serial Ports”.

If **TCP/IP** is selected, then the **IP Address :** and **IP Port :** fields must be populated. Certain devices also require that the **Username :** and **Password :** fields be populated as well.

The **Startup Cart :** and **Shutdown Cart :** fields take the number of a macro cart that will be run after the connection established or dropped, respectively.

## 12.5.8.2. Miscellaneous Settings

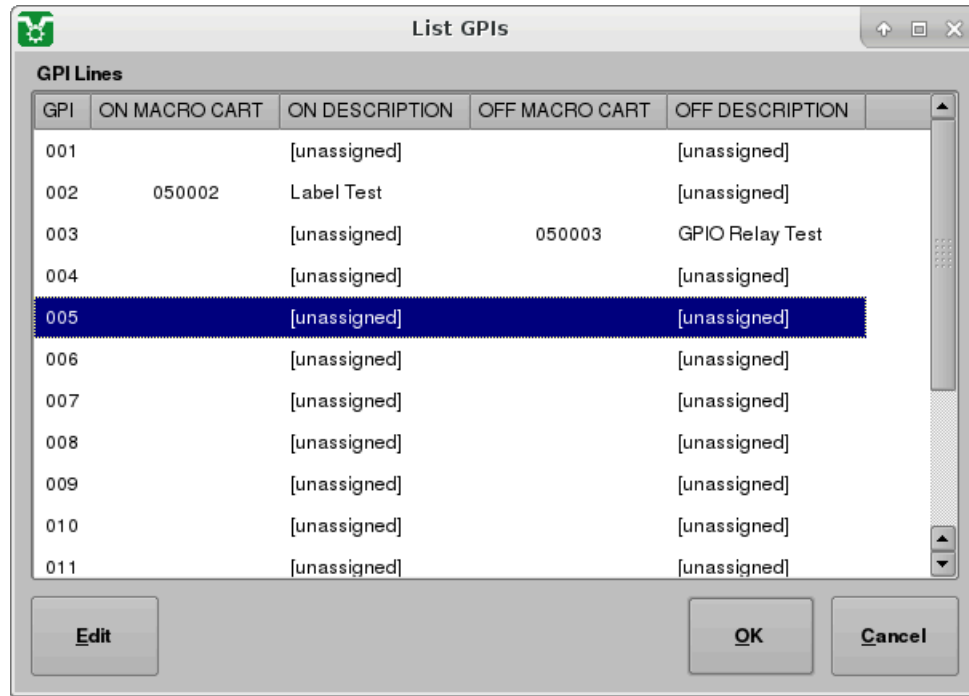
Below the Connection settings are various miscellaneous controls and buttons. Not all of these are used for all supported devices.

Use of the **Card :**, **Device :** and **Layer :** fields are specific to the type of device. See that device's entry in Appendix C, *Supported GPIO/Switcher Devices* for more information.

The **Inputs :**, **Outputs :**, **GPis :**, **GPOs :** and **Displays :** controls should be set to the number of those resources the target device contains. In many cases, these fields will be auto-detected by Rivendell's driver.

The **Configure Inputs** and **Configure Outputs** buttons can be used to assign names to each switcher input and output on the target device. These names will appear in `rdcatch(1)` when configuring record events.

The **Configure GPis** and **Configure GPOs** buttons can be used to configure the default action to be taken in response to reception of a GPIO event. Touching one of these buttons brings up the **List GPis** Dialog.



The List GPis Dialog

To edit a particular GPIO line, select its entry on the list and touch the `Edit` button to bring up the Edit GPI Dialog.

The Edit GPI Dialog

Two macro carts may be associated with each event: one for the leading edge [ON Transition] and one for the trailing edge [OFF Transition].

## Important

The macro cart associations configured here are merely defaults, set when the Rivendell service is [re]started. They can subsequently be altered dynamically through use of the GPI Set [GI] command. (See Section 14.8.18, “GPI Set [GI]”).

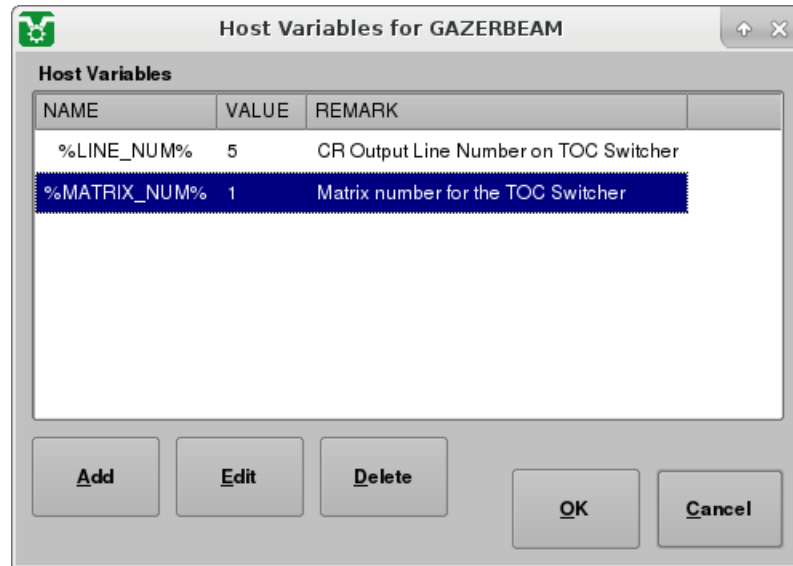
## 12.5.9. Configuring Host Variables

### 12.5.9.1. Overview

*Host variables* are alphanumeric tags bracketed by '%' characters --e.g. `%HOST_VAR%` -- that can be assigned string values on a per host basis. When used in the command list in a macro cart, the assigned string is automatically substituted for the variable name.

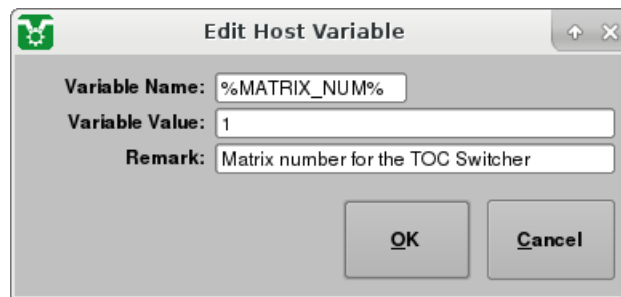
### 12.5.9.2. Editing Host Variables

To add, edit or delete host variables, touch the `Host Variables` button to open the Host Variables dialog.



The Host Variables Dialog

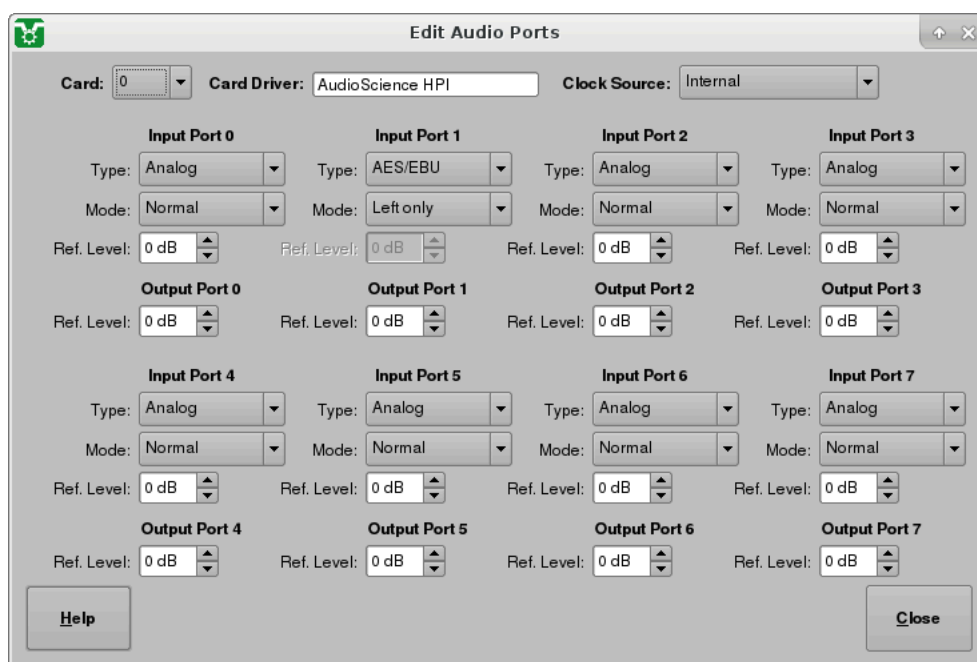
To edit the value of an host variable, select its entry on the Host Variables list and then touch the Edit button to bring up the Edit Host Variable dialog.



The Edit Host Variable Dialog

## 12.5.10. Configuring Audio Ports

To configure audio ports, touch the Audio Ports button to open the Edit Audio Ports dialog.



The Edit Audio Ports Dialog

## Note

As of this writing, settings made in this dialog will have effect only on audio devices using the AudioScience HPI driver.

The **Card :** dropdown is used to select the audio card to which to apply settings. **Clock Source :** is used to select the source of the sample clock.

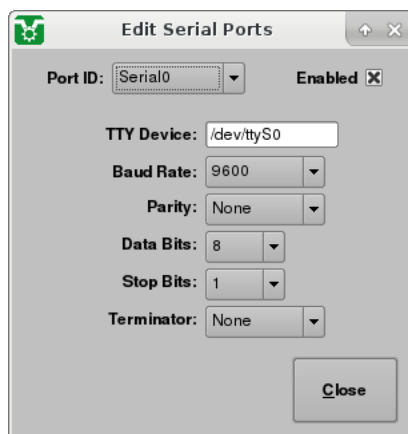
Each input and output port on a card can be set to be of a certain type (**Analog**, **AES/EBU** or **SP/DIFF**). The **Mode :** dropdown controls the routing of left/right signals (see table below), while the reference level of the signal at each port can be set with the **Ref. Level :** control.

**Table 12.3. Audio Port Mode Switch Settings**

Channels	Mode	Effect
1	Normal	Left+Right sum to mono
1	Swap	Left+Right sum to mono
1	Left Only	Left only to mono
1	Right Only	Right only to mono
2	Normal	Stereo
2	Swap	Stereo, Left swapped with Right
2	Left Only	Left only, Right muted
2	Right Only	Right only, Left muted

## 12.5.11. Configuring Serial Ports

To configure serial (COM) ports, touch the **Serial Ports** button to open the Edit Serial Ports dialog.

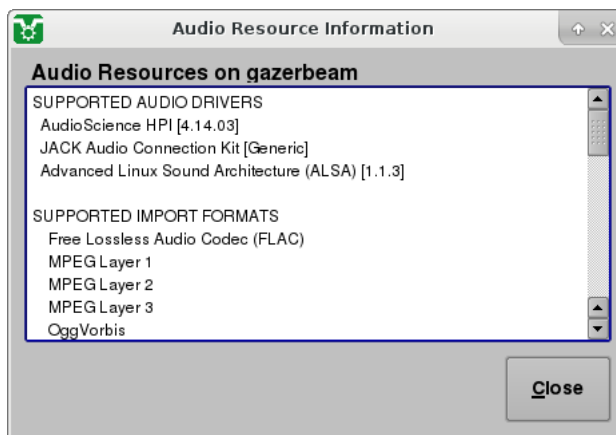


The Edit Serial Ports Dialog

Select the desired Rivendell serial port to configure in the `Port ID`: dropdown. The `Enabled` box must be ticked before parameters can be set.

## 12.5.12. Viewing Audio Resources

Touching the `Audio Resources` button will bring up the Audio Resource Information dialog, a read-only report detailing the current audio configuration and capabilities of Rivendell.



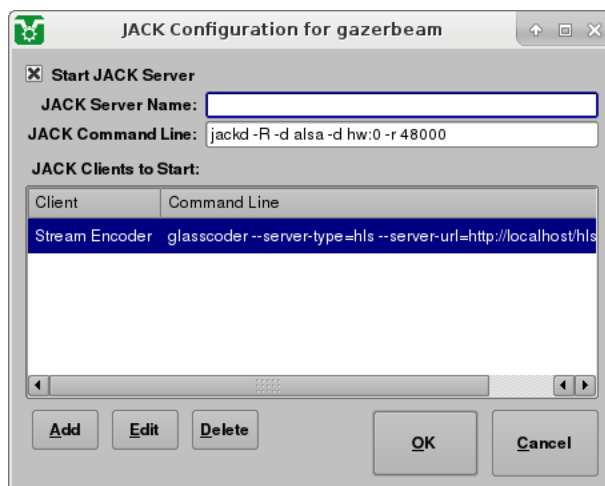
The Audio Resource Information Dialog

## 12.5.13. JACK Integration

The JACK Audio Connection Kit is an audio integration system that allows audio to be shared in real-time between multiple programs. More information can be found at <http://jackaudio.org>.

Rivendell's JACK connectivity is handed by the `caed(8)` daemon, and so both `jackd(1)` and `caed(8)` must operate under the same Linux user in order to be able to communicate. Under stock Rivendell, `caed(8)` is run as user 'root' [UID 0].

To configure Rivendell's integration with JACK, touch the `JACK Settings` button to bring up the JACK Configuration dialog.



The JACK Configuration Dialog

To have jackd(1) automatically [re]started whenever the Rivendell service is [re]started, tick the `Start JACK Server` box and enter the appropriate command-line invocation in the `JACK Command Line:` field. The name of the JACK instance to connect to [the `--name` option as provided to jackd(1)] can be entered in the `JACK Server Name:` field.

Rivendell can also be configured to [re]start JACK clients automatically each time the Rivendell service is [re]started by adding the appropriate command-line invocation to the `JACK Clients to Start` list. Filepath wildcards can be used in the command-line field. The clients will be run under the same user as that of the caed(8) daemon (user 'root' [UID 0] with sstock Rivendell). Port connections between JACK clients can be managed by use of the Jack Connect [JC] and Jack Disconnect [JD] RMLs. See Section 14.8.6, “Connect Jack Ports [JC]” and Section 14.8.10, “Disconnect Jack Ports [JD]”.

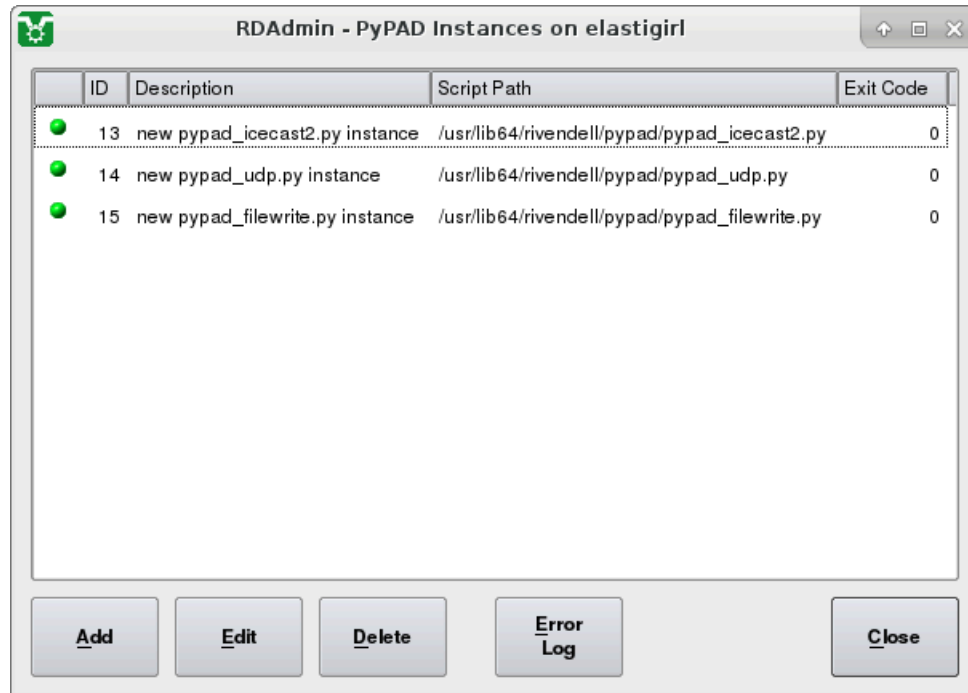
## 12.5.14. Managing PyPAD Instances

PyPAD is a system that is built into Rivendell that allows processing and transmission of Program Associated Data [PAD] by means of scripts written in the popular Python programming language.

### Note

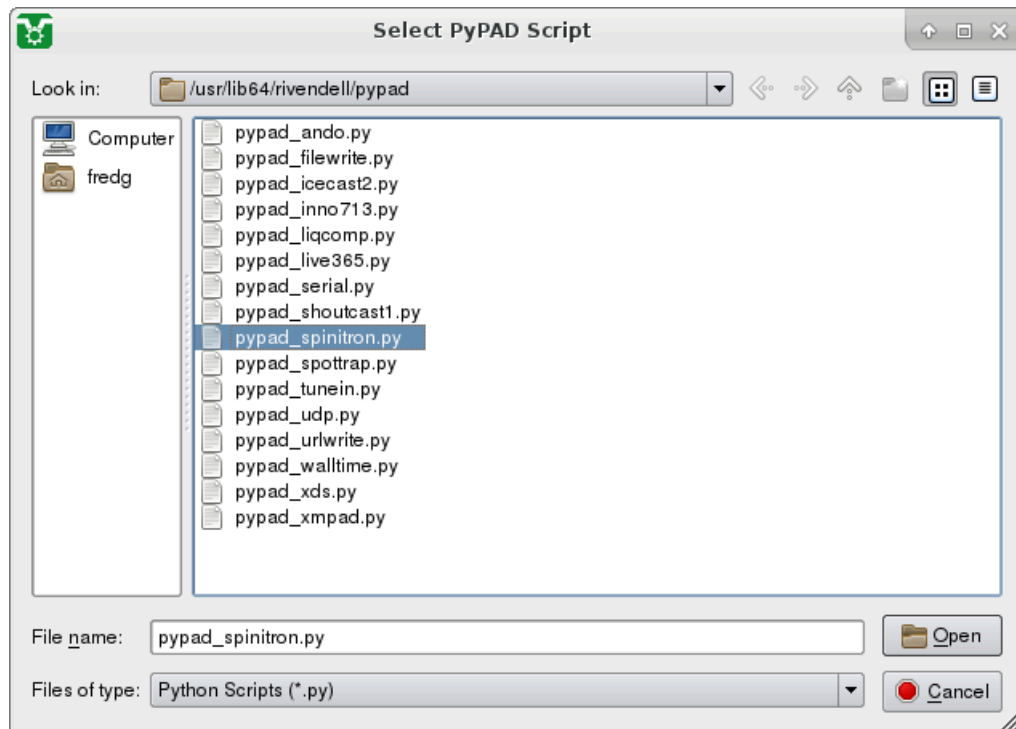
See Section 15.1.2, “PyPAD” for information on creating your own customized PyPAD scripts.

To see the list of PyPAD scripts configured to run on the selected host, touch the `PyPAD Instances` button to open the PyPAD Instances dialog.



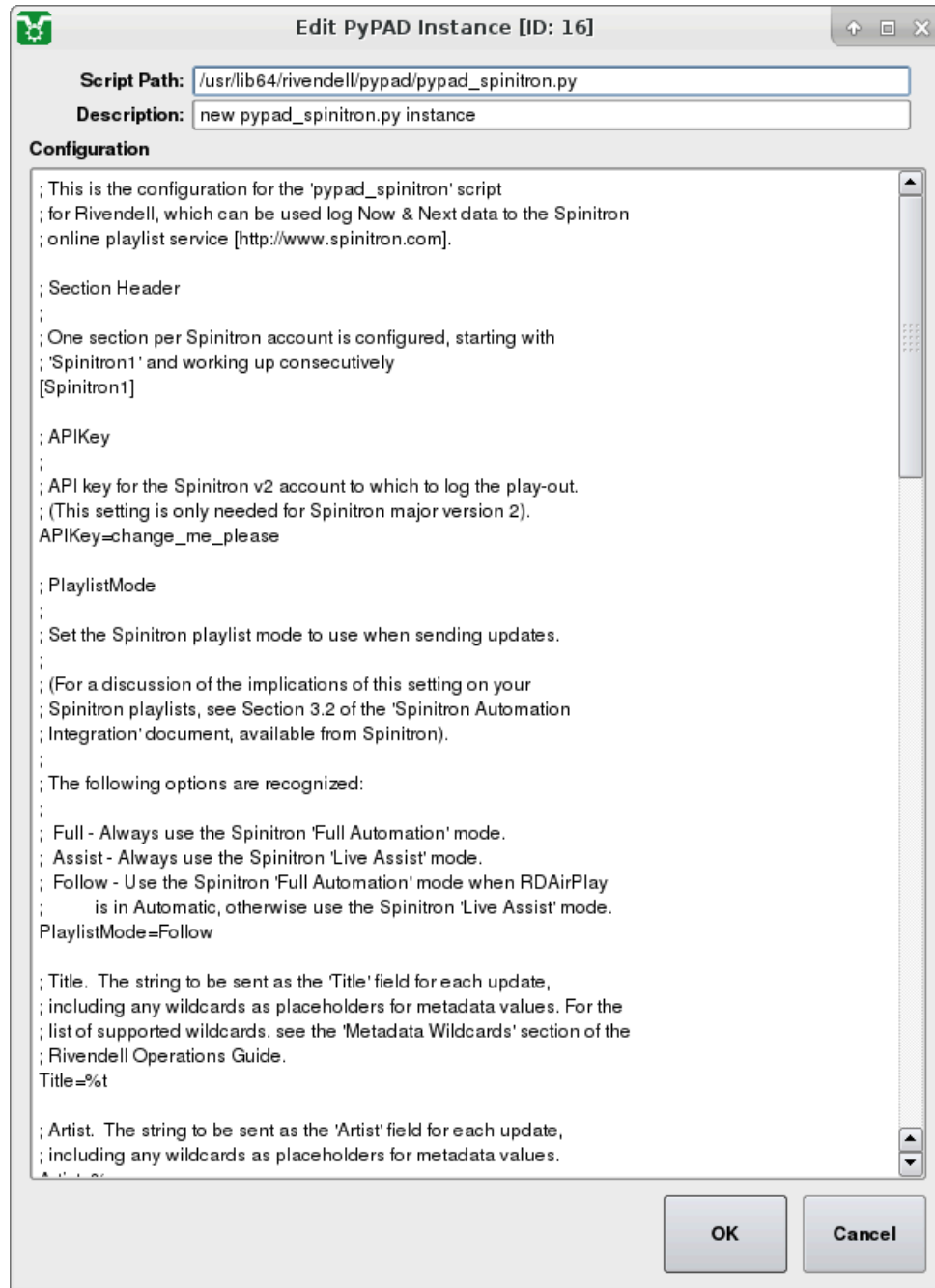
The PyPAD Instances Dialog

To add a new PyPAD instance, touch the Add button to open the Select PyPAD Script dialog.



The Select PyPAD Script Dialog

Select a script from the list and then touch the Open button to open the Edit PyPAD Instance dialog.



The Select PyPAD Script Dialog

The Configuration box contains lines of text that control the behavior of the script that's been selected. Lines that begin with a semicolon character [;] are comments; the rest are directives to the script.

When finished editing the configuration, touch the OK button to save the configuration and start the script running. The green light adjacent to the entry for the script instance just edited will turn red briefly before turning back to green, indicating that the changes to the configuration have been applied to the active instance.

**Note**

It is not necessary to restart rdairplay(1) for the configuration changes to be made effective.

### 12.5.14.1. Moving Legacy RLM Configurations to PyPAD

Rivendell v2.x included a feature called "Rivendell Loadable Modules" ("RLM" for short) that included much of the functionality now provided by PyPAD. The following RLMs that shipped as part of Rivendell v2.x have been ported to PyPAD and shipped as part of Rivendell 3.x:

```
rlm_ando
rlm_filewrite
rlm_icecast2
rlm_inno712
rlm_liqcomp
rlm_live365
rlm_serial
rlm_shoutcast1
rlm_spottrap
rlm_tunein
rlm_udp
rlm_urlwrite
rlm_walltime
rlm_xds
rlm_xmpad
```

The formats of the configuration files used for these plug-ins are unchanged under PyPAD. Thus, a "known good" configuration file for an RLM can simply be copy/pasted into the Configuration box in the Edit PyPAD Instance dialog when setting up its replacement PyPAD script.

**Caution**

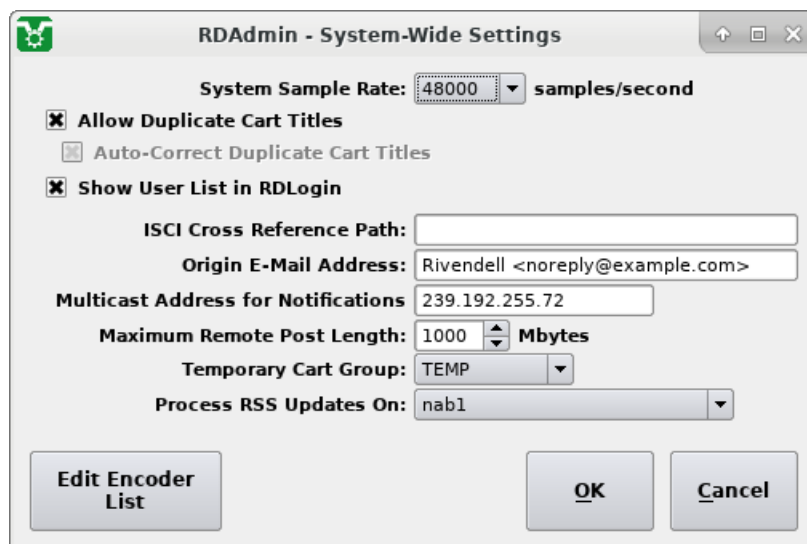
Be sure to remove completely the default "sample" configuration entries before copy/pasting in the "known good" ones!

#### 12.5.14.1.1. Moving a Spinitron RLM Configuration to PyPAD

In addition to the above, some of the functionality of the `rlm_spinitron_plus` RLM has been ported into the `pypad_spinitron` script. Specifically, support for the deprecated Spinitron v1 interface has been removed. Sites which have not yet transitioned to Spinitron v2 will need to do so in order to use this script. Sites which are already using Spinitron v2 can use their existing RLM configuration unchanged.

## 12.6. Managing System Settings

To manage system-wide settings --i.e. those settings that apply to *all* Rivendell hosts -- in RDAdmin, touch the System Settings button to open the System-Wide Settings dialog.



The System-Wide Settings Dialog

The `System Sample Rate`: dropdown sets the global sample rate to be used for Rivendell's audio store. This control should be set before ingesting any audio into a new Rivendell system and not altered thereafter.

### Warning

Changing this setting on a system with existing audio in the audio store may result in incorrect play-out of that audio!

The `Allow Duplicate Cart Titles` box, if not ticked, will force all carts to have a unique title. If unticked, then ticking the `Auto-Correct Duplicate Cart Titles` box will cause duplicate cart titles to be automatically made unique when imported. The unique name is constructed by appending "[*n*]", (where *n* is an integer) to the end of the title string.

### Warning

The ability to disallow duplicate cart titles in Rivendell **has been deprecated** and may be removed from future versions; it is included strictly to keep existing setups working. Use of it can cause other features within Rivendell to operate unreliably. It should never be used in new Rivendell setups!

If the `Show User List in RDLogin` box is ticked, `rdlogin(1)` will require users to enter their user name as well as their password when logging in (instead of providing all possible user names in a dropdown).

The `ISCI Cross Reference Path`: field takes the full path to the ISCI cross reference file used by the `rdrepld(8)` daemon (used only in conjunction with X-Digital copysplit replication).

The `Origin E-Mail Address`: field take the value that Rivendell will use as the "From:" address when sending e-mail.

### Note

Rivendell uses the system's `sendmail(1)` interface when originating e-mail. For many modern e-mail setups, additional site- and distro-specific configuration will likely be necessary beyond what can be covered here.

The `Multicast Address for Notifications:` field takes the IPv4 multicast address to use for communicating state and configuration changes between Rivendell hosts and modules. It should seldom be necessary to change this value from the default (`239.19.255.72`).

The `Maximum Remote Post Length:` field sets the maximum length POST submission that will be processed by the RDXport service. It should seldom be necessary to change this value.

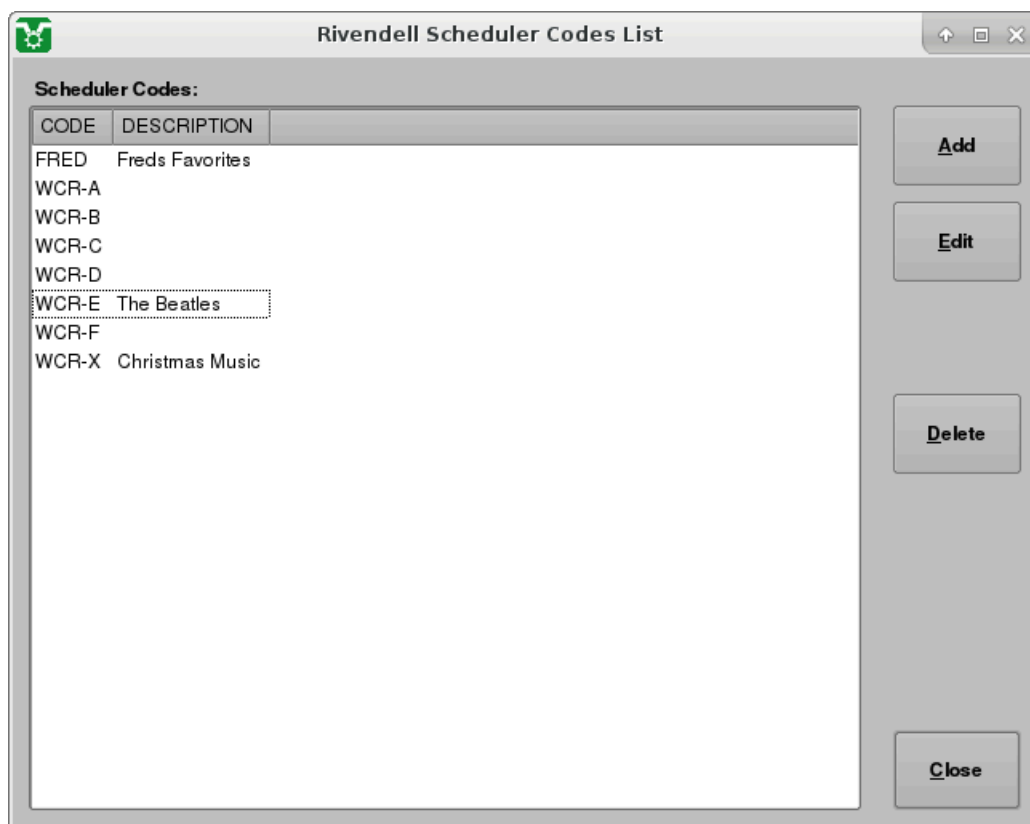
The `Temporary Cart Group:` dropdown sets the Rivendell group to be used for storing temporary carts --e.g. carts used for processing direct file play-outs in `rdcartslots(1)`.

The `Process RSS Updates On:` dropdown sets the Rivendell host to be used for processing automatic state changes for RSS feeds. If no RSS feeds are configured, this value can be set to **[none]**.

Touching the `Edit Encoder List` button will bring up the `Encoder Profiles` dialog. See Section 12.9.2, “Configuring Encoder Formats” for more information.

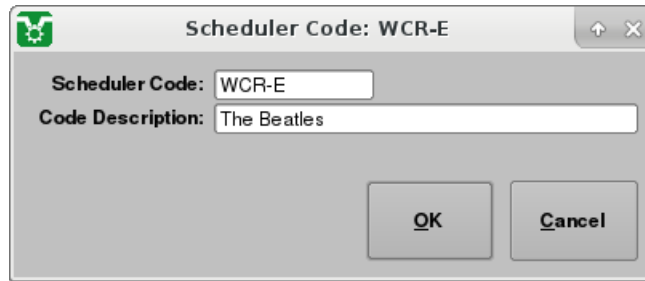
## 12.7. Managing Scheduler Codes

To manage scheduler codes, touch the `Scheduler Codes` button to bring up the Rivendell Scheduler Code dialog.



The Rivendell Scheduler Codes List Dialog

A new scheduler code can be added by touching the `Add` button to bring up the Scheduler Code dialog.

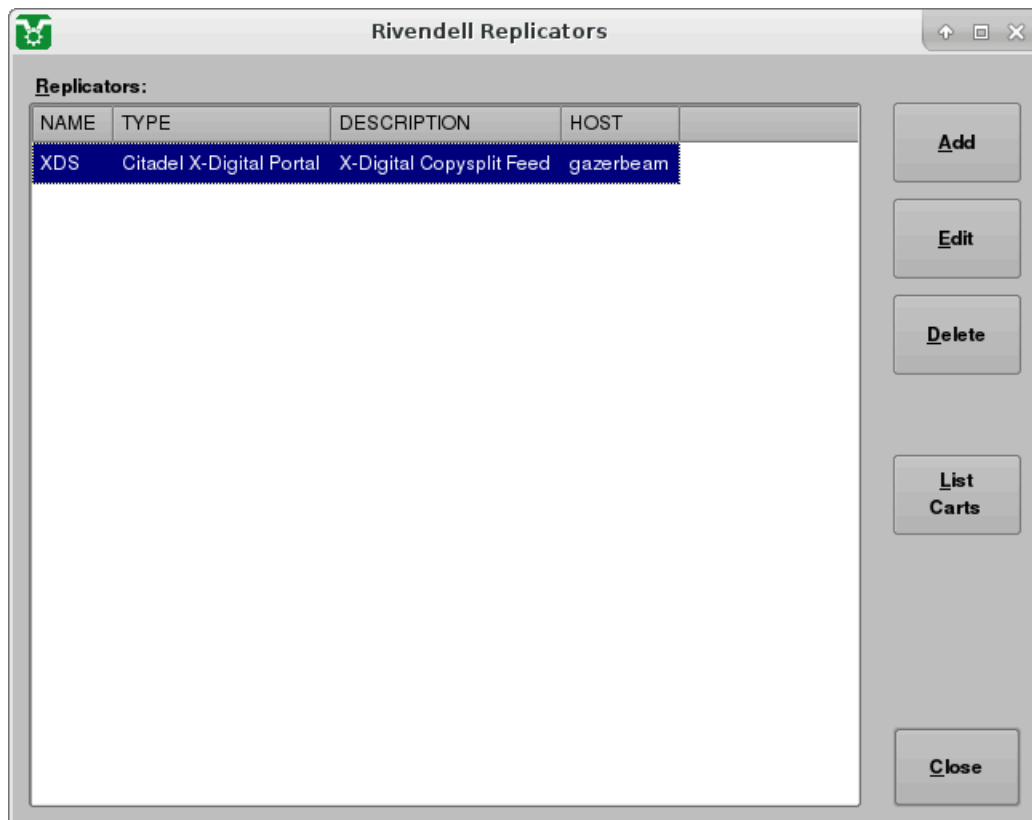


The Scheduler Code Dialog

## 12.8. Managing Replicators

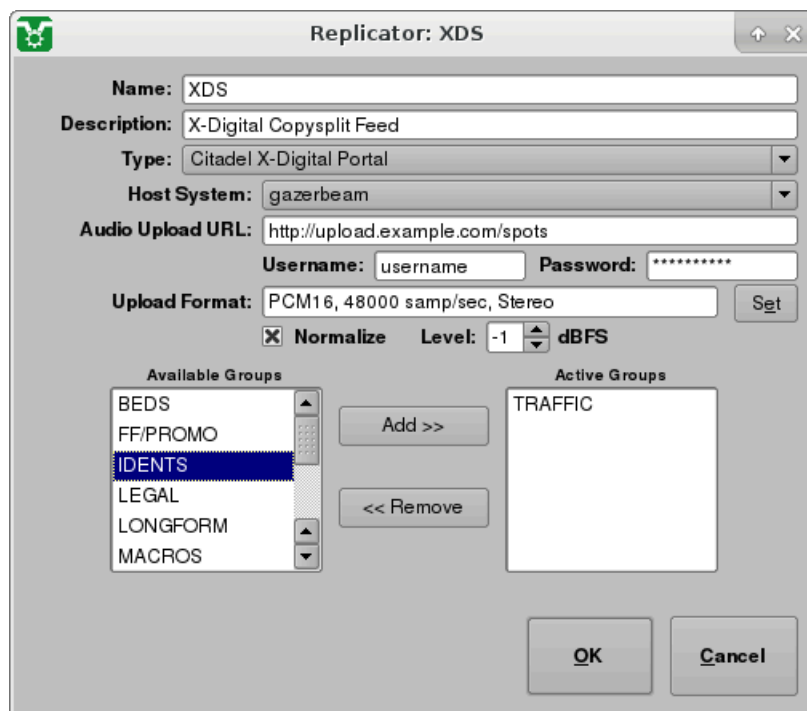
A *replicator* is a Rivendell service that provides the ability to move content automatically to different system on the basis of predefined rules. At present, Rivendell includes one such replicator, which can move audio material to an X-Digital satellite head-end system.

To manage replicators, touch the Manage Replicators button to bring up the Rivendell Replicators dialog.



The Rivendell Replicators Dialog

To add a new replicator, touch the Add button to bring up the Replicator dialog.



The Replicator Dialog

The **Name** : is a read-only field giving the name of the replicator.

The **Description** is a free-form text string providing a description of the replicator.

The **Type** : dropdown should be set to the type of replicator. At present, only one type is supported, **Citadel X-Digital Portal**.

The **Host System** : dropdown should be set to the name of the Rivendell Host upon which the `rdrepld(8)` daemon is run.

The **Audio Upload URL** : should be set to the URL of the upload location for audio to be sent to the remote system. It may also be necessary to set the **Username** : and **Password** : fields if that remote system requires it.

The **Upload Format** : should be set to provide the file and encoding format of the replicator uploads as required by the remote system. This can be done by touching the **Set** button. If the **Normalize** box is ticked, then audio will be peak-normalized to the level set by the **Level** : control before being uploaded.

The **Active Groups** list should be populated with the names of the Rivendell Groups from which audio to be replicated should be taken.

## 12.9. Configuring Webget

Configuration of the Webget service consists of three tasks:

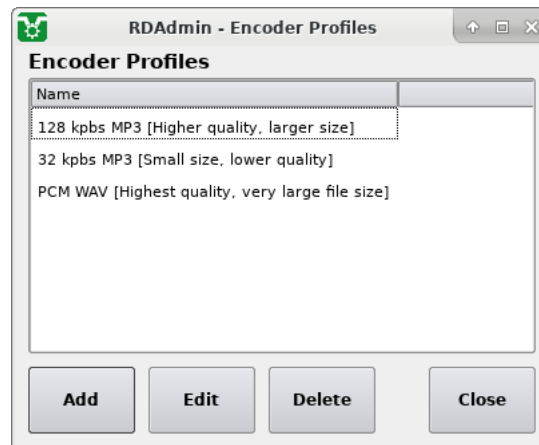
- Configure Rivendell to disallow duplicate cart titles.
- Configure a set of Encoder Formats
- Configure one or more Users for access

## 12.9.1. Disallowing Duplicate Cart Titles

See "Allow Duplicate Cart Titles" checkbox in Section 12.6, "Managing System Settings".

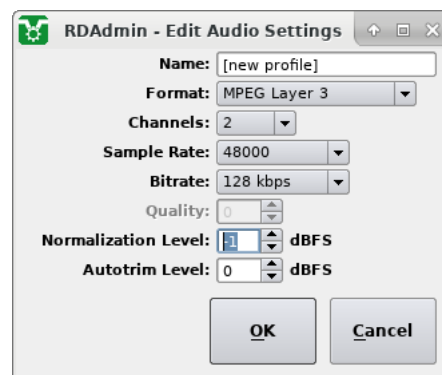
## 12.9.2. Configuring Encoder Formats

To configure Encoder Formats, log in to **rdadmin**(1), touch the System Settings button to open the System-Wide Settings button, then touch the Edit Encoder List button to open the Encoder Profiles dialog.



The Encoder Profiles Dialog

To add a new Encoder Profile, touch the Add button to open the Edit Audio Settings dialog.



The Edit Audio Settings Dialog

Enter the description of the Profile to appear in Webget, select the desired audio parameters and then touch the OK button.

Exiting Encoder Profiles can be modified or deleted by means of the Edit and Delete buttons, respectively.

## 12.9.3. Configuring Webget Users

To configure one or more users for Webget access, log in to **rdadmin**(1), touch the Manage Users button to open the Rivendell User List button, then create or select the desired user to open the User dialog.

For downloads, each Webget user must have the Allow WebGet Login permission enabled, as well as rights to one or more Groups set by touching the Group Permissions button.

For uploads, each Webget user must have the Allow WebGet Login and Create Carts permissions enabled, as well as rights to one or more Groups set by touching the Group Permissions button.

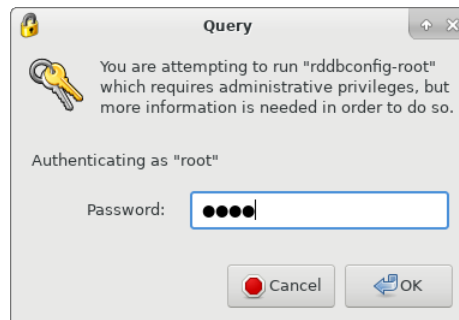
---

# Chapter 13. Managing the Rivendell Database with RDDbConfig

## 13.1. Overview

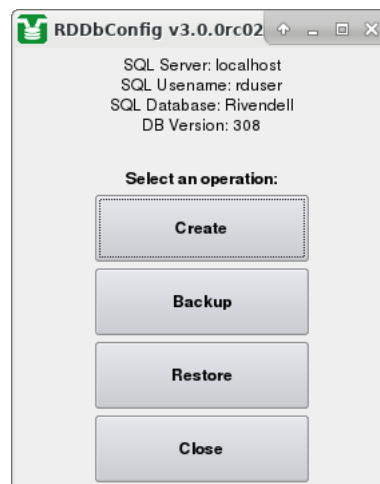
RDDbConfig is a GUI module that allows basic administration (creation, upgrading, backup and restoration) of a Rivendell database.

When starting up RDDbConfig, you will be prompted to enter the 'root' password for the system.



The Root Login Dialog

After entering the correct 'root' password, the main RDDbConfig window will be displayed.



The RDDbConfig Main Window

## 13.2. Creating a New Database

A 'new' database --i.e. one that contains only default objects -- can be generated by touching the Create button.

### Warning

Generating a new database will COMPLETELY OVERWRITE whatever database is currently loaded!

## 13.3. Backing Up the Database

To make a backup copy of the database, touch the `Backup` button. You will be prompted with a dialog to allow you to choose a location to save the resulting backup.

## 13.4. Restoring the Database from a Backup

To restore a previous backup, touch the `Restore` button. You will be prompted with a dialog to allow you to choose a location whence to load the back file.

### **Warning**

Restoring a previous database will COMPLETELY OVERWRITE whatever database is currently loaded!

---

# Chapter 14. Rivendell Macro Language

## 14.1. Overview

Rivendell Macro Language (or RML for short) is a set of commands implemented within Rivendell that can be used to program the system to take various actions. A wide variety of commands exist, ranging from control of outboard gear (such as switchers and GPIO devices) to control of various aspects of log playout in RDAirPlay, to Rivendell user management.

## 14.2. Protocol

The Normal form of a command takes the following syntax:

*cmd* [*arg*] [. . .]!

*cmd*                      A command mnemonic consisting of two alpha-numeric characters indicating the action to be performed.

*arg*                      Zero or more arguments, delimited by spaces or, if the last argument, by ! (see below)

!                          The ASCII character 33, indicating the end of the command sequence.

## 14.3. Command Delivery

To be executed by a Rivendell system, an appropriate command should be delivered to UDP ports 5858 or 5859 on said system, using the SOCK\_DGRAM connectionless protocol. Commands delivered to port 5858 may receive a reply back to the originating IP address at UDP socket 5860 to indicated command success/failure, while commanders delivered to 5859 will be processed, but no reply made.

## 14.4. Command Reply

If delivered to UDP port 5858, each command may receive a reply, formulated as follows:

*rpy* +/-

*rpy*                      The full command string (including arguments) originally received

  +                      ACK response, indicates success of the command.

  -                      NAK response, indicates failure of the command.

## 14.5. Specifying Color

In places where a color can be specified as a macro argument, the following predefined values are valid:

white  
red  
green  
blue  
cyan  
magenta

yellow  
gray  
lightGray  
black  
darkRed  
darkGreen  
darkBlue  
darkCyan  
darkMagenta  
darkYellow  
darkGray

## 14.6. Binary Data

Certain commands (e.g. **SO** and **UO**) have the ability to transmit arbitrary binary data in addition to textual characters. Such arbitrary binary data can be specified by means of escape codes as follows:

`%hexcode`

*hexcode*                      Two digit numeric value of the byte to send in hexadecimal.

For example, the sequence 'TEST' followed by a carriage return/newline could be specified as:

**TEST%0D%0A**

## 14.7. Log Machines

Some commands (e.g., **MD**, **PL**, and **PS**) require a *log machine* argument. See Section 6.2, “Log Machines” in Chapter 6, *Running Logs with RDAirPlay* for a detailed description of Log Machines.

The *log machine* argument in the context of Rivendell macros must be an integer ranging from Zero (0) to Three (3). 0 represents *all* log machines, 1 represents the *Main Log*, 2 represents *Aux Log 1*, and 3 represents *Aux Log 2*.

For example, the macro **PL 1 0!** starts playing at the first line (0) of the *Main Log* (log machine 1).

## 14.8. Commands

### 14.8.1. Air Gate [AG]

Module        **ripd(8)**

Mnemonic    **AG**

Process an RML only if the On-Air flag is ON.

**AG rml!**

Execute RML *rml* only if the On-Air flag on the local machine is ON.

### 14.8.2. Append Log [AL]

Module        **rdairplay(1), rdairplayd(8)**

Mnemonic    **AL**

Append a log to a currently loaded log.

**AL *mach logname*!**

Append the log named *logname* to the log currently loaded in log machine *mach*.

### 14.8.3. Binary Serial Out [BO]

Module        **ripd(8)**

Mnemonic    **BO**

Output a string of binary codes.

**BO *portnum hexcode* ...!**

Output a string of binary codes represented by *hexcode* . . on serial port *portnum*!

### 14.8.4. Clear Serial Trap [SC]

Module        **ripd(8)**

Mnemonic    **SC**

Clear a serial trap.

**SC *portnum cart string*!**

**SC *portnum cart*!**

**SC *portnum*!**

Clear a serial trap. The three argument form will clear all traps on *port* that reference *cart* and *string*. The two argument form will clear all traps on *port* that reference *cart*, while the one argument form will clear all traps on *port*.

### 14.8.5. Command Send [CC]

Module        **ripd(8)**

Mnemonic    **CC**

Send RML to a remote host.

**CC *dest* [:*udpport*] *rml*!**

Send the RML command *rml* to *dest*. *dest* may be either a Rivendell host name or an IP address. A UDP port value may be optionally specified as *udpport* (default value 5859).

### 14.8.6. Connect Jack Ports [JC]

Module        **ripd(8)**

Mnemonic    **JC**

Connect a JACK input port to an output port.

**JC *output input!***

Attempt to connect JACK input port *input* to *output*.

### 14.8.7. Console Label [CL]

Module        **ripd(8)**

Mnemonic    **CL**

Set the label on a control surface.

**CL *matrix surface chan label!***

On matrix *matrix*, set the input *chan* module label of control surface *surface* to *label*.

### 14.8.8. Copy Cut [CP]

Module        **rdcatchd(8)**

Mnemonic    **CP**

Copy cut audio and metadata.

**CP *srccart srccut dstcart dstcut!***

Copy the audio and metadata from cut number *srccut* in cart *srccart* to cut number *dstcut* in cart *dstcart*. The destination cart/cut must already exist.

### 14.8.9. Cut Event [CE]

Module        **rdcatchd(8)**

Mnemonic    **CE**

Place a cut event at the current location of an active RDCatch recording.

**CE *decknum eventnum!***

Place a cut event with event number *eventnum* at the current position of the active recording in RDCatch Deck *decknum*.

### 14.8.10. Disconnect Jack Ports [JD]

Module        **ripd(8)**

Mnemonic    **JD**

Disconnect a JACK input port from an output port.

**JD *output input!***

Attempt to disconnect JACK input port *input* from *output*.

## 14.8.11. Disconnect All Jack Ports [JZ]

Module      **ripd(8)**

Mnemonic    **JZ**

Disconnect all JACK input port connections.

**JZ!**

Attempt to disconnect all JACK port connections.

## 14.8.12. Duck Panel Button [PD]

Module      **rdairplay(1)**

Mnemonic    **PD**

Set the duck level of a SoundPanel button in RDAirPlay.

**PD *panel col row level fade [mport]*!**

Set the duck level of button at *column, row* of panel *panel*. Panel: **S1...S50** or **U1...U50**; **C** for *panel* means currently selected panel. If *col* and/or *row* is **0**: duck all buttons in *col* or *row*. If playing, the audio fades to *level* (in dbFS) in *fade* msec. If specified, only stop carts playing on panel port *mport*. The duck level will be set to 0 after the playback is finished, or the button is stopped or reset.

## 14.8.13. Execute Breakaway [DX]

Module      **rdcartslots(1)**

Mnemonic    **DX**

Execute a breakaway.

**DX *slotlen*!**

Execute a breakaway of length *len* (in mS) using the autofill carts configured for the service currently loaded in the *slot* slot. The slot must be in Breakaway mode. If a breakaway is currently executing, it will immediately be aborted and a new one started. Passing a '0' for *len* will cause any currently executing breakaway immediately to be aborted and input audio restored.

## 14.8.14. Execute Cart [EX]

Module      **rdcatchd(8)**

Mnemonic    **EX**

Execute a macro cart.

**EX *cartnum*!**

Execute macro cart *cartnum* on the local host.

## 14.8.15. Fire Salvo [FS]

Module      **ripd(8)**

Mnemonic   **FS**

Execute a switcher salvo.

**FS *matrix* *salvo*!**

Fire salvo number *salvo* on matrix *matrix*.

## 14.8.16. GPI Enable [GE]

Module      **ripd(8)**

Mnemonic   **GE**

Enable/disable a GPI line.

**GE *matrix* *type* *gpinum* *state*!**

Enable or disable the GPI line of type *type* indicated by *gpinum* on matrix *matrix*. Possible types are:

- I**   Input
- O**   Output

## 14.8.17. GPI Enable [GE] (old format, deprecated)

Module      **ripd(8)**

Mnemonic   **GE**

Enable/disable a GPI line.

**GE *matrix* *gpinum* *state*!**

Enable or disable the GPI line indicated by *gpinum* on matrix *matrix*.

## 14.8.18. GPI Set [GI]

Module      **ripd(8)**

Mnemonic   **GI**

Set action in response to a GPIO event.

**GI *matrix* *type* *gpinum* *state* *cart*!**

Execute the macro *cart* upon transition of the GPIO of type *type* and line *gpinum* on matrix *matrix* to *state*. Possible types are:

- I**   Input
- O**   Output

## 14.8.19. GPI Set [GI] (old format, deprecated)

Module      **ripd(8)**

Mnemonic    **GI**

Set action in response to a GPIO event.

**GI *matrix gpinum state cart!***

Execute the macro *cart cart* upon transition of the GPIO of line *gpinum* on matrix *matrix* to *state*.

## 14.8.20. GPO Set [GO]

Module      **ripd(8)**

Mnemonic    **GO**

Set the state of a GPIO line.

**GO *matrix type gponum state length!***

Command GPIO line *gponum* of type *type* on matrix *matrix* to *state* for *length* mS. A length of 0 indicates to hold the state indefinitely. Possible types are:

**I**    Input

**O**    Output

Possible states are:

**0**    OFF

**1**    ON

**-1**   Passthrough hardware input (valid only for Input type)

## 14.8.21. GPO Set [GO] (old format, deprecated)

Module      **ripd(8)**

Mnemonic    **GO**

Set the state of a GPIO line.

**GO *matrix gponum state length!***

Command GPIO line *gponum* on matrix *matrix* to *state* for *length* mS. A length of 0 indicates to hold the state indefinitely.

## 14.8.22. Insert Cart [PX]

Module      **rdairplay(1)**

Mnemonic    **PX**

Insert a cart in a log.

**PX** *mach cart [offset] [PLAY|SEGUE|STOP]!*

Insert cart *cart* after the currently playing or next event plus *offset* (default '0') lines on log machine *mach*. The transition may also be optionally specified.

## 14.8.23. Insert Serial Trap [SI]

Module      **ripd**(8)

Mnemonic    **SI**

Insert a serial trap to detect a character sequence.

**SI** *portnum cart string!*

Insert a serial trap to execute the macro cart *cart* upon receipt of *string* on serial port *port*.

## 14.8.24. Label Panel [PC]

Module      **rdairplay**(1)

Mnemonic    **PC**

Set the label of a SoundPanel button in RDAirPlay.

**PC** *panel col row label color!*

Set the button at *col*, *row* of panel *panel* to have a text label of *label* and a background color of *color*. Panel: **S**1...**S**50 or **U**1...**U**50; **C** for *panel* means currently selected panel.

## 14.8.25. Load Log [LL]

Module      **rdairplay**(1)

Mnemonic    **LL**

Load a log into RDAirPlay.

**LL** *mach [logname] [startline]!*

Load the log *logname* in log machine *mach*. After loading, start the log at line *startline* if it is  $\geq 0$ . If *startline* is -2, the log will be started at the first event if that event does not have a 'stop' transition. Default *startline*=-1. If no *log*> is specified, the machine's current log is unloaded.

## 14.8.26. Load Panel [PE]

Module      **rdairplay**(1)

Mnemonic    **PE**

Load a cart into a SoundPanel button in RDAirPlay.

**PE** *panel col row cart!*

Load cart *cart* into the button at *col,row* of panel *panel*. Panel: **S1...S50** or **U1...U50**; **C** for *panel* means currently selected panel.

## 14.8.27. Load Slot [DL]

Module      **rdcartslots(1)**

Mnemonic    **DL**

Load an RDCartSlots slot.

This command has two syntaxes, depending upon the mode of the slot.

Cart Deck Mode syntax:

**DL *slot cart*!**

Load the cart *cart* into the *slot* slot. Passing a '0' for *cart* will cause the slot to be unloaded. This command will be ignored if the slot is currently playing.

Breakaway Mode syntax:

**DL *slot svcname*!**

Set the *slot* slot to use service *svcname*. Omitting the *svcname* argument will cause the slot to be unloaded. This command will be ignored if the slot is currently executing a breakaway.

## 14.8.28. Login [LO]

Module      **ripd(8)**

Mnemonic    **LO**

Change the active Rivendell user context.

**LO *user password*!**

Set the current Rivendell user to *user*. If no arguments are supplied, log out the station --i.e. revert to the default user.

## 14.8.29. Macro Timer [MT]

Module      **ripd(8)**

Mnemonic    **MT**

Timer for running macro carts.

**MT *timernum timeout cart*!**

Set the macro timer *timernum* to execute macro cart *cart* in *timeout* milliseconds. Setting *timeout* to 0 disables the timer. Sixteen macro timers (numbered 1-16) are available on each Rivendell host.

## 14.8.30. Make Next [MN]

Module      **rdairplay(1)**

Mnemonic    **MN**

Load changes to a currently loaded log in RDAirPlay.

**RL *mach line*!**

Set the next event for log machine *mach* to line *line*>.

## 14.8.31. Message Box [MB]

Module        **ripd(8)**

Mnemonic    **MB**

Display a popup message box on a host display.

**MB *display severity msg*!**

Display the text *msg* in a popup window on X display *display*, with an icon to indicate *severity*. Valid values of *severity* are:

- 1 Information
- 2 Warning
- 3 Critical

When using the 'Message Box' [**MB**] RML, it may be necessary to configure the X server to allow local connections from other processes. One way to do this is to execute the following command as the local Rivendell user:

**xhost +local:**

For more information, see the **xhost(1)** man page.

## 14.8.32. No Operation [NN]

Module        none

Mnemonic    **NN**

Do nothing.

**NN!**

This RML does precisely nothing.

## 14.8.33. Pause Panel [PU]

Module        **rdairplay(1)**

Mnemonic    **PU**

Pause a SoundPanel button in RDAirPlay.

**PU *panel col row [mport]*!**

Pause the button at *col*, *row* of panel *panel*. Panel: **S1...S50** or **U1...U50**; **C** for *panel* means currently selected panel. If *col* and/or *row* is **0**: pause all playing buttons in *col* or *row*. If specified, start the payout on panel port *mport*.

### 14.8.34. Play Panel [PP]

Module      **rdairplay(1)**

Mnemonic    **PP**

Load a cart into a SoundPanel button in RDAirPlay.

**PP *panel col row [mport] [0|1]!***

Play the button at *col*, *row* of panel *panel*. Panel: **S1...S50** or **U1...U50**; **C** for *panel* means currently selected panel. If *col* and/or *row* is **0**: Start the first loaded button that is not active. If specified, start the payout on panel port *mport*. The started panel will stay active when finished, if the 5th argument is **1**.

### 14.8.35. Play Slot [DP]

Module      **rdcartslots(1)**

Mnemonic    **DP**

Play an RDCartSlots slot.

**DP *slot!***

Play the cart currently loaded in the *slot* slot. The slot must be in Cart Deck mode. This command will be ignored if the slot is unloaded or already playing.

### 14.8.36. Refresh Log [RL]

Module      **rdairplay(1)**

Mnemonic    **RL**

Load changes to a currently loaded log in RDAirPlay.

**RL *mach!***

Refresh the log currently loaded in log machine *mach*.

### 14.8.37. Run Shell Command [RN]

Module      **ripd(8)**

Mnemonic    **RN**

Run a shell command.

**RN *cmd!***

Run the shell command *cmd*.

## Note

The command is actually executed as:

```
/bin/sh -c cmd
```

using the user and group specified by the "RnRmlOwner=" and "RnRmlGroup=" directives in the "[Identity]" section of **rd.conf**(5).

## 14.8.38. Select Widget [PW]

Module      **rdairplay**(1)

Mnemonic    **PW**

Select right-hand widget in RDAirPlay.

**PW** *mach*!

Select right-hand widget to log-machine *mach* or **0** for sound panel.

## 14.8.39. Serial Out [SO]

Module      **ripd**(8)

Mnemonic    **SO**

Output a string on a serial port.

**SO** *portnum data*!

Output *data* on serial port *portnum*. *data* can consist of arbitrary binary data as well as textual characters (see **Binary Data** above).

## 14.8.40. Serial Reload [SY]

Module      **ripd**(8)

Mnemonic    **SY**

Reload the configuration for a serial port.

**SY** *portnum*!

Reload the configuration for serial port *portnum*. Normally, this should only be issued by RDAdmin following a configuration change.

## 14.8.41. Set Color Label [LC]

Module      **rdairplay**(1)

Mnemonic    **LC**

Display a color message in the label widget on RDAirPlay.

**LC *color string*!**

Display *string*> in color *color* in the message widget.

## 14.8.42. Set Default Now & Next Cart [SN]

Module      **rdairplay(1)**

Mnemonic    **SN**

Set the default Now & Next cart.

**SN now|next *mach cart*!**

Set the default Now & Next cart for log *mach* to *cart*.

## 14.8.43. Set Display [SD]

Module      **ripcd(8)**

Mnemonic    **SD**

Set a console display.

**SD *matrix display line col attr label*!**

On matrix *matrix*, set the console display *display* to *label*, starting at position *line*, *col* and using message attributes *attr*.

The message attributes value is constructed as follows:

Bit 7            Display mode

Bits 6,5        Video attribute

Bit 2,1,0       Message Text Color

Display Mode:

0    Overwrite text

1    Insert text

Video Attribute:

00   Normal

01   Flash

02   Reverse

Text Color:

000   White

001   Red

010 Yellow

011 Green

100 Cyan

101 Magenta

## 14.8.44. Set Duck Level [MD]

Module **rdairplay**(1)

Mnemonic **MD**

Set duck level for an RDAirPlay log machine.

**MD *mach level fade* [*mport*]!**

Set the duck level of *mach*, or **0** for all log machines. If playing, the audio fades to *level* (in dbFS) in *fade* msecs. If specified, only affect carts playing on machine port *mport*. Loading or clearing a log will set the duck level back to 0.

## 14.8.45. Set Label [LB]

Module **rdairplay**(1)

Mnemonic **LB**

Display a message in the label widget on RDAirPlay.

**LB *string*!**

Display *string*> in the message widget.

## 14.8.46. Set Mode [PM]

Module **rdairplay**(1)

Mnemonic **PM**

Set the mode of an RDAirPlay log machine.

**PM *mode* [*mach*]!**

Set log machine *mach* to mode *mode*. If mode is not given or the Mode Control Style is set to 'Unified', then all log machines are set to *mode*. Valid values for *mode* are:

1 LiveAssist

2 Auto

3 Manual

## 14.8.47. Sleep [SP]

Module **ripd**(8)

Mnemonic    **SP**

Pause for specified time.

**SP *msecs*!**

Wait for *msecs* milliseconds.

## 14.8.48. Start [PL]

Module        **rdairplay(1)**

Mnemonic    **PL**

Start a log at a specified line.

**PL *mach line*!**

Start log machine *mach* at line *line* if stopped, otherwise do nothing.

## 14.8.49. Start Button [PB]

Module        **rdairplay(1)**

Mnemonic    **PB**

Push an RDAirPlay Start button (1-7, numbered from the top).

**PB *button*!**

Push button *button*.

## 14.8.50. Start Next [PN]

Module        **rdairplay(1)**

Mnemonic    **PN**

Start the next event in a log.

**PN *mach* [*mport*] [*skip*]!**

Start log machine *mach*> if stopped, or start next event if already running. If specified, start the playout on machine port *mport*>. If *skip* is supplied, equal to '1' and the log machine is in Manual or Live Assist mode, then any intervening meta-events in log between the current 'next' event and the next cart will be skipped over.

## 14.8.51. Start Record Deck [RS]

Module        **rdcatchd(8)**

Mnemonic    **RS**

Start an RDCatch Recording

**RS *decknum cartnum cutnum maxlen*!**

Start recording to cut *cutnum* of cart *cartnum*, using RDCatch record deck *decknum* for a maximum time of *maxlen* mS. The record parameters used (format, sample rate, channels, etc) will be those configured for the selected deck in RDAAdmin->ManageHosts->RDCatch. The selected cart and cut must already exist. Any audio previously residing in the selected cart and cut will be overwritten.

## 14.8.52. Stop [PS]

Module       **rdairplay(1)**

Mnemonic     **PS**

Stop a log in RDAirPlay.

**PS *mach* | 0 [*fade*] [*mport*]!**

Stop log machine *mach*, or 0 for all log machines. If specified, only stop carts playing on machine port *mport*. If specified, fade out *fade* msecs.

## 14.8.53. Stop Panel [PT]

Module       **rdairplay(1)**

Mnemonic     **PT**

Stop a SoundPanel button in RDAirPlay.

**PT *panel col row* [*mport*] [0|1] *fade*!**

Stop the button at *col*, *row* of panel *panel*. Panel: **S1...S50** or **U1...U50**; **C** for *panel* means currently selected panel. If *col* and/or *row* is 0: stop all playing buttons in *col* or *row*. If specified, start the ployout on panel port *mport*. The stopped panel will stay active when finished, if the 5th argument is 1.

## 14.8.54. Stop Record Deck [RR]

Module       **rdcatchd(8)**

Mnemonic     **RR**

Stop an RDCatch Recording

**RR *decknum*!**

Stop any active recording on RDCatch deck *decknum*.

## 14.8.55. Stop Slot [DS]

Module       **rdcartslots(1)**

Mnemonic     **DS**

Stop an RDCartSlots slot.

**DS *slot*!**

Stop the cart currently loaded in the *slot* slot. The slot must be in Cart Deck mode. This command will be ignored if the slot is unloaded or already playing.

## 14.8.56. Switch Add [SA]

Module      **ripd(8)**

Mnemonic    **SA**

Add an input to an output.

***SA matrix input output!***

Command switch matrix number *matrix* to add input number *input* to output number *output*. Unlike **SWITCH TAKE**, this command leaves any other previously assigned inputs unchanged.

## 14.8.57. Switch Add With Gain [SG]

Module      **ripd(8)**

Mnemonic    **SG**

Add an input to an output while specifying the crosspoint gain.

***SG matrix input output gain!***

Command switch matrix number *matrix* to add input number *input* to output number *output* at gain *gain*. The gain is specified in 1/10 of a dB, with 0 = unity gain. Unlike **SWITCH TAKE**, this command leaves any other previously assigned inputs unchanged.

## 14.8.58. Switch Crosspoint Gain [SX]

Module      **ripd(8)**

Mnemonic    **SX**

Set crosspoint gain.

***SX matrix input output level!***

Command switch matrix number *matrix* to adjust the gain of the crosspoint connecting input *input* to output *output* to *level* dB.

## 14.8.59. Switch Level [SL]

Module      **ripd(8)**

Mnemonic    **SL**

Set input gain.

***SL matrix input level!***

Command switch matrix number *matrix* to adjust the gain of input number *input* to *level* dB.

## 14.8.60. Switch Reload [SZ]

Module      **ripd(8)**

Mnemonic    **SZ**

Reload the configuration for a switch matrix.

**SZ *matrix*!**

Reload the configuration for switch matrix *matrix*. Normally, this should only be issued by RDAdmin following a configuration change.

## 14.8.61. Switch Remove [SR]

Module        **ripd(8)**

Mnemonic    **SR**

Remove an input from an output.

**SR *matrix input output*!**

Command switch matrix number *matrix* to remove input number *input* from output number *output*. Unlike **SWITCH TAKE**, this command leaves any other previously assigned inputs unchanged.

## 14.8.62. Switch Take [ST]

Module        **ripd(8)**

Mnemonic    **ST**

Exclusively route an input to an output.

**ST *matrix input output*!**

Command switch matrix number *matrix* to take input number *input* to output number *output*. "Take" in this context implies removing any previously assigned inputs from the referenced output.

## 14.8.63. Toggle On Air Flag [TA]

Module        **ripd(8)**

Mnemonic    **TA**

Set the state of the On Air flag.

**TA 0|1!**

Set the On-Air flag to ON [1] or OFF [0].

## 14.8.64. UDP Out [UO]

Module        **ripd(8)**

Mnemonic    **UO**

Send data to a UDP port.

**UO *ipaddr udpport data*!**

Send *data* in a UDP packet to port *udpport* at *ipaddr*. *data* can consist of arbitrary binary data as well as textual characters (see **Binary Data** above).

---

# Chapter 15. Program Associated Data

## 15.1. Overview

Rivendell includes full support for the origination and transmission of program associated data (PAD) in realtime, including a Python module (PyPAD) that can be used to create scripts for interfacing Rivendell's PAD feed to most any arbitrary external system.

### 15.1.1. The JSON Interface

All Rivendell PAD updates are emitted as JSON documents [<https://www.json.org/>] of type `padUpdate` via TCP port 34289. A typical update looks like:

```
{
  "padUpdate": {
    "dateTime": "2019-03-28T15:09:01-04:00",
    "hostName": "elastigirl",
    "shortHostName": "elastigirl",
    "machine": 1,
    "onairFlag": false,
    "mode": "Automatic",
    "service": {
      "name": "Production",
      "description": "Production Log"
    },
    "log": {
      "name": "Example"
    },
    "now": {
      "startDateTime": "2019-03-28T15:09:01-04:00",
      "lineNumber": 0,
      "lineId": 0,
      "cartNumber": 10477,
      "cartType": "Audio",
      "cutNumber": 1,
      "length": 225500,
      "year": null,
      "groupName": "MUSIC",
      "title": "Allentown",
      "artist": "Billy Joel",
      "publisher": "",
      "composer": "",
      "album": "The Complete Hits Collection 1973-1997",
      "label": "",
      "client": "",
      "agency": "",
      "conductor": "",
      "userDefined": "",
      "songId": ""
    }
  }
}
```

```

        "outcue": "",
        "description": "Cut 001",
        "isrc": "",
        "isci": "",
        "externalEventId": "",
        "externalData": "",
        "externalAnncType": ""
    },
    "next": {
        "startDateTime": "2019-03-28T15:12:46-04:00",
        "lineNumber": 1,
        "lineId": 1,
        "cartNumber": 10153,
        "cartType": "Audio",
        "cutNumber": 1,
        "length": 168700,
        "year": null,
        "groupName": "MUSIC",
        "title": "Me & You & A Dog Named Boo",
        "artist": "Lobo",
        "publisher": "",
        "composer": "",
        "album": "'70s Radio Hits",
        "label": "",
        "client": "",
        "agency": "",
        "conductor": "",
        "userDefined": "",
        "songId": "",
        "outcue": "",
        "description": "Cut 001",
        "isrc": "",
        "isci": "",
        "externalEventId": "",
        "externalData": "",
        "externalAnncType": ""
    }
}
}

```

## 15.1.2. PyPAD

Rivendell ships with a Python 3 module called "pypad" that automates away most of the work involved in reading, parsing and processing the raw JSON data feed described above. A copiously commented example script can be found in the Rivendell source tree at `apis/pypad/tests/now_and_next.py`.

### 15.1.2.1. Starting Scripts Automatically with the "rivendell" Service

Rivendell can be configured to start one or more PyPAD scripts automatically whenever the "rivendell" systemd service is (re)started. In order to support this, a PyPAD script must meet the following requirements:

- Accept exactly three command-line arguments as follows:

**script** *host-name* *port-num* *config*

The *config* value should be passed to the `pypad.Receiver.setConfigFile()` method, and *host-name* and *port-num* values should be passed to the `pypad.Receiver().start()` method. See any of the production PyPAD scripts in the Rivendell sources in **apis/pypad/scripts/** for an example.

- If the script is configurable via a configuration file, provide a sample copy of the configuration file, using wherever possible sane default values along with comments documenting what the various parameters do. The file should have the the same base name as that of the script, but have an **.exemplar** extension.

For example, if the script is called **myscript.py**, the sample configuration file would be called **myscript.exemplar**.

- Install a copy of the script, along with a copy of the sample configuration file (if needed) in the Rivendell PyPAD script directory **\$(libdir)/rivendell/pypad/**.

### Note

In the RHEL/CentOS reference installation, this directory is **/usr/lib64/rivendell/pypad/**.

### Note

The **\$(libdir)** path component evaluates to the value used for the **--libdir** switch that was passed to the "configure" script when Rivendell was built [default value: **/usr/local/lib**].

All PyPAD scripts started in this manner will be run under the user/group specified by the **PypadOwner=** and **PypadGroup=** directives in the **[Identity]** section of the **rd.conf(5)** configuration file.

See Section 12.5.14, "Managing PyPAD Instances" for instructions on enabling a script that has been prepared in this manner.

---

# Chapter 16. Interfacing with the Linux Ecosystem: Command-Line Utilities

Rivendell includes a number of command-line utilities. Some of these can be used to perform efficient "bulk" operations --e.g. import thousands of audio files in one command -- while others are useful in various aspects of system maintenance. This section provides a brief overview of the available utilities; full documentation for each is available via the Linux man page facility.

## 16.1. rdclilogedit(1)

**rdclilogedit(1)** is a command-line interface (CLI) program that can be used to edit Rivendell logs. It is loosely modeled after the venerable **ed(1)** command-line editor and so is particularly well suited for use in scripting environments.

Full documentation is available by doing **man 1 rdclilogedit**.

## 16.2. rdconvert(1)

**rdconvert(1)** is a command-line interface (CLI) program that can be used to convert an audio file into a different format.

Full documentation is available by doing **man 1 rdconvert**.

## 16.3. rddbcheck(8)

**rddbcheck(8)** is a command-line interface (CLI) program that can be used to check a Rivendell database for consistency and correct errors found.

Full documentation is available by doing **man 8 rddbcheck**.

## 16.4. rdexport(1)

**rdexport(1)** is a command-line interface (CLI) program that can be used to export audio material from the Rivendell Library. It is particularly useful in situations where a large number of audio files need to be exported in an automated fashion, and is capable of exporting thousands of files with a single command-line invocation.

Full documentation is available by doing **man 1 rdexport**.

## 16.5. rdimport(1)

**rdimport(1)** is a command-line interface (CLI) program that can be used to import audio material into the Rivendell Library. It is particularly useful in situations where a large number of audio files need to be imported in an automated fashion, and is capable of importing thousands of files with a single command-line invocation.

Full documentation is available by doing **man 1 rdimport**.

## 16.6. rdmarkerset(8)

**rdmarkerset(8)** is a command-line interface (CLI) program that can be used to set or alter audio cut markers in the Rivendell Radio Automation System. It is capable of altering multiple cuts in a single operation.

Full documentation is available by doing **man 8 rdmarkerset**.

## 16.7. rdrevert(8)

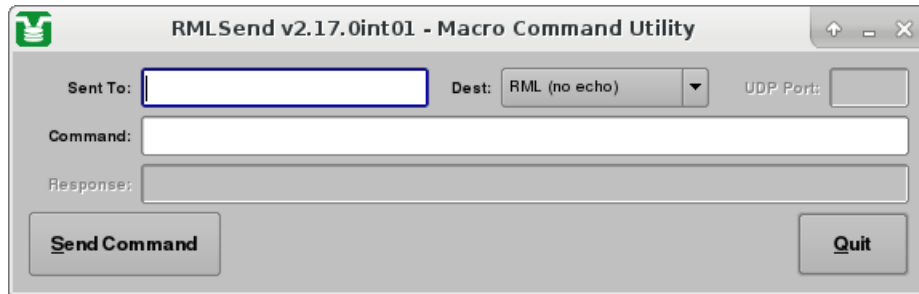
**rdrevert(8)** is a command-line interface (CLI) program that can be used to revert a Rivendell database to a previous schema version.

Full documentation is available by doing **man 8 rdrevert**.

## 16.8. rmlsend(1)

**rmlsend(1)** is a small utility that can be used to send RML commands to a local or remote Rivendell host. It can operate in two modes: GUI or a command line interface (CLI).

If started with no arguments, RMLSend will come up in GUI mode.



RMLSend in GUI Mode

Full documentation is available by doing **man 1 rmlsend**.

---

---

---

# Table of Contents

A. GNU Free Documentation License .....	162
A.1. GNU Free Documentation License .....	162
A.1.1. ADDENDUM: How to use this License for your documents .....	168
B. The GNU General Public License, Version Two .....	169
B.1. GNU GENERAL PUBLIC LICENSE .....	169
B.1.1. Preamble .....	169
B.1.2. GNU GENERAL PUBLIC LICENSE .....	169
B.1.3. NO WARRANTY .....	172
B.1.4. END OF TERMS AND CONDITIONS .....	173
B.2. How to Apply These Terms to Your New Programs .....	173
B.2.1. ....	173
B.2.2. ....	173
C. Supported GPIO/Switcher Devices .....	175
C.1. 360 Systems AM-16/B Audio Crosspoint Switcher .....	175
C.2. BroadcastTools 10x1 .....	175
C.3. BroadcastTools 16x1 .....	175
C.4. BroadcastTools 16x2 .....	175
C.5. BroadcastTools 8x2 .....	176
C.6. BroadcastTools ACS8.2 .....	176
C.7. BroadcastTools ADMS 44.22 Analog/AES Digital Matrix Switcher .....	177
C.8. BroadcastTools GPI-16 General Purpose Input Module .....	177
C.9. BroadcastTools Sentinel 4 Web AES Switcher .....	177
C.10. BroadcastTools SRC-16 .....	178
C.11. BroadcastTools SS 12.4 .....	178
C.12. BroadcastTools SS 2.1 .....	178
C.13. BroadcastTools SS 16.4 .....	178
C.14. BroadcastTools SS 4.1 MLR Switcher/Router .....	179
C.15. BroadcastTools SS4.2 .....	179
C.16. BroadcastTools SS4.4 .....	180
C.17. BroadcastTools SS8.2 .....	180
C.18. BroadcastTools Universal 4.1MLR>>Web .....	180
C.19. Grass Valley 7000 Protocol .....	181
C.20. Harlond Virtual Mixer .....	181
C.21. Kernel GPIO .....	181
C.22. Livewire LWRP Audio .....	182
C.23. Livewire LWRP GPIO .....	182
C.24. Livewire Multicast GPIO .....	182
C.25. Local Audio Adapter .....	183
C.26. Local GPIO .....	183
C.26.1. 15 Pin Joystick Port .....	183
C.26.2. MeasurementComputing GPIO Cards .....	184
C.27. Logitek vGuest .....	187
C.28. Modbus TCP .....	187
C.29. Quartz Electronics Type 1 Routing Protocol .....	187
C.30. Ross NK Video Switchers (via SCP/A Serial Interface) .....	187
C.31. Serial Port Modem Control Lines .....	188
C.32. Sierra Automated Systems 16000(D) Audio Router .....	188
C.33. Sierra Automated Systems 32000 Audio Router .....	188
C.34. Sierra Automated Systems 64000 Audio Router .....	189
C.35. Sierra Automated Systems 64000 Audio Router .....	189
C.36. Sierra Automated Systems User Serial Interface (USI) .....	189

---

C.37. Sine Systems ACU-1 (Prophet Version) .....	190
C.38. Software Authority Protocol .....	190
C.39. Starguide III Satellite Receiver .....	190
C.40. Wegener Unity4000 DVB Satellite Receiver .....	190
C.41. Wheatnet Blade LIO .....	191
C.42. Wheatnet Blade SLIO .....	191
D. Filepath Wildcards .....	192
D.1. Definition .....	192
D.2. Examples .....	194
E. ....	195
E.1. Metadata Wildcards .....	195
F. Rivendell Filter .....	197
F.1. Overview .....	197
F.2. Usage .....	197
F.3. Procedure .....	197
F.3.1. Create Rivendell Groups .....	197
F.3.2. Locate the External Rivendell Database and Audio Files .....	197
F.3.3. Verify Available Disk Space .....	197
F.3.4. Invoke Script .....	198
G. Wings Filter .....	199
G.1. Overview .....	199
G.2. Usage .....	199
G.3. Procedure .....	199
G.3.1. Create Rivendell Groups .....	199
G.3.2. Locate the 'Wings' Database and Audio Files .....	199
G.3.3. Verify Available Disk Space .....	199
G.3.4. Invoke Script .....	199
G.3.5. Clean Up .....	200

---

# Appendix A. GNU Free Documentation License

## A.1. GNU Free Documentation License

Version 1.3, 3 November 2008

Copyright © 2000, 2001, 2002, 2007, 2008 Free Software Foundation, Inc. <<https://fsf.org/>>

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

### 0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondly, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

### 1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant.

The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent. An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

The "publisher" means any person or entity that distributes copies of the Document to the public.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

## 2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

## 3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to give them a chance to provide you with an updated version of the Document.

#### 4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

- A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
- B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
- C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
- D. Preserve all the copyright notices of the Document.
- E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
- F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
- G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
- H. Include an unaltered copy of this License.

- I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
- J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section. You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.
- K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.
- L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.
- M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.
- N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.
- O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties—for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

## 5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same

name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

## 6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

## 7. AGGREGATION WITH EXISTING WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

## 8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

## 9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally, unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.

## 10.FUTURE VERSIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See <https://www.gnu.org/licenses/> [<https://www.gnu.org/licenses/>].

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

## 11.RELICENSING

"Massive Multiauthor Collaboration Site" (or "MMC Site") means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those works. A public wiki that anybody can edit is an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained in the site means any set of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

"Incorporate" means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is "eligible for relicensing" if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.

## A.1.1. ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

Copyright (C) YEAR YOUR NAME.

Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with ... Texts." line with this:

with the Invariant Sections being LIST THEIR TITLES, with the Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.

If you have Invariant Sections without Cover Texts, or some other combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.

---

# Appendix B. The GNU General Public License, Version Two

## B.1. GNU GENERAL PUBLIC LICENSE

Version 2, June 1991

Copyright (C) 1989, 1991 Free Software Foundation, Inc. 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA.

Everyone is permitted to copy and distribute verbatim copies of this license document, but changing it is not allowed.

### B.1.1. Preamble

The licenses for most software are designed to take away your freedom to share and change it. By contrast, the GNU General Public License is intended to guarantee your freedom to share and change free software--to make sure the software is free for all its users. This General Public License applies to most of the Free Software Foundation's software and to any other program whose authors commit to using it. (Some other Free Software Foundation software is covered by the GNU Library General Public License instead.) You can apply it to your programs, too.

When we speak of free software, we are referring to freedom, not price. Our General Public Licenses are designed to make sure that you have the freedom to distribute copies of free software (and charge for this service if you wish), that you receive source code or can get it if you want it, that you can change the software or use pieces of it in new free programs; and that you know you can do these things.

To protect your rights, we need to make restrictions that forbid anyone to deny you these rights or to ask you to surrender the rights. These restrictions translate to certain responsibilities for you if you distribute copies of the software, or if you modify it.

For example, if you distribute copies of such a program, whether gratis or for a fee, you must give the recipients all the rights that you have. You must make sure that they, too, receive or can get the source code. And you must show them these terms so they know their rights.

We protect your rights with two steps: (1) copyright the software, and (2) offer you this license which gives you legal permission to copy, distribute and/or modify the software.

Also, for each author's protection and ours, we want to make certain that everyone understands that there is no warranty for this free software. If the software is modified by someone else and passed on, we want its recipients to know that what they have is not the original, so that any problems introduced by others will not reflect on the original authors' reputations.

Finally, any free program is threatened constantly by software patents. We wish to avoid the danger that redistributors of a free program will individually obtain patent licenses, in effect making the program proprietary. To prevent this, we have made it clear that any patent must be licensed for everyone's free use or not licensed at all.

The precise terms and conditions for copying, distribution and modification follow.

### B.1.2. GNU GENERAL PUBLIC LICENSE

TERMS AND CONDITIONS FOR COPYING, DISTRIBUTION AND MODIFICATION

0. This License applies to any program or other work which contains a notice placed by the copyright holder saying it may be distributed under the terms of this General Public License. The "Program", below, refers to any such program or work, and a "work based on the Program" means either the Program or any derivative work under copyright law: that is to say, a work containing the Program or a portion of it, either verbatim or with modifications and/or translated into another language. (Hereinafter, translation is included without limitation in the term "modification".) Each licensee is addressed as "you".

Activities other than copying, distribution and modification are not covered by this License; they are outside its scope. The act of running the Program is not restricted, and the output from the Program is covered only if its contents constitute a work based on the Program (independent of having been made by running the Program). Whether that is true depends on what the Program does.

1. You may copy and distribute verbatim copies of the Program's source code as you receive it, in any medium, provided that you conspicuously and appropriately publish on each copy an appropriate copyright notice and disclaimer of warranty; keep intact all the notices that refer to this License and to the absence of any warranty; and give any other recipients of the Program a copy of this License along with the Program.

You may charge a fee for the physical act of transferring a copy, and you may at your option offer warranty protection in exchange for a fee.

2. You may modify your copy or copies of the Program or any portion of it, thus forming a work based on the Program, and copy and distribute such modifications or work under the terms of Section 1 above, provided that you also meet all of these conditions:
- a. You must cause the modified files to carry prominent notices stating that you changed the files and the date of any change.
  - b. You must cause any work that you distribute or publish, that in whole or in part contains or is derived from the Program or any part thereof, to be licensed as a whole at no charge to all third parties under the terms of this License.
  - c. If the modified program normally reads commands interactively when run, you must cause it, when started running for such interactive use in the most ordinary way, to print or display an announcement including an appropriate copyright notice and a notice that there is no warranty (or else, saying that you provide a warranty) and that users may redistribute the program under these conditions, and telling the user how to view a copy of this License. (Exception: if the Program itself is interactive but does not normally print such an announcement, your work based on the Program is not required to print an announcement.)

These requirements apply to the modified work as a whole. If identifiable sections of that work are not derived from the Program, and can be reasonably considered independent and separate works in themselves, then this License, and its terms, do not apply to those sections when you distribute them as separate works. But when you distribute the same sections as part of a whole which is a work based on the Program, the distribution of the whole must be on the terms of this License, whose permissions for other licensees extend to the entire whole, and thus to each and every part regardless of who wrote it.

Thus, it is not the intent of this section to claim rights or contest your rights to work written entirely by you; rather, the intent is to exercise the right to control the distribution of derivative or collective works based on the Program.

In addition, mere aggregation of another work not based on the Program with the Program (or with a work based on the Program) on a volume of a storage or distribution medium does not bring the other work under the scope of this License.

3. You may copy and distribute the Program (or a work based on it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you also do one of the following:
  - a. Accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
  - b. Accompany it with a written offer, valid for at least three years, to give any third party, for a charge no more than your cost of physically performing source distribution, a complete machine-readable copy of the corresponding source code, to be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange; or,
  - c. Accompany it with the information you received as to the offer to distribute corresponding source code. (This alternative is allowed only for noncommercial distribution and only if you received the program in object code or executable form with such an offer, in accord with Subsection b above.)

The source code for a work means the preferred form of the work for making modifications to it. For an executable work, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the executable. However, as a special exception, the source code distributed need not include anything that is normally distributed (in either source or binary form) with the major components (compiler, kernel, and so on) of the operating system on which the executable runs, unless that component itself accompanies the executable.

If distribution of executable or object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place counts as distribution of the source code, even though third parties are not compelled to copy the source along with the object code.

4. You may not copy, modify, sublicense, or distribute the Program except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense or distribute the Program is void, and will automatically terminate your rights under this License. However, parties who have received copies, or rights, from you under this License will not have their licenses terminated so long as such parties remain in full compliance.
5. You are not required to accept this License, since you have not signed it. However, nothing else grants you permission to modify or distribute the Program or its derivative works. These actions are prohibited by law if you do not accept this License. Therefore, by modifying or distributing the Program (or any work based on the Program), you indicate your acceptance of this License to do so, and all its terms and conditions for copying, distributing or modifying the Program or works based on it.
6. Each time you redistribute the Program (or any work based on the Program), the recipient automatically receives a license from the original licensor to copy, distribute or modify the Program subject to these terms and conditions. You may not impose any further restrictions on the recipients' exercise of the rights granted herein. You are not responsible for enforcing compliance by third parties to this License.
7. If, as a consequence of a court judgment or allegation of patent infringement or for any other reason (not limited to patent issues), conditions are imposed on you (whether by court order, agreement or otherwise) that contradict the conditions of this License, they do not excuse you from the conditions of this License. If you cannot distribute so as to satisfy simultaneously your obligations under this License and any other pertinent obligations, then as a consequence you may not distribute the Program at all. For example, if a patent license would not permit royalty-free redistribution of the Program by all those who receive copies directly or indirectly through you, then the only way you could satisfy both it and this License would be to refrain entirely from distribution of the Program.

If any portion of this section is held invalid or unenforceable under any particular circumstance, the balance of the section is intended to apply and the section as a whole is intended to apply in other circumstances.

It is not the purpose of this section to induce you to infringe any patents or other property right claims or to contest validity of any such claims; this section has the sole purpose of protecting the integrity of the free software distribution system, which is implemented by public license practices. Many people have made generous contributions to the wide range of software distributed through that system in reliance on consistent application of that system; it is up to the author/donor to decide if he or she is willing to distribute software through any other system and a licensee cannot impose that choice.

This section is intended to make thoroughly clear what is believed to be a consequence of the rest of this License.

8. If the distribution and/or use of the Program is restricted in certain countries either by patents or by copyrighted interfaces, the original copyright holder who places the Program under this License may add an explicit geographical distribution limitation excluding those countries, so that distribution is permitted only in or among countries not thus excluded. In such case, this License incorporates the limitation as if written in the body of this License.
9. The Free Software Foundation may publish revised and/or new versions of the General Public License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns.

Each version is given a distinguishing version number. If the Program specifies a version number of this License which applies to it and "any later version", you have the option of following the terms and conditions either of that version or of any later version published by the Free Software Foundation. If the Program does not specify a version number of this License, you may choose any version ever published by the Free Software Foundation.

10. If you wish to incorporate parts of the Program into other free programs whose distribution conditions are different, write to the author to ask for permission. For software which is copyrighted by the Free Software Foundation, write to the Free Software Foundation; we sometimes make exceptions for this. Our decision will be guided by the two goals of preserving the free status of all derivatives of our free software and of promoting the sharing and reuse of software generally.

### **B.1.3. NO WARRANTY**

11. BECAUSE THE PROGRAM IS LICENSED FREE OF CHARGE, THERE IS NO WARRANTY FOR THE PROGRAM, TO THE EXTENT PERMITTED BY APPLICABLE LAW. EXCEPT WHEN OTHERWISE STATED IN WRITING THE COPYRIGHT HOLDERS AND/OR OTHER PARTIES PROVIDE THE PROGRAM "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE ENTIRE RISK AS TO THE QUALITY AND PERFORMANCE OF THE PROGRAM IS WITH YOU. SHOULD THE PROGRAM PROVE DEFECTIVE, YOU ASSUME THE COST OF ALL NECESSARY SERVICING, REPAIR OR CORRECTION.
12. IN NO EVENT UNLESS REQUIRED BY APPLICABLE LAW OR AGREED TO IN WRITING WILL ANY COPYRIGHT HOLDER, OR ANY OTHER PARTY WHO MAY MODIFY AND/OR REDISTRIBUTE THE PROGRAM AS PERMITTED ABOVE, BE LIABLE TO YOU FOR DAMAGES, INCLUDING ANY GENERAL, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PROGRAM (INCLUDING BUT NOT LIMITED TO LOSS OF DATA OR DATA BEING RENDERED INACCURATE OR

LOSSES SUSTAINED BY YOU OR THIRD PARTIES OR A FAILURE OF THE PROGRAM TO OPERATE WITH ANY OTHER PROGRAMS), EVEN IF SUCH HOLDER OR OTHER PARTY HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

## B.1.4. END OF TERMS AND CONDITIONS

# B.2. How to Apply These Terms to Your New Programs

If you develop a new program, and you want it to be of the greatest possible use to the public, the best way to achieve this is to make it free software which everyone can redistribute and change under these terms.

To do so, attach the following notices to the program. It is safest to attach them to the start of each source file to most effectively convey the exclusion of warranty; and each file should have at least the "copyright" line and a pointer to where the full notice is found.

```
<one line to give the program's name and a brief idea of what it does.>  
Copyright (C) <year> <name of author>
```

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 59 Temple Place, Suite 330, Boston, MA 02111-1307 USA

Also add information on how to contact you by electronic and paper mail.

If the program is interactive, make it output a short notice like this when it starts in an interactive mode:

```
Gnomovision version 69, Copyright (C) year name of author  
Gnomovision comes with ABSOLUTELY NO WARRANTY; for details type `show w'.  
This is free software, and you are welcome to redistribute it  
under certain conditions; type `show c' for details.
```

The hypothetical commands `show w' and `show c' should show the appropriate parts of the General Public License. Of course, the commands you use may be called something other than `show w' and `show c'; they could even be mouse-clicks or menu items --whatever suits your program.

You should also get your employer (if you work as a programmer) or your school, if any, to sign a "copyright disclaimer" for the program, if necessary. Here is a sample; alter the names:

Yoyodyne, Inc., hereby disclaims all copyright interest in the program `Gnomovision' (which makes passes at compilers) written by James Hacker.

<signature of Ty Coon>, 1 April 1989  
Ty Coon, President of Vice

This General Public License does not permit incorporating your program into proprietary programs. If your program is a subroutine library, you may consider it more useful to permit linking proprietary applications with the library. If this is what you want to do, use the GNU Library General Public License instead of this License.

---

# Appendix C. Supported GPIO/Switcher Devices

The following GPIO/switcher devices are supported under Rivendell:

## C.1. 360 Systems AM-16/B Audio Crosspoint Switcher

Driver Name: 360 Systems AM-16/B

Supported RML Commands: Switch Take ['ST']

Control is done by means of MIDI connections to the 'MIDI IN' and 'MIDI OUT' ports on the back of the unit, with the appropriate MIDI device specified in the `Device:` field in `RDAdmin->ManageHosts->Switchers/GPIO`. The following settings should be configured on the AM-16/B:

Control Port Type: MIDI (jumper JMP1)

Program Send: OFF

Receive Channel: o o (Omni mode)

Memory Protect: OFF

The driver uses MIDI programs '0' and '1' on the AM-16/B when processing crosspoint changes; anything previously saved in those programs will be overwritten!

## C.2. BroadcastTools 10x1

Driver Name: BroadcastTools 10x1

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 2400 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

## C.3. BroadcastTools 16x1

Driver Name: BroadcastTools 16x1

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

## C.4. BroadcastTools 16x2

Driver Name: BroadcastTools 16x2

Supported RML Commands:      GPO Set ['GO']  
   Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

Operation in 'multidrop' mode is not supported.

## C.5. BroadcastTools 8x2

Driver Name:                      BroadcastTools 8x2

Supported RML Commands:      Switch Add ['SA']  
   Switch Remove ['SR']  
   Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 2400 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

The 8x2 should be configured to use 'Mix' mode. This can be done by holding down the F1 button on the switcher while powering up.

Operation in 'multidrop' mode is not supported.

## C.6. BroadcastTools ACS8.2

Driver Name:                      BroadcastTools ACS8.2

Supported RML Commands:      GPI Enable ['GE']  
   GPI Set ['GI']  
   GPO Set ['GO']  
   Switch Add ['SA']  
   Switch Level ['SL'] [output #1 only]  
   Switch Remove ['SR']  
   Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port speed on the ACS 8.2 should be set to 9600. Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, no termination.

The ACS 8.2 should be configured to use 'Mix' mode --i.e. DIP switches SW17-5 and SW17-6 should both be 'on', and the unit ID should be '0', with DIP switches SW17-1 and SW17-2 both 'off'.

Operation in 'multidrop' mode is not supported. If you wish to use GPI (referred to as 'PIP', for 'Parallel Input Port' in the Broadcast Tools documentation), then you will also need to be sure that DIP switch SW17-10 is ON.

The ACS 8.2 supports the Switch Level [SL] RML for connections to Output 1. Six different gain levels are supported: 0 dB, -3 dB, -6 dB, -10 dB, -15 dB and -20 dB. For a specified gain level of greater than or equal to -20, the applied gain will be rounded down to the next supported level. For gain levels of less than -20 dB, the minimum supported gain (-20 dB) will be applied.

## C.7. BroadcastTools ADMS 44.22 Analog/AES Digital Matrix Switcher

Driver Name: BroadcastTools ADMS 44.22

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Level ['SL']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of a serial connection to the unit's integrated serial port. The 'OPTIONS' switches on the back of the unit should be set as follows:

1: OFF (UP)  
2: OFF (UP)  
3: OFF (UP)  
4: OFF (UP)  
5: OFF (UP)  
6: OFF (UP)  
7: ON (DOWN)  
8: ON (DOWN)  
9: OFF (UP)  
10: OFF (UP)

The Rivendell serial interface should be set to use 9600 bits/sec, 8 bits, 1 stop bit and no flow control.

## C.8. BroadcastTools GPI-16 General Purpose Input Module

Driver Name: BroadcastTools GPI-16

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']

Control is done by means of a serial connection to the unit's integrated serial port. There is also a 'plus' version that features an integrated type B USB interface that simulates a serial port.

The unit should work correctly with factory default settings. The Rivendell serial interface should be set to use 9600 bits/sec, 8 bits, 1 stop bit and no flow control.

## C.9. BroadcastTools Sentinel 4 Web AES Switcher

Driver Name: BroadcastTools Sentinel 4 Web

Supported RML Commands: Switch Take ['ST']

Control is done by means of a TCP/IP connection to the unit's integrated Ethernet port.

On the Email/Network Setup page of the unit, be sure that the TCP Enabled box is checked and that TCP Listen Port is set to the same number as is used in the IP Port setting in Rivendell's driver configuration (56 by default).

## C.10. BroadcastTools SRC-16

Driver Name: BroadcastTools SRC-16

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']

Control is done by means of a serial connection to the unit's integrated serial port.

The unit should work correctly with factory default settings. The Rivendell serial interface should be set to use 9600 bits/sec, 8 bits, 1 stop bit and no flow control.

## C.11. BroadcastTools SS 12.4

Driver Name: BroadcastTools SS 12.4

Supported RML Commands: Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

The SS 12.4 should be configured to use 'Mix' mode. This can be done by setting DIP switches SW1-7 and SW-1-3 to OFF.

Operation in 'multidrop' mode is not supported.

## C.12. BroadcastTools SS 2.1

Driver Name: BroadcastTools SS 2.1

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

Operation in 'multidrop' mode is not supported.

## C.13. BroadcastTools SS 16.4

Driver Name: BroadcastTools SS 16.4

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

A total of 24 GPO outputs are supported, with the relays appearing as GPO lines 1-8 and the open collector outputs as lines 9-24. All 24 'PIP' inputs are supported as GPI devices.

The SS 16.4 should be configured to use 'Mix' mode and to have 'PIP' mode enabled. This can be done by setting DIP switches SW24-5, SW24-6 and SW24-8 to ON.

Operation in 'multidrop' mode is not supported.

## C.14. BroadcastTools SS 4.1 MLR Switcher/Router

Driver Name: BroadcastTools SS4.1 MLR

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port speed on the SS 4.1 should be set to 9600 (DIP switches SW6-4 and SW6-5 set to 'off'). Serial port parameters in RAdmin should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

The SS 4.1 should be configured to use unit ID '0', with DIP switches SW6-1, SW6-2 and SW6-3 all set to 'off'.

Operation in 'multidrop' mode is not supported. If you wish to use GPI (referred to as 'PIP', for 'Parallel Input Port' in the Broadcast Tools documentation), then you will also need to be sure that DIP switch SW6-7 is ON.

## C.15. BroadcastTools SS4.2

Driver Name: BroadcastTools SS4.2

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port speed on the SS 4.2 should be set to 9600 (DIP switches SW13-3 and SW13-4 set to 'off'). Serial port parameters in RAdmin should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

The SS 4.2 should be configured to use 'Mix' mode --i.e. DIP switches SW13-5 and SW13-6 should both be 'on', and the unit ID should be set to '0', with DIP switches SW13-1 and SW13-2 both 'off'.

Operation in 'multidrop' mode is not supported. If you wish to use GPI (referred to as 'PIP', for 'Parallel Input Port' in the Broadcast Tools documentation), then you will also need to be sure that DIP switch SW13-7 is ON.

## C.16. BroadcastTools SS4.4

Driver Name: BroadcastTools SS4.4

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port speed on the SS 4.4 should be set to 9600 (DIP switch SW3 set to 'off'). Serial port parameters in RDAdmin should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR/LF termination.

The SS 4.4 should be configured to use 'Mix' mode --i.e. DIP switches SW4 and SW5 should both be 'on', and the unit ID should be set to '0', with DIP switches SW1 and SW2 both 'off'.

Operation in 'multidrop' mode is not supported. If you wish to use GPI (referred to as 'PIP', for 'Parallel Input Port' in the Broadcast Tools documentation), then you will also need to be sure that DIP switch SW8 is 'on'. If you wish to use the open collector and relay outputs as GPO, then you will also need to be sure that DIP switch SW6 is 'off'.

## C.17. BroadcastTools SS8.2

Driver Name: BroadcastTools SS8.2

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to a four pin RJ11 modular jack on the back of the unit (an adapter to a standard DB9 connector is supplied by Broadcast Tools with the unit). Serial port speed on the SS 8.2 should be set to 19200 (some have found 9600 to work instead). Do *not* use 38400, as there are known bugs within the SS 8.2 when used with this speed! Serial port parameters should be set to 19200 baud rate (or 9600 if that worked instead), No parity, 8 data bits, 1 stop bit, CR/LF termination (or potentially no termination).

The SS 8.2 should be configured to use 'Mix' mode --i.e. DIP switches SW-14-4 and SW-14-5 should both be 'on', and the unit ID should be '0', with DIP switches SW-14-1, SW-14-2 and SW-14-3 all 'off'.

Operation in 'multidrop' mode is not supported. If you wish to use GPI (referred to as 'PIP', for 'Parallel Input Port' in the Broadcast Tools documentation), then you will also need to be sure that DIP switch SW-14-10 is ON.

## C.18. BroadcastTools Universal 4.1MLR>>Web

Driver Name: BroadcastTools 4.1 MLR>>Web

Supported RML Commands: GPI Enable ['GE']

GPI Set ['GI']  
Switch Take ['ST']

Control is by means of a TCP/IP connection to port 5002.

## C.19. Grass Valley 7000 Protocol

Driver Name: Grass Valley 7000 Protocol

Supported RML Commands: Switch Take ['ST']

Control is by means of a TCP/IP connection to port 12345.

## C.20. Harlond Virtual Mixer

Driver Name: Harlond Virtual Mixer

Supported RML Commands: Fire Salvo ['FS']  
GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Level ['SL']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is by means of a TCP/IP connection to port 5002. Output busses are mapped as follows:

**Table C.1. Harlond Output Buss Mappings**

Output	Buss
1	PGM
2	AUD
3	UTL
4	CUE

Input channel ON/OFF is sensed/controlled by means of the respective GPIO number using GE/GI/GO RMLs.

## C.21. Kernel GPIO

Driver Name: Kernel GPIO

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']

This driver can be used to control kernel-based GPIO interfaces, such as the GPIO pins on a Raspberry Pi. Pins are allocated such that inputs come first, followed by outputs.

Further information on kernel GPIO devices can be found at <https://www.kernel.org/doc/Documentation/gpio/sysfs.txt>

## C.22. Livewire LWRP Audio

Driver Name: Livewire LWRP Audio

Supported RML Commands: Switch Take ['ST']

Livewire is a distributed audio router and control system, with the components (called 'nodes') configured and controled via TCP/IP. More information can be found at <http://www.axiaaudio.com/>.

This driver can be used to create and remove connections between audio sources and destinations via Livewire Routing Protocol (LWRP).

Configuration is a matter of entering the IP address, password and base output number for each node in `RDAdmin->ManageHosts->Switcher/GPIO->LivewireNodes`. The driver will autodetect all other parameters from the nodes themselves. The resulting constellation of nodes can be controled with the 'Switch Take' ['ST'] RML by specifying the Livewire source stream number as the *input* parameter and the base output number+the slot number-1 for the *output* parameter.

## C.23. Livewire LWRP GPIO

Driver Name: Livewire LWRP GPIO

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']

Livewire is a distributed audio router and control system, with the components (called 'nodes') configured and controled via TCP/IP. More information can be found at <http://www.axiaaudio.com/>.

This driver can be used to control Livewire's GPIO subsystem by means of the Livewire Routing Protocol (LWRP) with both physical as well as 'virtual' GPIO devices.

Only two items need to be specified in the configuration: the `IP` address of the device to control and the `Layer`, with `V` specifying a virtual GPIO device and `D` specifying an actual physical one. The driver will autodetect all other parameters (e.g. the number of input and output lines) from the device itself.

## C.24. Livewire Multicast GPIO

Driver Name: Livewire Multicast GPIO

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']

Livewire is a distributed audio router and control system, with the components (called 'nodes') configured and controled via TCP/IP. More information can be found at <http://www.axiaaudio.com/>.

This driver provides the ability to access GPIO functions from Livewire- enabled control surfaces for setups that lack a virtual GPIO device --e.g. when interfacing audio directly to a Livewire node without using a native Livewire software audio driver or audio adapter.

When configuring it, the `IP Address` field should contain the address of the local interface to which the Livewire network is attached, while the `Livewire GPIOs` list should be populated with the stream number - GPIO line associations to be used.

## C.25. Local Audio Adapter

Driver Name:	Local Audio Adapter
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO'] Switch Add ['SA'] Switch Add With Gain ['SX'] Switch Remove ['SR'] Switch Take ['ST']

It's possible to use one or more of the actual audio adapters as a switcher device using this driver. Doing so makes it possible to route audio directly from the adapter inputs to outputs, while at the same time using it for audio capture/payout in the usual manner.

To configure it, set `Card:` to the number of the audio adapter to use and the `Inputs:` and `Outputs:` fields to the number of inputs and outputs on the card (as found in `RDADmin->ManageHosts->AudioResources`).

## C.26. Local GPIO

Driver Name:	Local GPIO
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO']

This driver supports a variety of GPIO devices, including:

15 Pin Joystick Port  
USB HID Devices  
MeasurementComputing GPIO Cards

### C.26.1. 15 Pin Joystick Port

Joystick support utilizes the Linux Input Device subsystem. Inputs are active-low, and should be wired as follows:

**Table C.2. 15 Pin Joystick Port Wiring**

Pin	Signal
2	Input 1
4	Ground
7	Input 2
5	Ground
10	Input 3
12	Ground

**Pin Signal**

14 Input 4  
12 Ground

In addition, you will need to connect 47 kohm resistors between the following pins: 1-3, 6-8, 9-11 and 13-15. While not strictly needed for the GPI portion of the interface to work, the kernel's analog joystick driver will refuse to initialize the port if these resistors (or a real joystick) are not present.

The device name of the joystick will be one of the `/dev/input/event $n$`  devices.

NOTE: There have been reports that some port models do not internally connect pin 12 to ground. The symptom of this situation will be that Inputs 1 and 2 work, but not Inputs 3 and 4. If this is the case, connecting the ground for Inputs 3 and 4 to pins 04 or 05 should remedy the problem.

## C.26.2. MeasurementComputing GPIO Cards

The following MeasurementComputing cards are supported:

PCI-PDIS08  
PCI-PDIS16  
PCI-DIO24

The device name for the card should be `/dev/gpion`.

### C.26.2.1. PCI-PDIS08 and PCI-PDIS16

The Measurement Computing PCI-PDIS08 and PCI-PDIS16 boards feature floating, opto-isolated inputs. The inputs are not polarity sensitive and may be driven by either AC or DC. The outputs are electro-mechanical relays with dry contacts.

**Table C.3. PCI-PDIS08 and PCI-PDIS16 Connector Pinout (DB37F)**

**Pin Signal**

1 Input 8/16  
20 Input 8/16  
  
2 Input 7/15  
21 Input 7/15  
  
3 Input 6/14  
22 Input 6/14  
  
4 Input 5/13  
23 Input 5/13  
  
5 Input 4/12  
24 Input 4/12  
  
6 Input 3/11

**Pin Signal**

25 Input 3/11

7 Input 2/10

26 Input 2/10

8 Input 1/9

27 Input 1/9

9 Output 8/16 C

28 Output 8/16 N/O

10 Output 7/15 C

29 Output 7/15 N/O

11 Output 6/14 C

30 Output 6/14 N/O

12 Output 5/13 N/C

13 Output 5/13 N/O

31 Output 5/13 C

14 Output 4/12 N/C

32 Output 4/12 N/O

33 Output 4/12 C

15 Output 3/11 N/C

16 Output 3/11 N/O

34 Output 3/11 C

17 Output 2/10 N/C

35 Output 2/10 N/O

36 Output 2/10 C

18 Output 1/9 N/C

19 Output 1/9 N/O

37 Output 1/9 C

### C.26.2.2. PCI-DIO24

The Measurement Computing PCI-DIO24 board features 24 bi-directional, TTL level signal lines, referenced to a common ground. The driver can be configured to use all of the lines as inputs or outputs (mixing inputs and outputs on the same board is not supported). When used as inputs, termination resistor packs should be installed.

**Table C.4. PCI-DIO24 Connector Pinout (DB37F)**

Pin	Signal
-----	--------

37	Input 1
----	---------

36	Input 2
----	---------

35	Input 3
----	---------

34	Input 4
----	---------

33	Input 5
----	---------

32	Input 6
----	---------

31	Input 7
----	---------

30	Input 8
----	---------

10	Input 9
----	---------

9	Input 10
---	----------

8	Input 11
---	----------

7	Input 12
---	----------

6	Input 13
---	----------

5	Input 14
---	----------

4	Input 15
---	----------

3	Input 16
---	----------

29	Input 17
----	----------

28	Input 18
----	----------

27	Input 19
----	----------

26	Input 20
----	----------

25	Input 21
----	----------

24	Input 22
----	----------

23	Input 23
----	----------

22	Input 24
----	----------

11	Ground
----	--------

13	Ground
----	--------

15	Ground
----	--------

17	Ground
----	--------

19	Ground
----	--------

21	Ground
----	--------

18	+5 vdc
----	--------

20	+5 vdc
----	--------

16	+12 vdc
----	---------

**Pin Signal**

14 +-12 vdc

## C.27. Logitek vGuest

Driver Name:	Logitek vGuest
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO'] Set Display ['SD'] Switch Take ['ST']

Before using the driver, the resources within the Logitek Audio Engine system that you wish to control must be made available in a 'vGuest' account within the Logitek 'Supervisor' system. Then, those same resources must be mapped within the Rivendell driver. For the 'ST' RML, the Logitek Engine Numbers and Device Numbers are mapped to logical Rivendell Inputs and Outputs within the Configure Inputs and Configure Outputs dialogs. For the GPO RMLs, various Logitek 'switches' (by which we mean anything that can be turned on and off, such as faders feeds, not just GPIO) are mapped to logical Rivendell GPIO lines by means of their Logitek Engine, Device and Buss numbers.

## C.28. Modbus TCP

Driver Name:	Modbus TCP
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO']

This driver supports GPI devices that use the industry-standard Modbus TCP protocol at TCP port 502. The device to be controlled should be configured to use Modbus ID #1. For more information on Modbus, see <http://www.modbus.org/>.

## C.29. Quartz Electronics Type 1 Routing Protocol

Driver Name:	Quartz Type 1
Supported RML Commands:	Fire Salvo ['FS'] Switch Take ['ST']

Control can be done either by means of an RS-232C connection or by means of TCP/IP to TCP port 23.

## C.30. Ross NK Video Switchers (via SCP/A Serial Interface)

Driver Name:	Ross NK-SCP/A Interface
Supported RML Commands:	Switch Take ['ST']

Control is done by means of an RS-232C connection to a NK-SCP/A serial interface. Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit, CR termination. The Breakaway to use is defined by setting the 'Card' parameter in the driver configuration, with Card 0 = Breakaway 1, Card 1 = Breakaway 2, etc.

## C.31. Serial Port Modem Control Lines

Driver Name: Serial Port Modem Control Lines

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']

This driver enables GPIO via the modem control lines on an RS-232C serial device. The lines map as follows:

**Table C.5. Modem Serial Lines GPI Signal Mapping**

Output	Buss
1	Data Set Ready (DSR)
2	Clear To Send (CTS)
3	Carrier Detect (CI)
4	Ring Indicator (RI)

**Table C.6. Modem Serial Lines GPO Signal Mapping**

Output	Buss
1	Data Terminal Ready (DTR)
2	Ready To Send (RTS)

## C.32. Sierra Automated Systems 16000(D) Audio Router

Driver Name: SAS 16000(D)

Supported RML Commands: Switch Take ['ST']

Both analog and AES3 digital (D) variants are supported. Control can done by means of an RS-232C connection to the 'User Serial Interface' port on the unit. Serial port parameters should be: 9600,N,8,1.

## C.33. Sierra Automated Systems 32000 Audio Router

Driver Name: SAS 32000

Supported RML Commands: Switch Add ['SA']  
Switch Level ['SL'] (requires appropriate SAS hardware support)

Switch Remove ['SR']

Switch Take ['ST']

Control is done by means of an RS-232C connection to the 'Computer RS-232' port on the AXC-8 System Controller. Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit and no terminator. The AXC-8 must be equipped with firmware built to use the 'conventional' command protocol -- the 'enhanced' version will not work!

## C.34. Sierra Automated Systems 64000 Audio Router

Driver Name: SAS 64000

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to the 'Computer RS-232' port on the AXC-8 System Controller. Serial port parameters should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit and no terminator. The AXC-8 must be equipped with firmware built to use the 'conventional' command protocol -- the 'enhanced' version will not work!

## C.35. Sierra Automated Systems 64000 Audio Router

Driver Name: SAS 64000-GPI

Supported RML Commands: GPO Set ['GO']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to the 'Computer RS-232' port on a GPI-1600 GPIO interface. Serial port parameters should be set to 19200 baud rate, no parity, 8 data bits, 1 stop bit and no terminator. This driver allows control of the system's GPO outputs as well as audio crosspoints.

## C.36. Sierra Automated Systems User Serial Interface (USI)

Driver Name: SAS USI

Supported RML Commands: Console Label ['CL']  
Fire Salvo ['FS']  
GPO Set ['GO']  
Switch Add ['SA']  
Switch Crosspoint Gain ['SX']  
Switch Level ['SL']  
Switch Remove ['SR']  
Switch Take ['ST']  
Switch Take With Gain ['SG']

Control can done either by means of an RS-232C connection to one of the serial ports on a DRC-16E card or by means of TCP/IP to a PC running SAS's Server Module software. TCP connections are normally made to port 1350 on the Server Module system.

## C.37. Sine Systems ACU-1 (Prophet Version)

Driver Name: Sine ACU-1 (Prophet)

Supported RML Commands: Switch Add ['SA']  
Switch Remove ['SR']  
Switch Take ['ST']

Control is done by means of an RS-232C connection to the RS-232 port on the unit. Serial port parameters in RAdmin should be set to 57600 baud rate, even parity, 8 data bits, 1 stop bit and no terminator.

The ACU-1 should be set to use factory default settings. This can be done by simultaneously pressing buttons 1 and 8 on the front panel of the unit for at least one second.

## C.38. Software Authority Protocol

Driver Name: Software Authority Protocol

Supported RML Commands: GPI Enable ['GE']  
GPI Set ['GI']  
GPO Set ['GO']  
Switch Take ['ST']

Used to control devices (such as the Axia 'PathFinder' system) by means of the 'Software Authority' protocol. Control is by means of a TCP/IP connection (typically to port 9500) on the controlled system. The Card parameter should be set to the 'Router Number' of the router to be controlled.

Most parameters, including the number of inputs and outputs as well as the endpoint names, are autodetected by the driver.

## C.39. Starguide III Satellite Receiver

Driver Name: StarGuide III

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to the RS-232 port on the unit. The port should be configured on the receiver to use a speed of 9600. Serial port parameters in RAdmin should be set to 9600 baud rate, no parity, 8 data bits, 1 stop bit and no terminator. Once configured, use RAdmin to create inputs that correspond to the StarGuide Provider and Source IDs available on the selected DVB carrier. Provider and Source ID data is available from the provider network.

## C.40. Wegener Unity4000 DVB Satellite Receiver

Driver Name: Wegener Unity 4000

Supported RML Commands: Switch Take ['ST']

Control is done by means of an RS-232C connection to one of the two RS-232 ports on the unit. If possible, use serial port number one, as the receiver uses a larger data buffer with that port. The selected port should

be configured in the receiver to be of type "Terminal" with a speed of 19200. Serial port parameters should be set to 19200 baud rate, no parity, 8 data bits, 1 stop bit and no terminator. Once configured, use RDAdmin to create inputs that correspond to the DVB stream names available on the selected DVB carrier.

Caution is needed when scheduling record events from the Unity4000, as the unit is capable of outputting a given DVB stream to only a single output at a time. Commanding a stream to an output will cause that stream to be silently deselected from a previously selected output.

## C.41. Wheatnet Blade LIO

Driver Name:	WheatNet LIO
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO']

Control is done by means of a TCP/IP connection to port 55776 on a blade. The only required configuration parameters are `IP Address` and `IP Port`. The number of pins is auto-detected at driver startup.

## C.42. Wheatnet Blade SLIO

Driver Name:	WheatNet SLIO
Supported RML Commands:	GPI Enable ['GE'] GPI Set ['GI'] GPO Set ['GO']

Control is done by means of a TCP/IP connection to port 55776 on a blade. The only required configuration parameters are `IP Address` and `IP Port`. The number of pins is auto-detected at driver startup.

---

# Appendix D. Filepath Wildcards

Filepath wildcards can be used in most places in RDAAdmin where a filename is required.

## D.1. Definition

A date/time wildcard in Rivendell has the following form:

**%<delta-secs><meta-char><fmt-char>**

where:

- |                           |   |
|---------------------------|---|
| <b>%</b>                  | A literal percent.  |
| <b>&lt;delta-secs&gt;</b> | Optional. A time offset, in seconds, to apply to the base date-time (normally, the current wall time). Default value is 0.  |
| <b>&lt;meta-char&gt;</b>  | Optional. One of the following meta-characters: <ul style="list-style-type: none"><li><b>^</b> Convert value indicated by <b>&lt;fmt-char&gt;</b> to all uppercase.</li><li><b>\$</b> Convert the initial character of the value indicated by <b>&lt;fmt-char&gt;</b> to uppercase.</li></ul>   |
| <b>&lt;fmt-char&gt;</b>   | One of the following letters: <ul style="list-style-type: none"><li><b>a</b> Abbreviated weekday name --e.g. 'mon', 'tue'</li><li><b>A</b> Full weekday name --e.g. 'monday', 'tuesday'</li><li><b>b</b> Abbreviated month name --e.g. 'jan', 'feb'</li><li><b>B</b> Full month name --e.g. 'january', 'february'</li><li><b>c</b> [unassigned]</li><li><b>C</b> Century</li><li><b>d</b> Day of the month, zero padded (01 - 31)</li><li><b>D</b> Date (mm-dd-yy)</li><li><b>e</b> Day of the month, space padded ( 1 - 12)</li><li><b>E</b> Day of the month, unpadded (1 - 12)</li><li><b>f</b> [unassigned]</li><li><b>F</b> Date (yyyy-mm-dd)</li><li><b>g</b> Two digit year, as per ISO 8601</li><li><b>G</b> Four digit year, as per ISO 8601</li><li><b>h</b> Abbreviated month name --e.g. 'jan', 'feb'</li><li><b>H</b> Hour, 24 hour, zero padded (00 - 23)</li></ul> |

<b>i</b>	Hour, 12 hour, space padded ( 0 - 12)
<b>I</b>	Hour, 12 hour, zero padded (00 - 12)
<b>j</b>	Day of year, zero padded (000 - 355)
<b>J</b>	Hour, 12 hour, unpadded (1 - 12)
<b>k</b>	Hour, 24 hour, space padded ( 0 - 23)
<b>K</b>	[unassigned]
<b>l</b>	Month, unpadded (1-12)
<b>L</b>	[unassigned]
<b>m</b>	Month, zero padded (01 - 12)
<b>M</b>	Minute, zero padded (00 - 59)
<b>n</b>	[unassigned]
<b>N</b>	[unassigned]
<b>o</b>	[unassigned]
<b>O</b>	[unassigned]
<b>p</b>	AM/PM string
<b>P</b>	[unassigned]
<b>q</b>	[unassigned]
<b>Q</b>	[unassigned]
<b>r</b>	Rivendell Host Name [not FQDN]
<b>R</b>	Rivendell Host Short Name
<b>s</b>	Service Name
<b>S</b>	Seconds, zero padded (00 - 60)
<b>t</b>	[unassigned]
<b>T</b>	[unassigned]
<b>u</b>	Day of the week, numeric, 1=Monday, 7=Sunday
<b>U</b>	[unassigned]
<b>v</b>	[unassigned]
<b>V</b>	Week number, as per ISO 8601
<b>w</b>	Day of the week, numeric, 0=Sunday, 6=Saturday

**w** Week number, as per ISO 8601  
**x** [unassigned]  
**X** [unassigned]  
**y** Two digit year  
**Y** Four digit year  
**z** [unassigned]  
**Z** [unassigned]  
**%** A literal '%'

## D.2. Examples

For the date time of February 3rd, 2017 at 2:34:26 PM:

<b>%b</b>	feb
<b>%B</b>	february
<b>%^B</b>	FEBRUARY
<b>;%B</b>	February
<b>%A</b>	friday
<b>%86400A</b>	saturday
<b>%-86400A</b>	thursday
<b>%a</b>	fri
<b>%u</b>	5
<b>%D</b>	02-03-17
<b>%j</b>	034
<b>%H:%M:%S</b>	14:34:26
<b>%3600H:%3600M:%3600S</b>	15:34:26
<b>%1800H:%1800M:%1800S</b>	15:04:26
<b>%-1800H:%-1800M:%-1800S</b>	14:04:26
<b>%m/%d/%Y - %H:%M:%S</b>	02/03/2017 - 14:34:26
<b>%m/%d/%Y - %I:%M:%S %p</b>	02/03/2017 - 02:34:26 PM

---

## E.1. Metadata Wildcards

These codes are used in Rivendell to indicate when a substitution of the indicated cart metadata field should be performed --e.g. in the '--metadata-pattern' switch of `rdimport(1)` or the `RLMResolveNowNext*()` functions in the Rivendell Loadable Module API.

**Table E.1. Metadata Wildcards**

Now	Next	Field
%a	%A	Artist
%b	%B	Record Label
%c	%C	Client
%d(<dt>)	%D(<dt>)	Date/Time (see the Metadata DateTime Specification for values of <dt>)
%e	%E	Agency
%f	%F	[unassigned]
%g	%G	Rivendell group name
%h	%H	Event length (milliseconds)
%i	%I	Cut Description
%j	%J	Cut Number
%k	%K	Start [%k]/end [%K] time for <b>rdimport(1)</b> [HH:MM:SS]
%l	%L	Album
%m	%M	Composer
%n	%N	Rivendell cart number
%o	%O	Outcue
%p	%P	Publisher
%q	%Q	Start [%q]/end [%Q] date for <b>rdimport(1)</b> [YYYY-MM-DD]
%r	%R	Conductor
%s	%S	Song ID
%t	%T	Title
%u	%U	User Defined
%v	%V	Event length (seconds, rounded down)
%wc	%WC	Industry Standard Commercial Identification (ISCI) Code
%wi	%WI	International Standard Recording Code
%wm	%Wm	MusicBrainz Recording ID
%wr	%Wr	MusicBrainz Release ID
%x	%X	Log line ID (numeric)
%y	%Y	Release Year
%z	%Z	Log line number (numeric)
%%	%%	Literal "%" (ASCII 37)
\r	\r	Literal Carriage Return (ASCII 13)

---

<code>\n</code>	<code>\n</code>	Literal Linefeed (ASCII 10)
-----------------	-----------------	-----------------------------

**Table E.2. Metadata DateTime Specification**

Wildcard	Meaning
<b>d</b>	The day as a number without a leading zero (1 to 31)
<b>dd</b>	The day as a number with a leading zero (01 to 31)
<b>ddd</b>	The abbreviated localized day name ('Mon' or 'Sun')
<b>dddd</b>	The long localized day name ('Monday' or 'Sunday')
<b>M</b>	The month as a number without a leading zero (1 to 12)
<b>MM</b>	The month as a number with a leading zero (01 to 12)
<b>MMM</b>	The abbreviated localized month name ('Jan' or 'Dec')
<b>MMMM</b>	The long localized month name ('January' or 'December')
<b>yy</b>	The last two digits of the year
<b>yyyy</b>	The full four digits of the year
<b>h</b>	The hour without a leading zero (0 - 23, or 1 - 12 if using AM/PM display)
<b>hh</b>	The hour with a leading zero (00 - 23, or 01 - 12 if using AM/PM display)
<b>m</b>	The minute without a leading zero (0 - 59)
<b>mm</b>	The minute with a leading zero (00 - 59)
<b>s</b>	The second without a leading zero (00 - 60)
<b>ss</b>	The second with a leading zero (00 - 60)
<b>z</b>	The milliseconds without a leading zero (0 - 999)
<b>zzz</b>	The milliseconds with leading zeros (000 - 999)
<b>AP</b>	Use AM/PM display. The 'AP' will be replaced by 'AM' or 'PM' as appropriate
<b>ap</b>	Use AM/PM display. The 'ap' will be replaced by 'am' or 'pm' as appropriate

---

# Appendix F. Rivendell Filter

## F.1. Overview

Rivendell\_filter is a script designed to be used to import existing audio and meta-data from another Rivendell system.

## F.2. Usage

```
rivendell_filter {-h hostname} {-u username} {-p password} {-A audio-dir} {-g default-group} {-s start-cartnum} {-e end-cartnum}
```

-h <i>hostname</i>	The MySQL hostname of the source Rivendell database.
-u <i>username</i>	The MySQL username of the source Rivendell database.
-p <i>password</i>	The MySQL password of the source Rivendell database.
-A <i>audio-dir</i>	The path to the directory containing the source Rivendell audio files.
-g <i>default-group</i>	The name of the group in which to place carts belonging to a source Group for which there is no corresponding destination Group.
-s <i>start-cartnum</i>	The first cart in the range of those to be transferred.
-e <i>hostname</i>	The last cart in the range of those to be transferred.

## F.3. Procedure

In order transfer carts from an external Rivendell system, proceed as follows:

### F.3.1. Create Rivendell Groups

In RDAdmin->ManageGroups, create a Group to correspond to each Rivendell Group that exists in the library to be imported, and an additional group to catch any carts that may not have a corresponding Group.

### F.3.2. Locate the External Rivendell Database and Audio Files

The directory containing the audio files can be mounted from a remote system if needs be. Read-only access is adequate (and in fact recommended), as the script does not modify these items in any way.

### F.3.3. Verify Available Disk Space

Verify that enough disk space is available in the '/var/snd/' directory of the destination system to accomodate the audio to be imported. You should have at least the amount of space currently occupied by the source files, plus 5 percent additional.

## F.3.4. Invoke Script

Start up the script, as described in the USAGE section above. The script will print progress reports as it proceeds, or notify you of error conditions as required.

### **Duplicate Cart Numbers**

If a cart from the source system has the same number as the destination, the destination cart (data and *\*all\** audio) will be overwritten!

### **Note on Audio Processing**

Rivendell\_filter does not alter or reencode the audio sample data in any way, and thus does *\*not\** incur any generation or transcoding loss of quality. At the same time, this means that the incoming audio will be brought into the new Rivendell system *\*exactly\** as it exists in the source system, with all parameters (e.g. sample rate, bit rate, level, etc) unaltered. If you need to alter one or more of these parameters as part of the import process, we suggest you use the RDImport script instead.

### **Note on Group Assignments**

Rivendell\_filter makes no attempt to enforce group numbering rules! If a group to which a given source cart belongs exists on the destination system, the cart will be placed in that group, regardless of numbering rules.

---

# Appendix G. Wings Filter

## G.1. Overview

Wings Filter is a script designed to be used to import existing audio and meta-data from an AirForce 'Wings' automation system.

## G.2. Usage

**wings\_filter** {-g *default-group*} {-d *db-file*} {-A *audio-dir*} [-e *audio-ext*]

-g *default-group*      The name of the group in which to place carts belonging to a source tab in Wings for which there is no corresponding destination Group.

-d *db-file*              The path to the Wings database file.

-A *audio-dir*            The path to the directory containing the Wings ATX audio files.

-s *audio-ext*            The filetype extension fo the Wings ATX files. By default, this is 'ATX', but can be changed to other values here if necessary.

## G.3. Procedure

In order import audio from an existing Wings system, proceed as follows:

### G.3.1. Create Rivendell Groups

In RDAAdmin->ManageGroups, create a Group to correspond to each Wings Tab value that exists in the library to be imported, and an additional group to catch any Wings entries that may not have a valid Group. When creating these groups, it is essential that a default cart number range be configured for each group that is large enough to accomodate all anticipated imports.

### G.3.2. Locate the 'Wings' Database and Audio Files

These can be mounted from a remote system if needs be. Read-only access is adequate, as the script does not modify these items in any way.

### G.3.3. Verify Available Disk Space

Verify that enough disk space is available in the '/var/snd/' directory to accomodate the audio to be imported. You should have at least the amount of space currently occupied by the Wings ATX files, plus 5 percent additional.

### G.3.4. Invoke Script

Start up the script, as described in Section G.2, "Usage". The script will print progress reports as it proceeds, or notify you of error conditions as required.

## G.3.5. Clean Up

If desired, use RAdmin->ManageGroups to rename the single-letter import groups to more intuitive names.

### **Note on Audio Processing**

Wings Filter does not alter or reencode the audio sample data in any way, and thus does *\*not\** incur any generation or transcoding loss of quality. At the same time, this means that the incoming audio will be brought into Rivendell *\*exactly\** as it exists in the Wings system, with all parameters (e.g. sample rate, bit rate, level, etc) unaltered. If you need to alter one or more of these parameters as part of the import process, we suggest you use the RDImport script instead.